

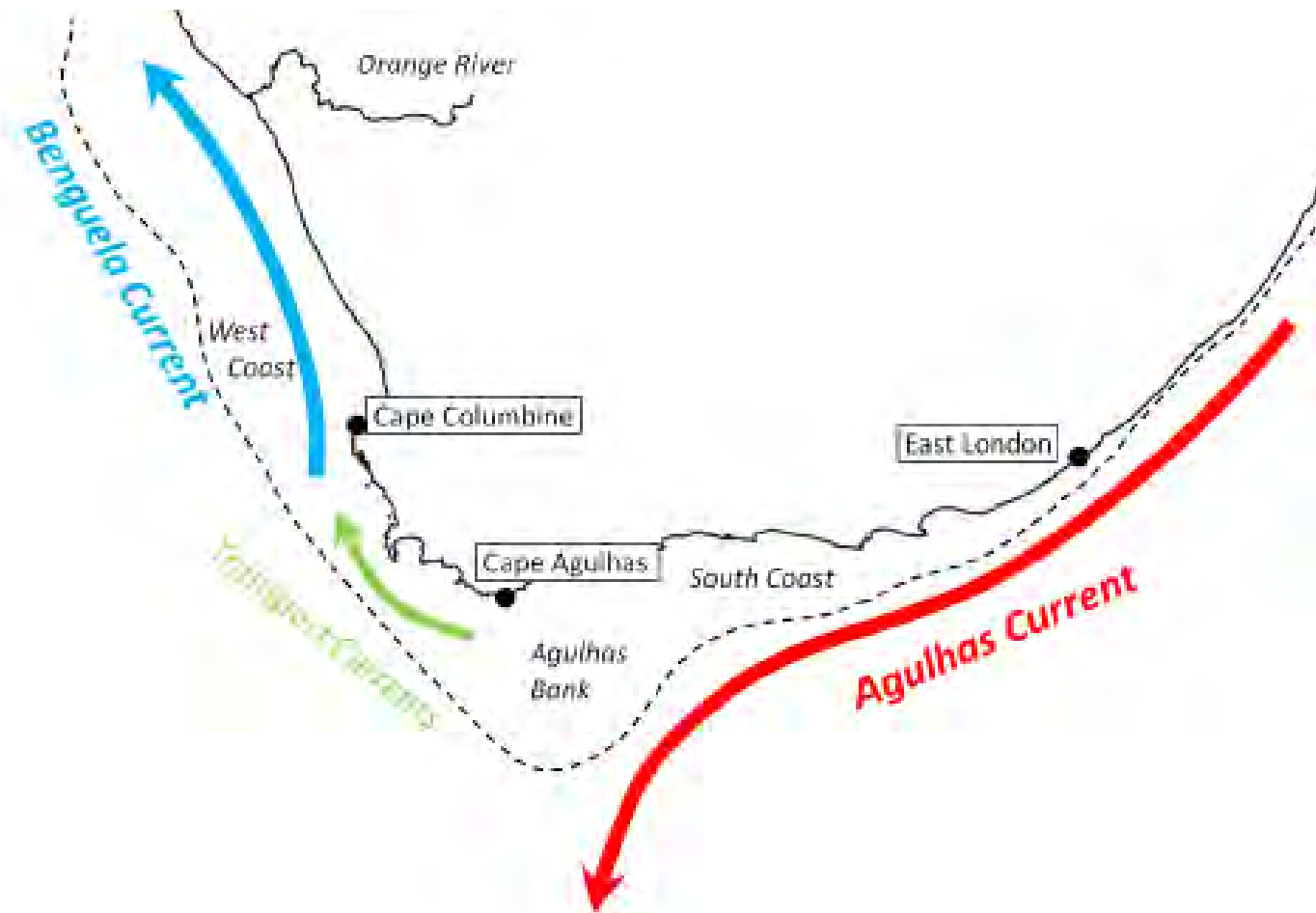
# Modelling impacts of climate change on fisheries in the southern Benguela system

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**Department of Ichthyology and Fisheries Sciences**



**A Belmont Coastal  
Vulnerability Theme  
Project**

**Global learning for local solutions: Reducing vulnerability of  
marine-dependent coastal communities (GULLS)**



# Southern Benguela system

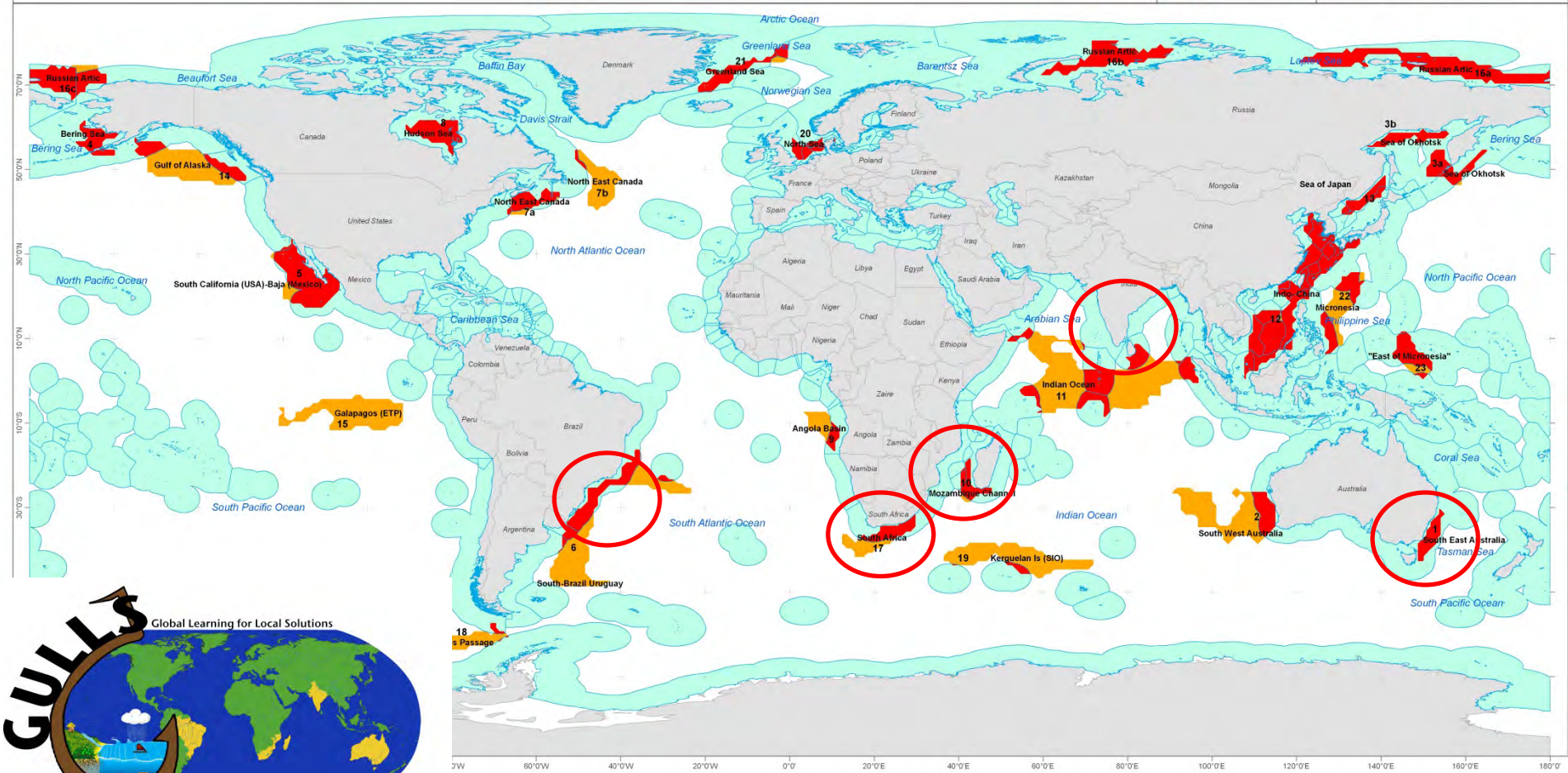
# Marine Global Hotspots

Hotspots and EEZ in the World



■ Exclusive Economic Zone  
■ Hotspot included in an EEZ  
■ Hotspot

Projection: GCS World, WGS 1984  
 Source: VLIZ (2011), Maritime Boundaries Geodatabase  
 Global Marine Hotspots - UTAS/CSIRO  
 Author: Eise Gaertner - April 2012 - IMAS, CSIRO



# Aims

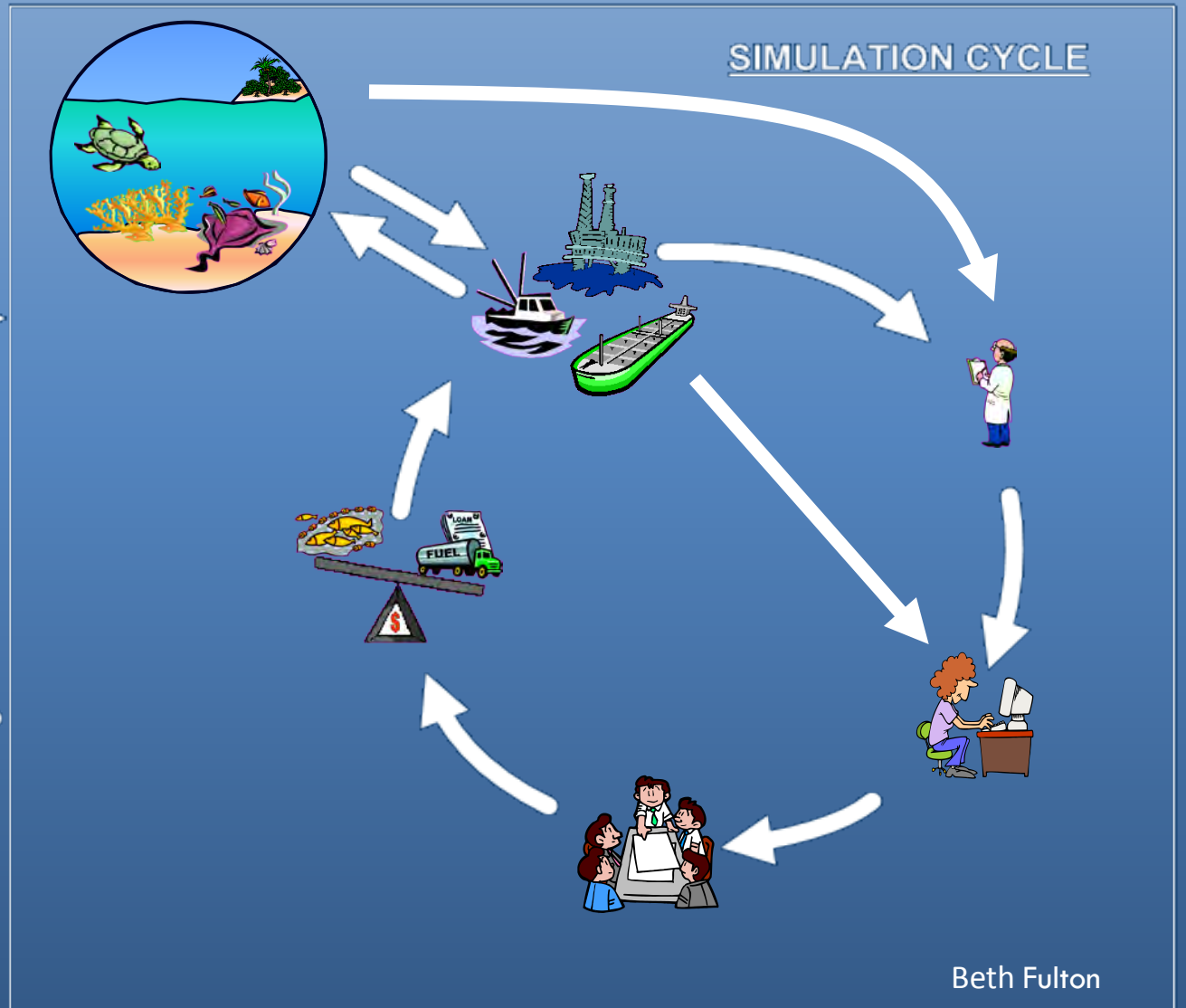
- Explore the impacts of climate change and variability on the abundance and distribution of key species, and their implications for management of selected fisheries.

# Atlantis

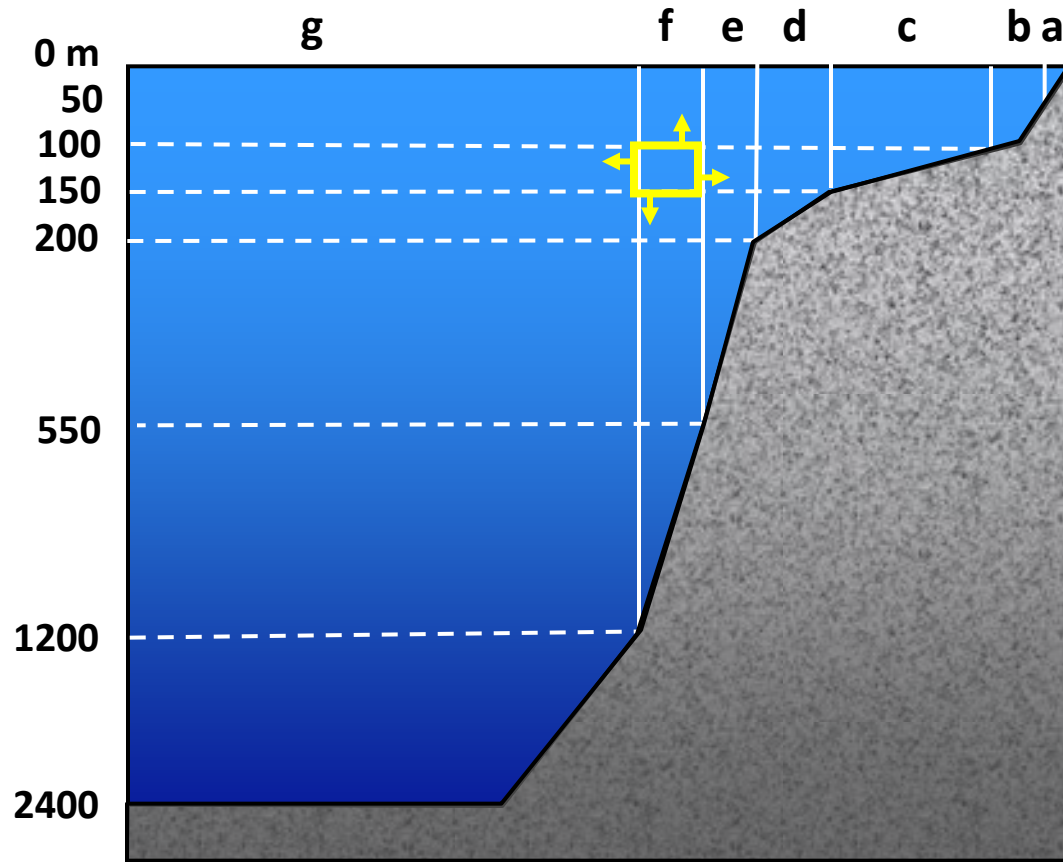
## MSE DESIGN AND ANALYSIS

DEFINE OBJECTIVES →

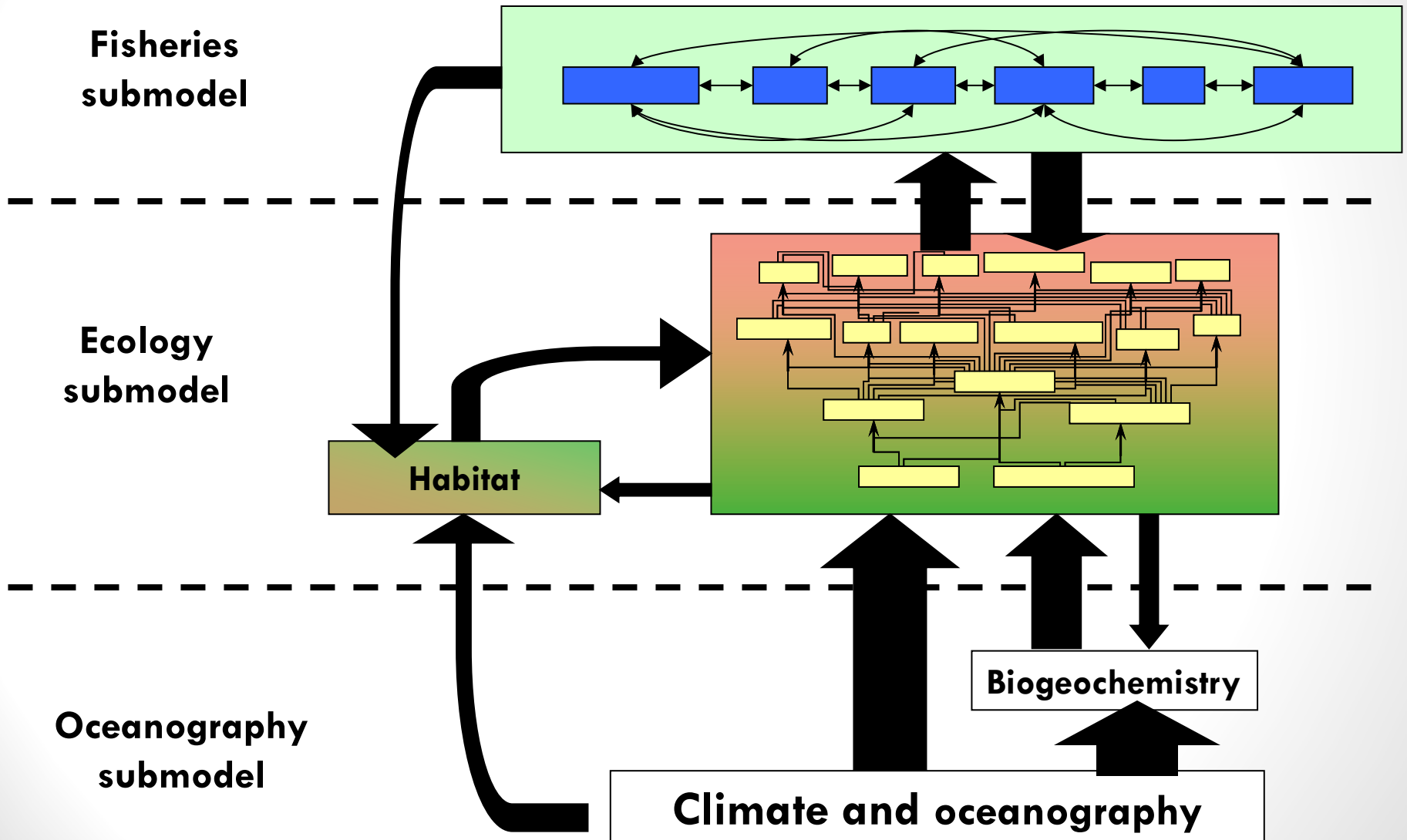
← PERFORMANCE MEASURES



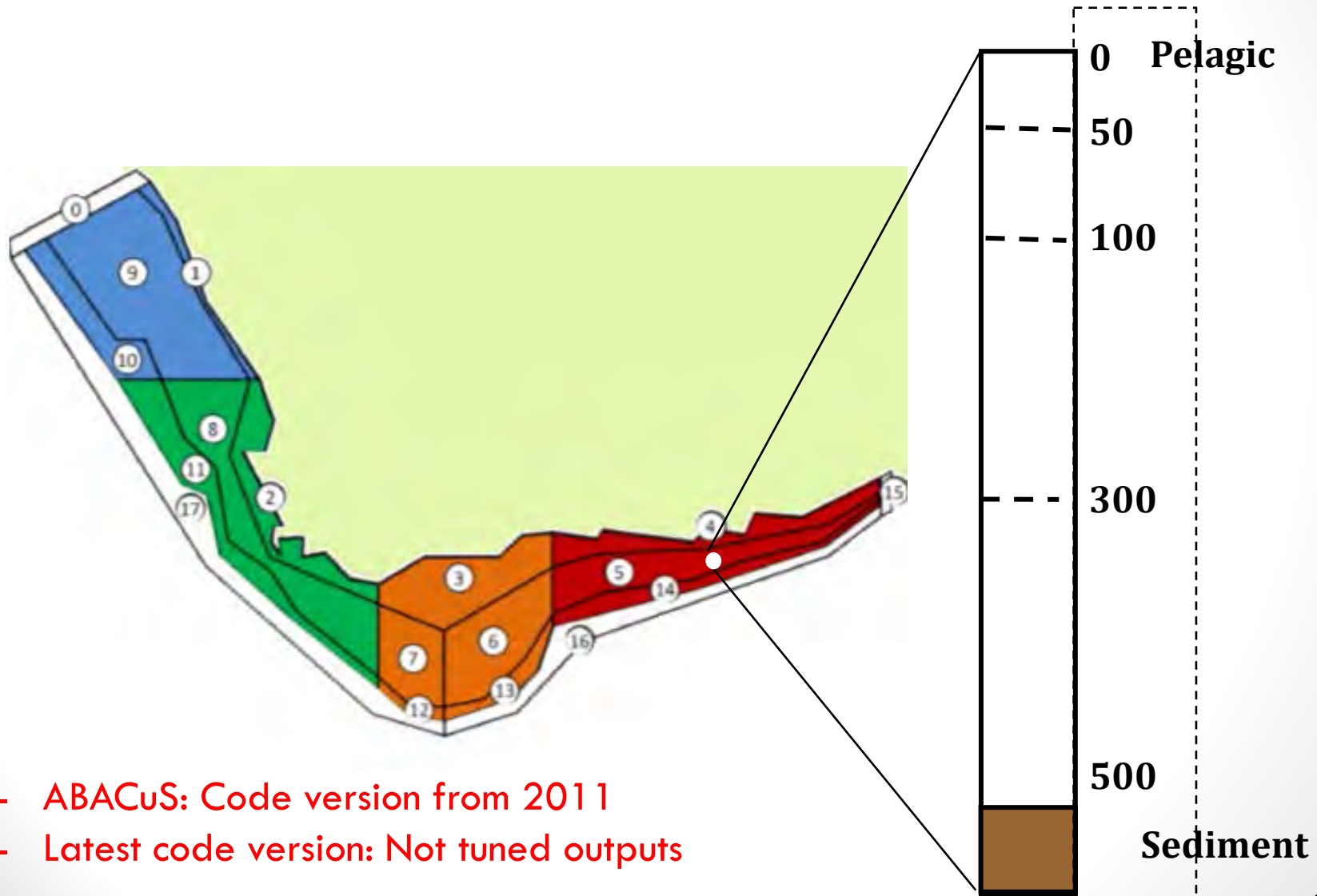
# Atlantis - Geography



# Atlantis - Submodels



# Atlantis on the Benguela and Agulhas Currents (ABACuS)

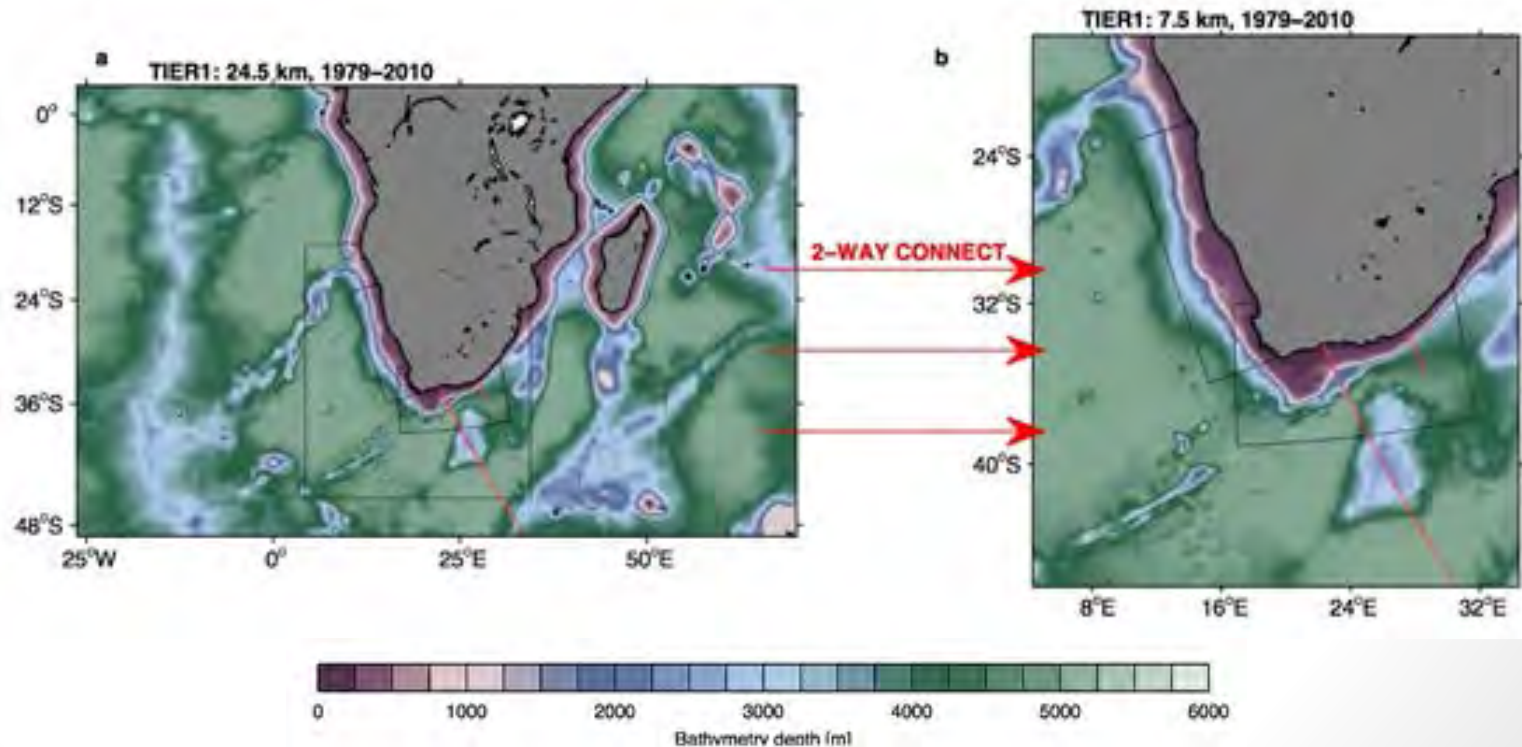


- ABACuS: Code version from 2011
- Latest code version: Not tuned outputs



# Hydrodynamics

- ABACuS: ROMS 1993, constant temperature, salinity
- Updated: ROMS 1990-1999, seasonal variability  
1/12 ° resolution



# Biology

- Detritus, bacteria
- Small phytoplankton, large phytoplankton, macroalgae
- Invertebrate (biomass pools) : 6
- Zooplankton (micro-, meso- and macro-)
- Macrozoobenthos, meiobenthos
- Squid



# Biology

19 functional groups



8 single species groups



18 Vertebrates (age structured groups, condition: structural and reserve weight)

# Fisheries

## **Small Pelagics**

Anchovy

Sardine

Horse mackerel

Round herring

## **Line fisheries**

Large pelagic fish

Snoek

Pelagic-feeding demersal  
fish

Benthic- and pelagic-  
feeding chondrichthyans

## **Demersal**

Shallow-water hake

Deep water hake

Cape horse mackerel

Other demersal fish

Benthic-feeding demersal  
chondrichthyans

## **Squid**

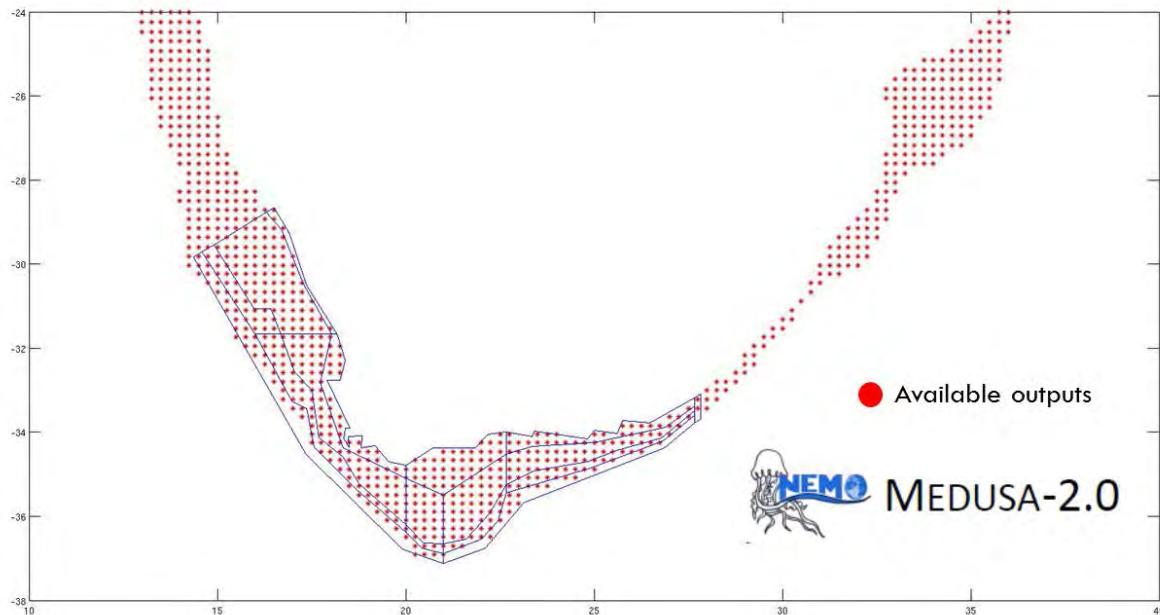
Chokka squid

Cuttlefish

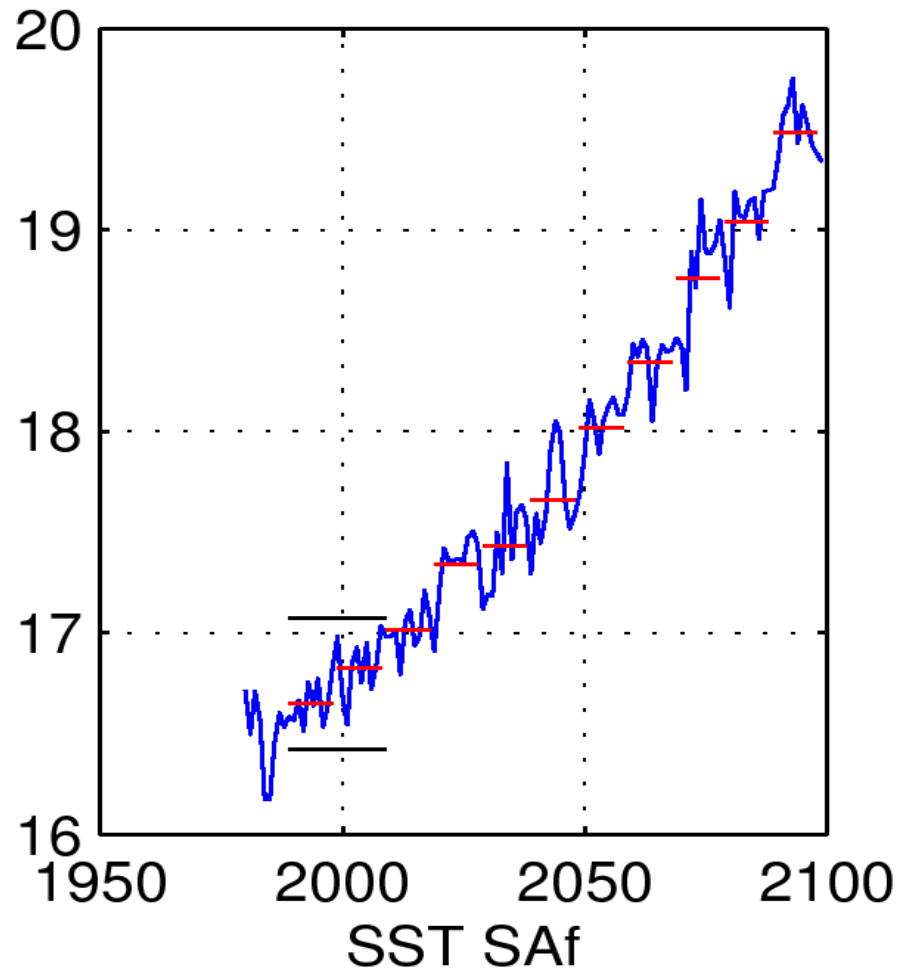
Flying squid

# Climate change scenarios

- Representative Concentration Pathway (RCP) 8.5 scenario
- Coupled biogeochemical NEMO-MEDUSA 2.0 model
- 100 years time series (2000-2099)
- Fishing and management scenarios

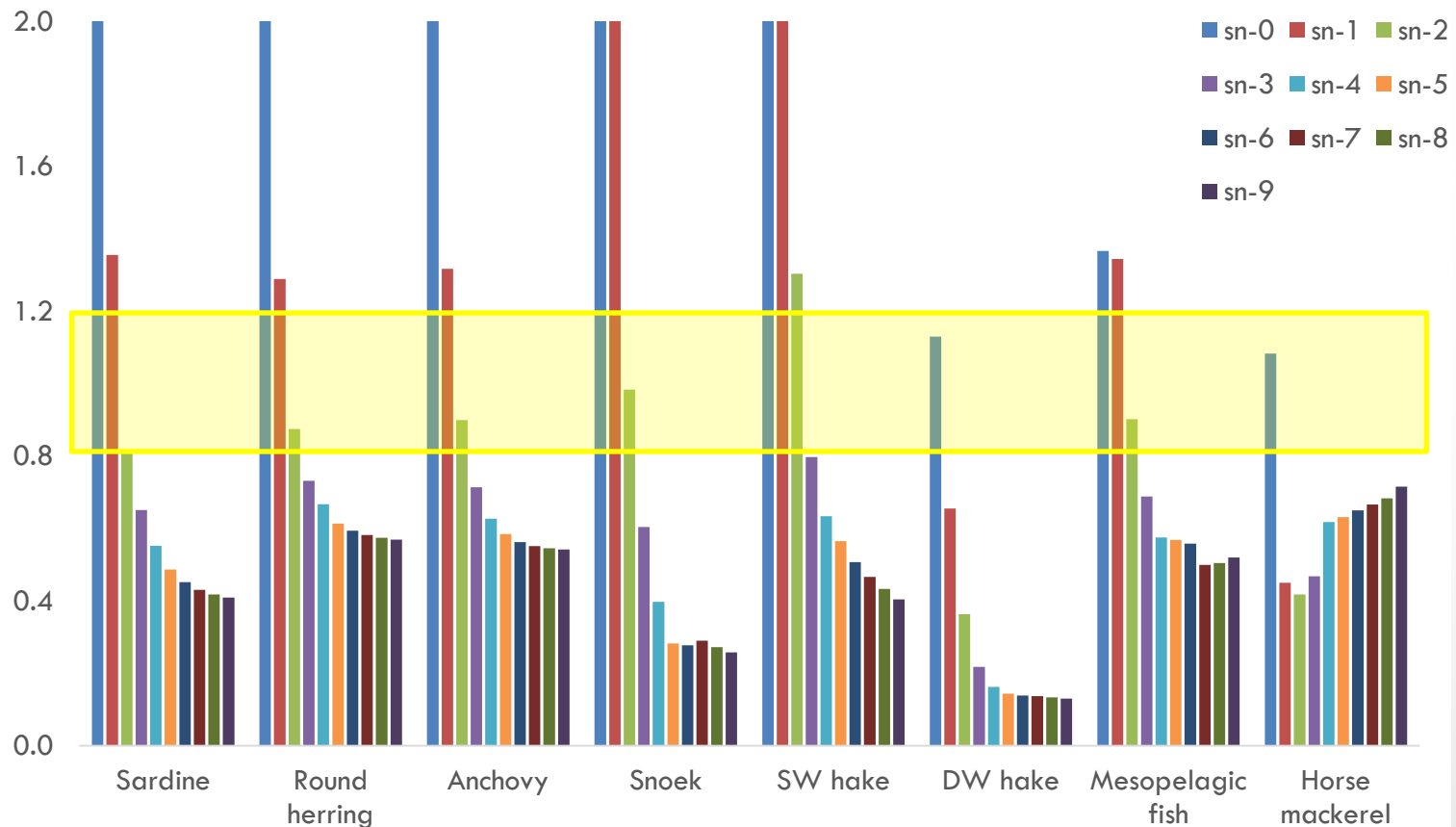


# Annual and decadal averaged SST Southern Benguela RCP 8.5



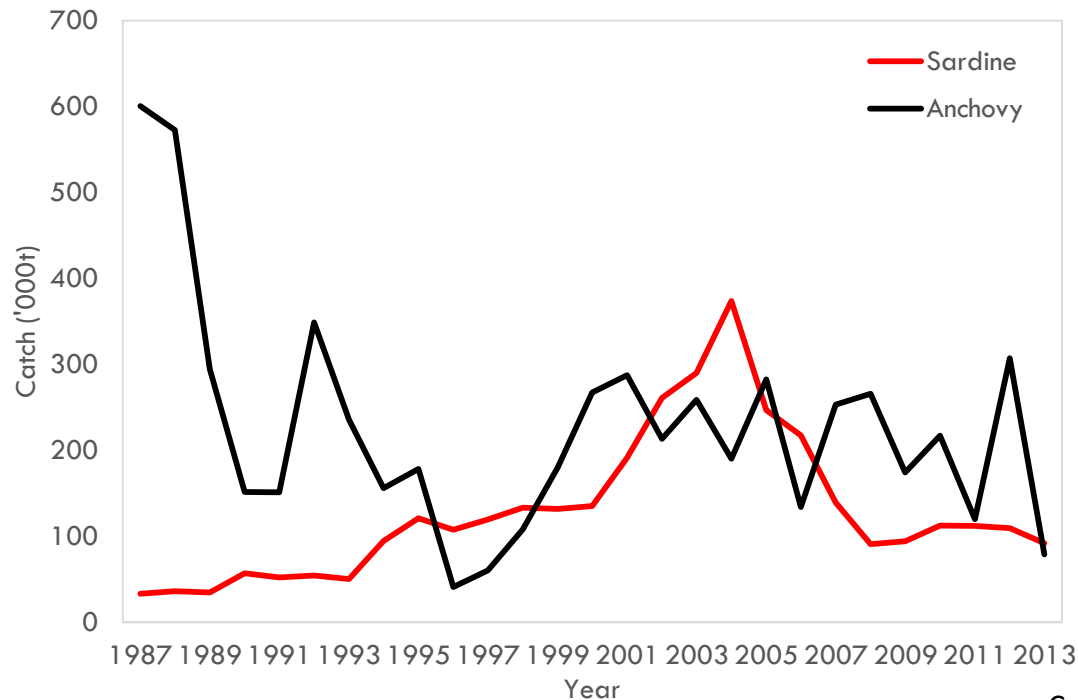
# Next Steps: Model calibration

- Prevent groups from going extinct
- Have vertebrates growing at a reasonable size-at-age



# Next Steps: Model calibration

- For species with historical data, the model must recreate observations of abundance from surveys or assessments
- For species with no historical data, the model should yield reasonable time series of abundance
- Capture observed spatial distributions





# Thanks!!!

