Side Event 4

Toward new scenario on small pelagic fish spatial population dynamics related on both hydrodynamic and biogeochemical simulations

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Abstract

Small pelagic fish species are keystones species in upwelling ecosystems because they are dominant in biomass and they transfer energy from low trophic levels to top predators. Upwelling ecosystems are often referred to as "wasp-waist" because only a few small pelagic species are present and operate this transfer. The atmospheric variability usually causes high fluctuation in the upwelling intensity, duration and extent. The responses of the small pelagic fish species to this variability is complex. This complexity integrates mainly fish migration, larval retention, predation, competition, fishing, food, oxygen and temperature limitations. A growing number of studies have shown that it is now possible to capture a large part of this complexity with spatially explicit biophysical individual-based models forced with accurate hydrodynamic and biogeochemical simulations of their environment. Applying a systematic sensitivity test to such a model can give important insight into the main drivers of the small pelagic fish biomass variability. Here we describe such a generic model that can be adapted for different small pelagic fish species and geographical areas. It is a full life cycle multi-generational model, which allows us to study age truncation effects, homing behaviour and evolutionary effects. As an illustration, we present results

obtained for the Sardinella aurita population off North-West Africa, the main small pelagic fish species in the region. The hydrodynamic and biogeochemical environment were simulated by the coupled regional models (ROMS-PISCES) in a configuration covering the area 05°-40°N and 05°-30°W, with a ~8 km resolution over three decade (1980-2009). We argue that this approach is well-suited to data poor ecosystems. Indeed, the needs for a new species/area configuration mainly consist in (1) an accurate, *i.e* "validated", inter-annual hydrodynamic and biogeochemical simulations of the environment; (2) specific Dynamic Energy Budget parameters; and (3) simple rules to reproduce fish schools kinematics. The whole provides a new framework to analyse observed fish spatio-temporal distribution and biomass complexity. Such issue can be achieved by confrontation between the different scales and aspect the modeled fish populations and the one found in the observations through the Pattern Oriented Modeling approach.

Keywords: North-West African Upwelling System, small pelagic fish, *Sardinella aurita*, fish migration, inter-annual trends.

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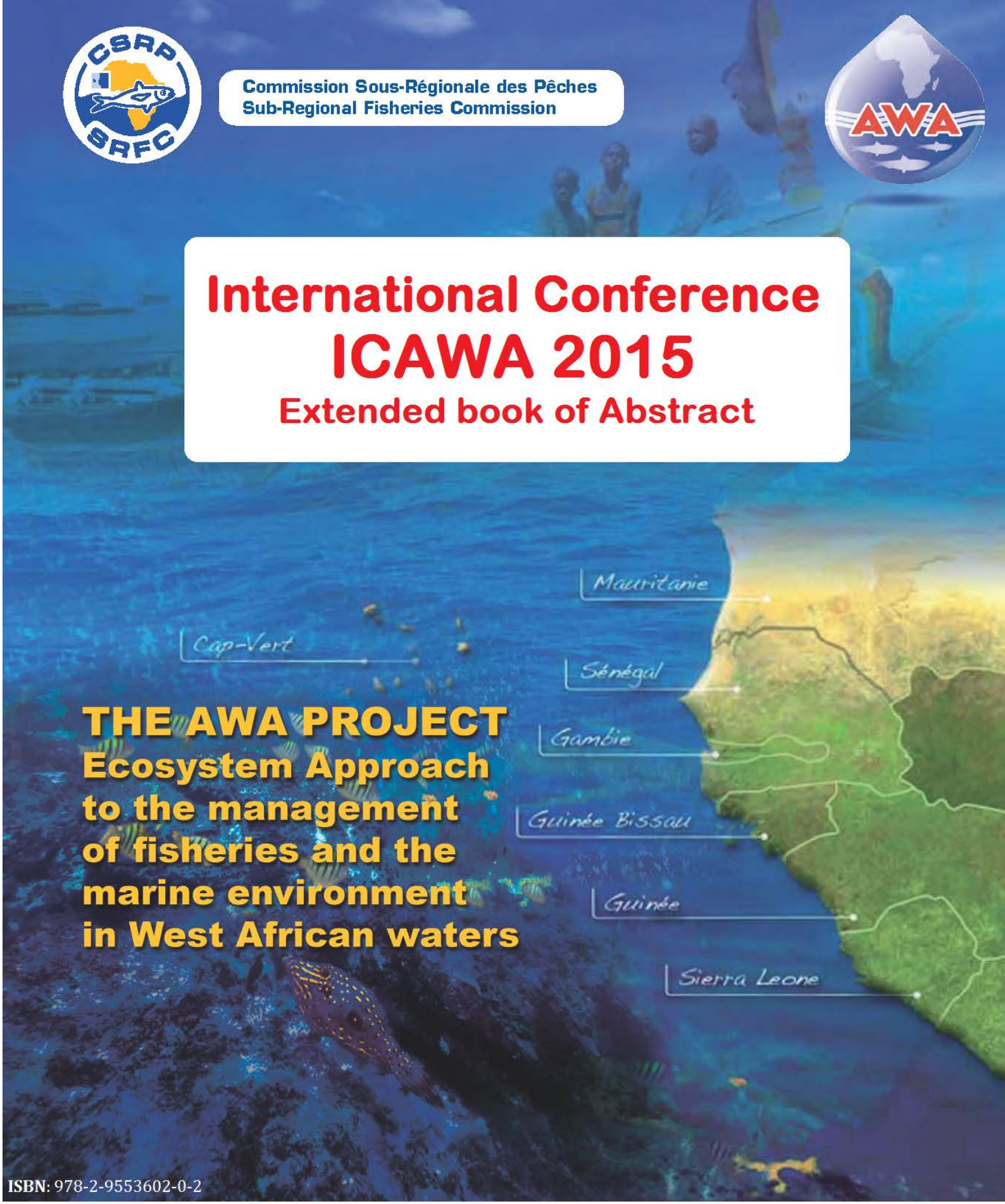

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