

NansClim



Climate effects on biodiversity,  
abundance and distribution of  
marine organisms

A PROJECT FUNDED BY NORAD

## *Co-operation between*



- National Institute of Fisheries Research (INIP), Angola
- The national information and research centre (NatMIRC), Namibia
- Department of Agriculture, Forestry and Fisheries (DAFF) and Department of Environmental Affairs (DEA) in Cape Town, South Africa
- Institute of Marine Research (IMR), Norway

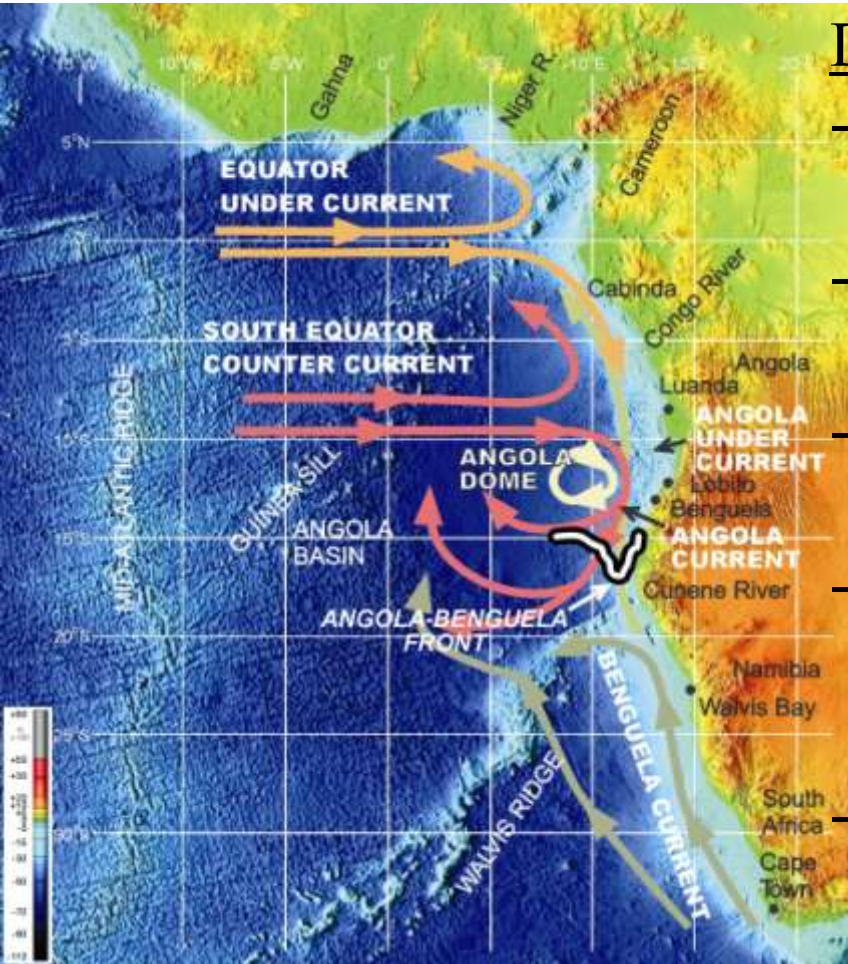


# Goal

- **Identify and describe possible trends in ocean climate and corresponding changes in marine biodiversity and fisheries in the Benguela current system, using data collected through the “Nansen programme” together with relevant local data**



# Data from Dr. Fridtjof Nansen + local data



## Data and what information they give;

- Environmental factors; temperature, salinity, oxygen
- Biodiversity; fish, plankton and benthic species,
- Distribution; species and length groups, environmental
- Vulnerable areas; spawning areas, coral reefs, high biodiversity, low oxygen
- Available resources; growth and abundance of commercial species



# Expected outcome

- a better understanding of the effects of climate change and **variability** on the marine ecosystem in the Benguela region
- future scenarios of climate effects on marine resources
- strengthened regional cooperation
- **regional competence building** on ecosystem effects of climate change
- increased public awareness of climate change in relation to fisheries and marine environment
- possible implications of climate change on fisheries and other marine activities



# Key Questions;

- are there any identifiable ecosystem changes as a result of climate change?
- how will the distribution and abundance of marine species and communities alter with climate change?
- which species are candidate indicators for climate change impacts?
- where are sensitive areas or hotspots of change?
- How will ocean productivity alter with climate change?



# NansClim last meeting - BCC annual science forum, October 2012



*4<sup>th</sup>* Annual  
Science  
Forum

of the  
Benguela Current Commission

15-18 October 2012  
Safari Court Hotel  
Windhoek, Namibia

Benguela  
CURRENT COMMISSION



# NansClim publications

- 6 papers so far
- 15 – 20 papers expected i 2013
- Special volume i Fisheries Oceanography
- Synthesis of the project i 2013

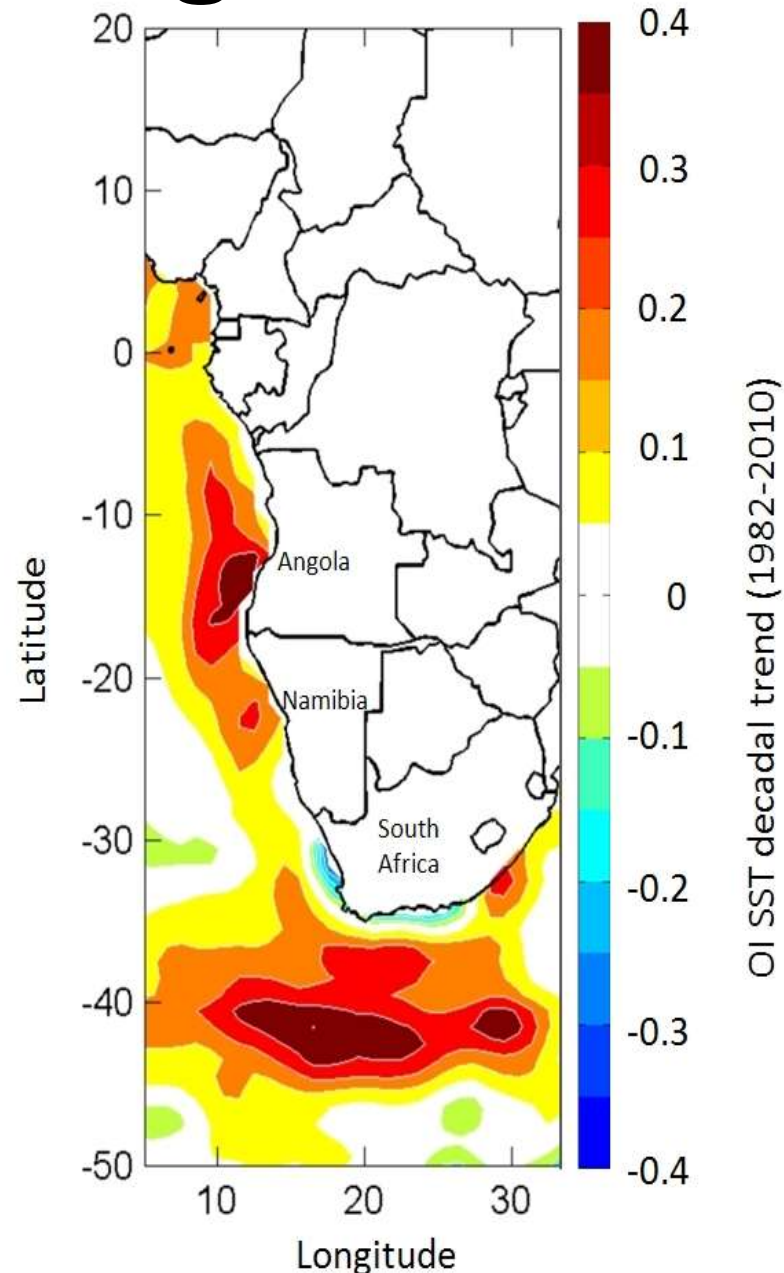


# Some results;



# Oceanografi

- General increase in temperature, BUT
- Different processes within the Benguela LME
- The fig shows changes in temp (1982-2010);
  - Red = increase in temp
  - Blue = decrease in temp
  - White, yellow and green = small changes in temperature



Mathieu Rouault (pers. comm)



## Angola Current - across the north and central Angolan shelf

- driven by seasonality, external drivers
- tropical Atlantic influences
- low productivity
- poleward flow

## Angola Benguela Front

- separates the two systems
- large seasonal & inter annual variability

## The north and central Namibian shelf:

- carbon – rich and oxygen-poor
- cold upwelling system, local drivers (wind)
- equator-ward flow

## •The Luderitz-Orange river cone area:

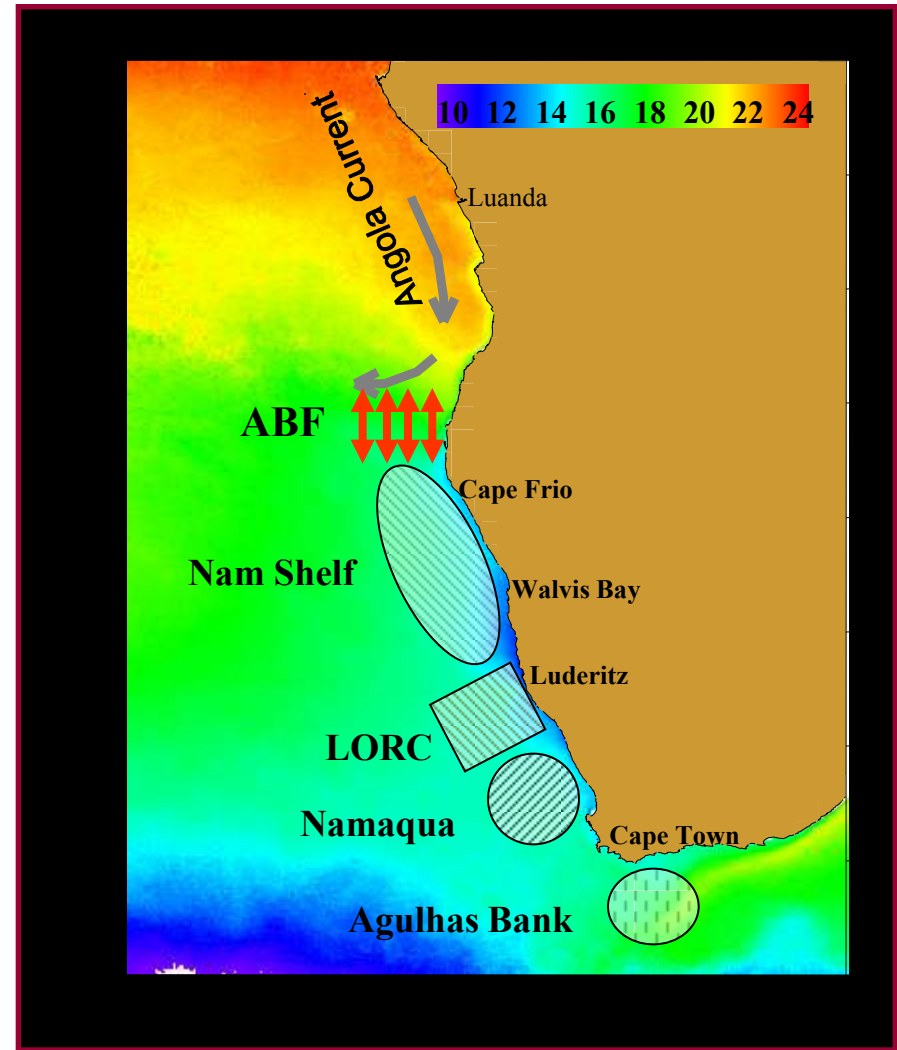
- turbulence and offshore advection predominate
- upwelling source water changes.

## The Namaqua shelf

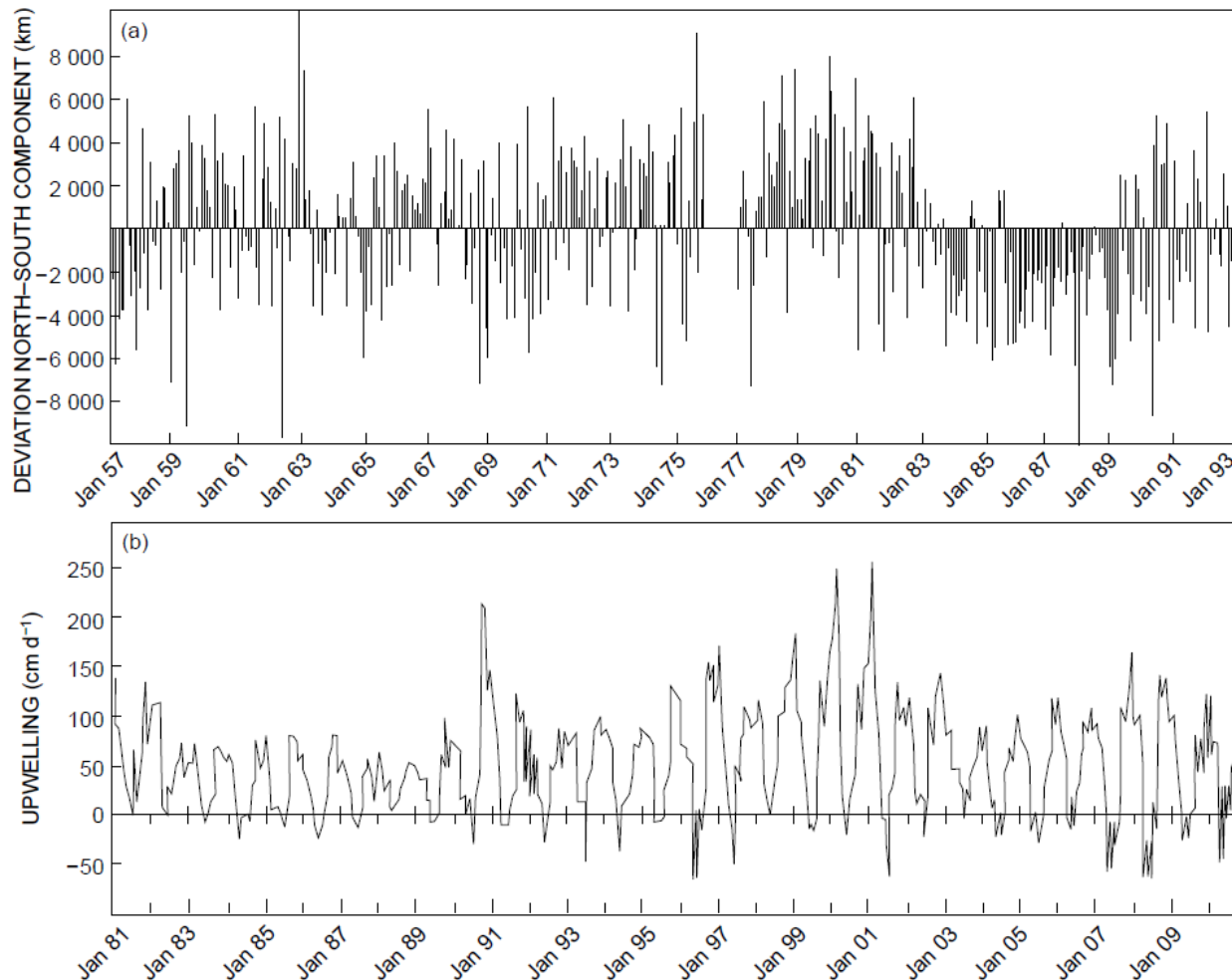
- rich in carbon and oxygen except close inshore

## Agulhas Bank

- The Agulhas Bank, driven by seasonality - linked by resource life histories to the Benguela upwelling system

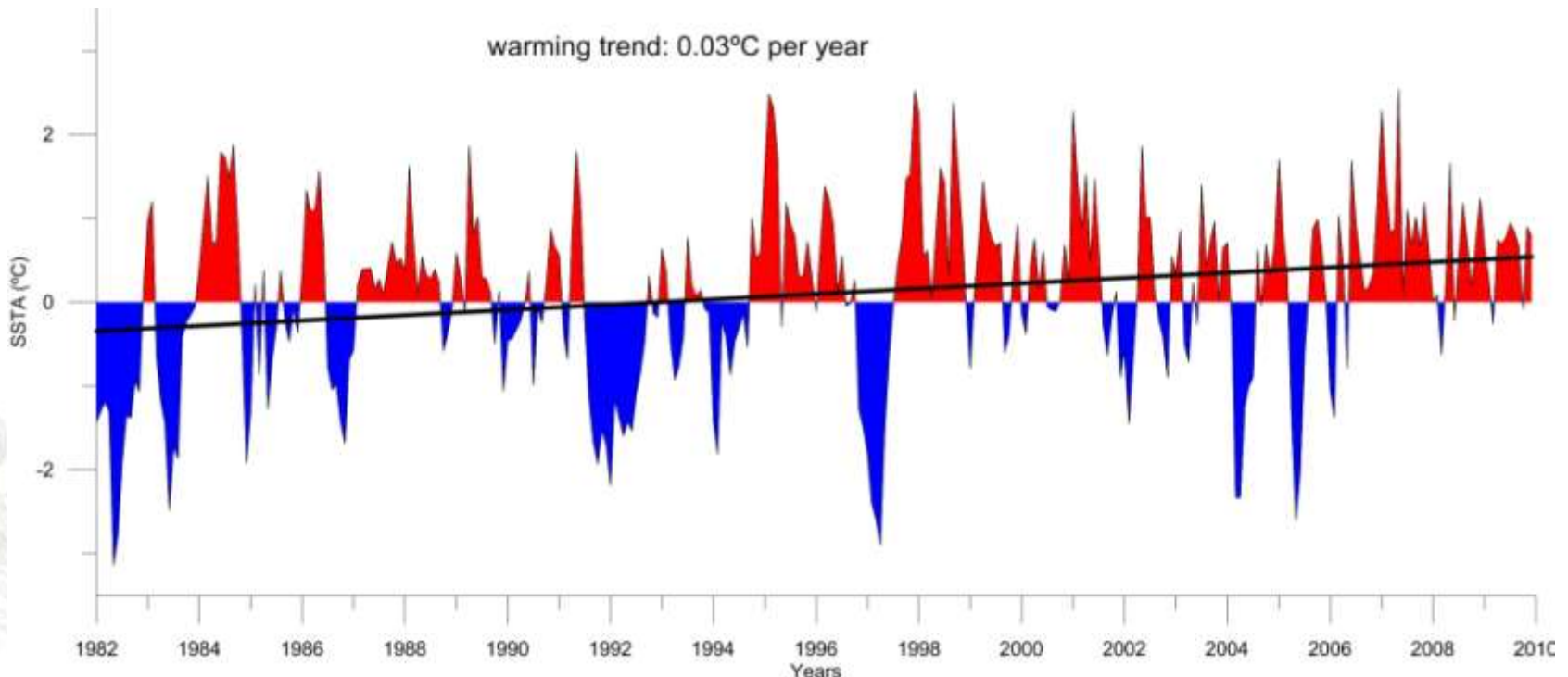


- **St Helena Bay (southern Benguela)**
  - Annual variation in wind pattern upwelling
  - No trend=> affected by top-down factors (fishing)



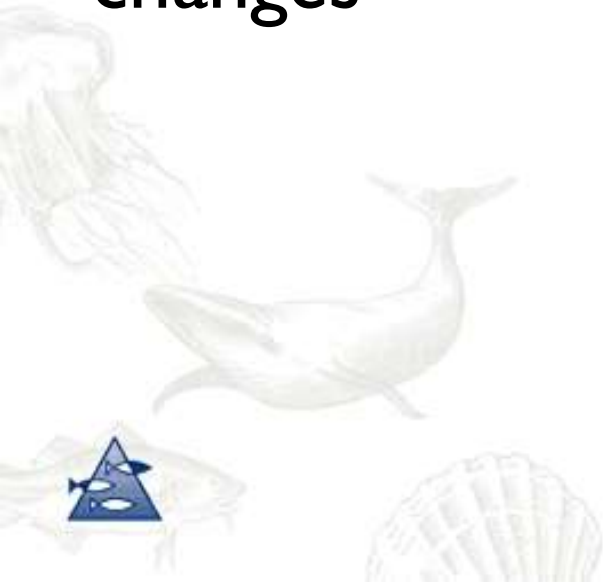
**Figure 2:** Wind characteristics for Cape Columbine 1957–2010: (a) monthly north–south wind anomalies, 1957–1993 (updated from Shannon et al. 1992; note no data for 1976); (b) mean monthly Ekman upwelling, 1981–2010, based on sea level pressure differences and calculated geostrophic winds during that period (DEA 2011). Note low southerly winds between 1982 and 1989/1990 and low upwelling

- Angola: increased temperature, clear trend



SST anomaly angola – Sea surface temperature anomaly (deviation from the seasonal cycle) 1982-2010. Data obtained from the Pathfinder SST time series (v 5.0). Data extracted for the first 25 km from the coast along the entire tropical Angolan coast, from 6 30 to 11 30 S.

- Shifts in fish distribution observed
- Generally smaller bodied fish (suggesting more rapid life cycles) tended to be more responsive
- Results of the study highlight the complex nature of the response of fish populations to climate or other changes



- A sustained increase in depth of fish populations in BCLME will have ecological (via trophic interactions) and economic consequences (increased fishing cost to the fishing industry).
- Currently, there is a lack of complete policy document to address socio-economic, conservation and biodiversity consequences of climate-related changes in BCLME and consequences for supported fisheries (i.e. cases study from Kenya and the skipjack study)
- Vulnerability of various components of ecosystem (and supported economic sectors) to climate change and related phenomena need to be assessed, and potential adaptation strategies need to be formalised

