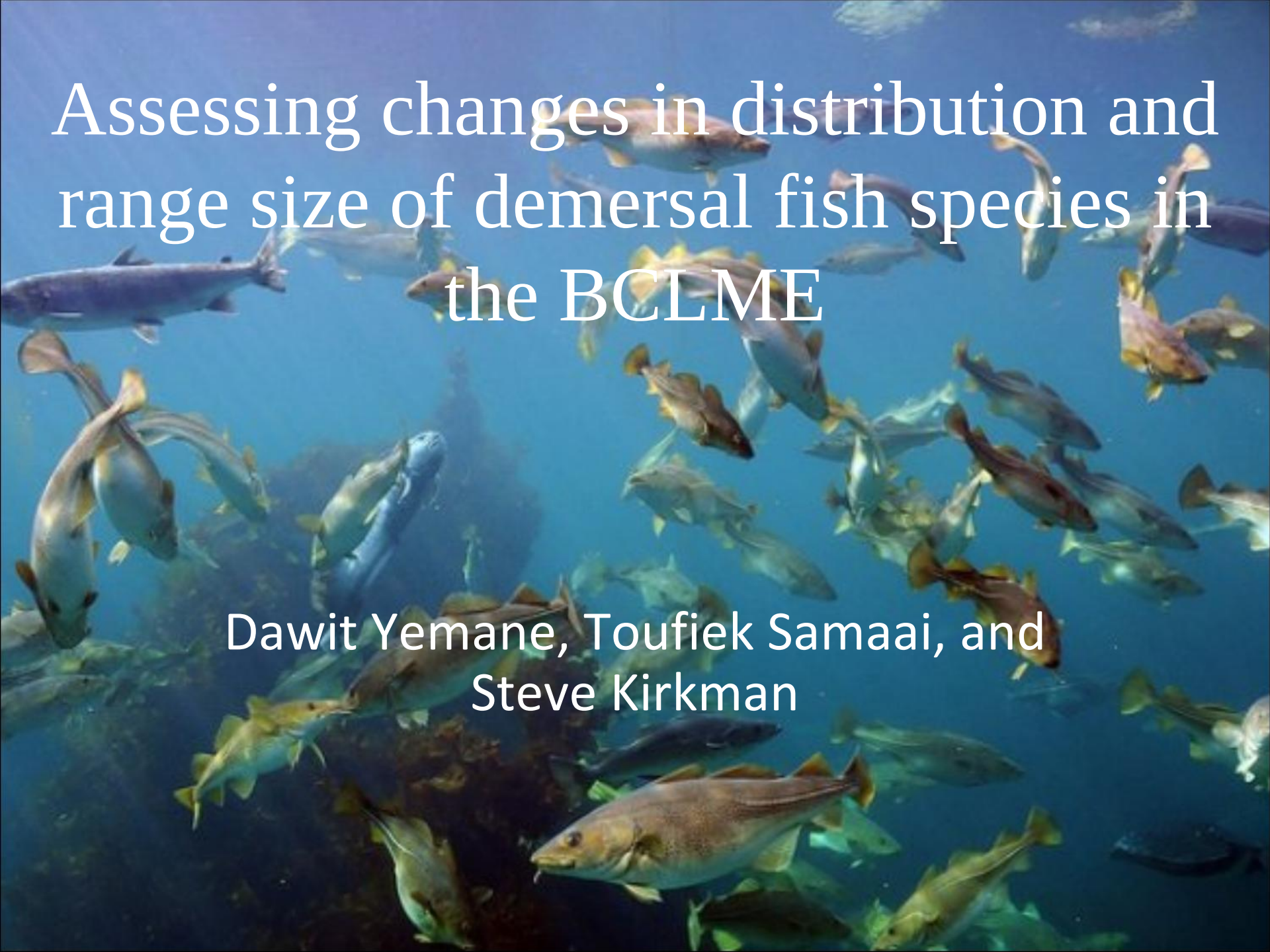
Assessing changes in distribution and range size of demersal fish species in the BCLME



Dawit Yemane, Toufiek Samaai, and Steve Kirkman

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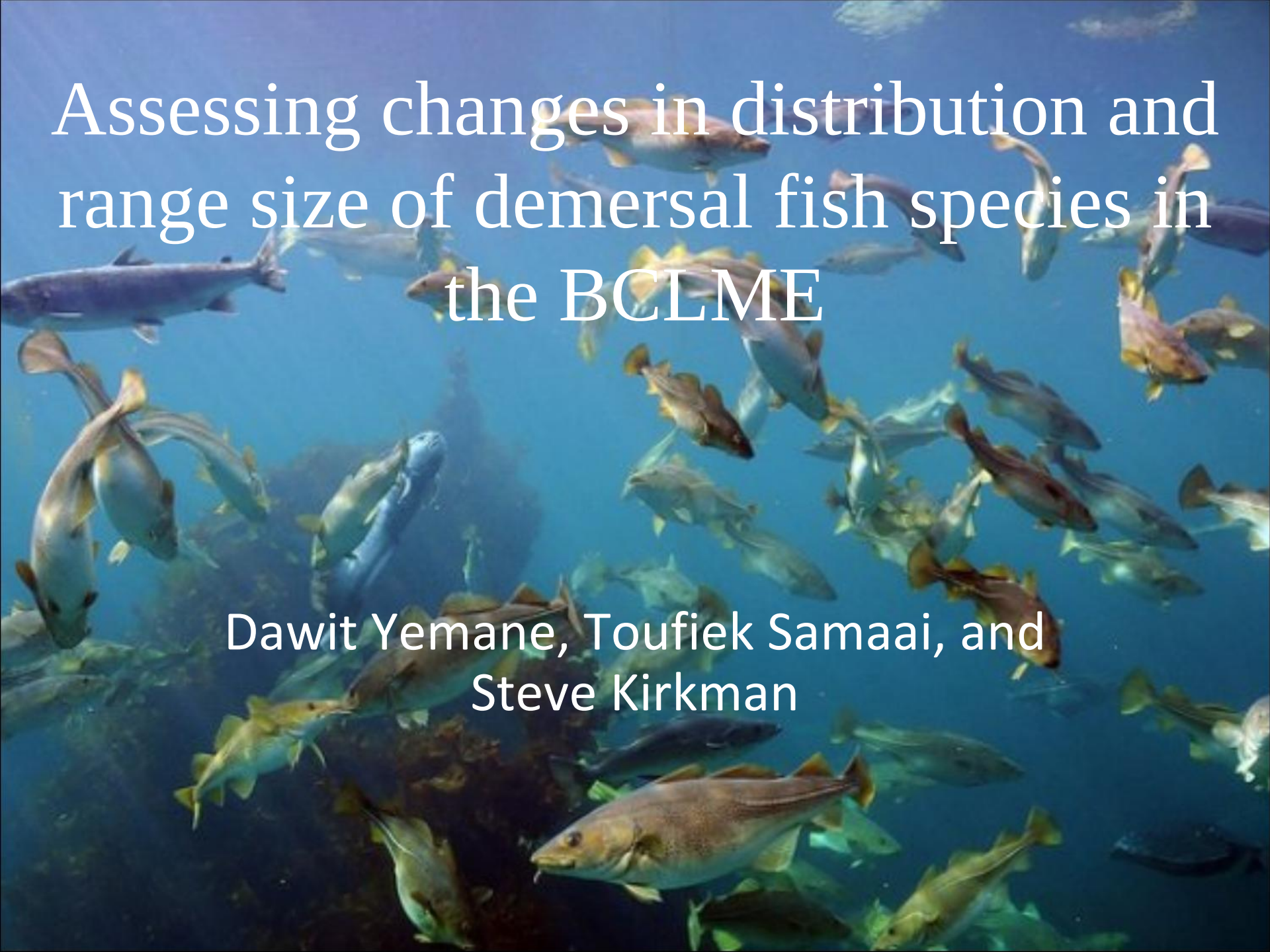

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Background

- Fish distribution is governed by multitude of factors that act on different life-history stages and operate at different spatial and temporal scale
  - Physiologically optimum environmental condition
  - Dispersal capacity
  - Spatio-temporal co-occurrence of prey species

- Some of the expected of consequences of climate change:
  - Shifts in distribution (towards higher latitude with warming)
  - Changes in demographic vital rates (growth, recruitment, survival)
  - Phenological shifts (earlier arrival of spring bloom and its cascading consequence)

Climate change and deepening of the North Sea fish assemblage: a biotic indicator of warming seas

Nicholas K. Dulvy[1,2*] Stuart I. Rogers[1] Simon Jennings[1] Vanessa Stelzenmüller[1]
Stephen R. D

Range contraction in large pelagic predators

Clima

Boris Worm[a,1] and Derek P. Tittensor[a,b,c]

Shifts in Marine Fishes

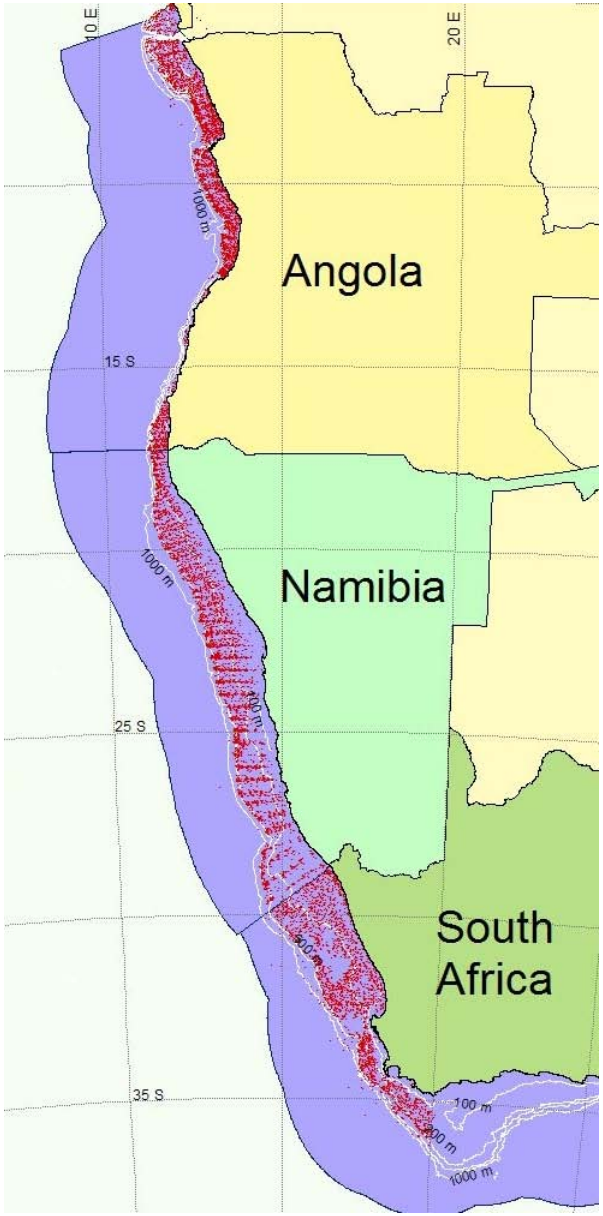
Allison L. Perry,[1*] Paula J. Low,[2†] Jim R. Ellis,[2] John D. Reynolds[1*]

Data sources and methods

- Data were obtained from the routine annual demersal biomass assessment survey off the three countries (Angola, Namibia, and South Africa) in the BCLME.
- Only survey conducted during the same season were included in the analysis (summer)
- Species that occur in more than 5% of all trawl station

Data sources and methods

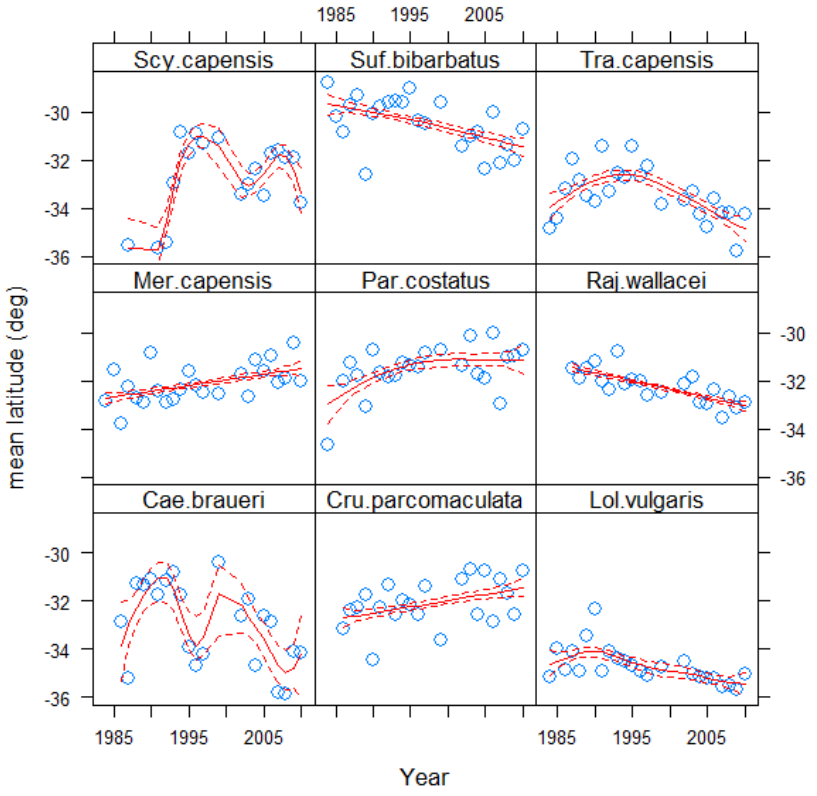
Map of the Bengula Current Large Marine Ecosystem (BCLME). Bottom trawl surveys conducted over the entire study period, 1985 – 2010, indicated by red dots.



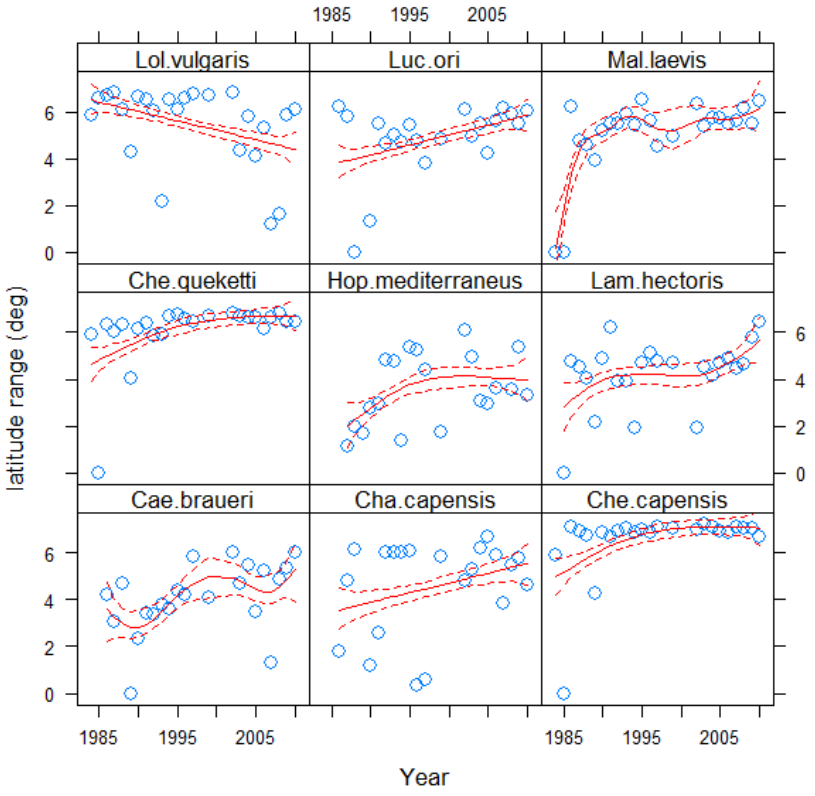
Data sources and methods

- The following indices of distribution/range size shift were calculated:
  - Mean latitude of distribution
  - Mean depth of distribution
  - Range of latitude
  - Range of depth
- Temporal trend in these indicators were calculated.

Temporal trend in mean latitude and latitudinal range: South Africa

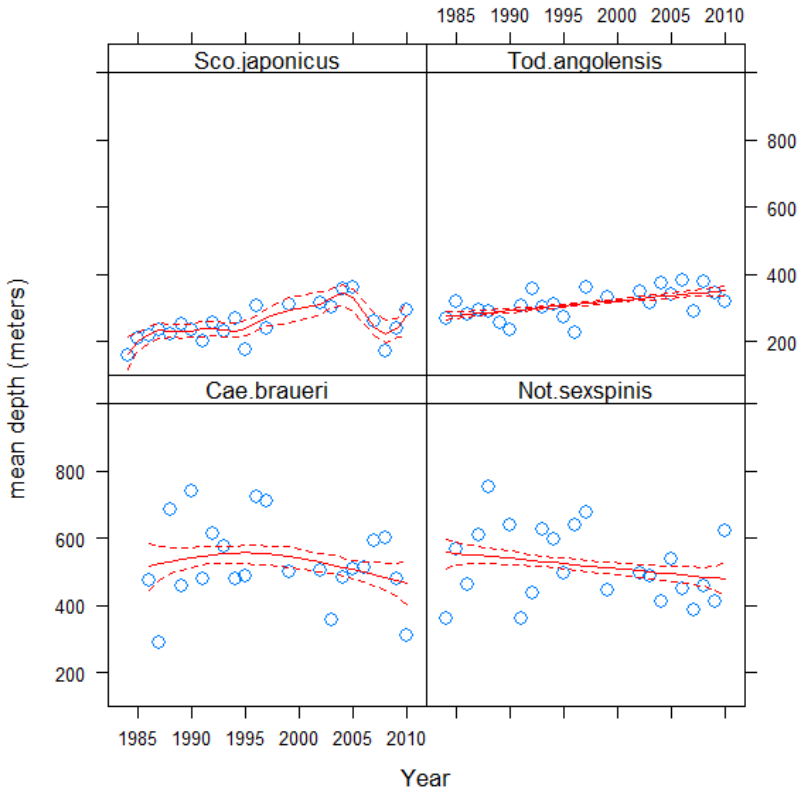


Significant change in mean latitude



Significant change in latitudinal range

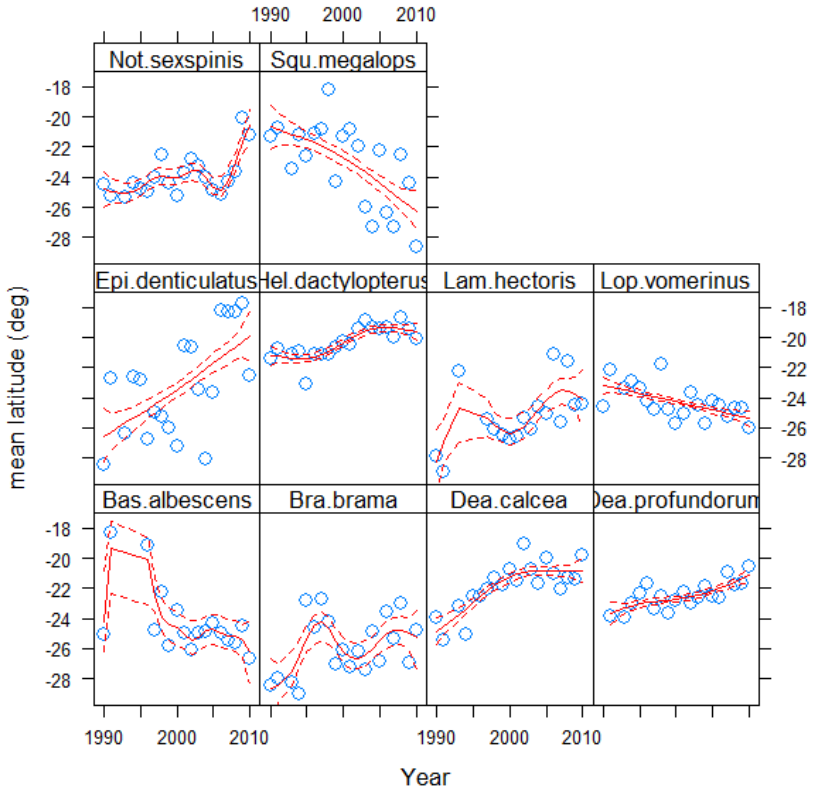
Temporal trend in mean depth and depth range: South Africa



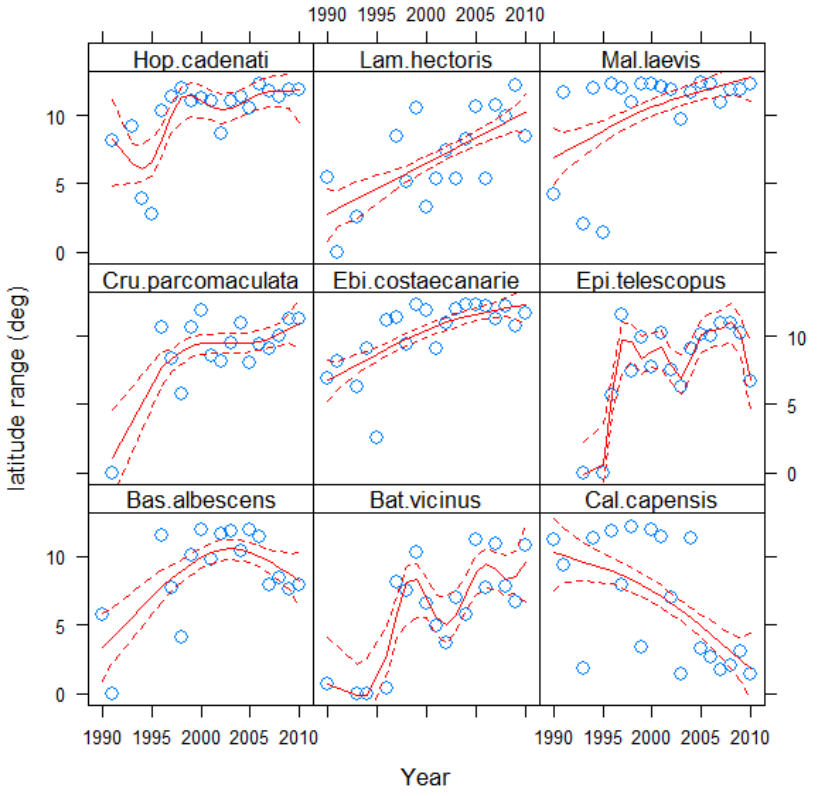
Significant change in mean depth

Significant change in depth range

Temporal trend in mean latitude and latitudinal range: Namibia

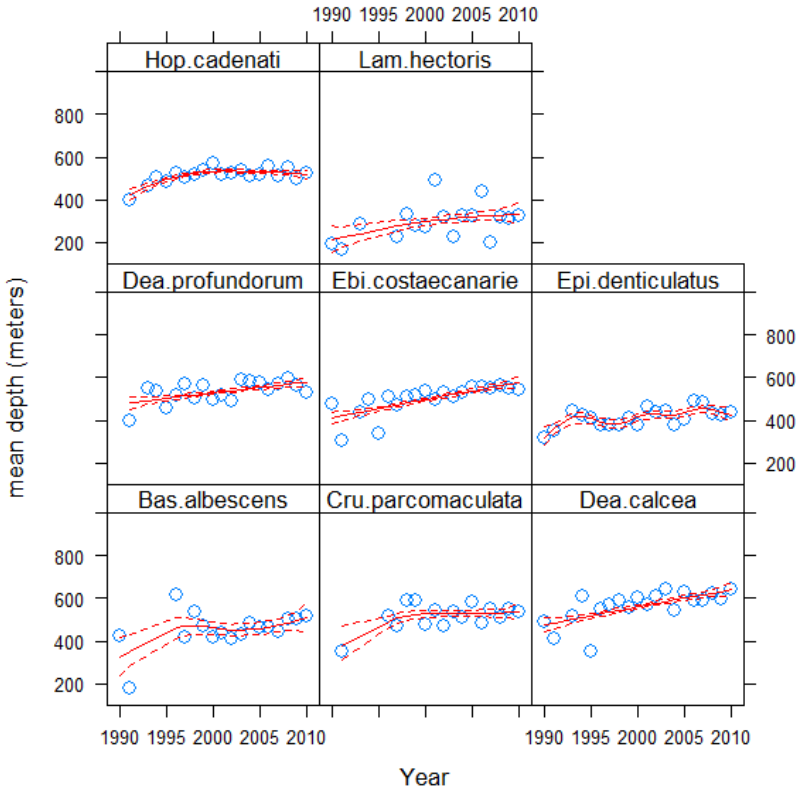


Significant change in mean latitude

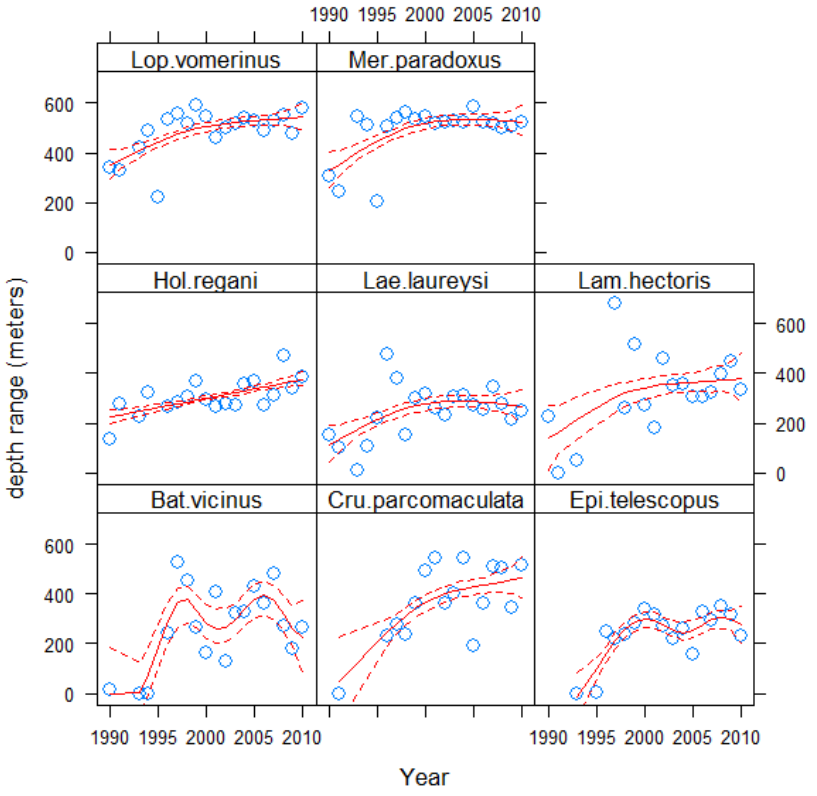


Significant change in latitudinal range

Temporal trend in mean depth and depth range: Namibia

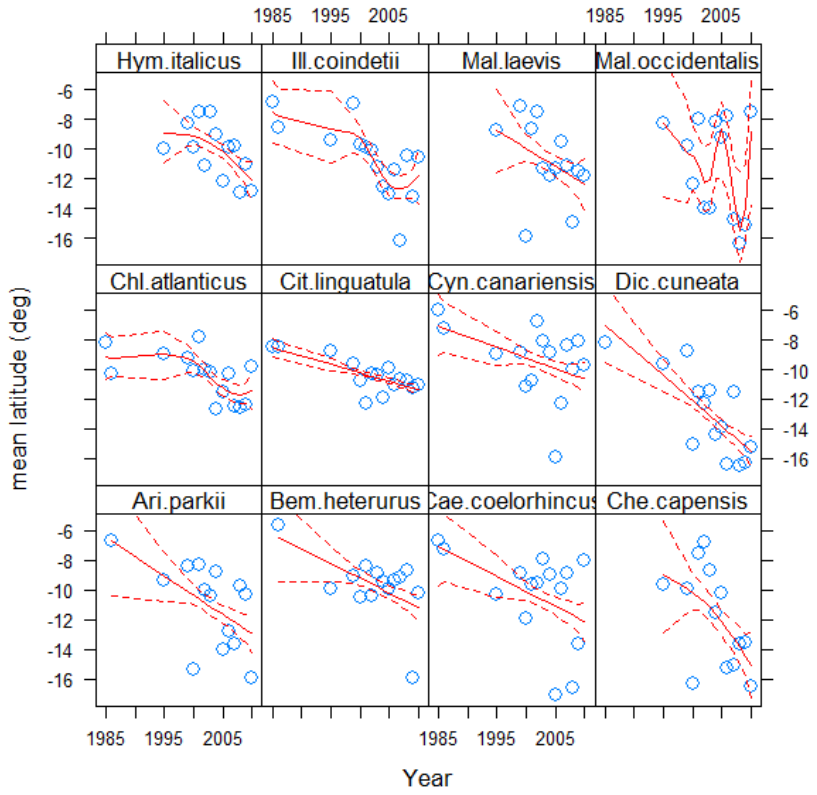


Significant change in mean depth

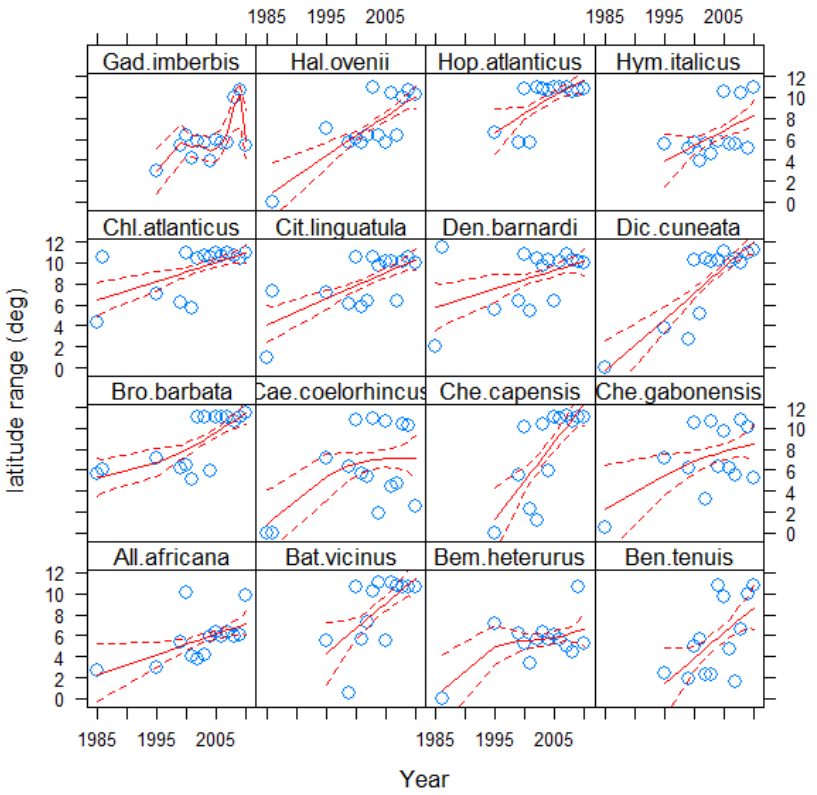


Significant change in depth range

Temporal trend in mean latitude and latitudinal range: Angola

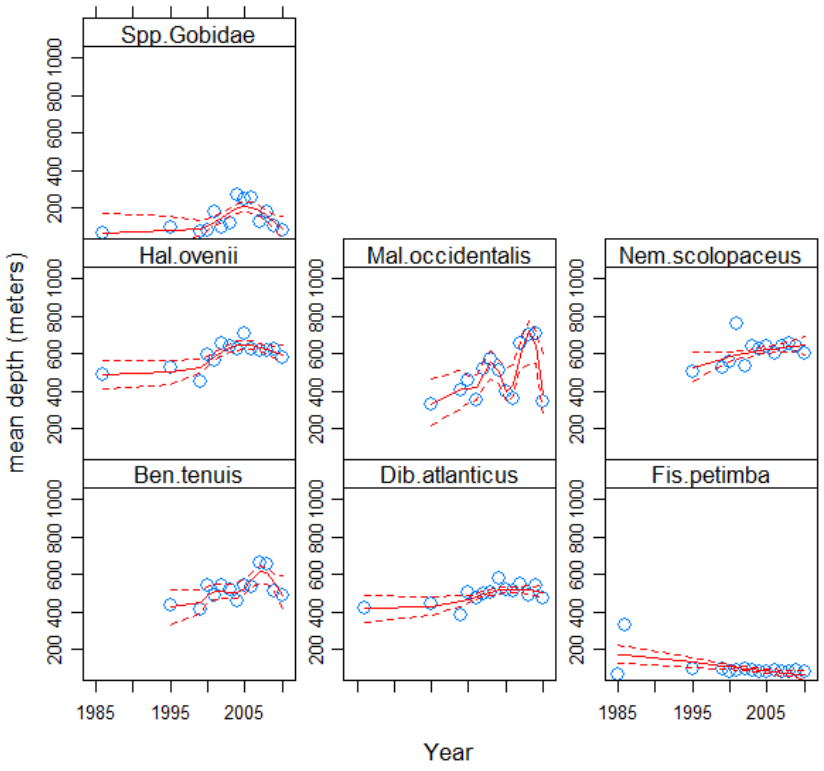


Significant change in mean latitude

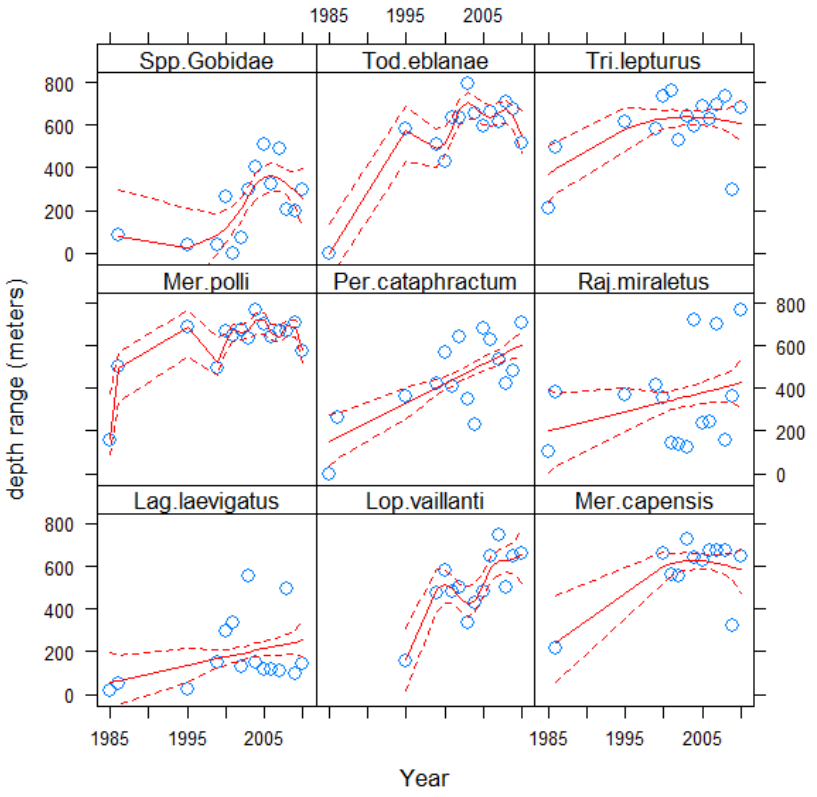


Significant change in latitudinal range

Temporal trend in mean depth and depth range: Angola

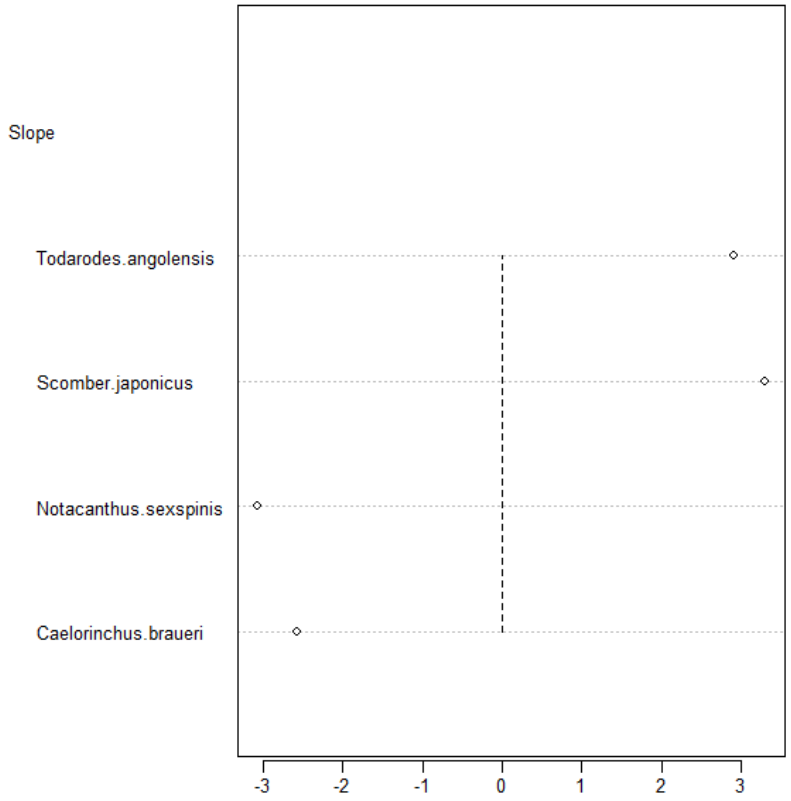


Significant change in mean depth



Significant change in depth range

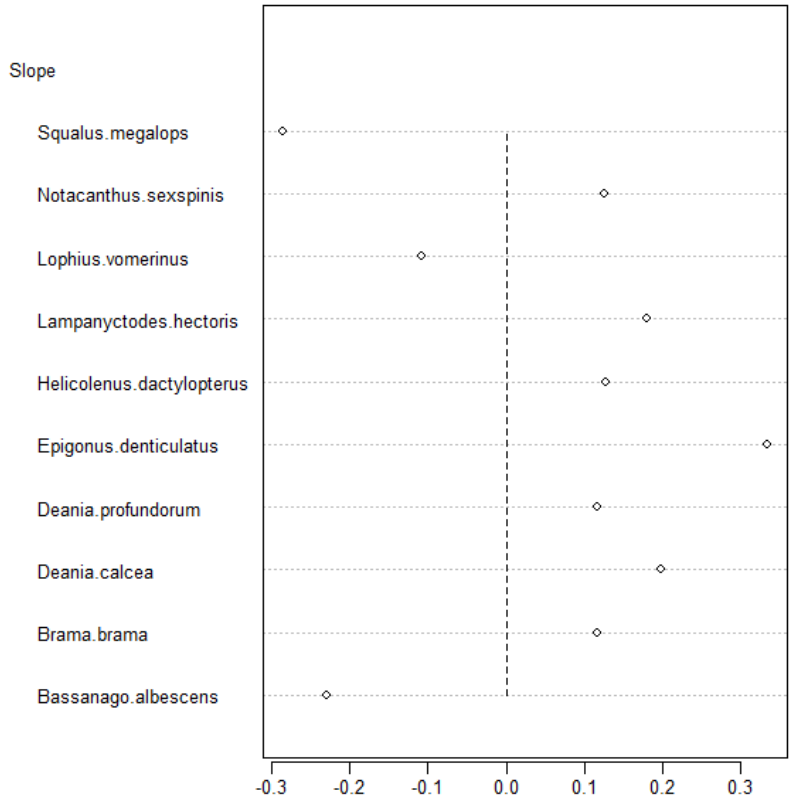
Slope of temporal trend in mean depth and mean latitude: South Africa



Significant change in mean depth

Significant change in mean latitude

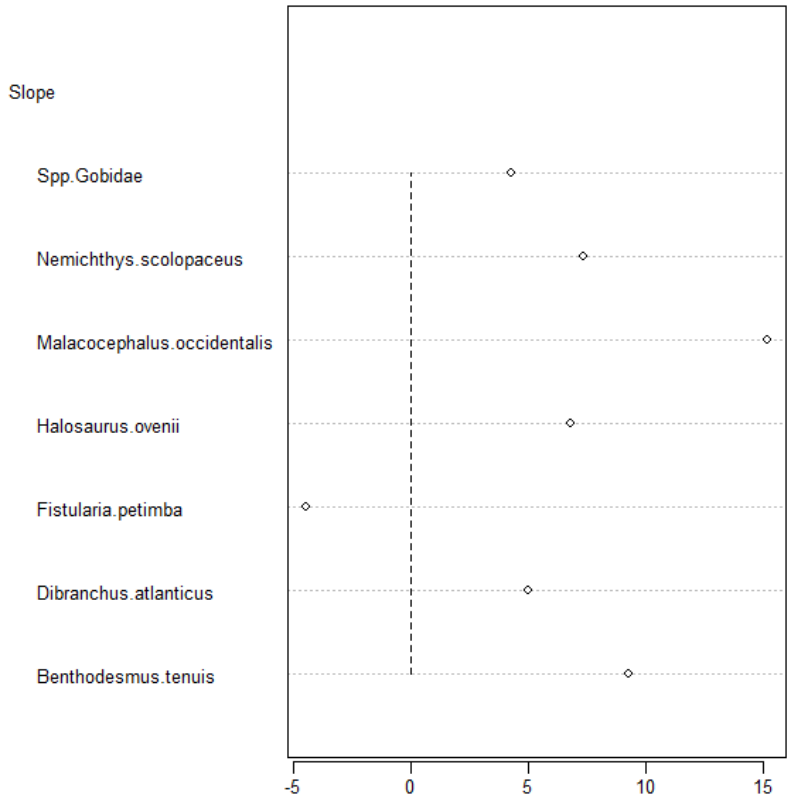
Slope of temporal trend in mean depth and mean latitude: Namibia



Significant change in mean depth

Significant change in mean latitude

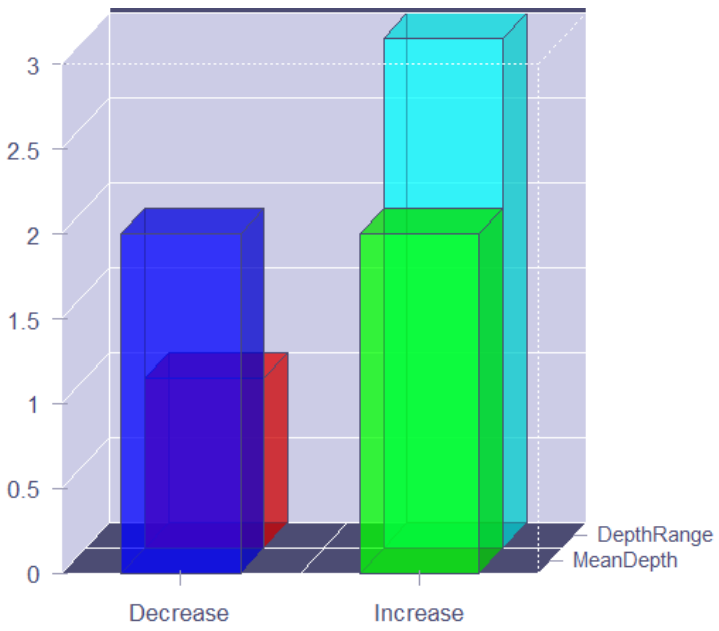
Slope of temporal trend in mean latitude and mean latitudinal: Angola



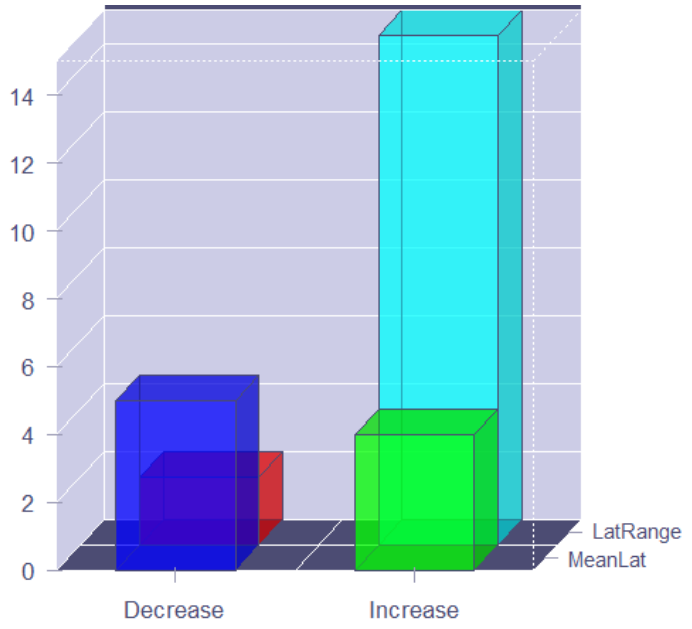
Significant change in mean depth

Significant change in mean latitude

Change in distribution and range size: South Africa

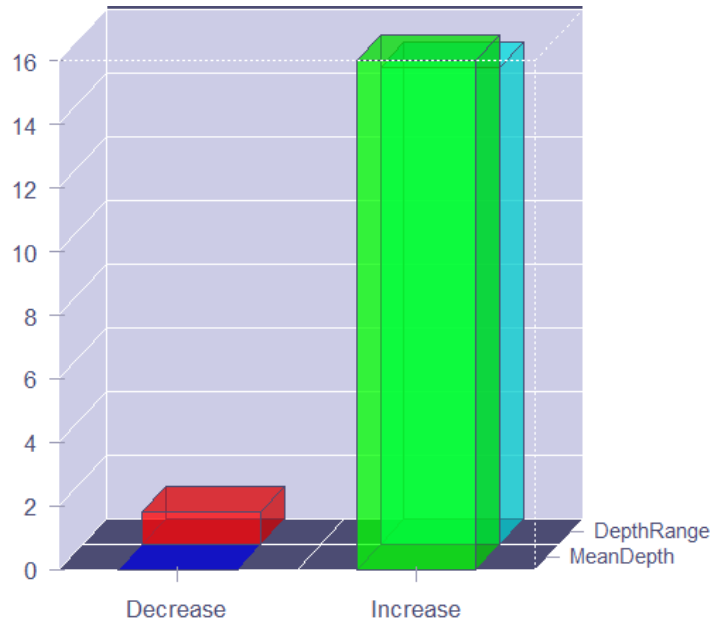


Significant change in depth



Significant change in latitude

Change in distribution and range size: Namibia



Significant change in depth

Significant change in latitude

Most species moved to deeper waters and extended their depth range. Most species also extended their latitudinal range but relatively more species moved northward

Change in distribution and range size: Angola

Significant change in depth

Significant change in latitude

Most species go deeper and increased their depth range. Over time most species's center of gravity shifted south also extended their latitudinal range

- Across the BCLME temporal change in distribution and range size of demersal fish populations was found.
- Overall most species showed changes in mean latitude and mean depth, south ward and into deeper water, that are in agreement with expected changes predicted with warming.