



## Winter/spring or summer? Upwelling driven spawning in the Canary Current Ecosystem validated through generalized additive models

Maik TIEDEMANN<sup>1,\*</sup>, Heino FOCK<sup>1</sup>, Luc Bonaventure BADJI<sup>2</sup> and Patrice BREHMER<sup>3,4</sup>

<sup>1</sup>Thünen-Institute for Sea Fisheries (TI), Federal Research Institute for Rural Areas, Forestry and Fisheries (FRIRAFF), Palmaille 9, 22767 Hamburg, Germany

<sup>2</sup>Université Cheikh Anta Diop de Dakar (UCAD), Institut Fondamental d'Afrique Noire (IFAN), BP 5005 Dakar, Senegal

<sup>3</sup>Institut de Recherche pour le Développement (IRD), UMR 195 Lemar, BP 1386, Dakar, Sénégal

<sup>4</sup>Institut Sénégalais de Recherches Agricoles (ISRA)/Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), BP 2241, Dakar, Senegal

\*Correspondance: Tél: (+49) 178 7286029; Courriel: [maik.tiedemann@ti.bund.de](mailto:maik.tiedemann@ti.bund.de) (M. TIEDEMANN)

Reçu le 15/10/2015; publié le 15/05/2016

AWA © MS WP2\_S2\_21

### Abstract

Reproduction of fish species is dependent on species specific environmental conditions in the Canary Current Large Marine Ecosystem (CCLME). Especially upwelling intensity is suggested to impact spawning time and location. Upwelling intensity drastically decreases from winter/spring to summer in the Senegalese - Mauritanian coastal area, the southern part of the CCLME. While in winter - spring trade winds from the high pressure system of the Azores induce a permanent upwelling, in summer monsoon winds induce a northward warm Guinean water influx in the Senegalese - Mauritanian coastal area weakening upwelling intensity. Larval fish distribution patterns obtained from three research cruises (FRV Thalassa and FRV Walther Herwig III in winter/spring 2014 and 2015 as well as FRV Walther Herwig III in summer 2014) reveal their relationship to different upwelling intensities according to an upwelling index based on sea surface temperature between 22.5° - 13°N latitude. Generalized additive models (GAMs) were used to model larval fish abundance data with environmental factors like upwelling index, sea surface temperature, sea surface salinity, bottom depth and location (longitude + latitude). GAMs validated observations from species like round sardinella (*Sardinella aurita*) and white-spotted lantern fish (*Diaphus rafinesquii*) avoiding winter and spring to spawn in the Western Sahara - Banc d'Arguin region, where cold and strong upwelling conditions prevail.

**Keywords:** CCLME, spawning, larval fish distribution, GAM, *Sardinella aurita*, *Diaphus rafinesquii*.



Commission Sous-Régionale des Pêches  
Sub-Regional Fisheries Commission



# International Conference ICAWA 2015

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: 978-2-9553602-0-2



Bundesministerium  
für Bildung  
und Forschung



Institut de recherche  
pour le développement



Liberté • Égalité • Fraternité  
RÉPUBLIQUE FRANÇAISE  
Ministère des Affaires étrangères  
et du Développement International  
Ministère de l'Enseignement  
Supérieur et de la Recherche

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).

**With the collaboration of:**

Peter BRANDT, Bamol Ali SOW, Alban LAZAR, Xavier CAPET, Heino FOCK, Eric MACHU, Hamet Diaw DIADIHO, Didier JOUFFRE, Ibrahima DIALLO, Joern SCHMIDT, Werner EKAU, Amadou GAYE, Mahfoudhould TALEB SIDI, Modou THIAW, Cl Abdoulaye DIOP, Adama MBAYE, Dienaba Beye TRAORE, Moussa SALL, Mariline DIARA, Assane FALL, Ibrahima LY, Ivanice MONTEIRO, Vamara KONE, Aboubacar TOGUYENI, Marie BONNIN, Abdelmalek FARAJ.

---

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

Sub Regional Fisheries Commission / Commission Sous Régionale des Pêches ©2016

**Cover design:** AWA (BMBF – IRD) project

**Logo and flyers:** Laurent CORSINI (IRD)

**Translation:** Amadou NDIONE (independent)

---

**Sponsors ICAWA 2015:**

