



## Effect of climate variability on decadal changes in small pelagic fisheries in the West African upwelling Ecosystem: the case of *Sardinella aurita* in Senegal

**Modou THIAW<sup>1</sup>, Saliou FAYE<sup>1</sup>, Pierre-Amaël AUGER<sup>2</sup>, Timothée BROCHIER<sup>3,1</sup>,  
and Patrice BREHMER<sup>3,1</sup>**

<sup>1</sup>Institut Sénégalais de Recherches agricoles (ISRA), Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), BP 2241, Dakar, Sénégal

<sup>2</sup>Instituto Milenio de Oceanografía and Escuela de Ciencias del Mar, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

<sup>3</sup>Institut de Recherche pour le Développement (IRD), UMR195, BP 1386, Hann, Dakar Sénégal

\*Correspondance: Tél: (221) 77 445 23 91; Courriel: [modouth@hotmail.fr](mailto:modouth@hotmail.fr) (M. THIAW)

Reçu le 13/12/2016; publié le 15/03/2017  
AWA © MS WP2\_S2\_73

### Abstract

In Northwest African upwelling system, the populations of *Sardinella aurita* show evidence of important long-term natural fluctuations in their abundance, which have implications for medium and long-term forecasting of catches. These fluctuations seem to be related, among other factors, to large-scale climatic variability, raising important scientific and economic concerns. Understanding the processes affecting recruitment/abundance is a fundamental objective of fisheries biology. Thus, this study assesses the effect of climatic variability on the abundance of *S. aurita* in Northwest African upwelling system. Monthly data indicating the abundance of sardinella were first estimated from commercial statistics, using Generalized Linear Model techniques over the period 1966-2011. Abundance indices were then compared with environmental indices, at the local scale, a Coastal Upwelling Index (CUI) and a coastal Sea Surface Temperature (SST) index, and on a large scale, the North Atlantic Oscillation (NAO), the Atlantic Multidecadal Oscillation (AMO) and the Multivariate El Niño Southern Oscillation Index (MEI), using time series analyses, linear models and generalized additive models. The results showed that the abundance of sardinella is determined by a strong seasonal pattern and inter-annual fluctuations. The abundance of *S. aurita* peaked in spring and in autumn. The trend of the sardinella abundance was significantly correlated with the CUI, especially in autumn and spring. Interannual fluctuations of *S. aurita* abundance are respectively driven by the precocity and the duration of the upwelling season that is attributed to distinct migration patterns. *Sardinella* species also respond with a delay of around 4 years to the winter NAO index and the autumn CUI, and the AMO index respectively, either related to migration patterns. The wide variations in sardinella biomass are caused by variations in environmental



conditions, which should be considered in the implementation of an ecosystem-based approach in sardinella stocks management.

**Keywords:** climatic change, small-scale fisheries, North-West Africa, sardinella.



Commission Sous-Régionale des Pêches  
Sub-Regional Fisheries Commission



# International Conference ICAWA 2016

Extended book of Abstract

**THE AWA PROJECT**  
Ecosystem Approach  
to the management  
of fisheries and the  
marine environment  
in West African waters

Cap-Vert

Mauritanie

Sénégal

Gambie

Guinée BISSAU

Guinée

Sierra Leone

ISBN: 978-2-9553602-0-5



Bundesministerium  
für Bildung  
und Forschung



Institut de Recherche  
pour le Développement  
FRANCE



Liberté • Égalité • Fraternité  
RÉPUBLIQUE FRANÇAISE

Trilateral German-French-African research initiative

---

**EDITED BY:**

Patrice BREHMER (IRD-France; Dakar), Babacar BA (CSRP, Sub-Region; Banjul) & Gerd KRAUS (TI, Germany; Hamburg).

**TECHNICAL SUPPORT:** Marie Madeleine GOMEZ (CSRP), Ndague DIOGOUL (IRD-UCAD).

**WITH THE COLLABORATION OF:**

Bamol Ali SOW , Alban LAZAR, Heino FOCK, Xavier CAPET, Aka Marcel KOUASSI, Idrissa Lamine BAMY, Osvaldina SILVA, Eric MACHU, Vamara KONE, Moustapha DEME, Didier JOUFFRE, Joern SCHIMDT, Modou THIAW, Suzanne TRAORE, Abdoulaye DIOP, Justine DOSSA, Didier JOUFFRE, Ibrahima DIALLO, Arnaud COMOLET, Zacharie SOHOU, Hamet DIADHOU, Célestin BLE, Rafael ALMAR, Moussa SALL, Abou BAMBA, Dano J.A. ROELVINK, Ibrahima LY, Marie BONNIN , Dienaba Beye TRAORE, Adama MBAYE, Hassane Dedah FALL, Mohamed M'barek O. SOUEILIM.

---

**ISBN:** 978-2-9553602-0-5

Sub Regional Fisheries Commission / Commission Sous Régionale des Pêches ©2017

**COVER DESIGN:** AWA (BMBF – IRD) project

**LOGO AND FLYERS:** Laurent CORSINI (IRD)

**TRANSLATION:** Amadou NDIONE (independent)

---

**SPONSORS ICAWA 2016**

