



# **Canary Current Large Marine Ecosystem Project**

"Response of pelagic Species to Climate  
Change in the Canary Current LME"



# Project information

- The preparatory (pdf-b) phase of the project: 2004-2006
- Implementation of the full phase started 1 April 2010
- FAO and UNEP act as GEF agencies
- GEF allocation: USD 8,790,000
- 7 participating countries in West Africa
- RCU in Dakar, Senegal



# CCLME project goal:

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“To reverse the degradation of the  
Canary Current Large Marine Ecosystem  
caused by over-fishing, habitat modification  
and changes in water quality  
by adoption of an ecosystem approach”



# CCLME project goal:

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## **The project consists of three components**

“Process”

“Marine Living Resources” and

“Biodiversity, Habitat and Water Quality”

## **To support TDA/SAP formulation:**

8 working groups will be consulted (six of them established by the CCLME project); and

5 demonstration projects will be implemented



## Working group climate change

### *Members:*

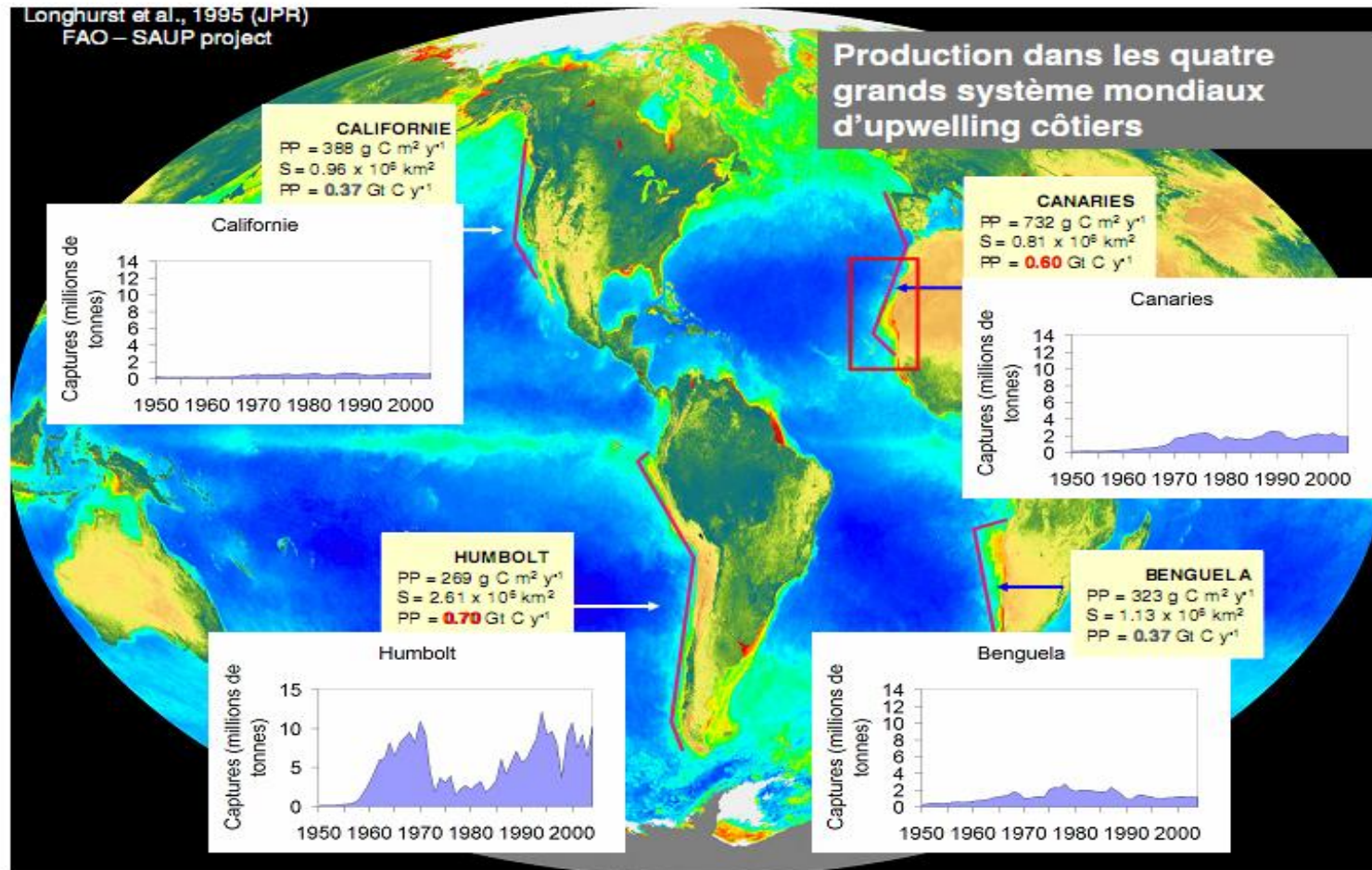
Designated country participants

Key experts identified by the RCU

CCLME partners can also nominate representatives to participate (self-sponsored)



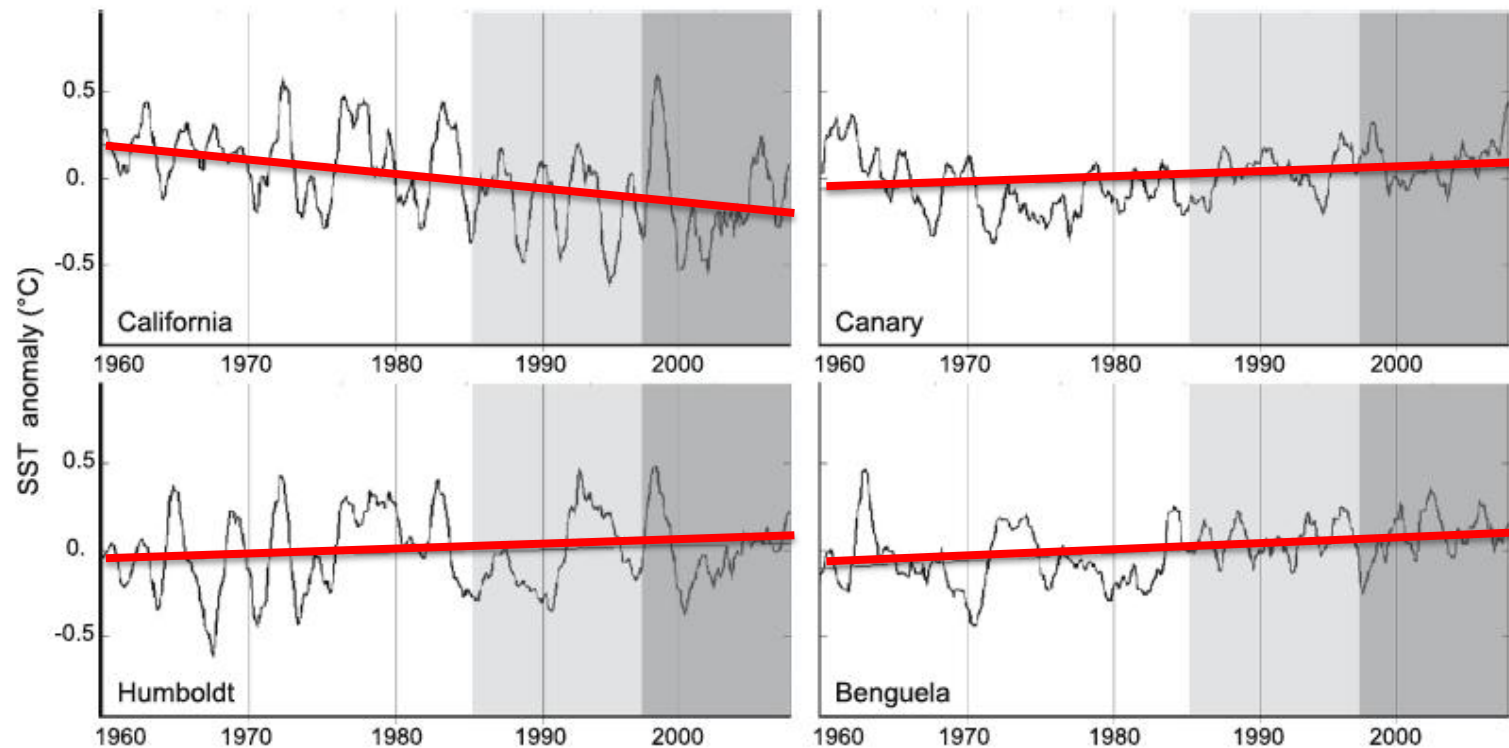
*The Canary Current large marine ecosystem constitutes one of the four main eastern boundary upwelling ecosystems of the world, thus hosting high productivity and fisheries.*



# Temperature trends (1960-2007)

*Preface/Progress in Oceanography 83 (2009) 1–14*

11



**Fig. 4.** Same as Fig. 3 for the EBUes continental margins (California 15°N–45°N; Canary 10°–43°N; Humboldt 40°S–5°S; Benguela 33°–12°S). Major El Niño events are indicated by vertical arrows (courtesy of H. Demarcq, IRD, France).

(Freon et al.)



# The impact of the upwelling in NW Africa

- exceptional very high primary and secondary productivity (Cury and Roy, 1989; Binet, 1997; Demarcq and Faure, 2000).
- The productivity sustains a large variety of small pelagic species
- significant variability in the biomass of small pelagic species and their distribution



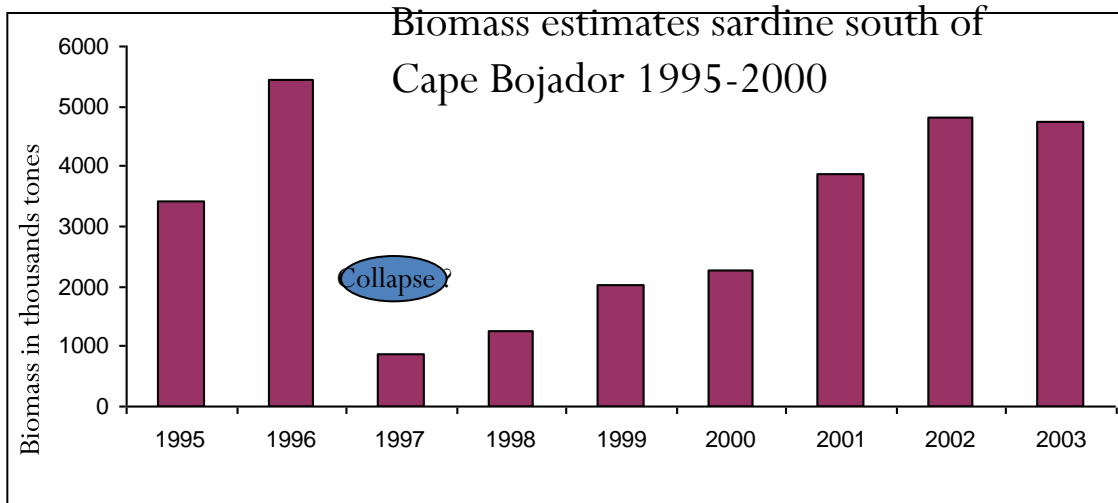
The diagram illustrates the cascading effects of Global Warming on the ocean ecosystem. It features a central 3D blue block representing the ocean, with various components and their interactions labeled around it.

- Global Warming** (in a red box) is the central driver, with arrows pointing to several key changes:
  - Change in Wind Stress**: Indicated by a large grey arrow at the top.
  - Change in Ocean Circulation**: Indicated by a curved arrow at the top right.
  - Change in Shortwave Radiation**: Indicated by a curved arrow at the top right.
  - Change in Precipitation & Evaporation**: Indicated by a cloud icon on the left.
  - Change in Fish Resources**: Indicated by a fish icon on the top surface of the block.
  - Decrease in Zoo. Biomass**: Indicated by a curved arrow pointing to a small brown circle on the right.
  - Shift in the Dominant Zooplankton Group**: Indicated by a curved arrow pointing to a small brown circle on the right.
  - Decrease in Phy. Biomass**: Indicated by a curved arrow pointing to a small green circle on the right.
  - Shift in the Dominant Phytoplankton Group**: Indicated by a curved arrow pointing to a small green circle on the right.
  - Large (Diatom) → Small (Coccolith.)**: A specific shift in phytoplankton, with a reference to *Watanabe et al., 2003, 2004*.
  - Decrease in Nutrient Supply**: Indicated by a curved arrow pointing to a small green circle on the right.
  - Decrease in Winter Mixing**: Indicated by a curved arrow pointing to a small green circle on the right.
  - Decrease in  $\text{CaCO}_3$  Producer by the Lower PH**: Indicated by a curved arrow pointing to a small green circle on the right.
- Ocean Acidification**: Indicated by a curved arrow pointing to a small green circle on the right.
- Decrease in  $\text{CaCO}_3$  Producer by the Lower PH**: Indicated by a curved arrow pointing to a small green circle on the right.
- Decrease in Stratification**: Indicated by a curved arrow pointing to a small green circle on the right.
- Decrease in Temperature**: Indicated by a curved arrow pointing to a small green circle on the right.
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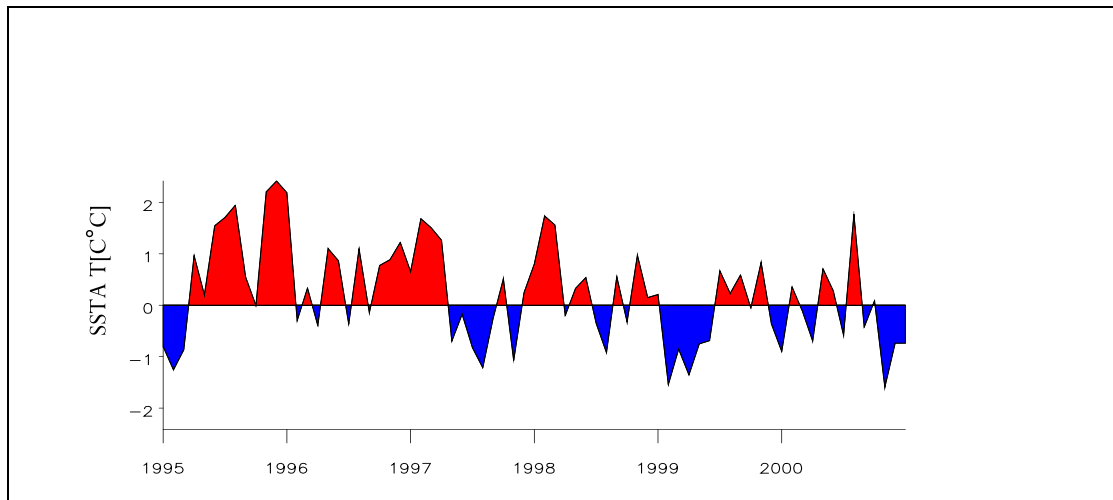
From F. Werner NOAA

During the past ten years, three major events occurred in the area and are according to all (scientists and policy makers) related to the impacts of climate change

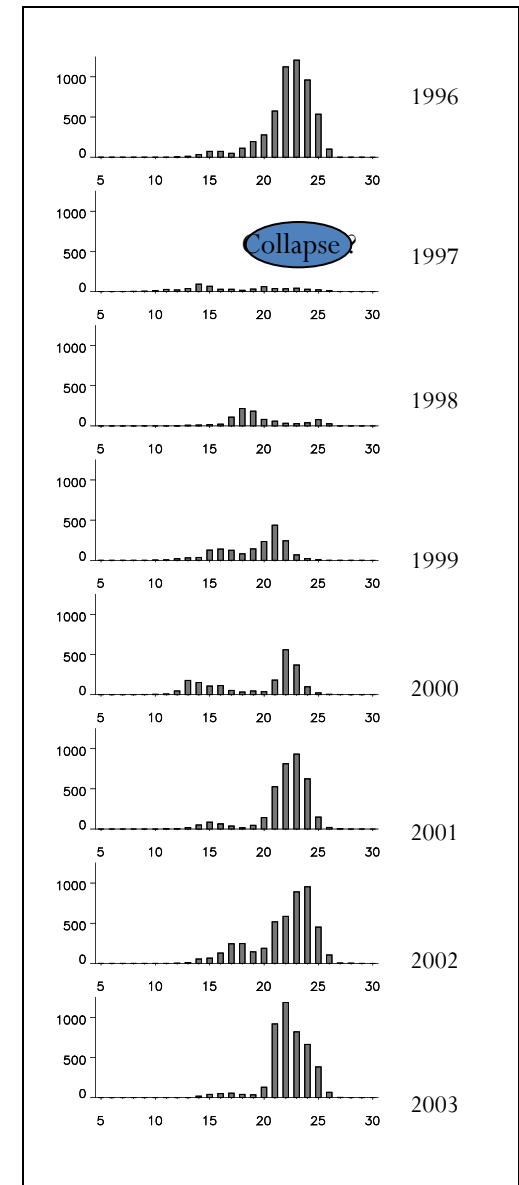
- Sardine Stock collapse as natural event (1997)
- Migrating sardinella to the North
- Important decline of sardine stock in 2006 (Fish with lesions common in 2005)



The biomass estimates of Sardine between 16° and 29° N from acoustic surveys with R/V Dr. Fridtjof Nansen during November 1995-2003.



The evolution of SST anomaly off Cape Blanc (20° 50'N, 17° 30'W), 1995-2000



Biomass of sardine by length classes  
(Length in centimeters)

Thank you for your attention

