

Promoting Ecosystem-based Approaches to Fisheries Conservation in LME's

- GEF-funded MSP;
- 2004-2007.



- Ecosystem modeling training and application for GEF/LME projects.

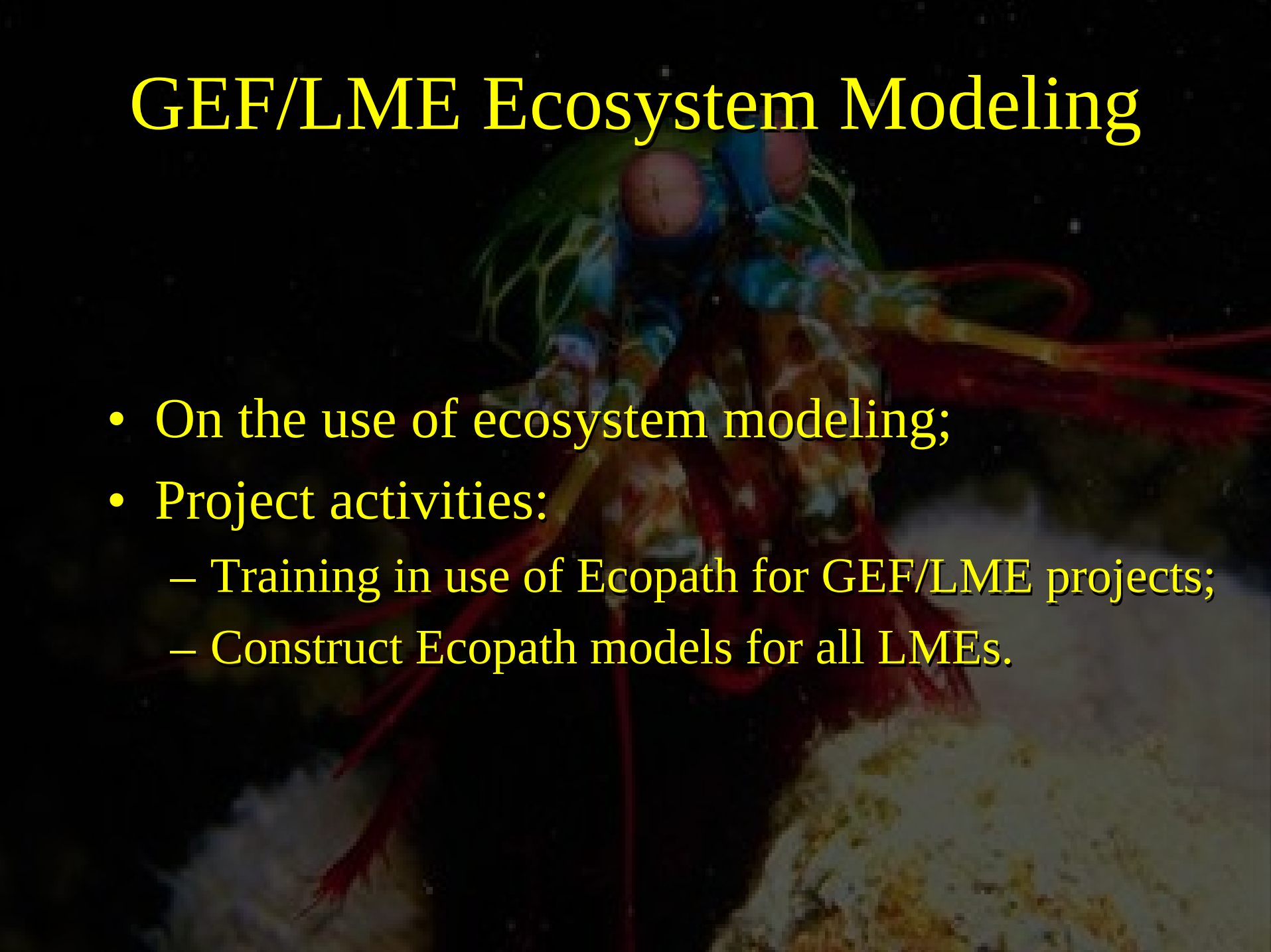


LME 8th CC, Paris,
3-4 July, 2006

Villy Christensen,
UBC



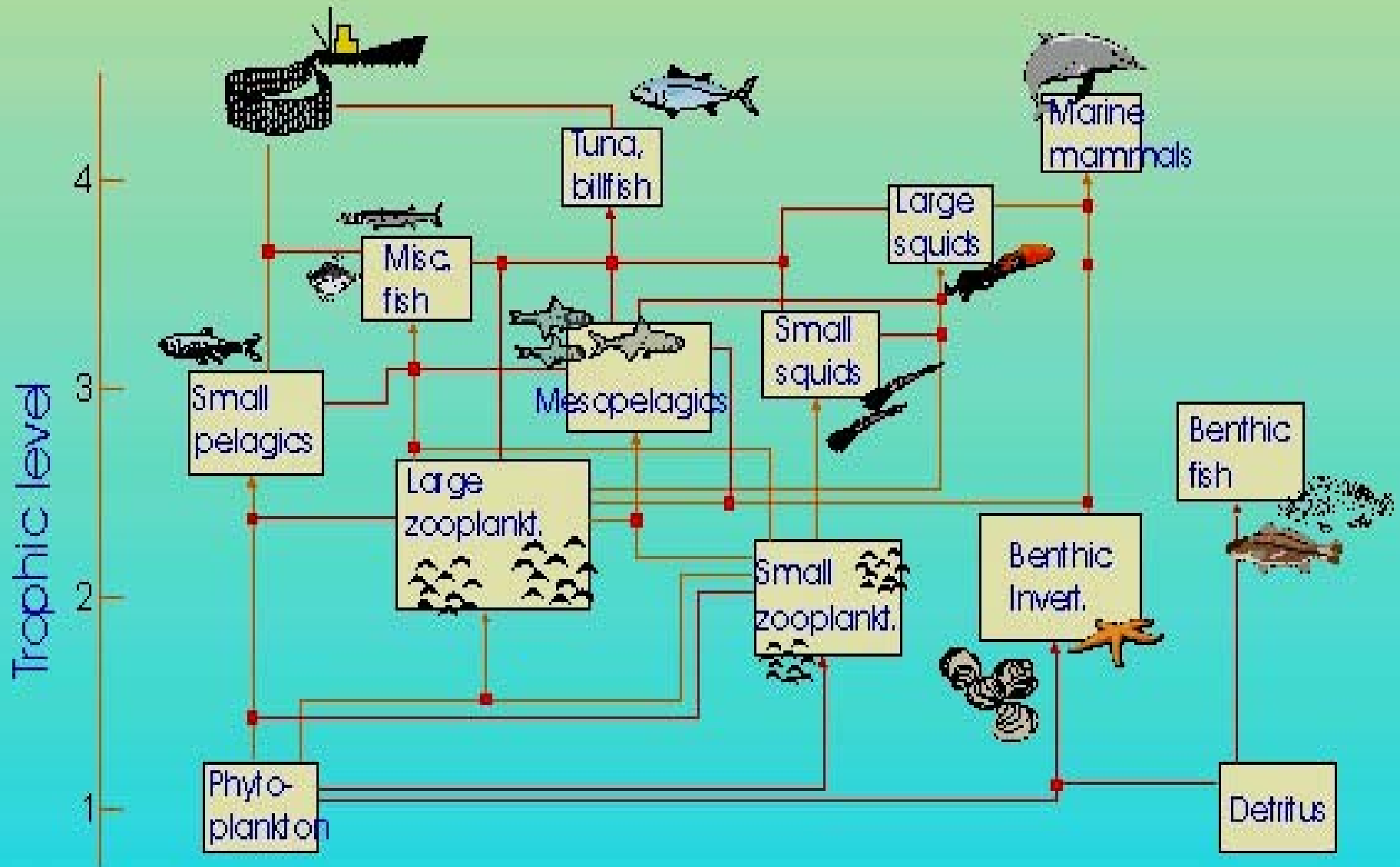
GEF/LME Ecosystem Modeling



- On the use of ecosystem modeling;
- Project activities:
 - Training in use of Ecopath for GEF/LME projects;
 - Construct Ecopath models for all LMEs.



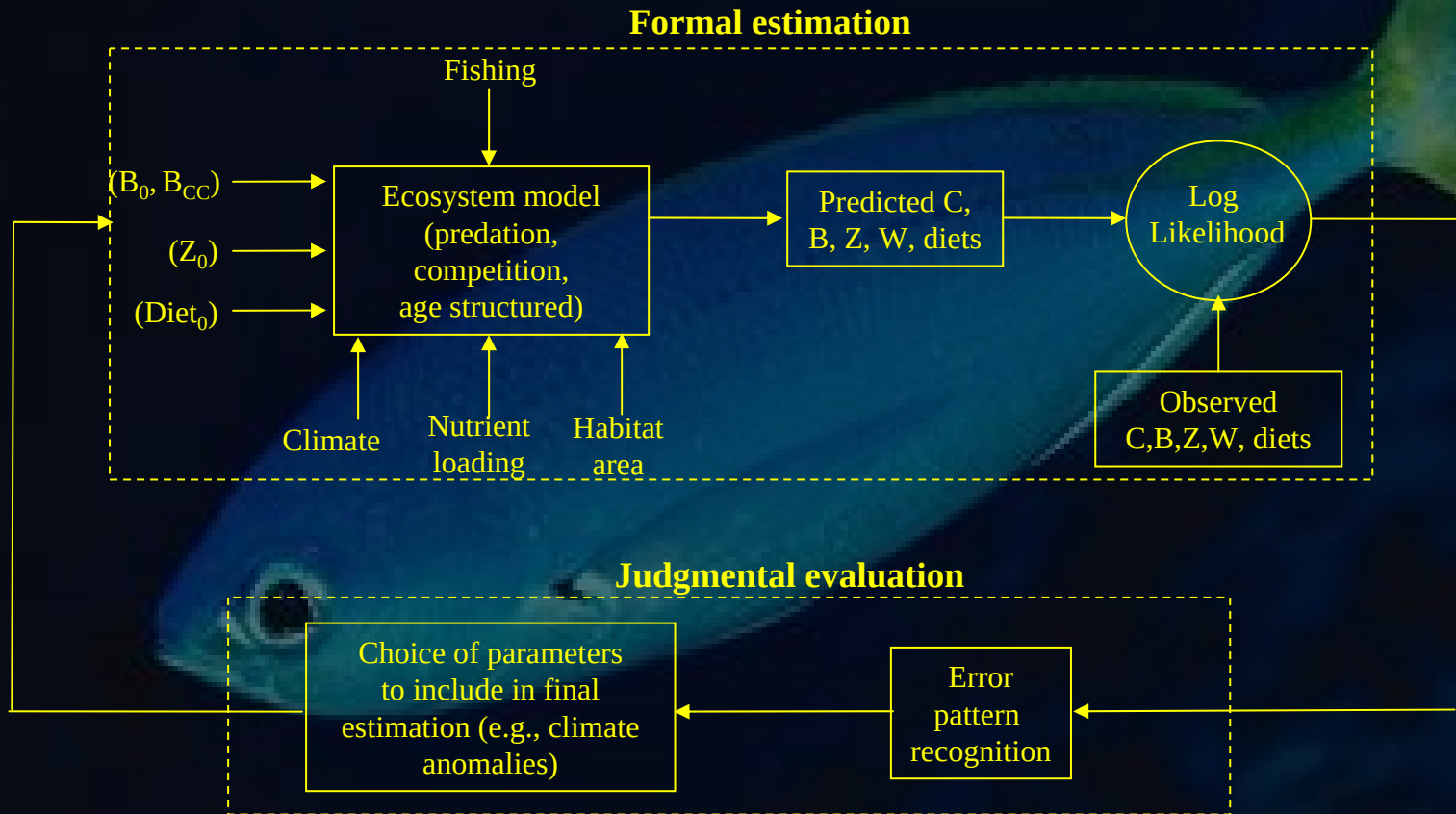
Ecopath: Mass-balance model



Ecosystem effects

- We evaluate ecosystem effects of fishing and environmental factors (incl. nutrient loading) by analyzing historic trends in ecosystems;
- We can use the models for ecosystem based management:
 - Modeling focus on policy questions;
 - Evaluating trade-offs calls for predictions about how impacts may vary with policy choices;
 - No way to avoid predictive models;
 - We use simple models that emphasize ‘major’ interactions and dependencies.

Modeling process: fitting & drivers

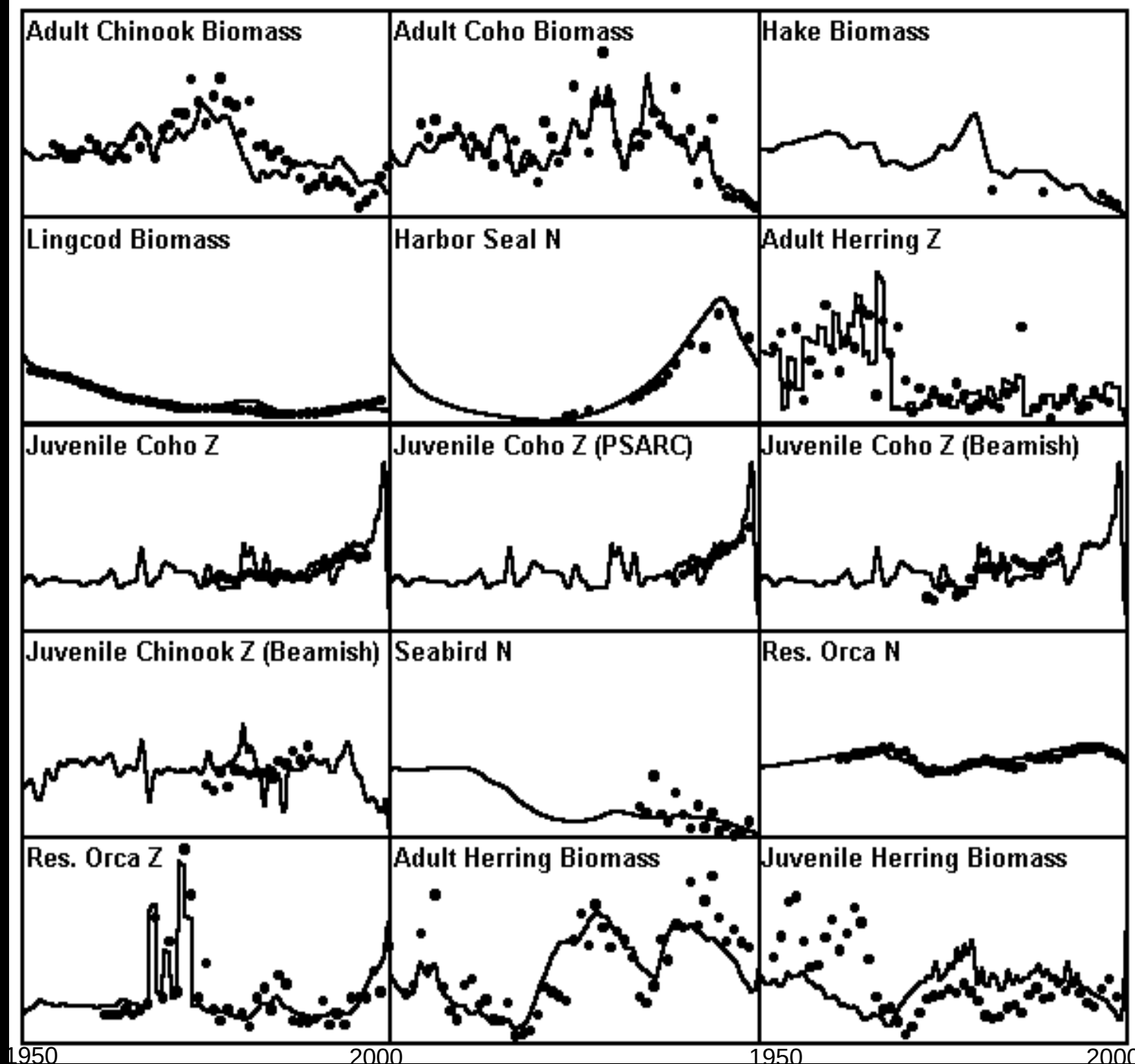


Are seals
causing fish
declines in
the Georgia
Strait?

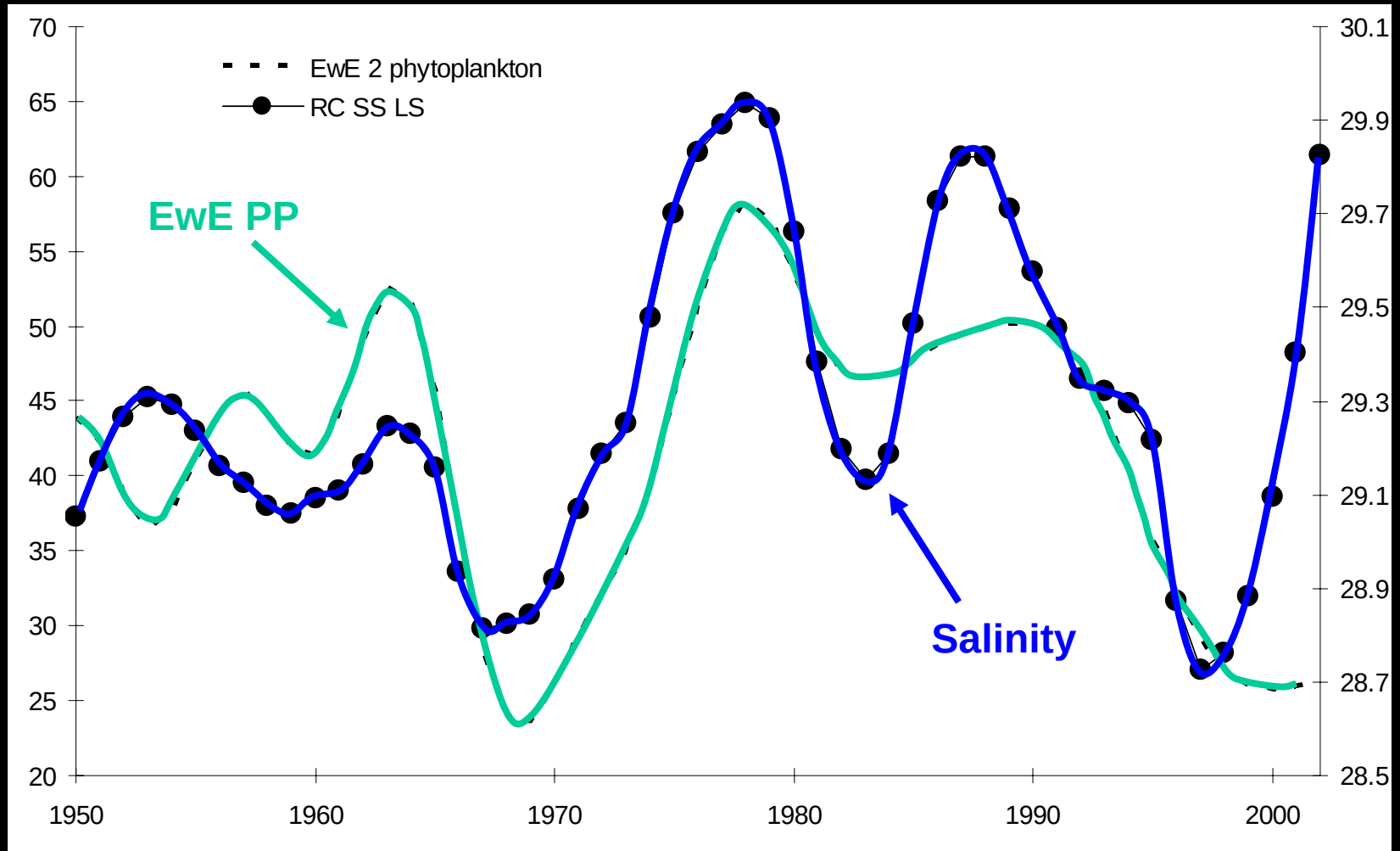
Is it fishing?

Is it
environ-
mental
change?

Or, is it all
three?

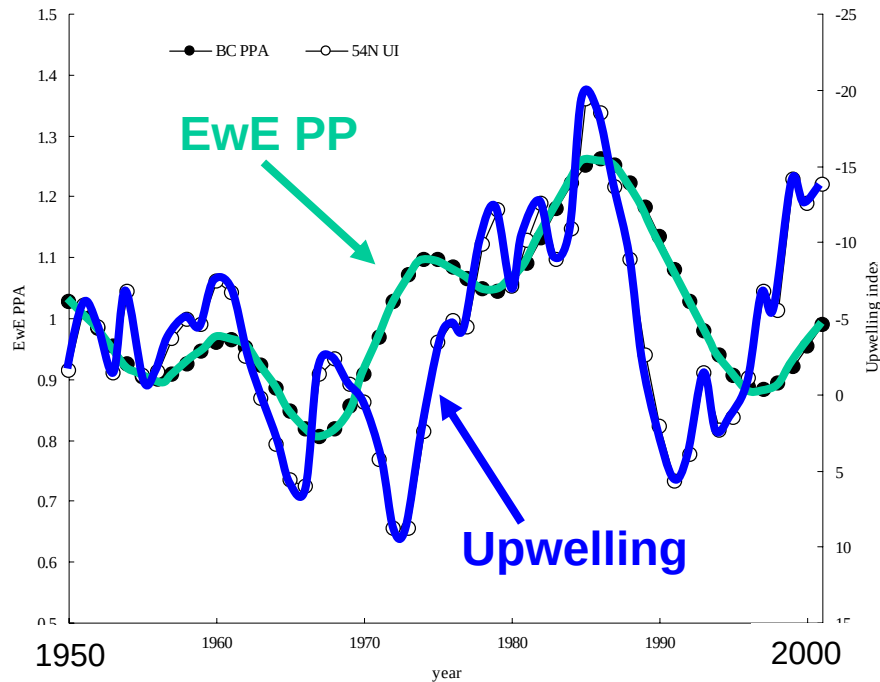


Strait of Georgia



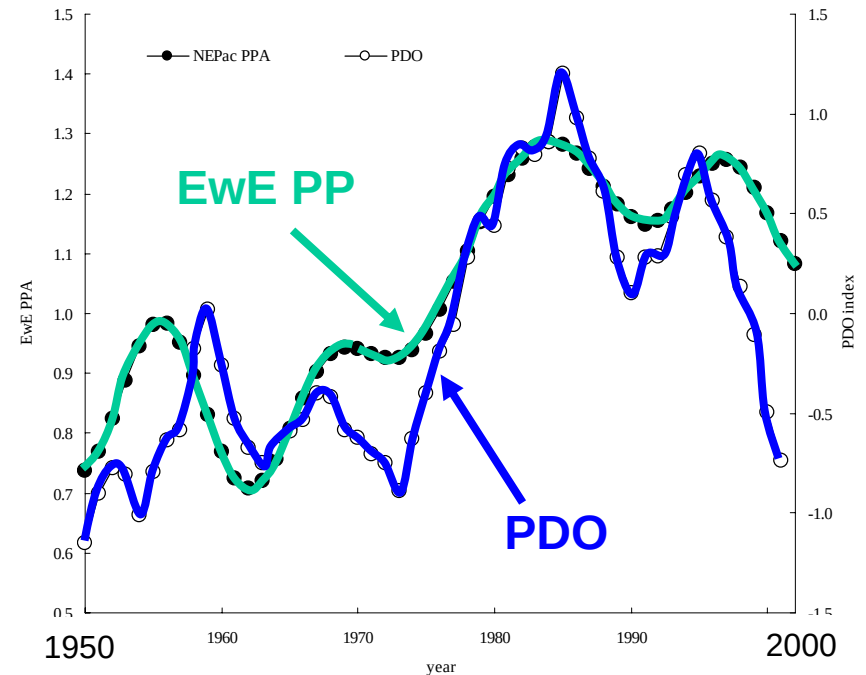
- EwE PP & Index of Fraser River runoff (summer salinity at two measuring stations in the Strait)

BC Shelf



- EwE PP & average annual upwelling at 54°N

NE Pacific



- EwE PP & Pacific Decadal Oscillation

Ecosystems where EwE models have been tested using historical trend data

- E Bering Sea
- Aleutian Islands
- W&C GoAlaska
- E GoAlaska
- N British Columbia
- British Columbia
- W Vancouver Island
- Strait of Georgia
- NE Pacific
- CN & ET Pacific
- U Gulf of California
- NWHI, Hawaii
- Bay of Quinte
- Oneida Lake
- Lake Superior
- Scotian Shelf
- Chesapeake Bay
- Tampa Bay
- N Gulf of Mexico
- S Brazil Bight
- Central Chile
- Norwegian/Barents
- North Sea
- English Channel
- Baltic
- S Catalan Sea
- S Benguela
- Gulf of Thailand
- South China Sea



Are we finally able to develop useful predictive models for ecosystem management?

- It's beginning to look like it;
- We can with some credibility describe agents of mortality and trophic interdependencies;
- Evaluation of relative impact of fisheries and environmental factors is making good progress

Relevant policy questions

- How do we evaluate trade-offs in resource exploitation?
- How do we optimize exploitation of marine resources?
- How will future land use patterns impact marine resources?
 - Impact on biodiversity?
- What are the likely consequences of climate change?

GEF/LME Ecopath training



- 4WFC training course, May 2004;
- Baltic RSP workshop, Oct 2004
- Benguela Current workshop, Dec 2005
- Guinea Current workshop, April 2006
- SE/E Asia workshop, Spring 2007

4th WFC EwE Training Course

- May 10-14, 2004, Vancouver, BC, Canada
- 31 participants from Argentina, Australia, Brazil, Canada, Chile, Faroe Islands, Indonesia, Italy, Portugal, Spain, Switzerland, UK, USA;
 - 7 instructors from Canada, Denmark, Malaysia, Italy, USA
- Linked to Network of AFS;

Baltic Regional Sea WS

- Oct 18-22, Jūrmala, Latvia 17 participants from Estonia, Latvia, Lithuania, Poland, Sweden, and Denmark;
- Participants constructed ECOPATH models for Pärnu Bay, Ainaži/Dzeni area, Pape area, and Putsk Bay (BSRP coastal study sites in Estonia, Latvia, Lithuania, Poland), as well as the Curonian Lagoon, Gdansk Bay and the open Baltic Proper. Plus conceptual model of nutrient loading/retention, phyto- and zooplankton;
- Follow-up:
 - ICES Productivity Study Group;
 - Theme session at ICES Annual Science Meeting 2005 on 'Impact of External Forcing on Flows in Marine Trophic Networks', 22 oral presentations, 2 posters.

Benguela WS

- Dec 5-9 (14), 2005
- 20 participants from South Africa, Namibia, France, Norway, New Zealand
- Participants developed preliminary models for areas of interest or improved previously-constructed models



Guinea Current WS

- April 18-22, 2006
- 26 participants representing all 16 countries of the region
- Introductory training course focused on model construction
- Follow-up:
 - Advanced training course on using models for fisheries management based on models from the region
 - Book describing the fisheries of the GC.



GEF/LME Ecopath training

- 4WFC training course, May 2004;
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- Guinea Current workshop, April 2006
- SE/E Asia workshop, Spring 2007
- How do we follow up?

LME model construction

- Spatial models for all LME's
 - Time period: 1950 – present;
 - Spatial resolution: $\frac{1}{2}^{\circ} \times \frac{1}{2}^{\circ}$;
 - One for each LME's;
- Databases
 - Biomass of benthos, plankton, mesopelagics, marine mammals and birds;
 - Fish diversity, growth parameters, diets;
 - Primary production (1958-present);
 - Effort, (1950-present)
 - Catches, prices (1950 – present).

For each of 64 LME:

- Description, incl. area of coral reefs, seamounts, and estuaries, and primary production;
- Ecopath model;
- Description of published Ecopath models;
- Biodiversity: commercial fish, cephalopods, marine mammals and marine birds;
- Trophic pyramid and marine trophic index;
- Catches and value of catches by species and country fishing (1950–);
- Governance profile.

LME information: www.SeaAroundUs.org



Web Products: Large Marine Ecosystems

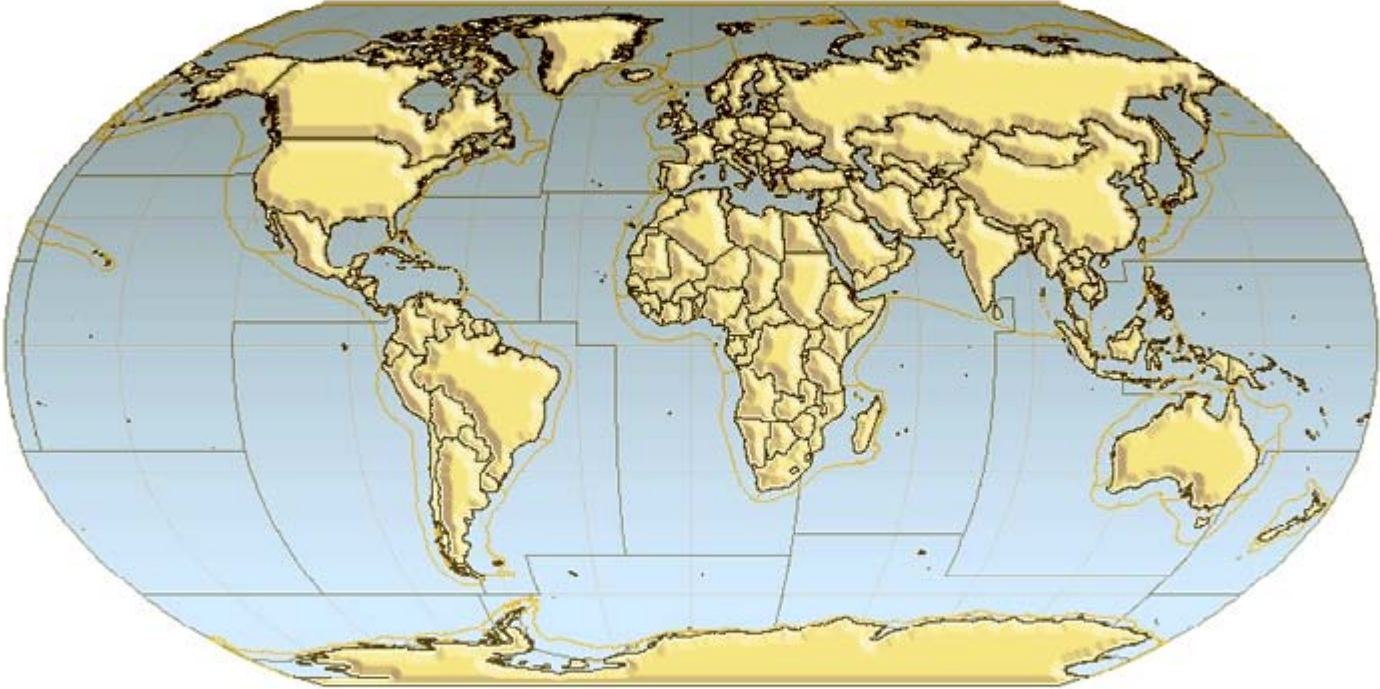
[FAQ](#) [GIS map](#) [Project page](#) [Web products](#)

LME

Bay of Bengal

Go! 

[Version 2.2](#)



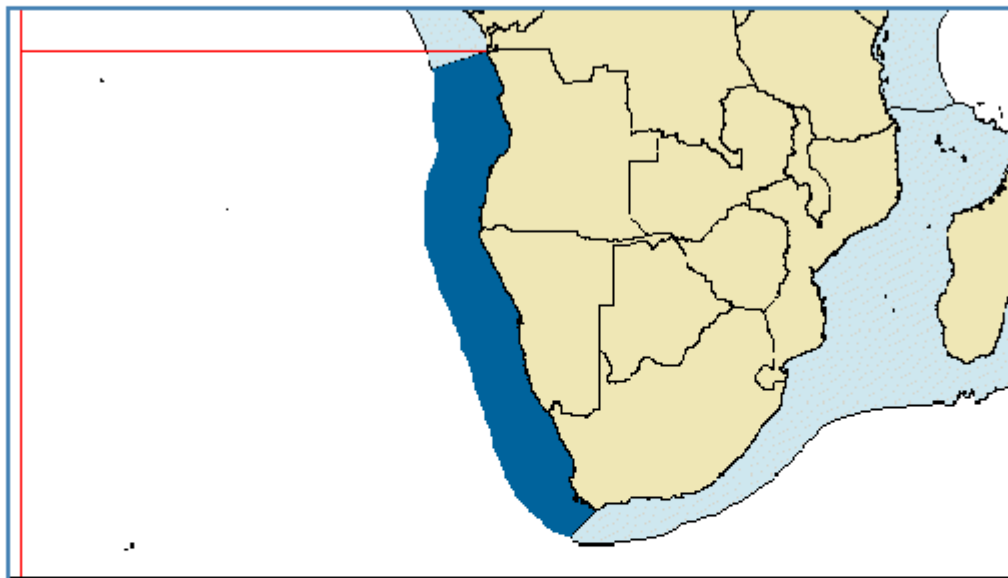
The Fisheries Centre

THE PEW CHARITABLE TRUSTS

The University of British Columbia



LME: Benguela Current



Legend

FAO areas

Area:	1,456,812 km ²
Coral Reefs:	0 % of world
Sea Mounts:	0.0600 % of world
Primary Production:	1158 mgC·m ⁻² ·day ⁻¹

Catches by:

Values by:

- Species
- Higher groups
- Functional groups
- Country fishing

Biodiversity

- Marine fishes
- Cephalopods
- Marine mammals
- Commercial species

Ecosystems

- Primary production
- Fish parameters
- Trophic pyramid
- Coral reefs
- Estuaries
- Ecopath models
- Marine trophic index

Governance

- LME profile
- Treaties & Coven.





Photo: Andrew Trites