



Climate Change in the Benguela Current LME and the Benguela Current Commission

By

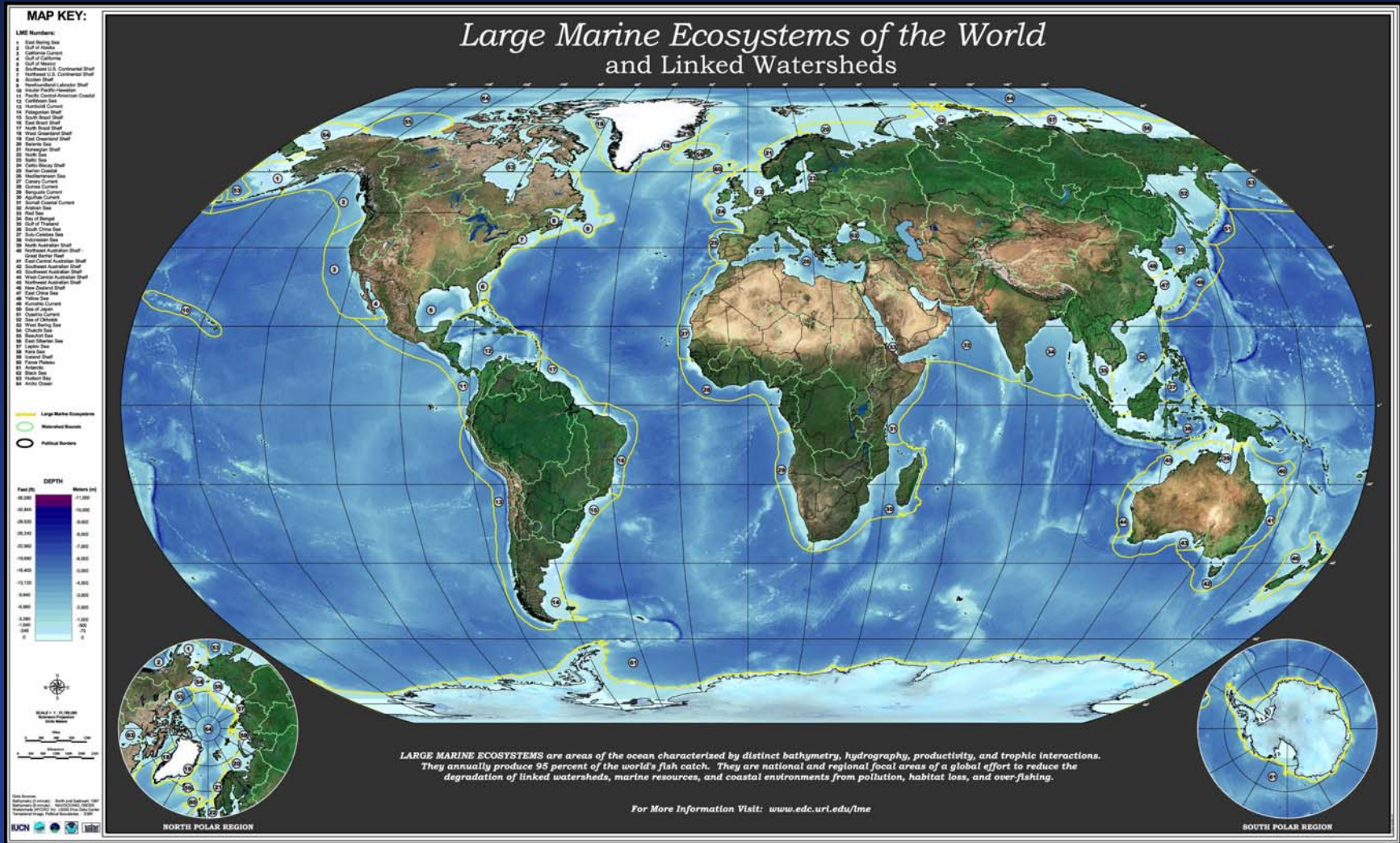
Michael J. O'Toole

Chief Technical Advisor

IOC-IUCN-NOAA-UNEP Large Marine Ecosystem

8th Consultative Committee Meeting, 3-4 July 2006, Paris, France

LARGE MARINE ECOSYSTEMS OF THE WORLD



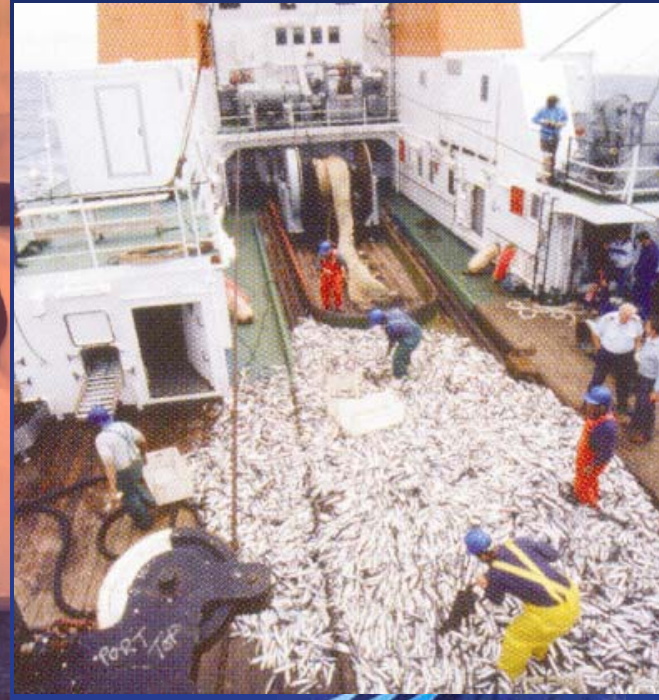
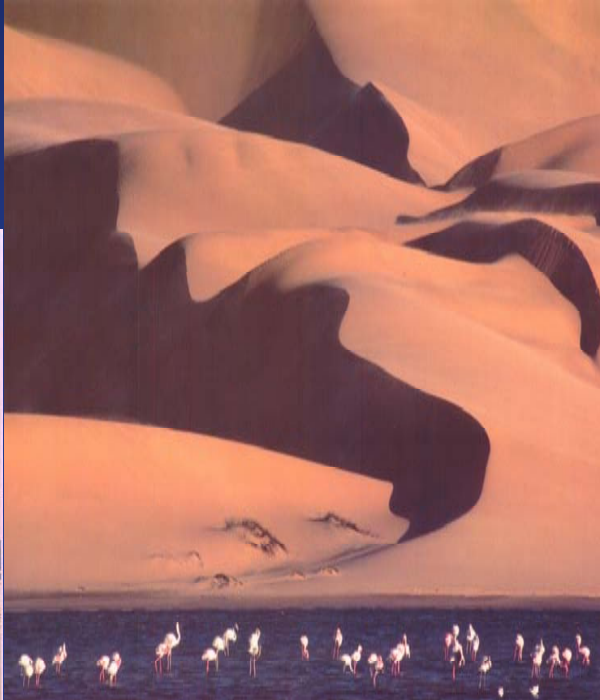
Benguela Current LME Programme

- Countries: Angola, Namibia and South Africa
- Duration: 2002 - 2007
- Implementing agency: UNDP
- Executing agency: UNOPS
- GEF: US\$ 15,000,000.00
- In-kind: US\$ 18,000,000.00



MARINE RESOURCE UTILISATION

- Commercial fisheries
- Artisanal fisheries
- Diamond mining
- Offshore oil and gas
- Recreational fisheries
- Nature-based tourism



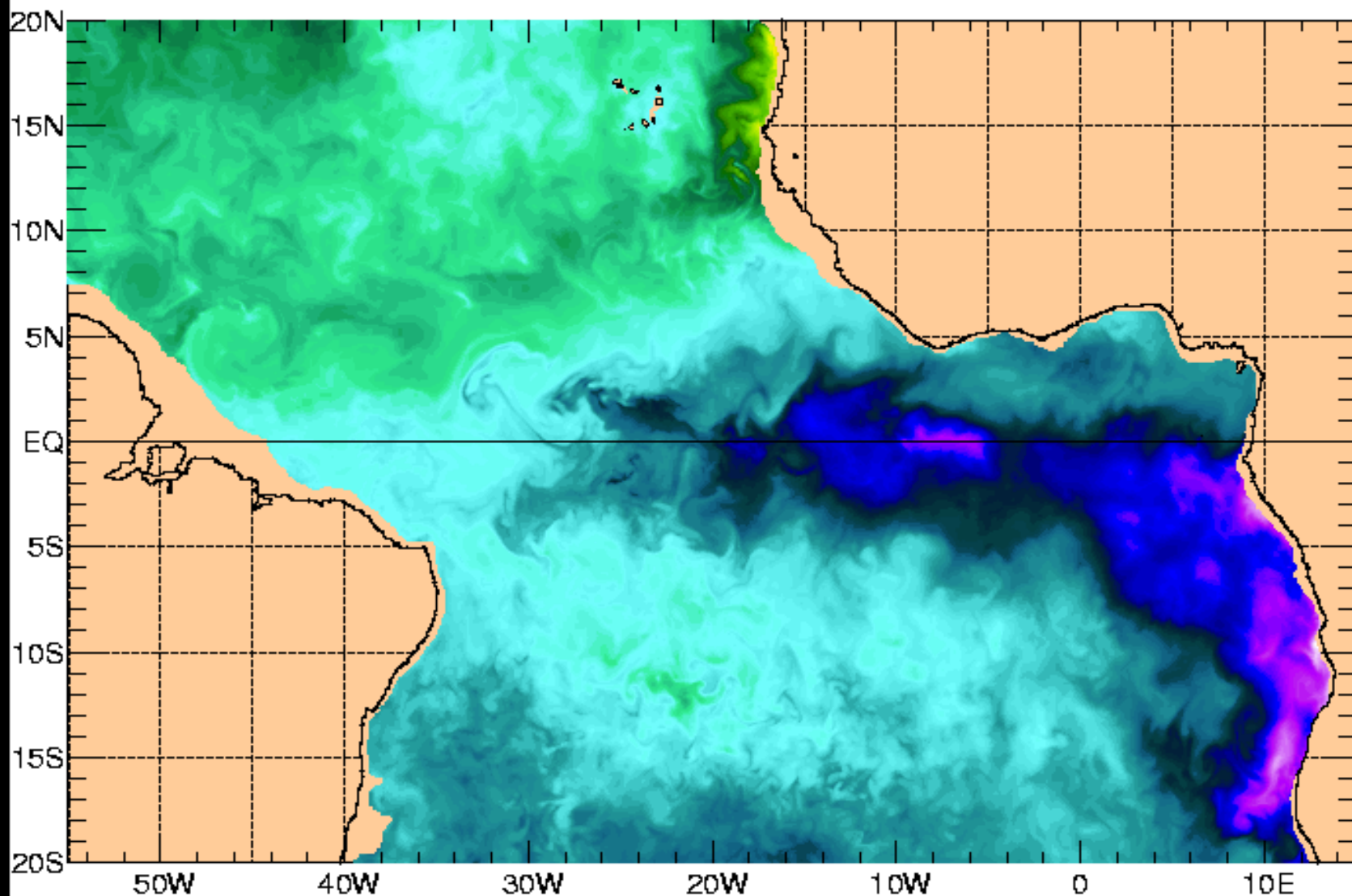
EXTREME EVENTS

Benguela Nino's
Harmful Algal Blooms
Low oxygen
Sulphur eruptions



UNCLASSIFIED: 1/16° Global NLOM

SST ANOMALY 720 HR FCST VALID: 20050715



Cl = 0.125 °C,

-5.75 -4.25 -2.75 -1.25 0.25 1.75 3.25 4.75 6.25

NAVAL OCEANOGRAPHIC OFFICE

Approved for public release. Distribution unlimited.



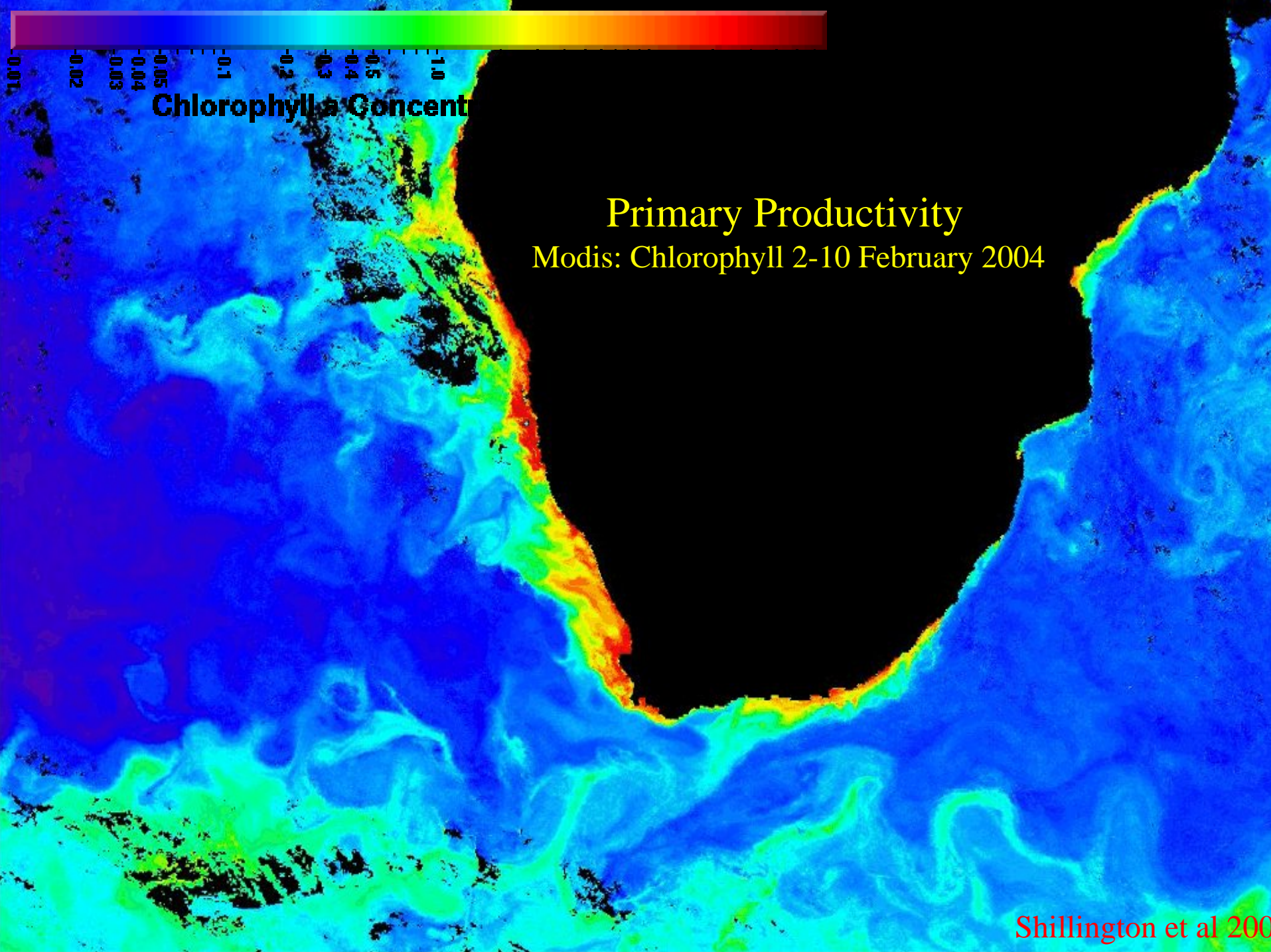
ENVIRONMENTAL VARIABILITY

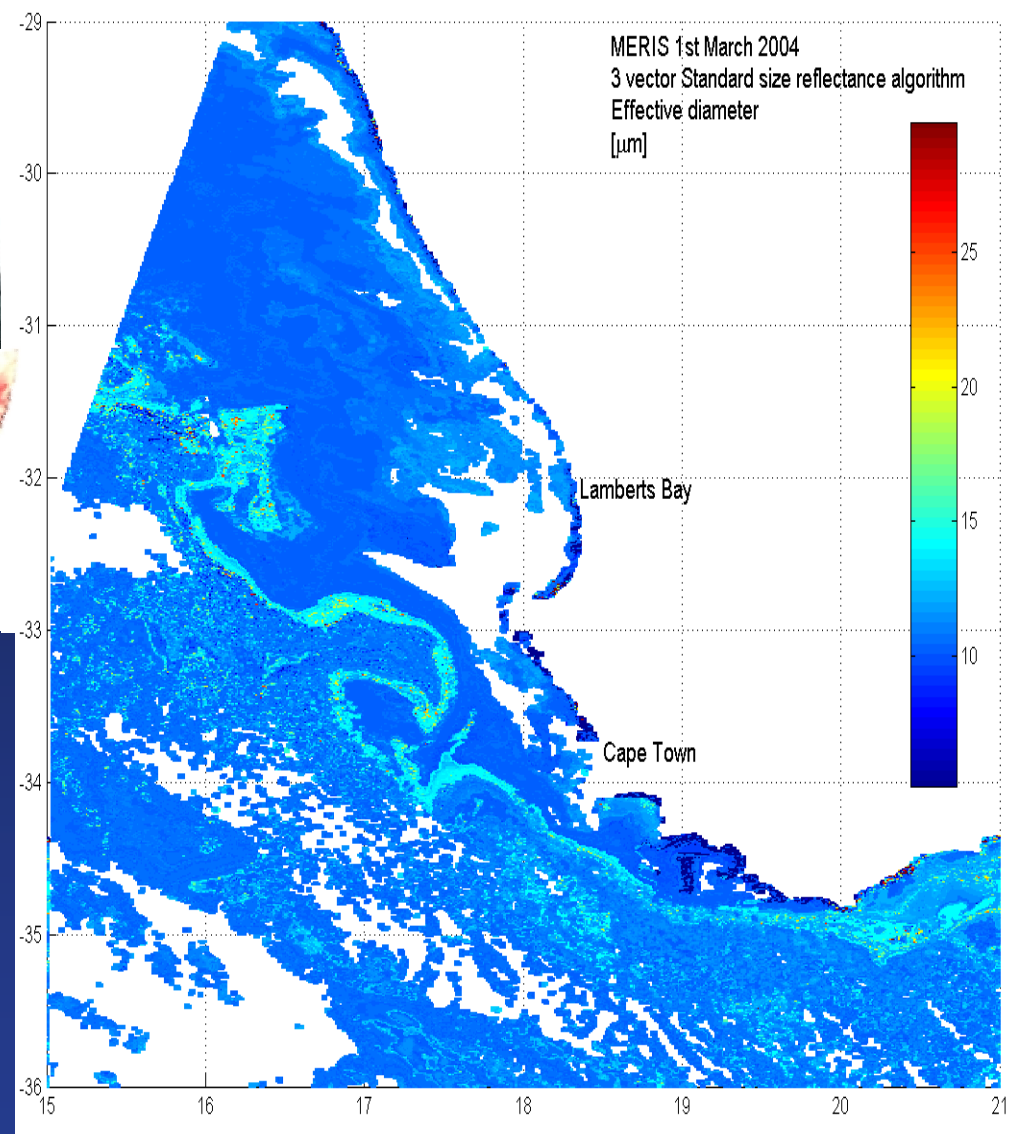
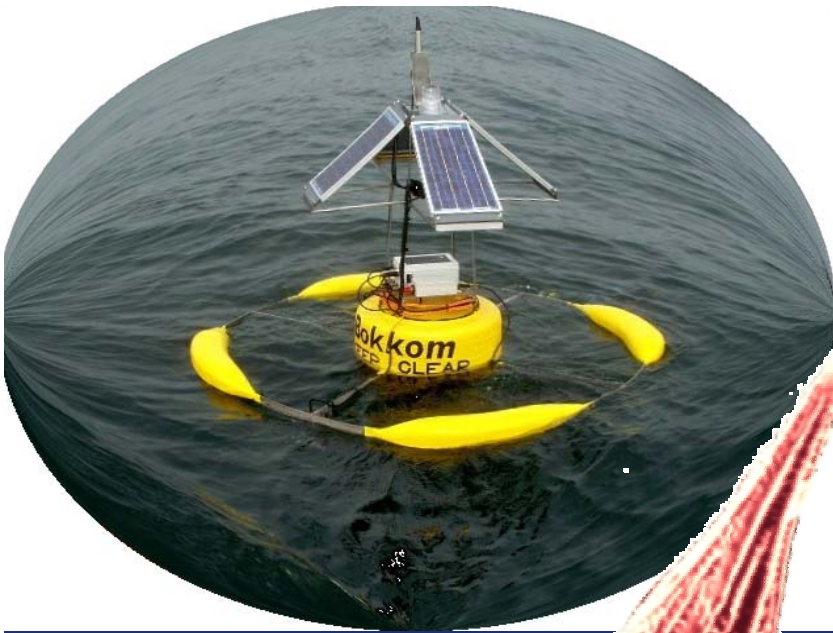
- Develop early warning system
- Improve predictability of extreme events
- Establish baseline data
- Monitor harmful algal blooms
- Assess links to climate change

MARINE BIODIVERSITY

- Map vulnerable species / habitats
- Assess alien species –ballast water
- Conserve marine biological biodiversity
- Establish marine protected areas





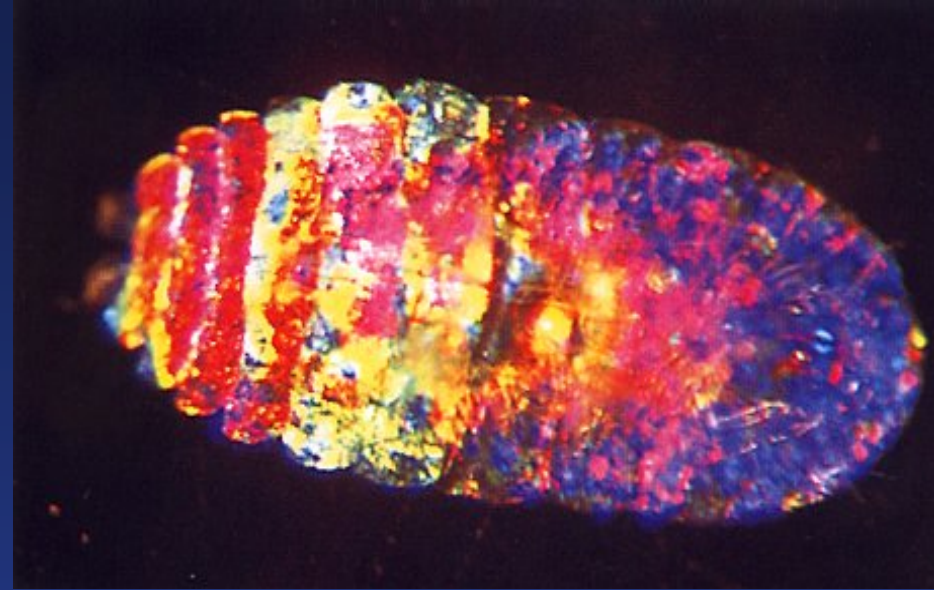
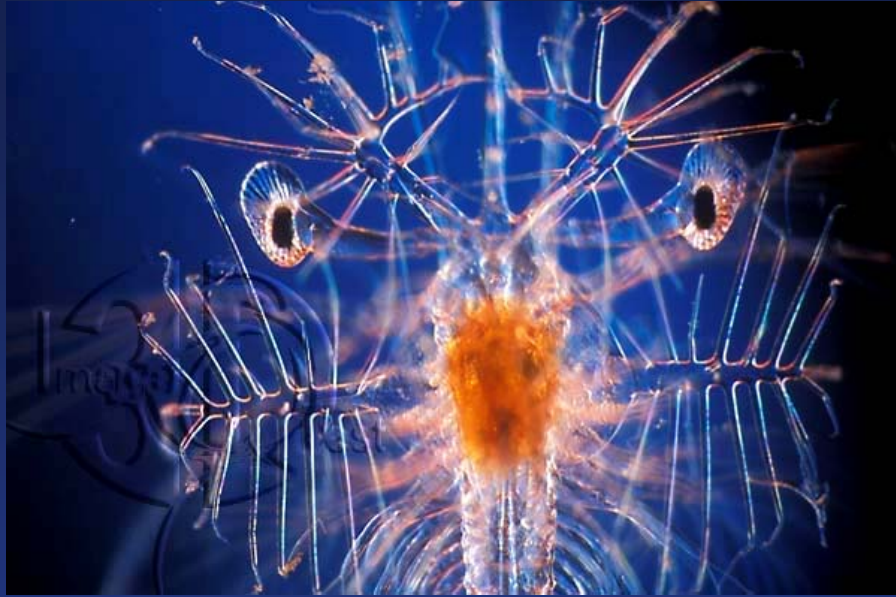


Harmful Algal Bloom Observation Systems in the southern Benguela – Real time monitoring – BCLME Project



Benguela Plankton

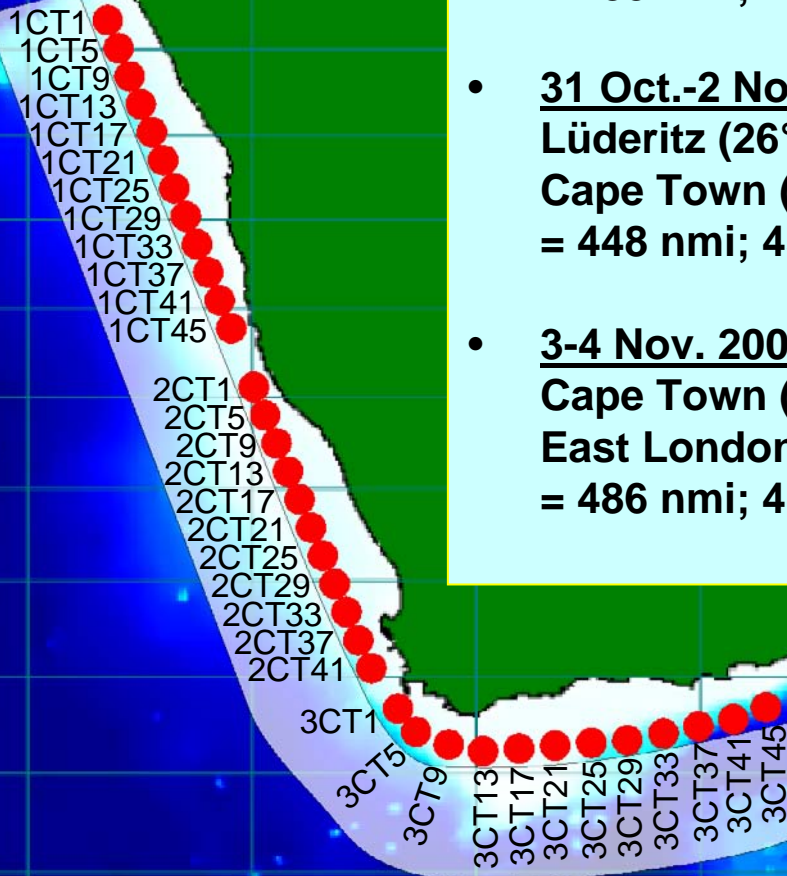
Environmental Status Indicators



- Regional monitoring lines for zooplankton off South Africa, Namibia and Angola
- Continuous Plankton Recorder /Aquashuttle
...deployed in region
- Training (NOAA /Southampton Oceanography)

3 CPR tows between Cape Frio and East London
Total distance covered: 1 422 nmi

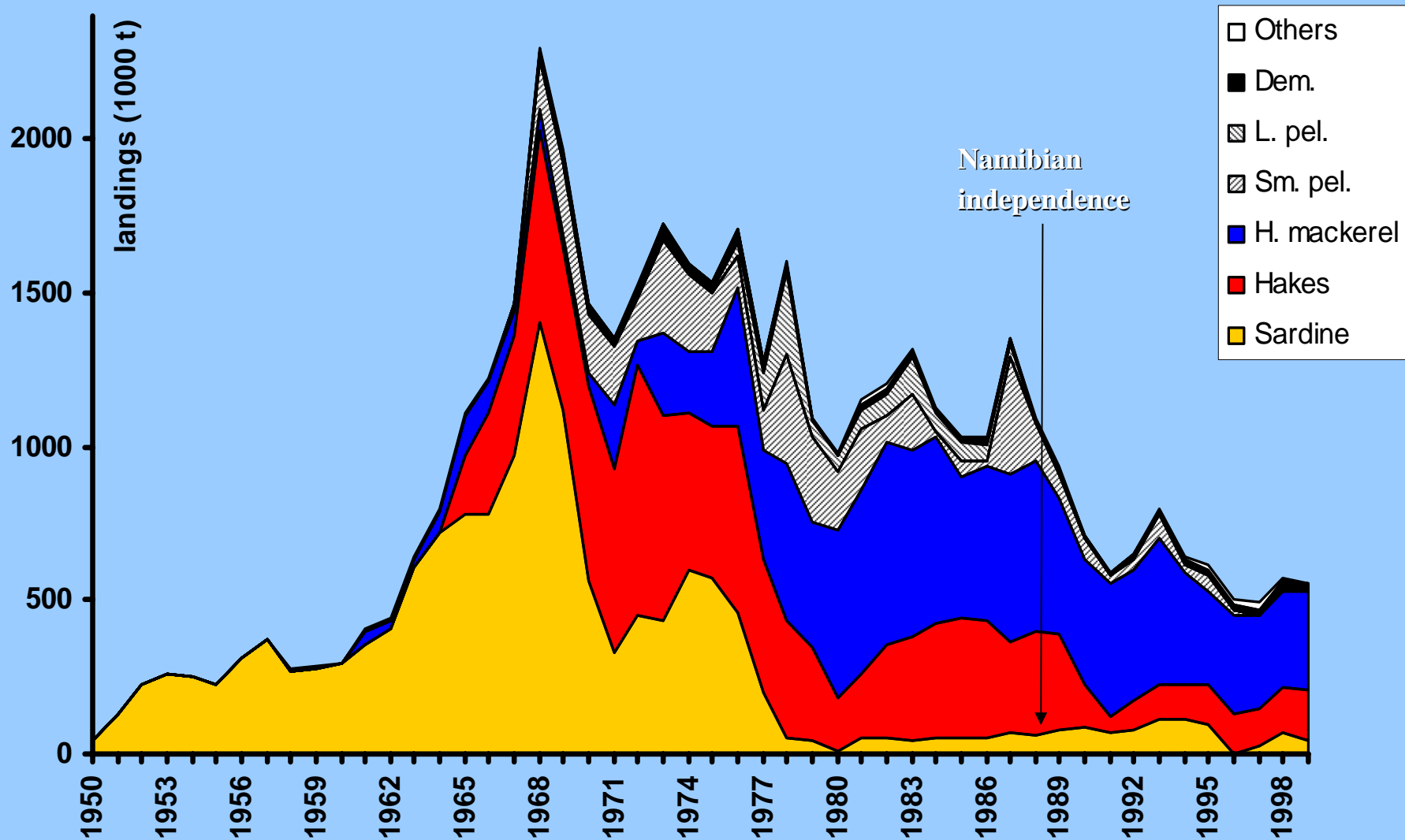
- 28-30 Oct. 2005:
Cape Frio (18°31'S 011°43'E) to
Lüderitz (26°9'S 14°47'E)
= 488 nmi; 48 10-nmi samples
- 31 Oct.-2 Nov. 2005:
Lüderitz (26°41'S 014°58'E) to
Cape Town (33°36'S 018°03'E)
= 448 nmi; 43 10-nmi samples
- 3-4 Nov. 2005:
Cape Town (33°53'S 018°19'E) to
East London (33°35'S 027°15'E)
= 486 nmi; 48 10-nmi samples



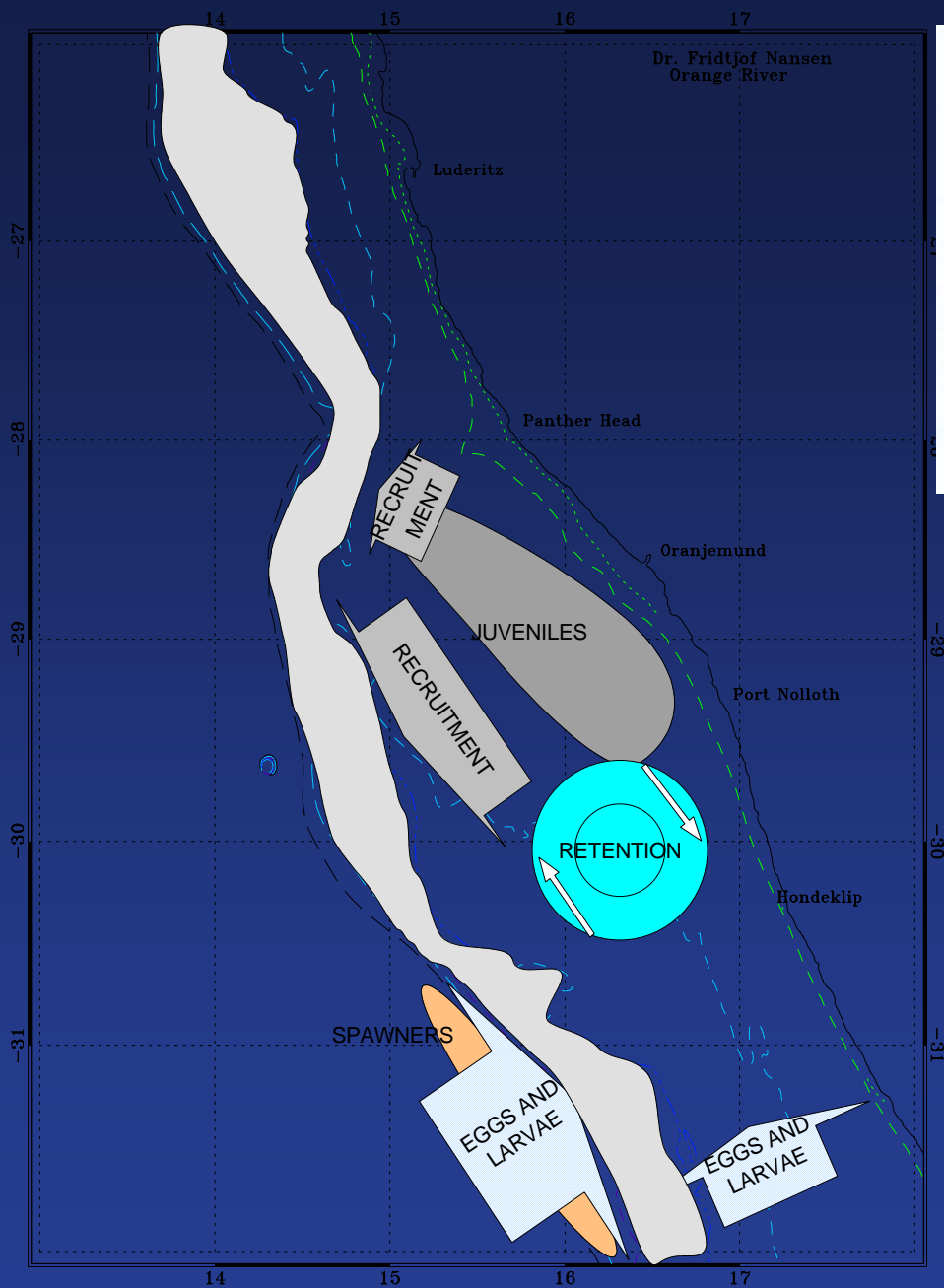


- Ecosystem approach to fisheries management (EAF)
- Monitoring of top predators as indicators of ecosystem change

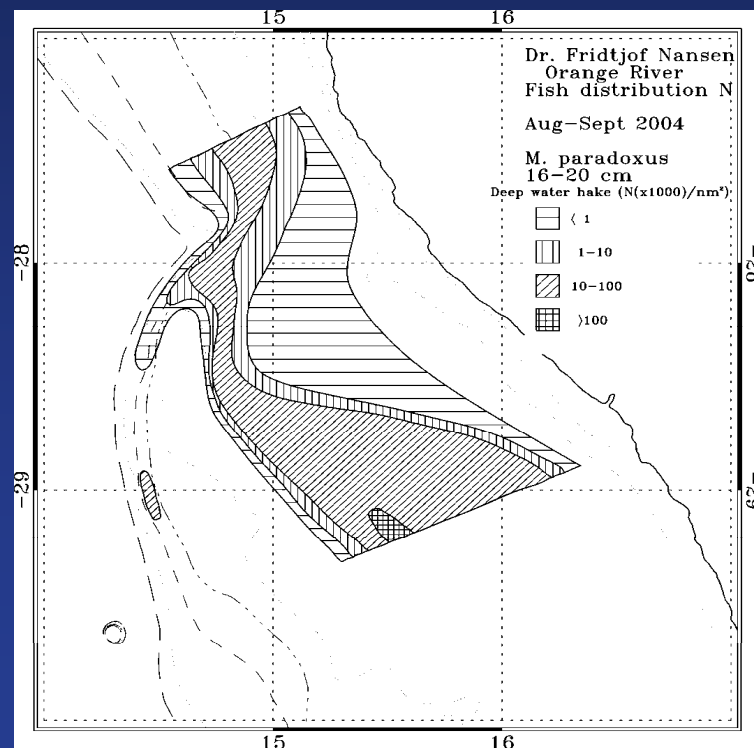




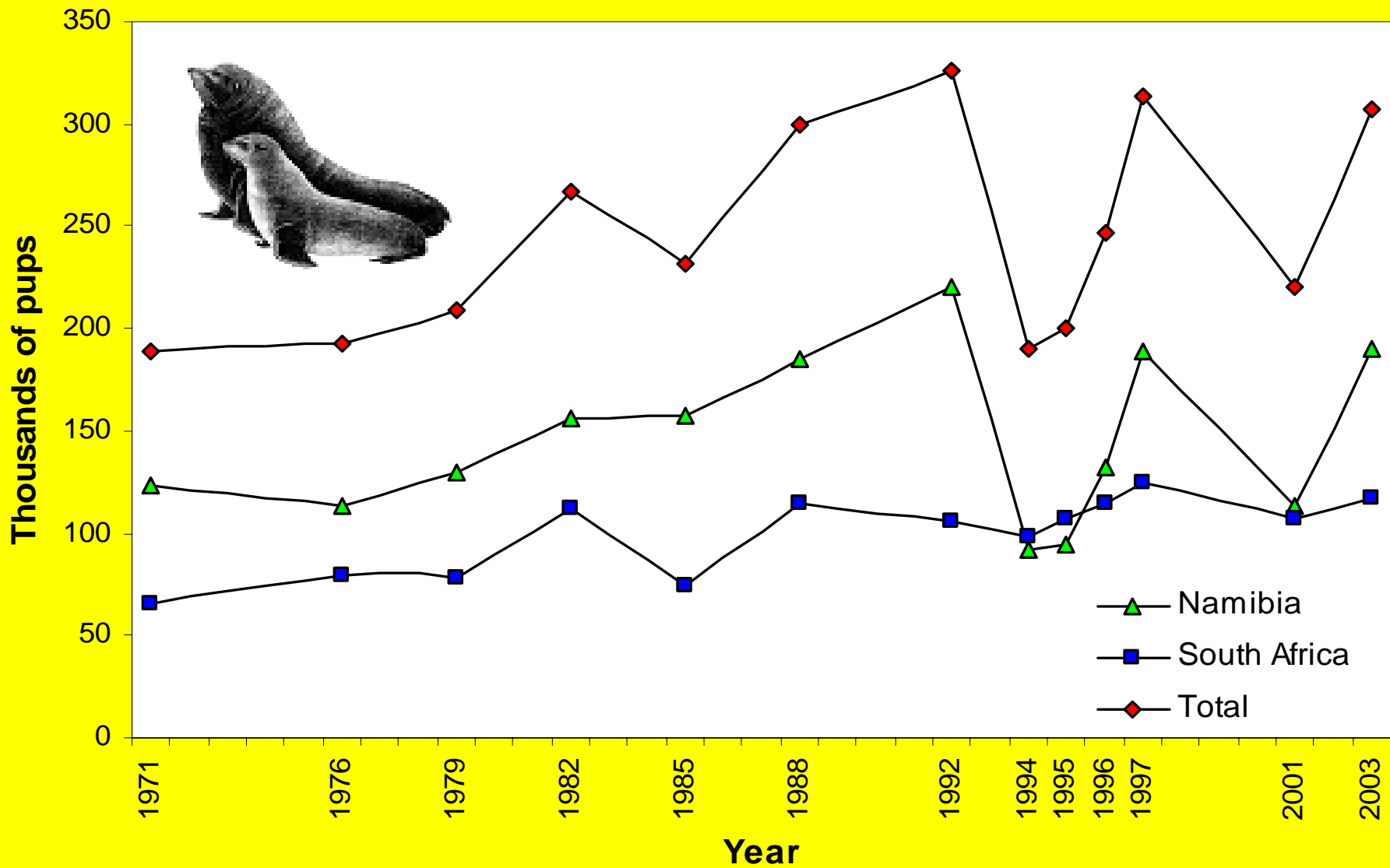
Trends in Namibian fish catches (1950 – 1999)



MERME092 *Merluccius paradoxus* TL 17.4 cm South Africa SA
 Tr. st. 452 S 31° 36' E 17° 51' Fishing/bottom depth: 118/118 m 29.01.2002 OA



Conceptual model for hake in South Africa – Namibia



Trends in seal pup numbers in the BCLME region



Transboundary Resource – Bronze Whaler Sharks



BCLME Project – Angola and Namibia





Satellite tagging of Bronze Whaler Shark

MANAGEMENT OF POLLUTION

- Harmonisation of water quality guidelines
- Regional oil spill contingency plan
- Assessment of land-based sources of marine pollution



- Transboundary pollution monitoring
- Marine litter programme

COASTAL DEGRADATION SHOWING LARGE SCALE IMPACT OF DIAMOND MINING NEAR SA-NAMIBIA BOUNDARY

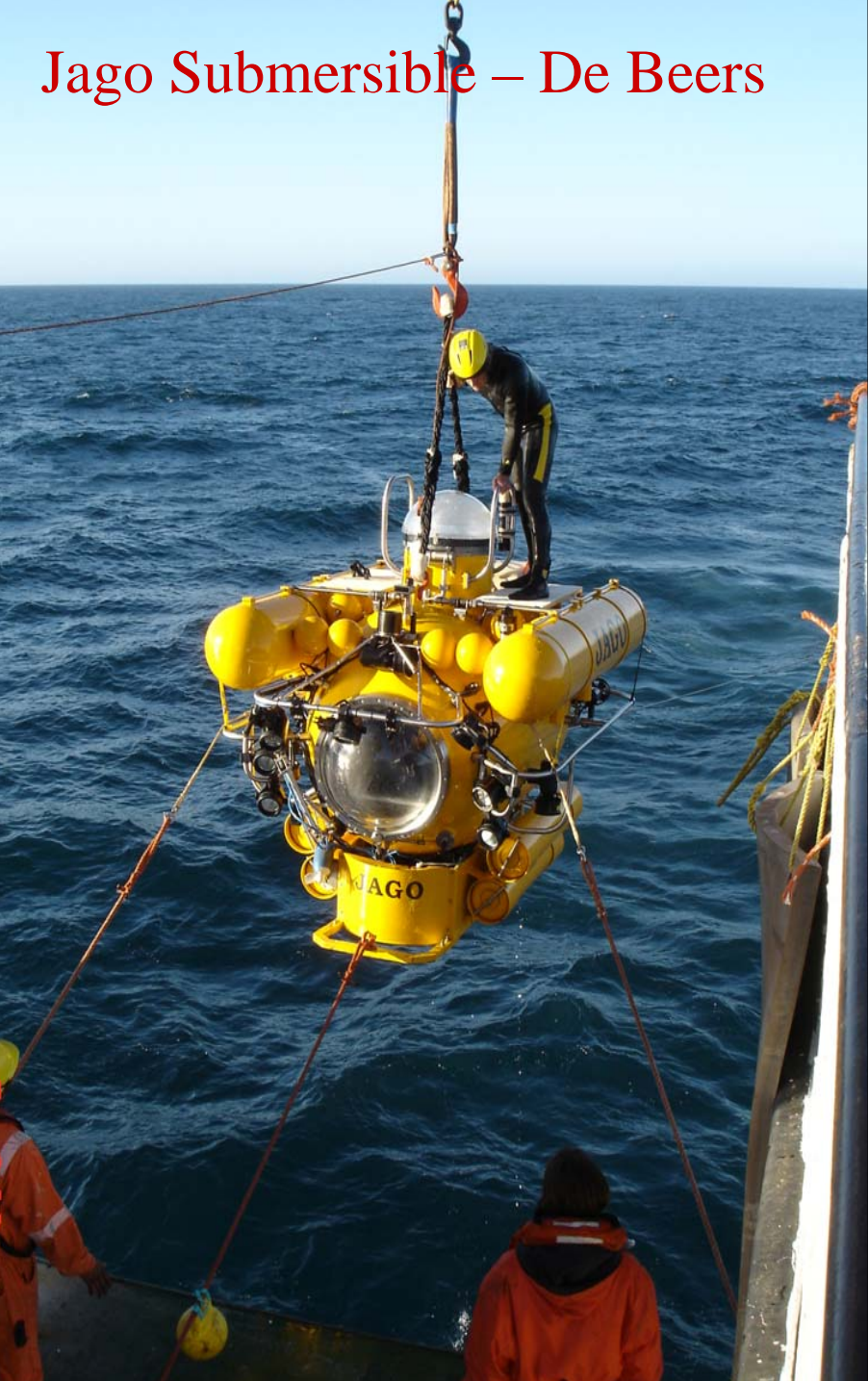




Cumulative impacts of diamond mining on Benguela Large Marine Ecosystem: BCLME Project – Assessment and Mitigation



Jago Submersible – De Beers



Seabed Crawler





Marine diamonds – Namibia: 90% gem quality



Development and Implementation of Strategic Plan for Capacity Strengthening



Adaptation to Climate Change Benguela Current LME

BCLME Phase 2 (Project 1)

REQUEST FOR PIPELINE ENTRY

PDF BLOCK B APPROVAL

(Global Environment Facility)

US\$ 8.0 million (GEF) US\$ 20.0 (Co-finance)



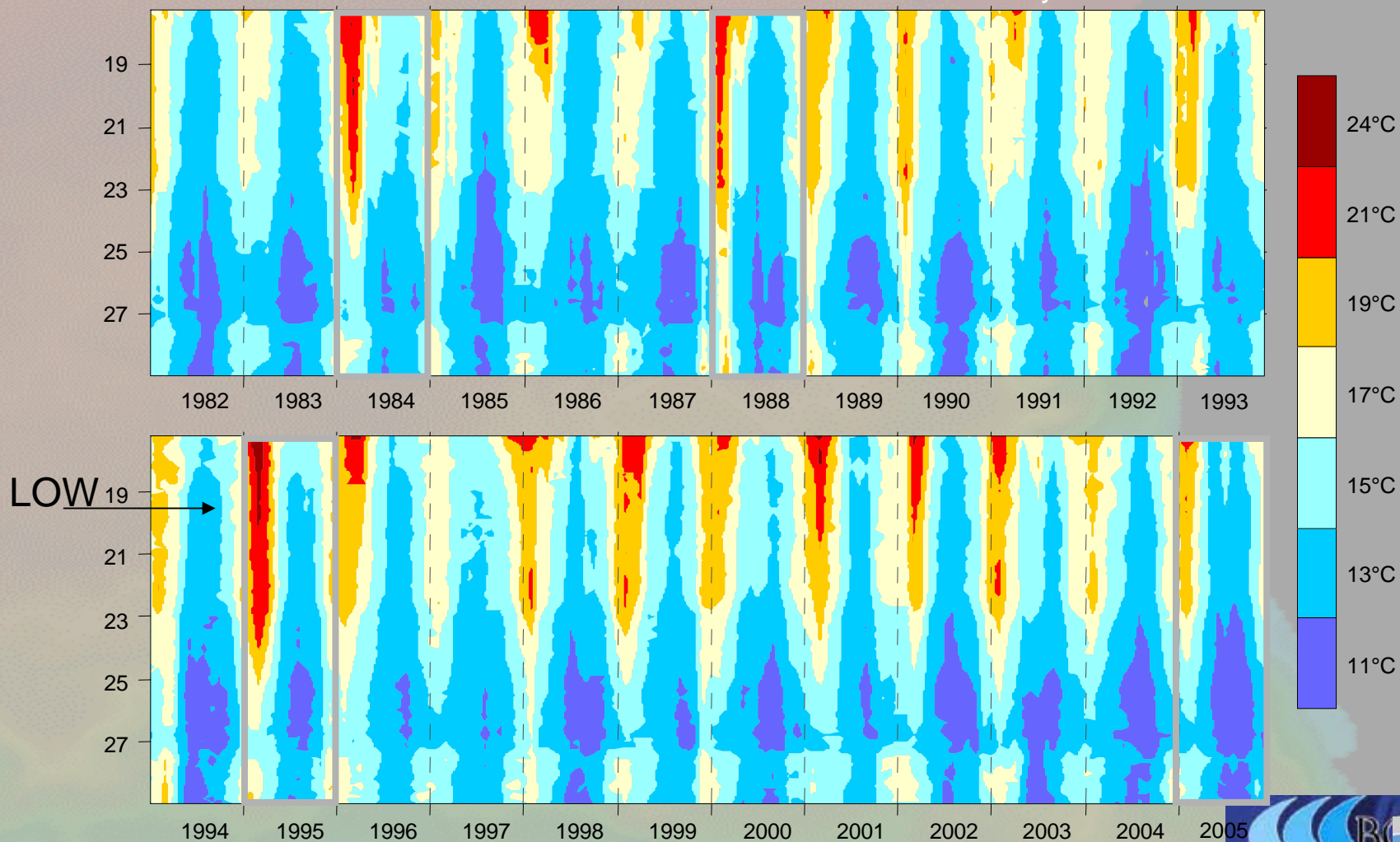
Variability and Impacts of Change in the BCLME (50 years)

Physical Environment

- rise of 1°C in SST (coastal and offshore)
- 5 major Benguela Nino's warm events
- Poleward propagation of major hypoxia in northern Benguela in 1994 –ecosystem collapse
- Frequent eruption of hydrogen sulphide in coastal waters of Namibia – toxic and fish mortalities

1994 / 1995 Benguela Nino

January Mean SST



Variability and Impacts of Change in the BCLME (50 years)

Phytoplankton and Zooplankton

- Decadal changes indicating increase in phytoplankton abundance from 1980-2000
- 100 fold increase in zooplankton abundance estimates (western Cape) from 1950 - to 1995
- Seasonal cycle of zooplankton biomass has altered
- Copepods more abundant off Namibia compared with 20 years ago
- HABs increasing in frequency in BCLME – uncertain links to climate change: negative consequences



Variability and Impacts of Change in the BCLME (50 years)

Living Marine Resources

- Large decrease in epi-pelagic fish resources in Namibia 1960-1990 (7.5 million tonnes to 0.7 million tonnes)
- Disappearance of anchovy following collapse of sardine fishery in Namibia; increase in horse mackerel, gobies and jellyfish
- Decline in penguins and gannet by 85% in Namibia and increase in fur seals between 1956 and 2005
- Spectacular sardine recovery in Southern Benguela in the early 1990's
- Recent marked shifts in distribution of sardines and rock lobster around to eastern Cape



3. Benguela Resources – Managing Change

3.2 Benguela Living Resources

1994 / 1995 Benguela Nino

Boyer & Hampton: Overview of Namibia's Living Marine Resources

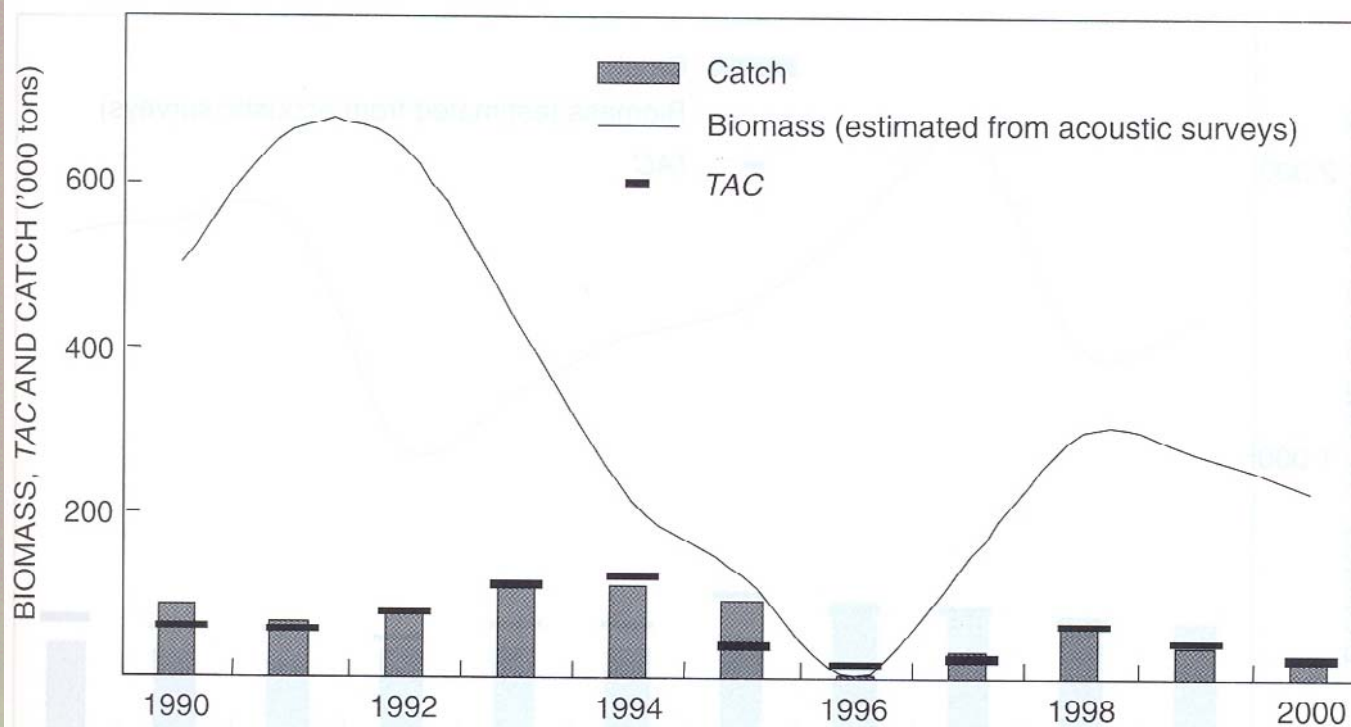
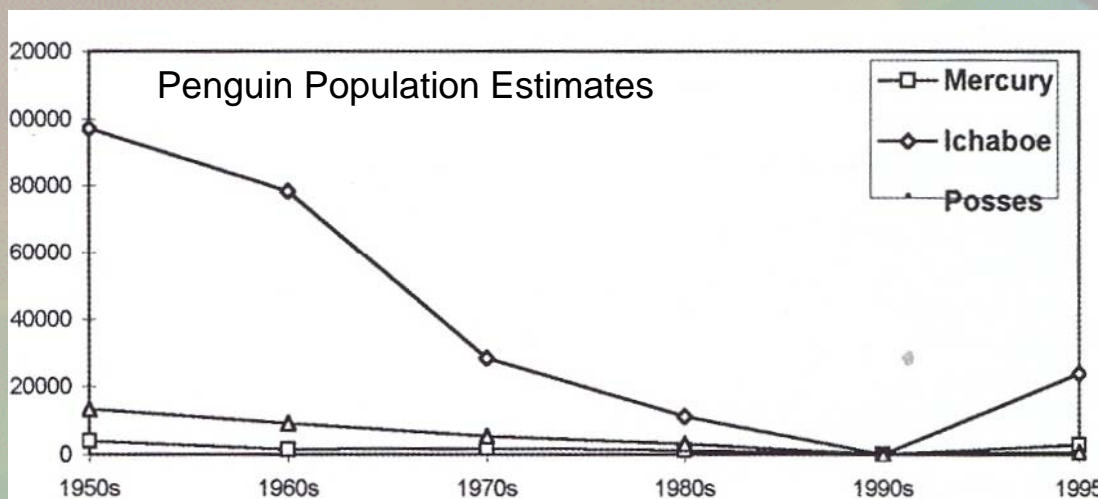
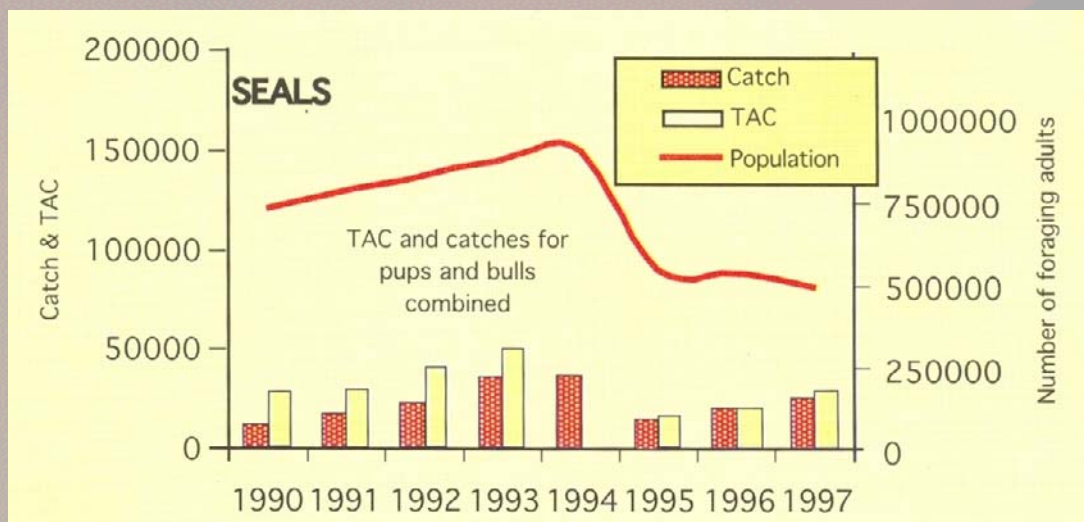


Fig. 8: TAC, catch and mean annual estimated biomass for sardine off Namibia and Angola during the 1990s

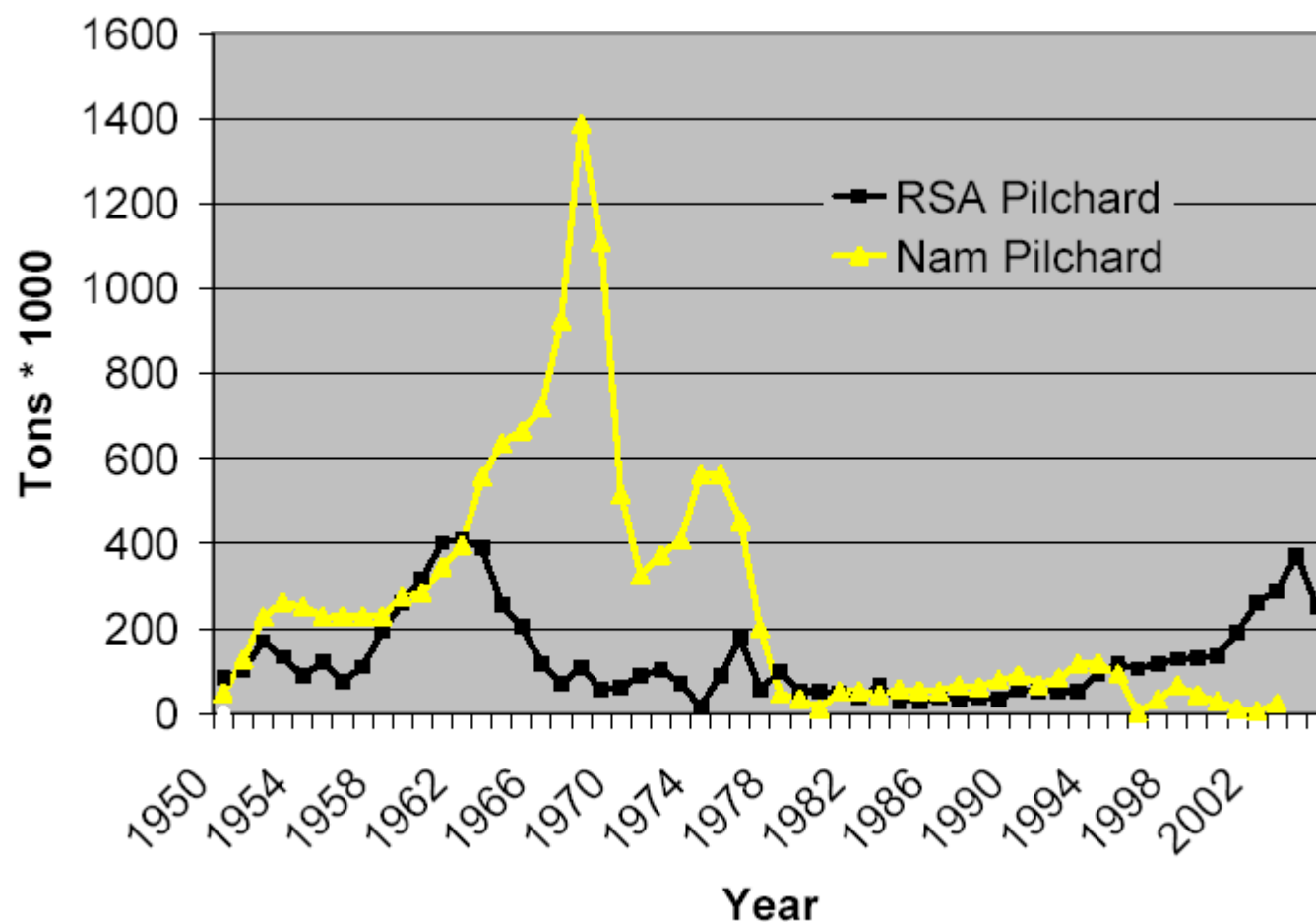
Benguela Living Resources

1994 / 1995 Benguela Nino



Benguela Living Resources

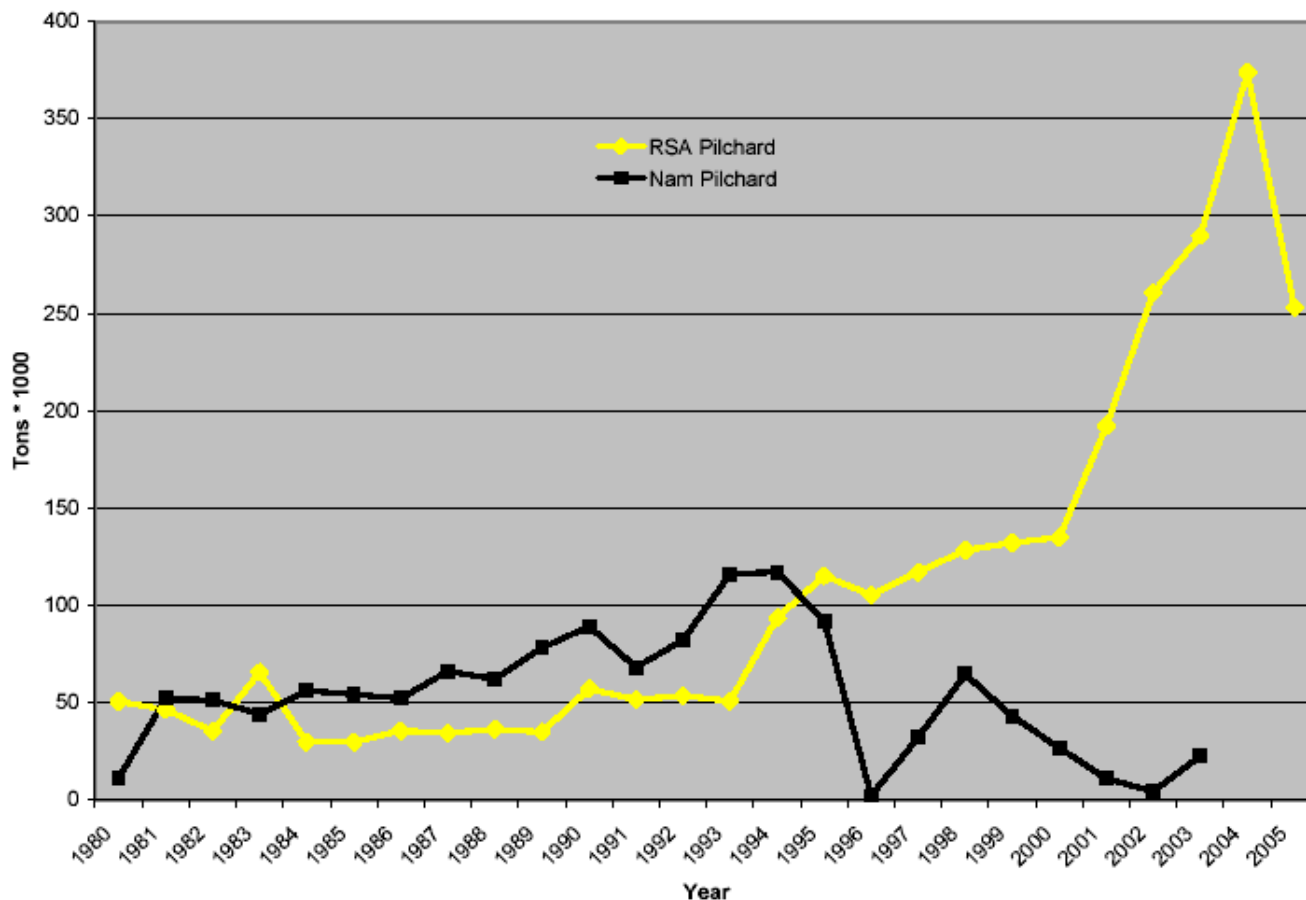
2003 Sardine Boom



3. Benguela Resources – Managing Change

3.2 Benguela Living Resources

2003 Sardine Boom



SEA SURFACE TEMPERATURE ANOMALY

Lobster Dynamics
Sardine Eastward Shift
Non-recovery of N-Benguela Sardine?

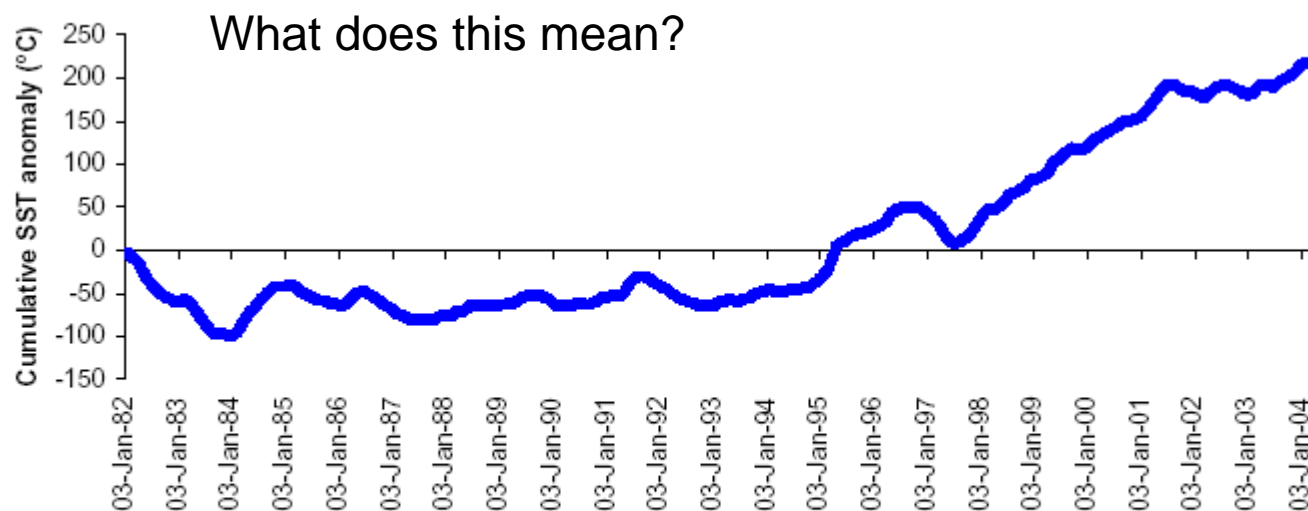


Figure 4: Cumulative SST anomaly over the Namibian shelf (satellite derived).

Variability and Impacts of Change in the BCLME (50 years)

Socio-economic consequences

- Collapse of sardine and rock lobster fishery in Namibia during 1960s-1970's : decimated canning industry, large job losses
- Harm done to hake resources in Namibia (hypoxic event – failure to recover despite conservative mgt.
- Economic and job losses (rock lobster mortalities and HABs)
- Eastward spread of pelagics – impacts on processing industry, jobs and fish quality
- HABs and developing mariculture industry (threats of markets, jobs and development)



Adaptation to Climate Change

BCLME 2 Project

Concept Document and PDF B Application

(US\$ 8 million grant: US\$ 20 co-finance)

- **Goal :** Orderly development and sustainable use of fisheries and other living marine resources under conditions of Climate Change
- **Objective :** assist countries and BCC to adapt to the impacts of Climate Change to ensure sustainable livelihoods, food security and good governance



Adaptation to Climate Change

BCLME 2 Project

Project Outcome (1) US\$ 1.0 million

Isolation of key variables and drivers of the BCLME attributed to climate change

- **robust scenarios on likely impacts**
- **management options, risk analysis, EAF and mitigation measures re: socio-economic effects**
- **enhance monitoring and assessment of BCLME (SEIS , GOOS-Africa partnership)**
- **cost-effective early warning system**



Adaptation to Climate Change

BCLME 2 Project

Project Outcome (2) US\$ 2.0 million

Development of adaptation strategy and management approach to address negative climate change effects on fisheries and coastal community sectors

- **sustainable development of fisheries using EAF approach under impacts of climate change**
- **development of sustainable and/or alternative livelihoods as a means of poverty reduction**
- **promotion of regional food security**



Adaptation to Climate Change

BCLME 2 Project

Project Outcome (3) US\$0.75 million

Development of capacity to address anticipated increase in severity of HABs, shellfish sanitation and implications thereof

- real-time monitoring systems**
- laboratory analysis of toxins**
- HABs monitoring and contingency**
- shellfish sanitation implementation plan**

Adaptation to Climate Change

BCLME 2 Project

Project Outcome (4) US\$3.0 million

Develop and implement compensatory mechanisms in response to impacts of climate change

- offset losses through development of alternatives e.g. aquaculture
- capitalise on new opportunities that may arise

Adaptation to Climate Change

BCLME 2 Project

Project Outcome (5) US\$1.0 million

Strengthen capacity of regional managers, policy makers and stakeholders in BCLME (BCC) to implement EAF approach in response to climate change

- **Development and incorporate management tools, models and other inputs**

Project Outcome (6) US\$0.25 million

Develop a global learning component

- **lessons learned in BCLME : Adaptation in relation to climate change**
- **Application to comparable ecosystems in other parts of the world**



THE BENGUELA CURRENT COMMISSION

INTERIM AGREEMENT

**To be endorsed by the three countries
29th August 2006, Cape Town**



Benguela Current Commission Objectives

- **Establish a formal institutional structure for co-operation between contracting States**
- **Facilitate understanding, protection and conservation and sustainable use of BCLME**
- **Implement the Strategic Action Programme (SAP)**



BENGUELA CURRENT COMMISSION

Ministerial Conference

Benguela Current Commission

Living Marine Resources
Sub-Committee

Ecosystem Health
Sub-Committee

Minerals and Oil
Sub-Committee

Secretariat

Executive Secretary / Ecosystem Coordinator

Ecosystem Advisory Committee

Working Groups

e.g.

Hake

Pilchard

Pollution

Marine Mining

Climate Change

Socio-economics

Data and Information



Jurisdiction and Scope

- **BCLME area (Cabinda – Port Elizabeth)**
 - internal waters
 - territorial seas and EEZ's
- **Activities (adverse impacts)**
 - human activities
 - aircraft
 - vessels

Co-operation between States

- **Building capacity of the Commission**
 - Secretariat
 - Ecosystem Advisory Committee
 - Subsidiary bodies
- **Implementing the Strategic Action Programme**
- **Negotiating, agreeing and endorsing a more comprehensive legal instrument by 2012**

Benguela Current Commission

- Appointment of national delegation
- 1st Meeting within 3 months after signing
 - adopt rules and procedures
 - determine composition of committees
 - rotating chair / consensus
 - appoint executive secretary (within 9 months)
 - appoint ecosystem co-ordinator
 - stakeholder consultations and mechanisms for interaction with private sector, NGO and communities

Benguela Current Commission Secretariat

- **Implementation of SAP**
- **Arrange meetings and supply administrative and financial services**
- **Negotiate with donors and partners**
- **Draft plans, work programmes and budgets**
- **Information exchange and dissemination**
- **Prepare performance reports**
- **Any other functions required by Commission**

Ecosystem Advisory Committee

- Experts nominated by each member State
- Support decision and provide expert advice
 - scientific
 - management
 - legal
- Build capacity within member States to generate and provide expert advice

Ecosystem Advisory Committee

- **Will meet once a year – decisions by consensus**
- **Will convene within 3 months of first meeting of Commission**
- **Establish working groups or sub-committees**
- **Annual submission of draft work plan (2 years)**
- **Annual report of it's activities**

Comprehensive Legal Instrument

--‘ The Contracting States shall use their best endeavours to bring into force by no later than 31st December 2012, a binding legal instrument that will establish a comprehensive framework to implement an ecosystem approach to conservation and development of the Benguela Current Large Marine Ecosystem’ ----



Benguela Current Commission

- **Funding**
 - member states (equal portions)
 - donors and partners
- **Disputes**
 - negotiation or mediation
- **Maritime boundaries**
 - no relation to delimitation of national boundaries

Benguela Current Commission

- **Relations with other International Agreement**
 - shall not affect existing international agreement
(except where they threaten the health of BCLME)
- **BCC Interim Agreement entry into force**
 - within 30 days of two or more parties signing the agreement

Implementation and Sustainability of OMP for Benguela Current Commission

BCLME Phase 2 (Project 2)

REQUEST FOR PIPELINE ENTRY

PDF BLOCK B APPROVAL

(Global Environment Facility)

US\$ 8.0 million (GEF) US\$ 16.0 (Co-finance)



OUTCOMES

- **Sustainable infrastructure to support BCC**
- **National policy reform to support ecosystem approach to management**
- **Development of long-term sustainable capacity to implement LME management components**
- **Scientific and technical knowledge interpreted and translated into OMP's**