Coastal Ecosystems

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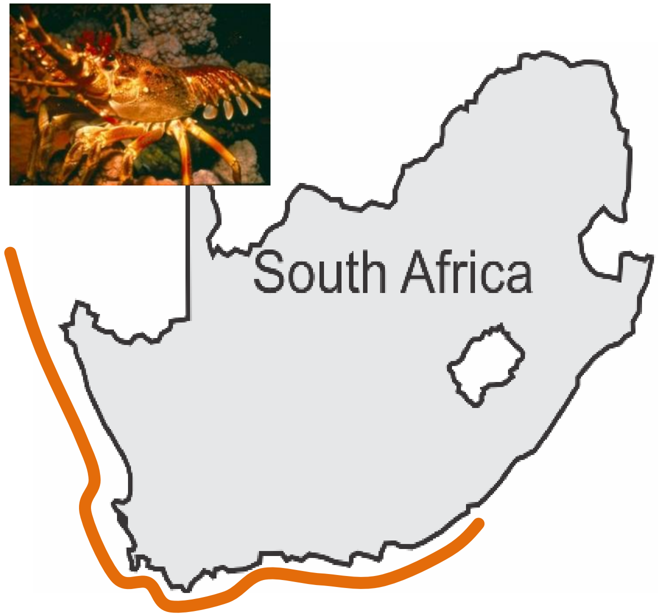
Coastal Ecosystems

1. *Evidence of changes that can be attributed to climate change/climate variability*

2. *What are known/projected changes due to long term changes in climate?*

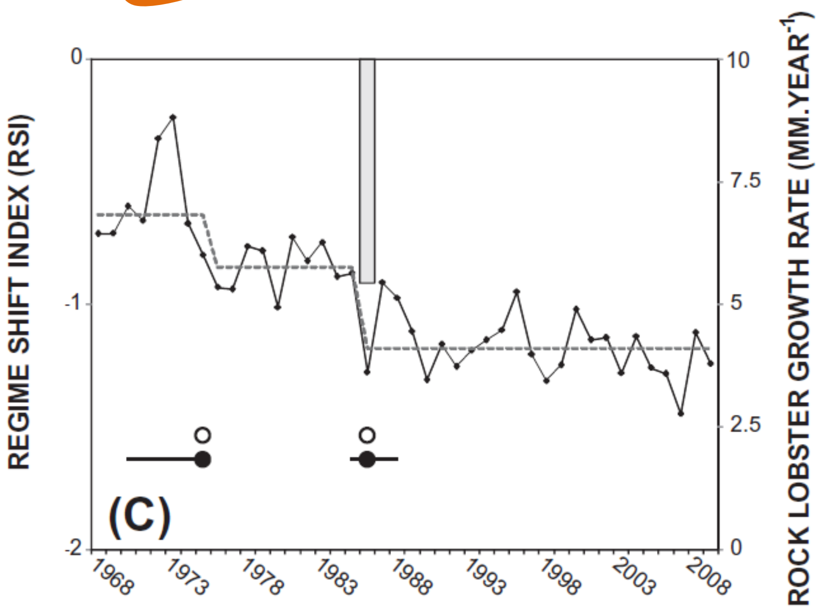
3. *What are the challenges in forecasting/modelling long term changes at a local scale?*

West Coast Rock Lobster *Jasus lalandii*

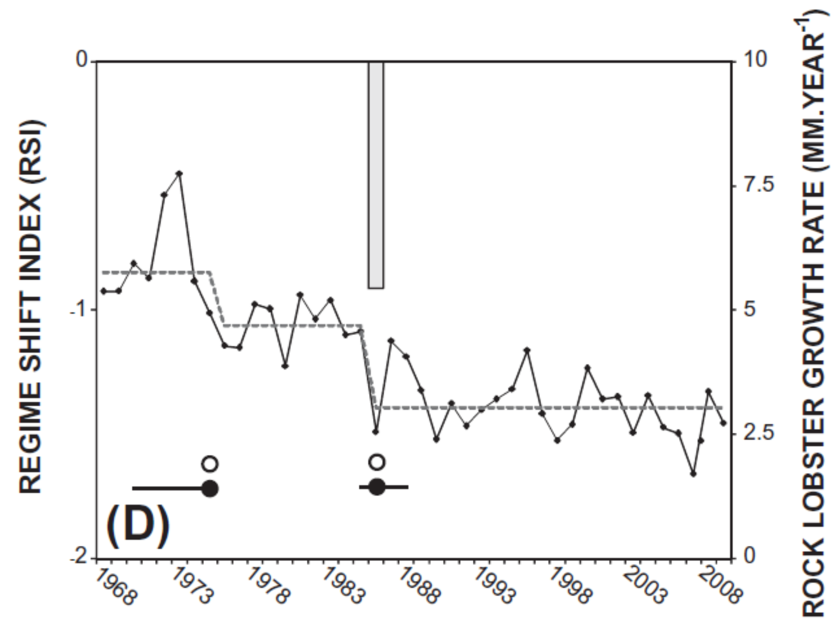


1. Growth rates declined in 1980s

- *Red tides ➔ LOW ➔ overcrowding ➔ competition*
- *Climate ➔ primary production ➔ food availability ➔ competition*



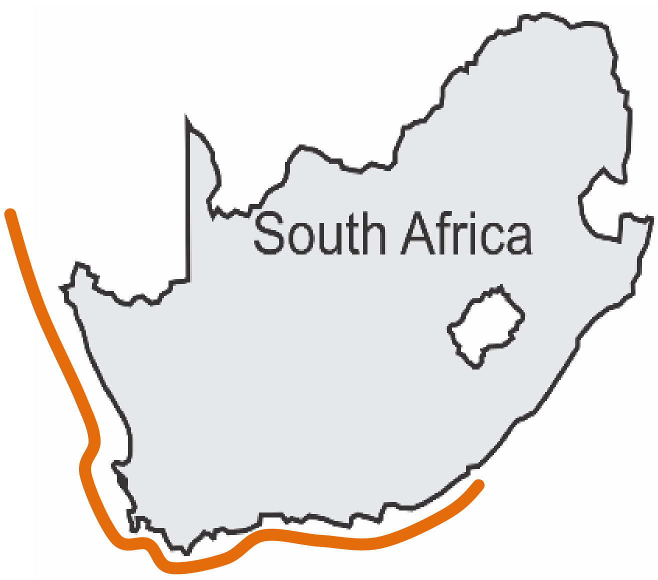
West Coast



South-West Coast

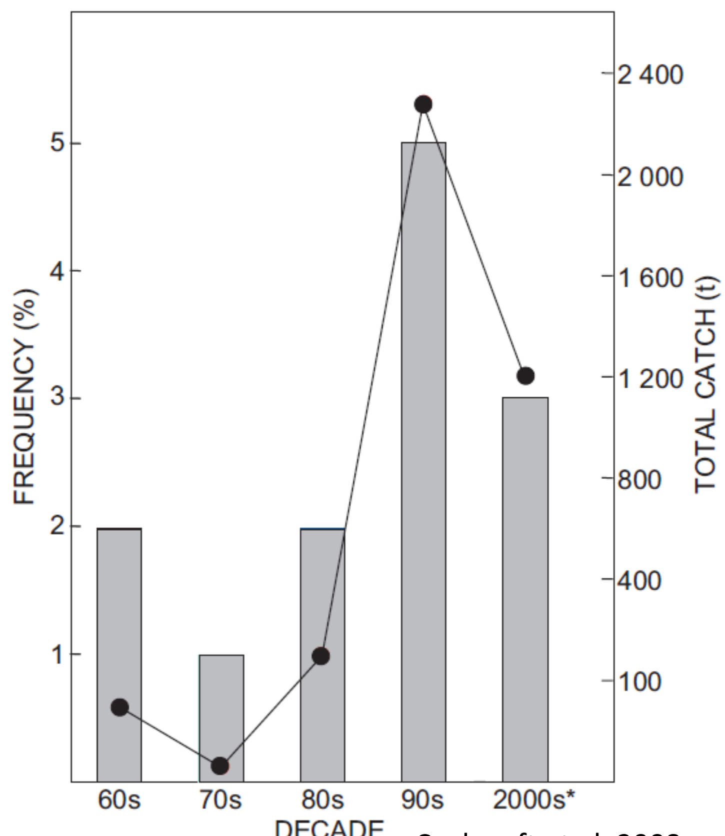
Blamey et al. 2012

West Coast Rock Lobster *Jasus lalandii*



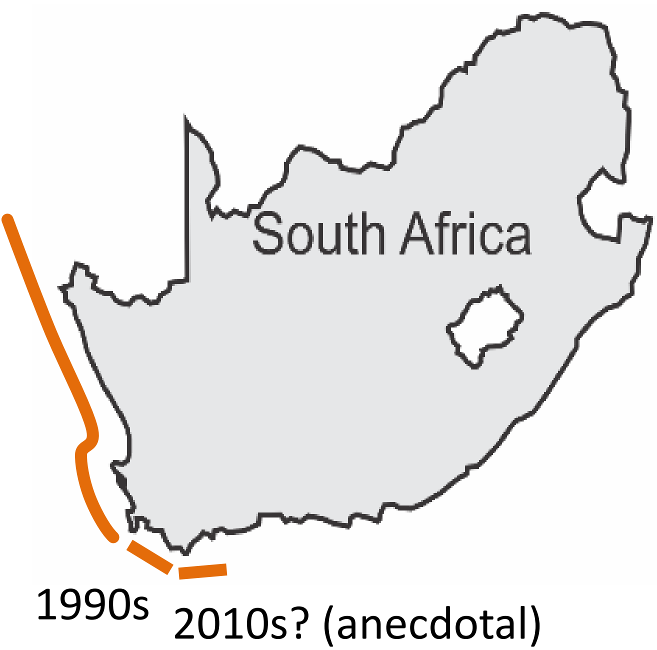
2. Increased lobster walkouts in 1990s

- *Intolerant of low-oxygen levels*
- *LOW ➔ lobsters forced inshore ➔ walkout*



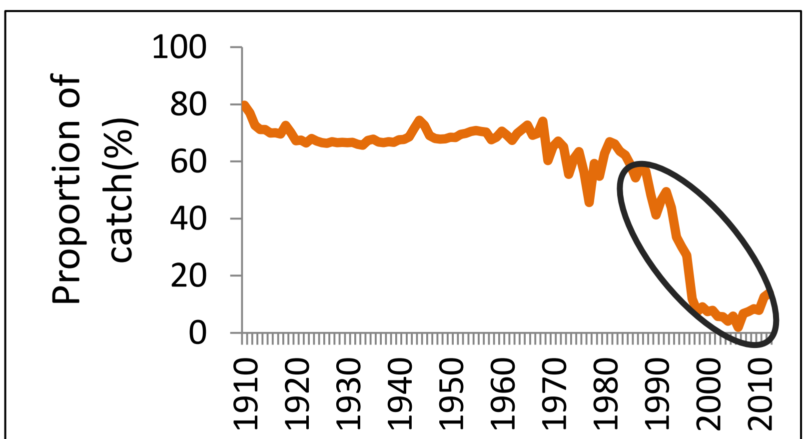
Cockcroft et al. 2008

West Coast Rock Lobster *Jasus lalandii*

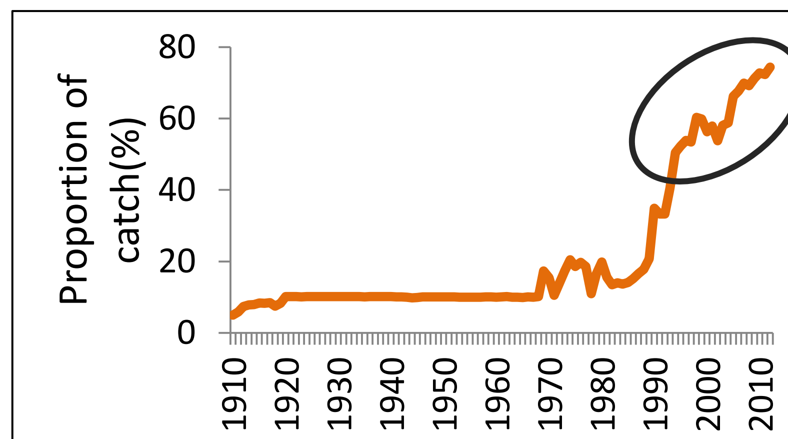


3. Shift in catch/abundance early 1990s

- *Declining resource on west coast*
- *Increased abundance on south-west coast*
- *Reason for eastward shift unknown, possibly linked to environmental change* (Cockcroft et al. 2008)
- *Ripple effects on rest of ecosystem* (Blamey et al. 2010, Blamey & Branch 2012)



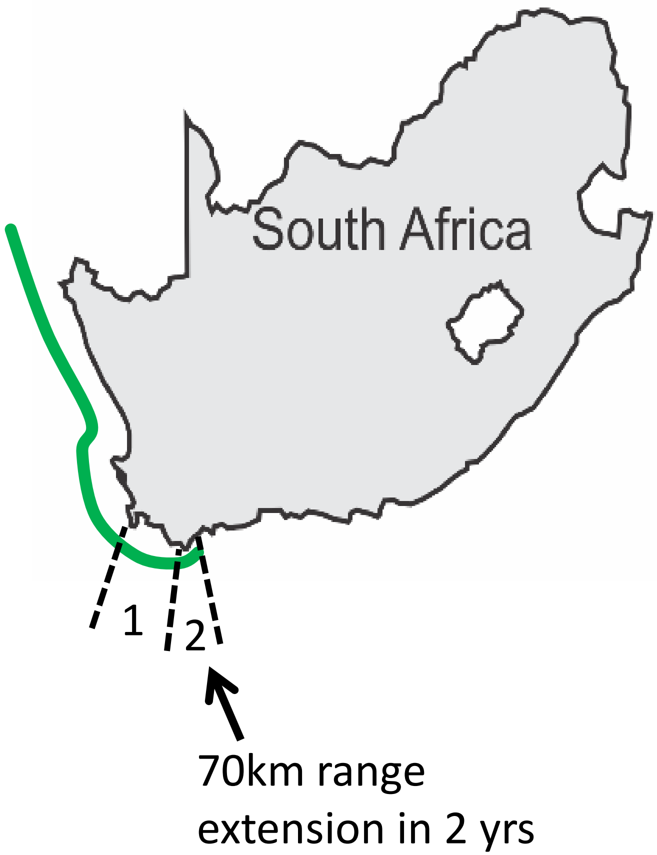
West Coast



South-West Coast

Cockcroft et al. 2008; Blamey et al. 2012

Kelps: *Ecklonia maxima*



1. Increased abundance east of C. Point

- *Cooler water temperatures?*
- *Increased nutrient supply? (via ↑upwelling or nutrient run-off?)*

2. Range extension east of C. Agulhas

- *Cooler water temperatures?*
- *Increased nutrient supply? (Via ↑upwelling or nutrient run-off?)*

Bolton et al. 2012; Reimers et al. 2014

Increased kelp abundance in False Bay

1950

2011

Reimers et al. 2014 AJMS

1992

2011

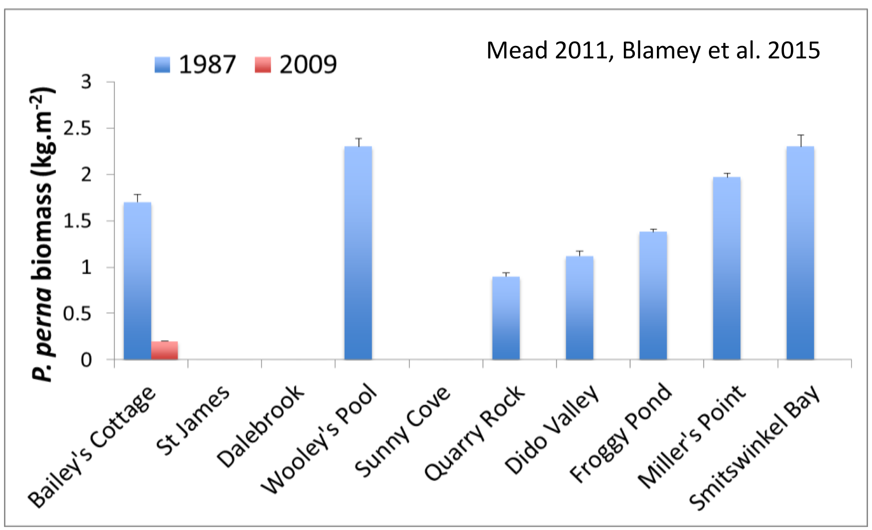
Increased kelp abundance in Hermanus

c. 1920 | 2012 | Reimers et al. 2014 AJMS

Rocky Shores: Brown mussel *Perna perna*

> 200km retraction in mussel beds

1. Range retraction since 1980s
   - *Cooler water temperatures in south (warm-water mussel)*



Rocky Shores

- Intertidal communities located at biogeographical breakpoints e.g. between cool-temperate ecoregion on the west coast and warm-temperate ecoregion on south coast have come to resemble each other over time (Mead 2010)

- Non-native species: Range expansion and increased abundance correlated with temperature changes (Rius et al. 2013)

- Native species: very few drastic shifts been recorded

Sandy Beaches

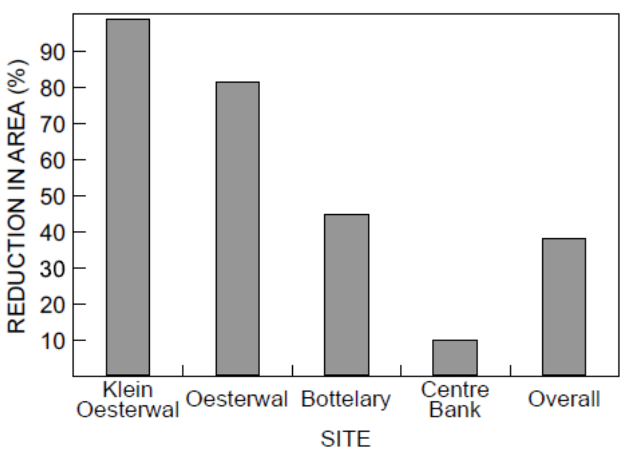
Climate change not expected to cause dramatic shifts in sandy shore communities, relative to other pressures (Harris et al. 2011)

However, potential changes in distribution of some biota could be affected by changes in temperature, rainfall, wind, currents and upwelling regimes (Mead et al. 2013)

Seagrasses

1. Langebaan Lagoon

- *38% of the seagrass (Z. capensis) area been lost since 1960, with some sites showing up to 98% loss*
- *Linked to changes in temperature but also anthropogenic disturbance*



Mead et al. (2013)

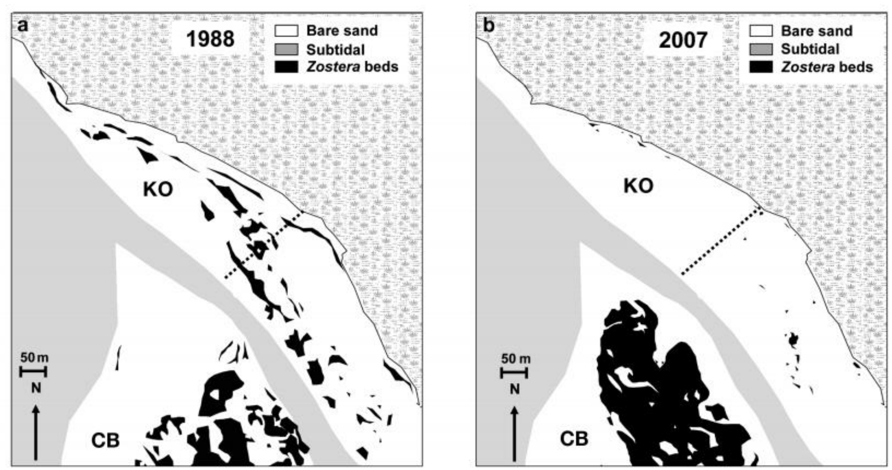


Fig. 3. *Zostera capensis.* Changes in total areas of the seagrass at Klein Oesterwal (KO) and Centre Bank (CB) between (a) 1988 (b) and 2007. Dashed lines indicate approximate transect positions. Maps are based on orthophotos with digitised seagrass beds

Pillay et al. (2010)

Coral Reefs

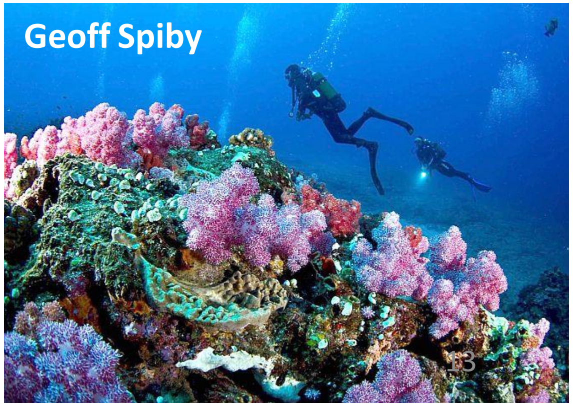
* Long-term monitoring program initiated in 1993

1. Bleaching events

- *minor event in 1998*
- *more significant event in 2000*
- *overall, bleaching has been minimal compared to other regions (e.g. northern WIO)*

2. Coral community

- *Changes in coral cover – early 2000s*
- *Changes in coral recruit success – early 2000s*
- *Linked to warmer temperatures*



See Celliers and Schleyer 2002; Schleyer et al. 2008; Ateweberhan et al. 2013

Projected changes

DRIVERS

- Temperature likely to be one of the biggest drivers
- But also winds, upwelling, storms, OA

RESPONSE

- Distribution ranges
- Growth & reproduction
- Community composition
- Behaviour?
- Trophic cascades

Challenges in forecasting/modelling long term changes at a local scale?

- High variability – both spatial and temporal
- Effects often compounded by other factors e.g. fishing, introduced species, habitat modification
- Long-term data are patchy; shifting baselines?
- Need for experimental and modelling studies
- Long-term monitoring in no-take areas