

Biological changes in the offshore environment of the southern Benguela

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Human activities & changing ecosystems:

PRESSURES:

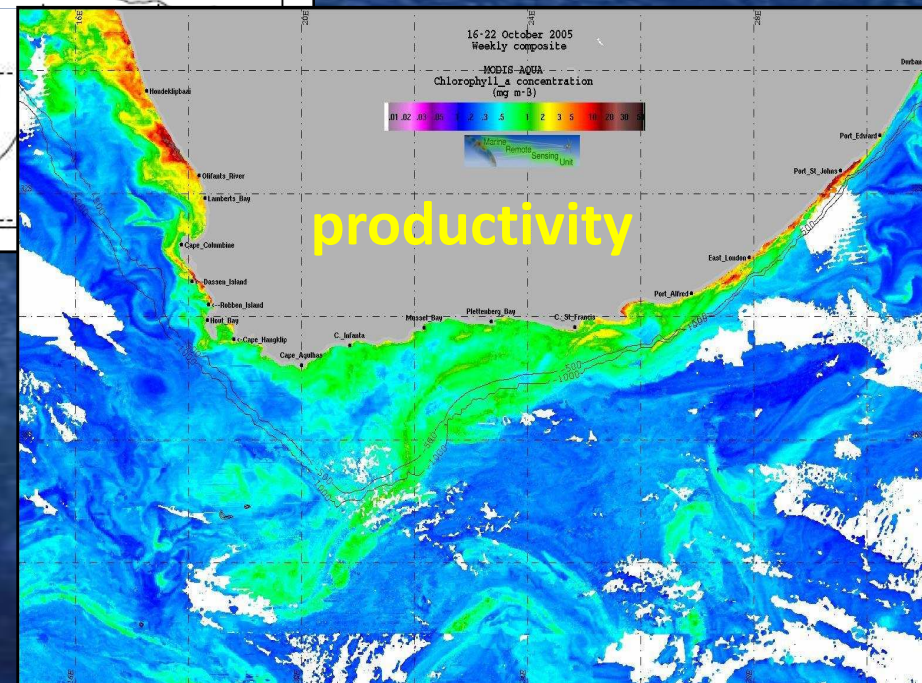
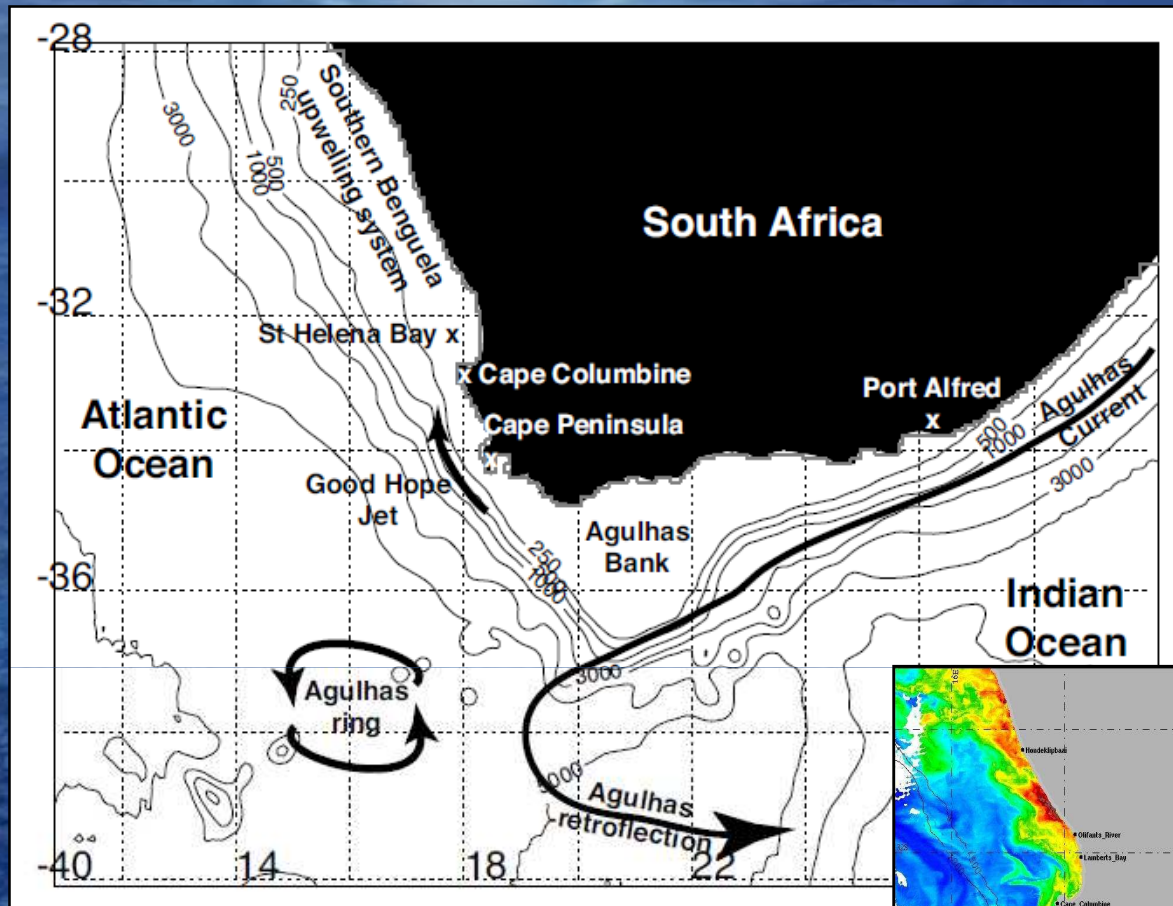
- Climate change
- Ocean acidification
- Pollution
- Habitat alteration
- Invasive species
- Fishing



Expect changes in:

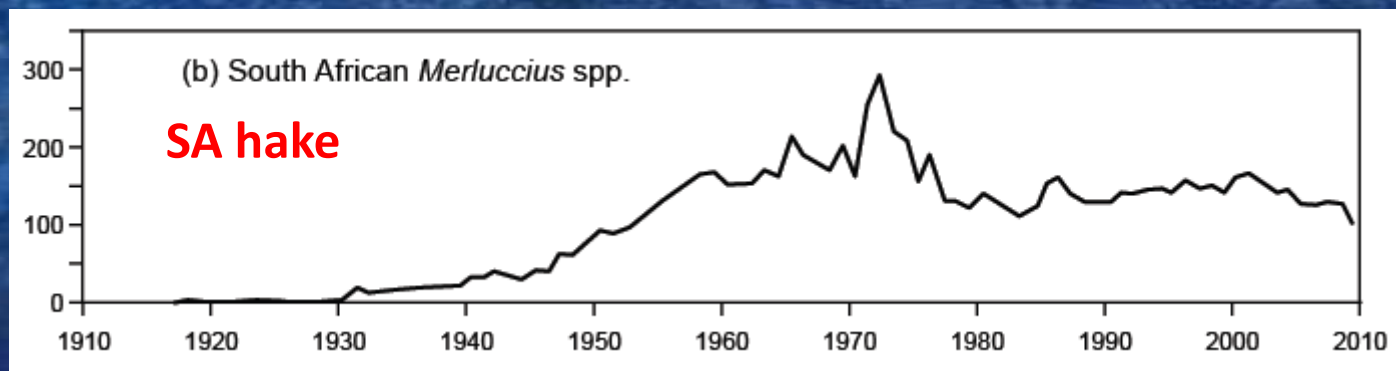
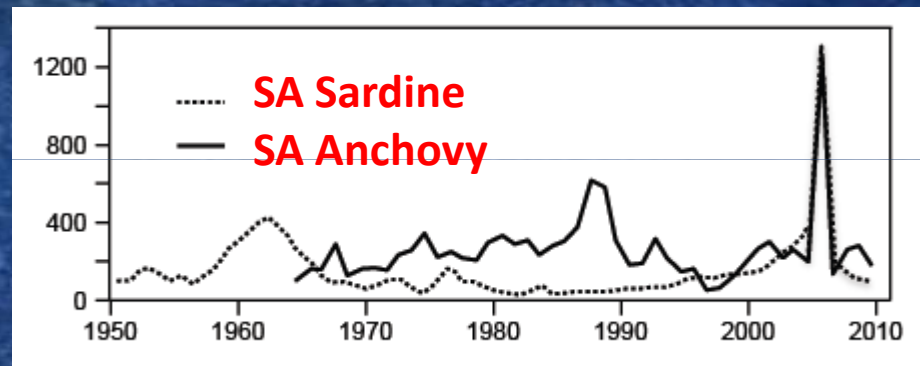
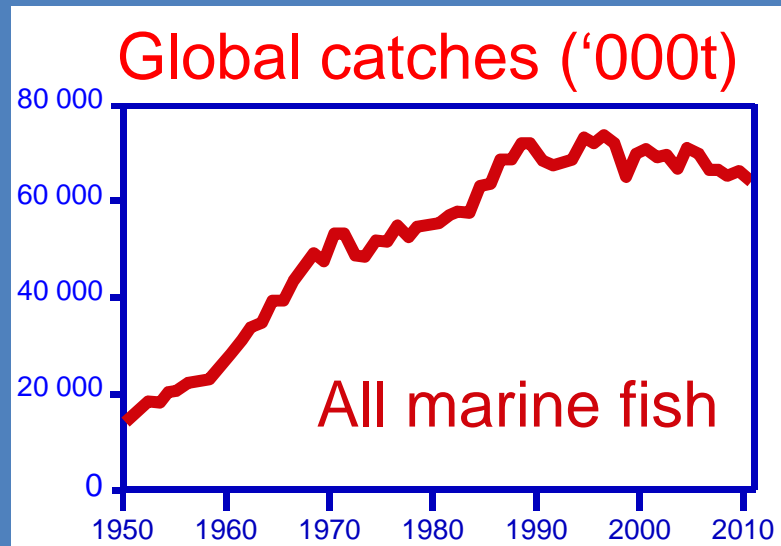
- Distribution
- Phenology/ timing
- Foodweb & productivity
- Morphology

Ability to adapt depends on life-history



Blanke et al. 2009, *Journal of Geophysical Research*

Fishing pressure



Impacts?

Food web changes

Age structure

Bycatch

Habitat destruction

Prey depletion

Heavier reliance on recruitment events

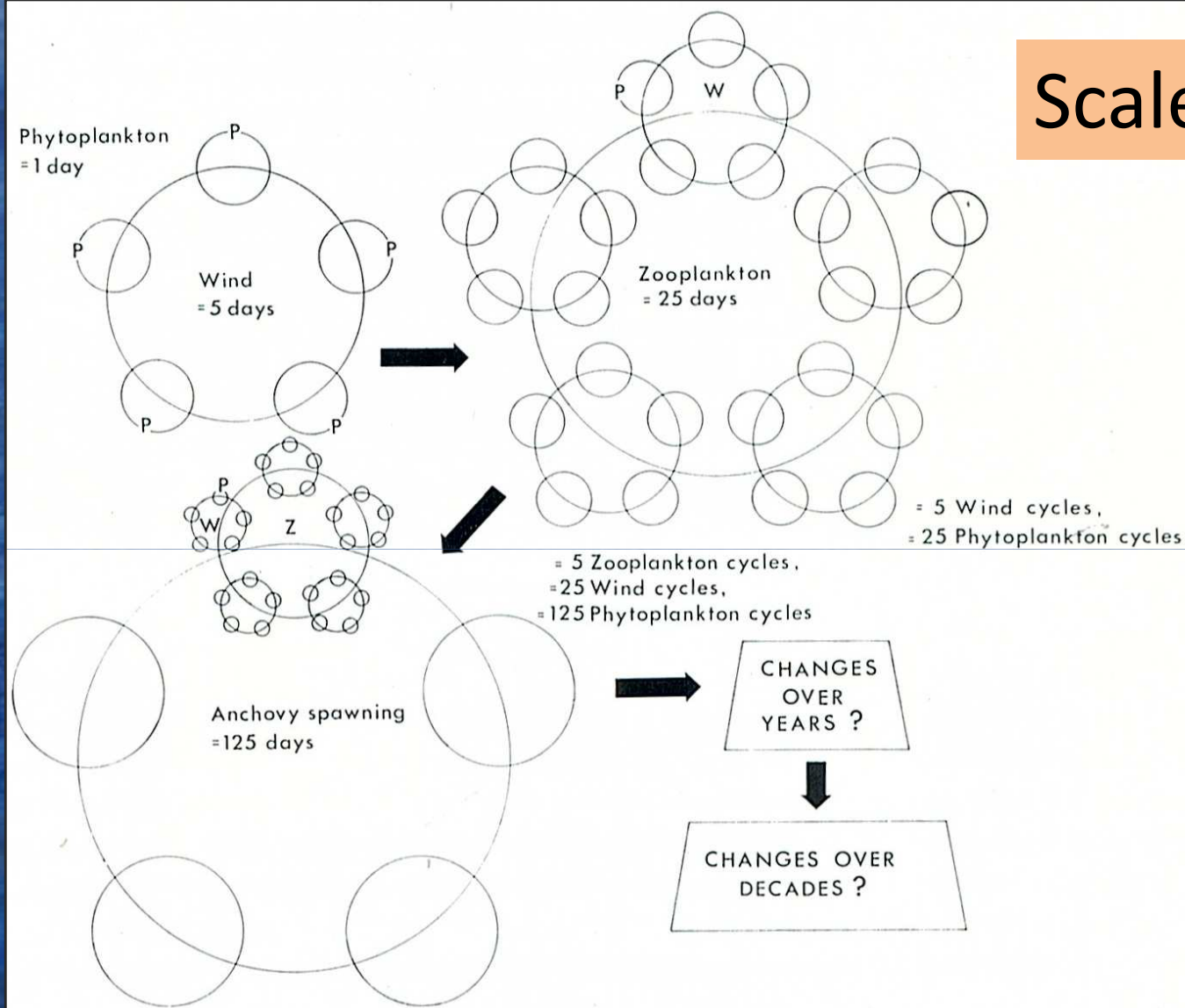
Community structure

Overexploitation

Long-line fisheries kill up to
20,000 birds/ year off southern
Africa (mostly off Namibia)

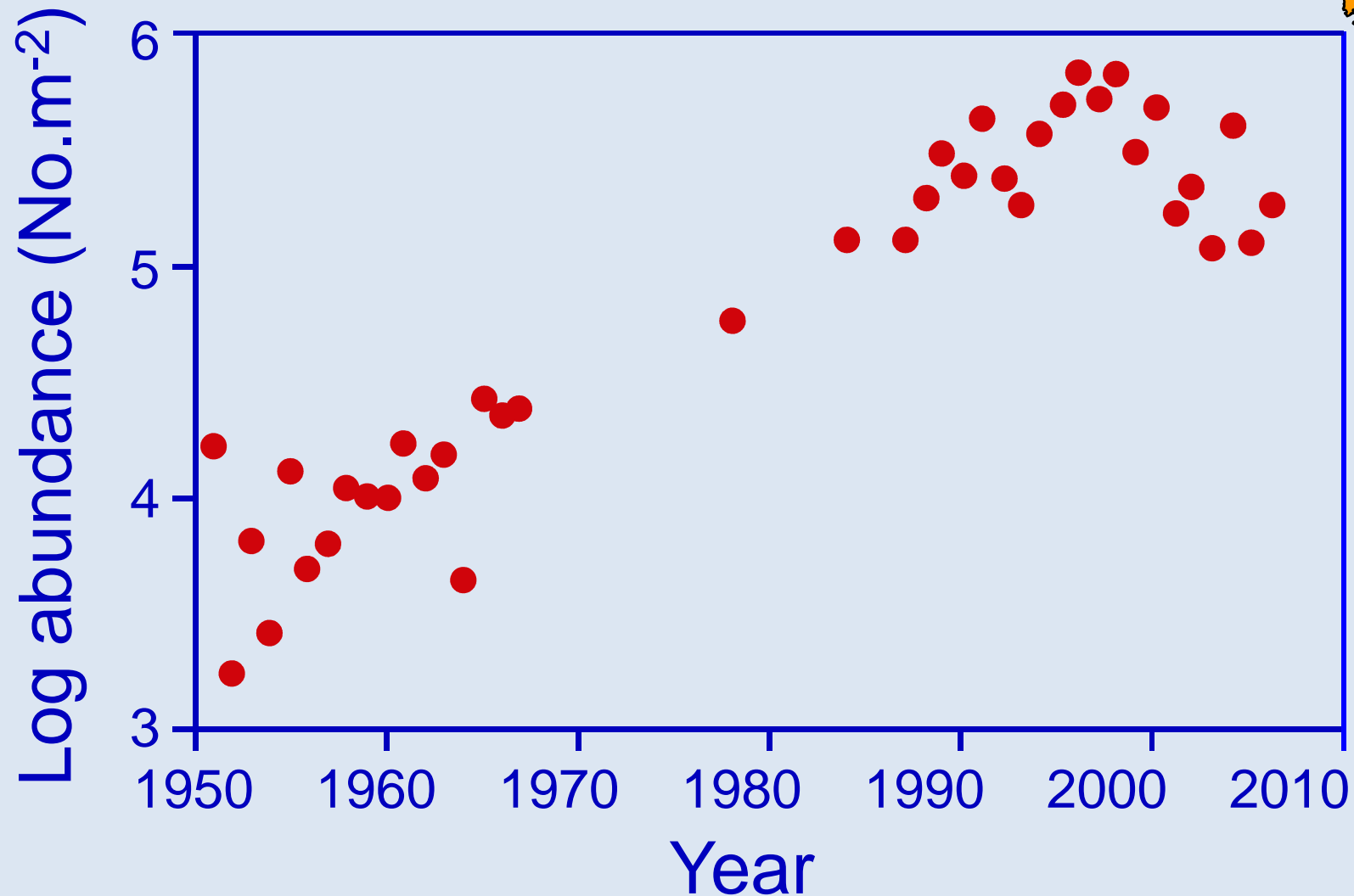
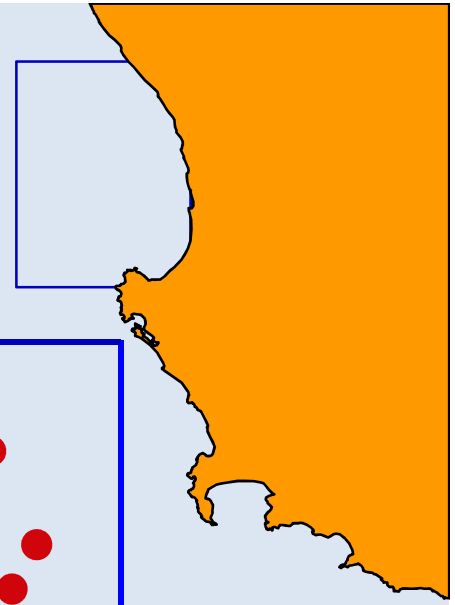


Scale

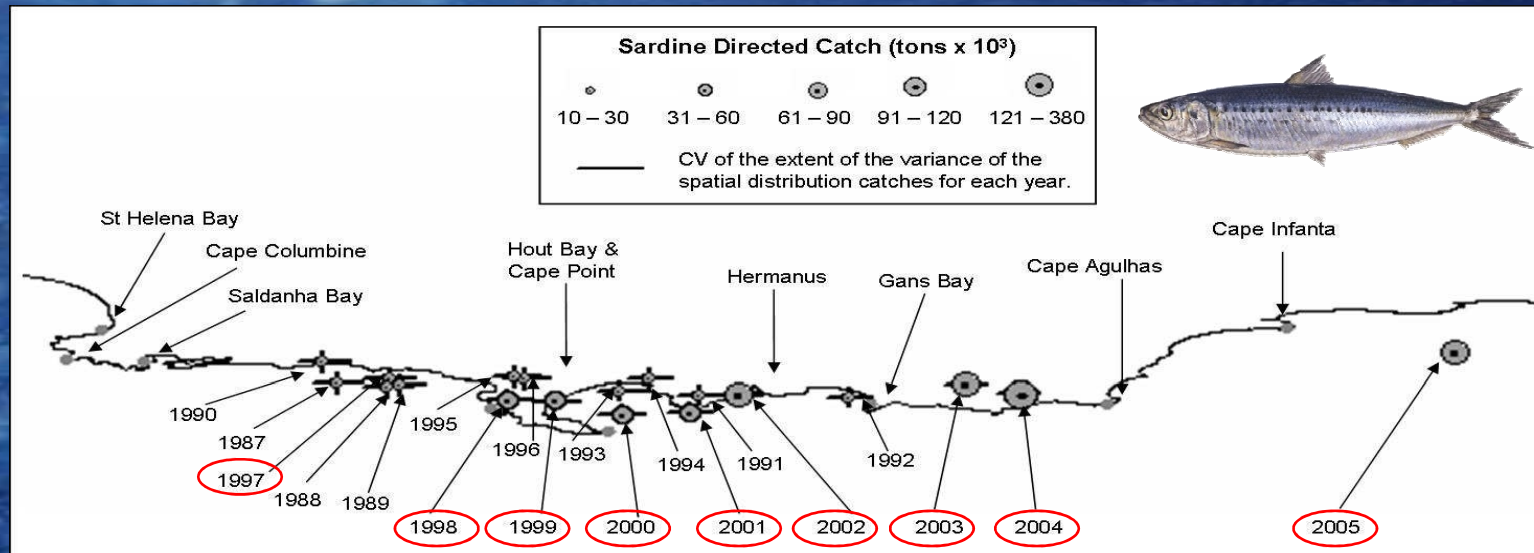


10. — A simple time scale model of interacting cycles in the southern Benguela region.

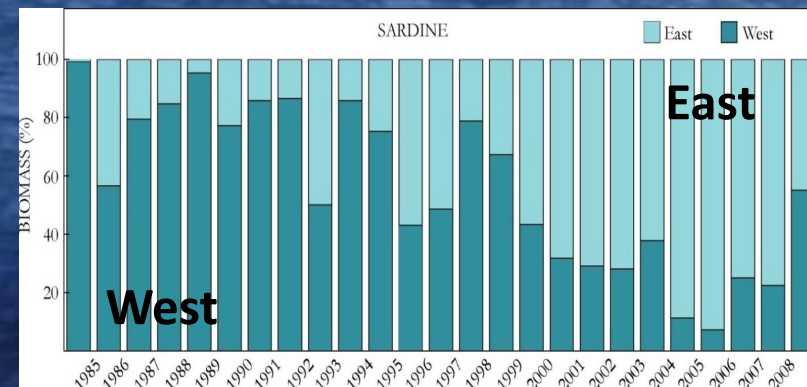
Abundance of zooplankton in St Helena Bay



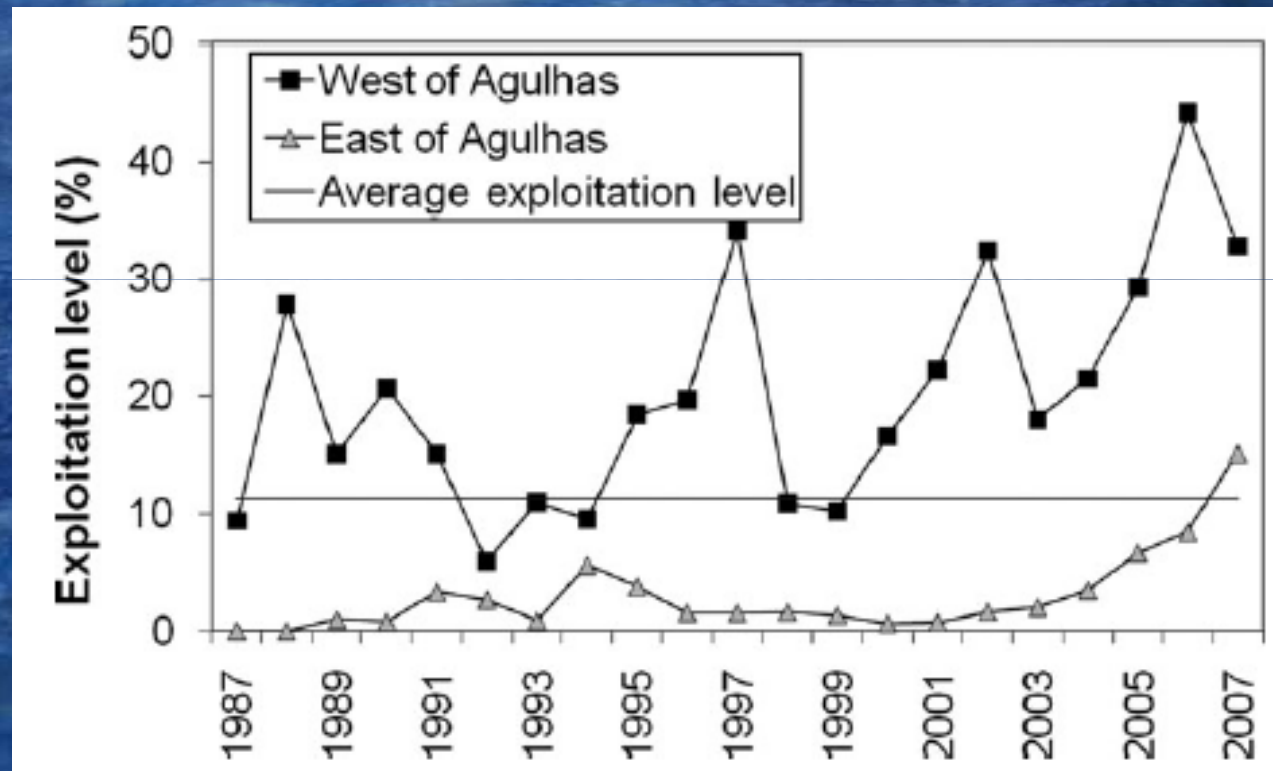
Changes in distribution & abundance Small pelagic fish



Centre of gravity (mean location) of sardine catches: 1987-2004 (Fairweather *et al.* 2007, *African Journal of Marine Science*)



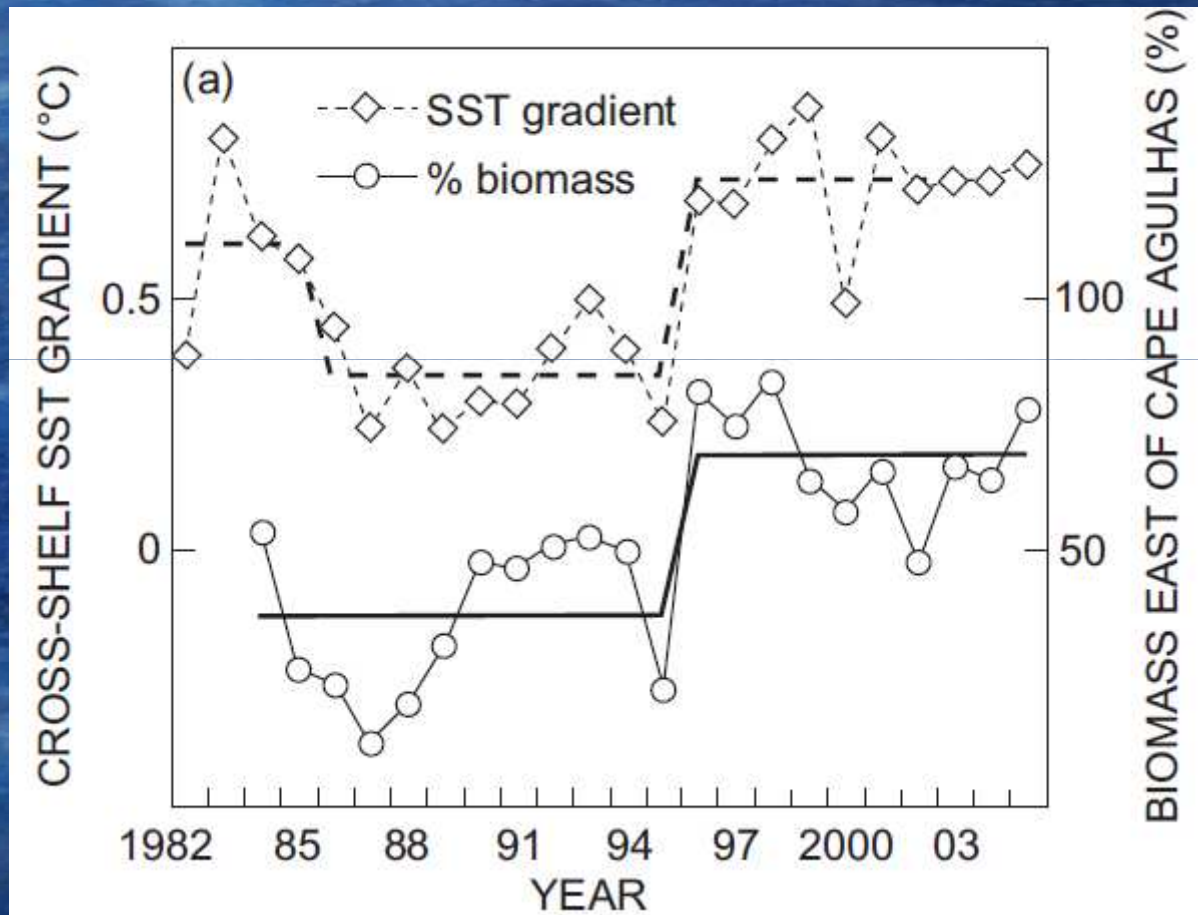
Changes in distribution & abundance Sardine



→ Very uneven
exploitation
levels

Coetzee *et al.* 2008, *ICES Journal of Marine Science*

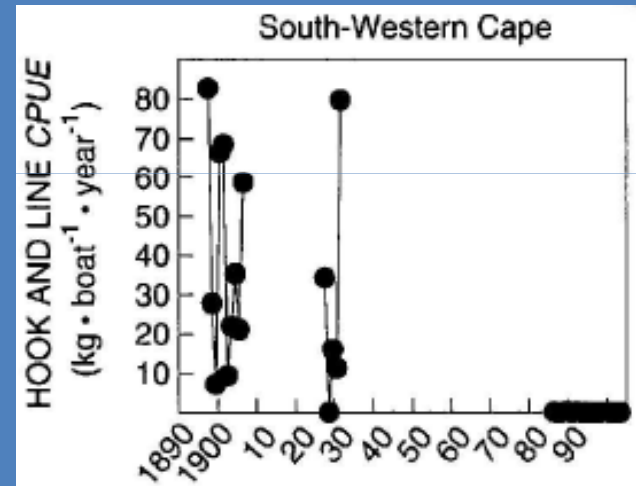
Changes in distribution & abundance Anchovy



Roy *et al.* 2007, *African Journal of Marine Science*

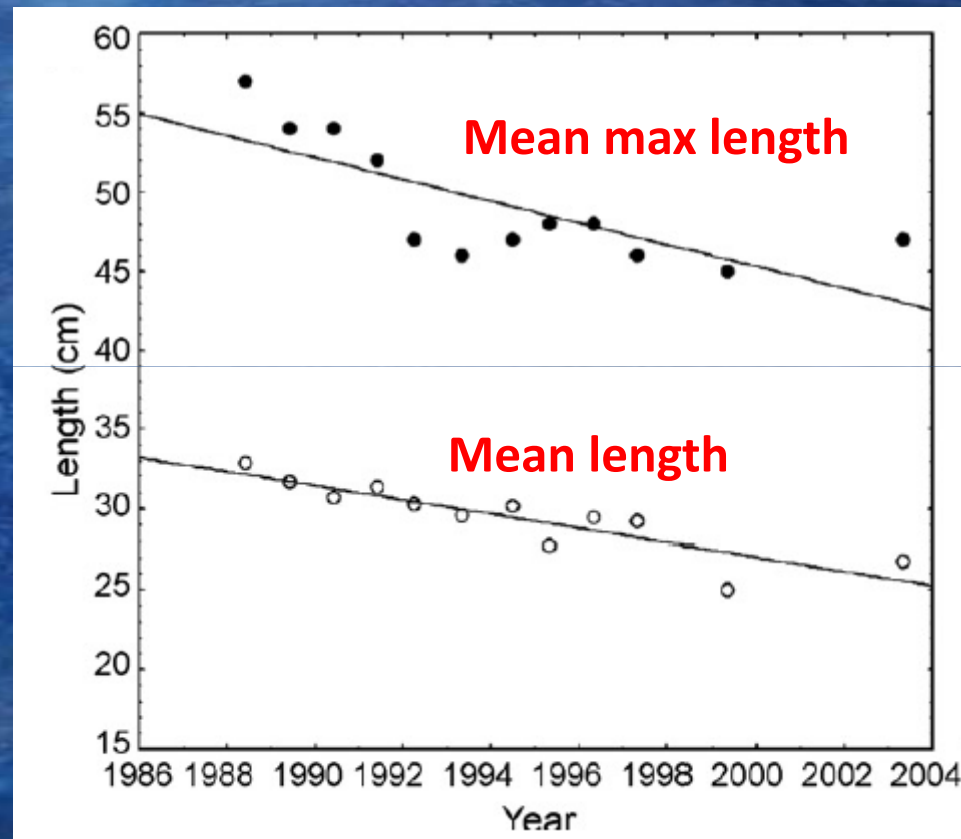
Changes in distribution & abundance Linefish

- Fewer large, slow-growing, resident fish
- More small, fast-growing, shoaling/ nomadic fish
- Tropical & subtropical spp. found further south
- WC: less diverse
- SC: more diverse



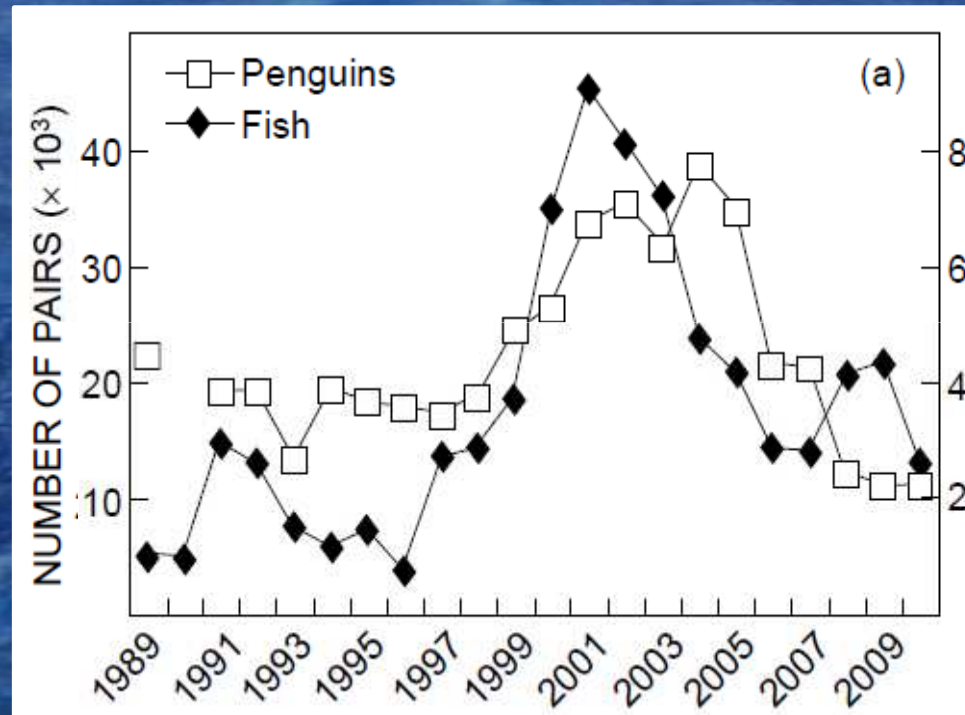
Average annual CPUE for seventyfour
(Griffiths 2000, *South African Journal of
Marine Science*)

Decline in mean length of demersal community on the south coast



after Yemane *et al.* 2008, *Fisheries Research*

Changes in distribution & abundance Seabirds

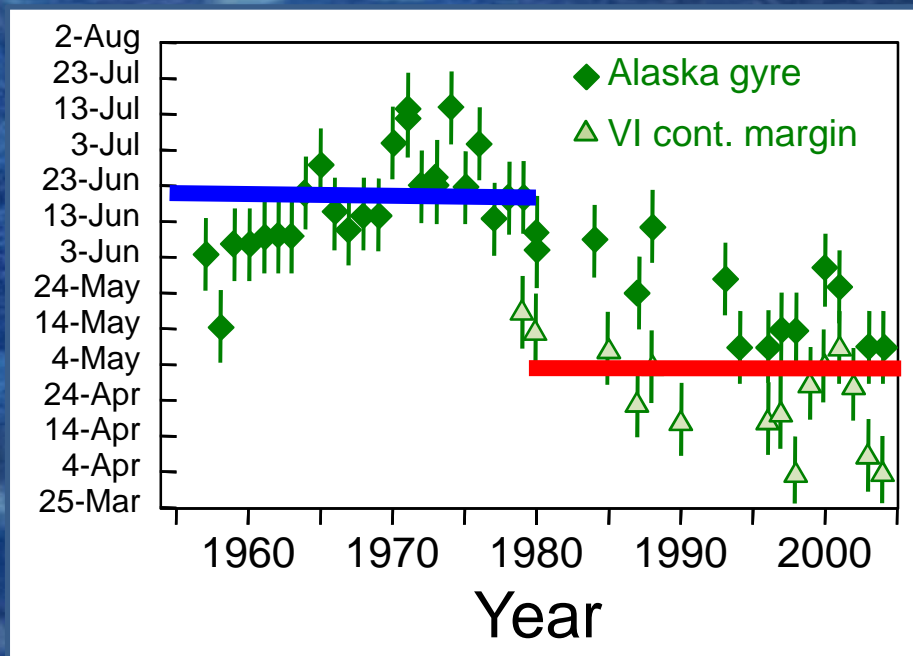
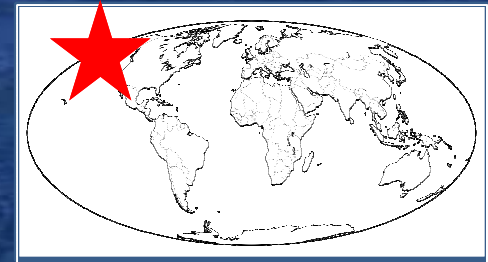


- Site-faithful; long-lived; small forage range = VULNERABLE (e.g. African penguins, Cape gannets)
- Wide-ranging swift terns = \uparrow

Trends in combined sardine & anchovy biomass and African penguin in the Western Cape (Crawford *et al.* 2011, *African Journal of Marine Science*)

Changes in timing & phenology:

Dates at which *Neocalanus plumchrus* reaches its annual biomass maximum



Ecosystem-level changes:

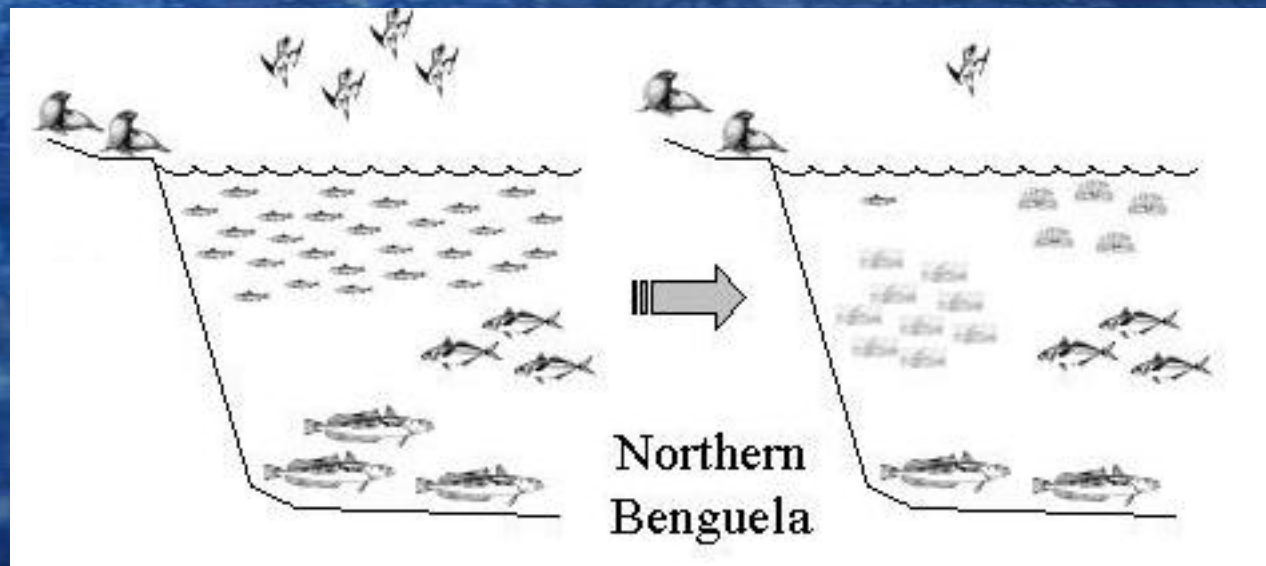
Concurrent shifts in
multiple time series



System-level shifts?
(early 90s & 2000s)


Complex interactions, difficult to disentangle cause & effect


Namibia:



Van der Lingen *et al.* 2006, in *Benguela, Predicting a Large Marine Ecosystem*

Indicators for the seas





FRANÇAIS
ESPAÑOL
ENGLISH

STATUS OF MARINE ECOSYSTEMS

To view an ecosystem and a evaluation of its state, click on the corresponding location in the world map or consult the list below.

[Ecosystems](#)

COMPARATIVE APPROACH


Select and compare the states and trends of several ecosystems (pie diagrams and time series)

[Compare](#)

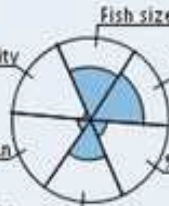
ABOUT indiSeas

Methods details
About us

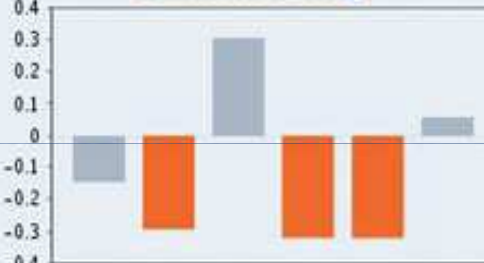
[to the map](#)



State (2003 - 2005)




Trends (1996 - 2005)




Indicator	Trend (1996-2005)
FS	-0.15
TL	-0.28
B	0.30
P	-0.28
LS	-0.28
FP	0.05


Southern Benguela



[Description](#)



[Key Species](#)



Anchovy was dominant in the 1980s but declined by the 90s and stocks of sardine, redeye, horse mackerel and Cape hake increased. The "high pelagic fish biomass" situation of the early 2000s was short-lived, stocks of both anchovy and sardine again declining. There is little room for expansion of the hake fishery above present levels. Most linefish stocks are currently overfished and cause for concern. Indicators suggest that the system has been deteriorating from 1996-2005 (mean life span, % predators and TL of the landings) but biomass of surveyed stocks increased. The decline in TL in part reflected the upsurge in small pelagic fish in the early 2000s. The environment has been a more important driver of ecosystem change than fisheries.

by Lynne Shannon

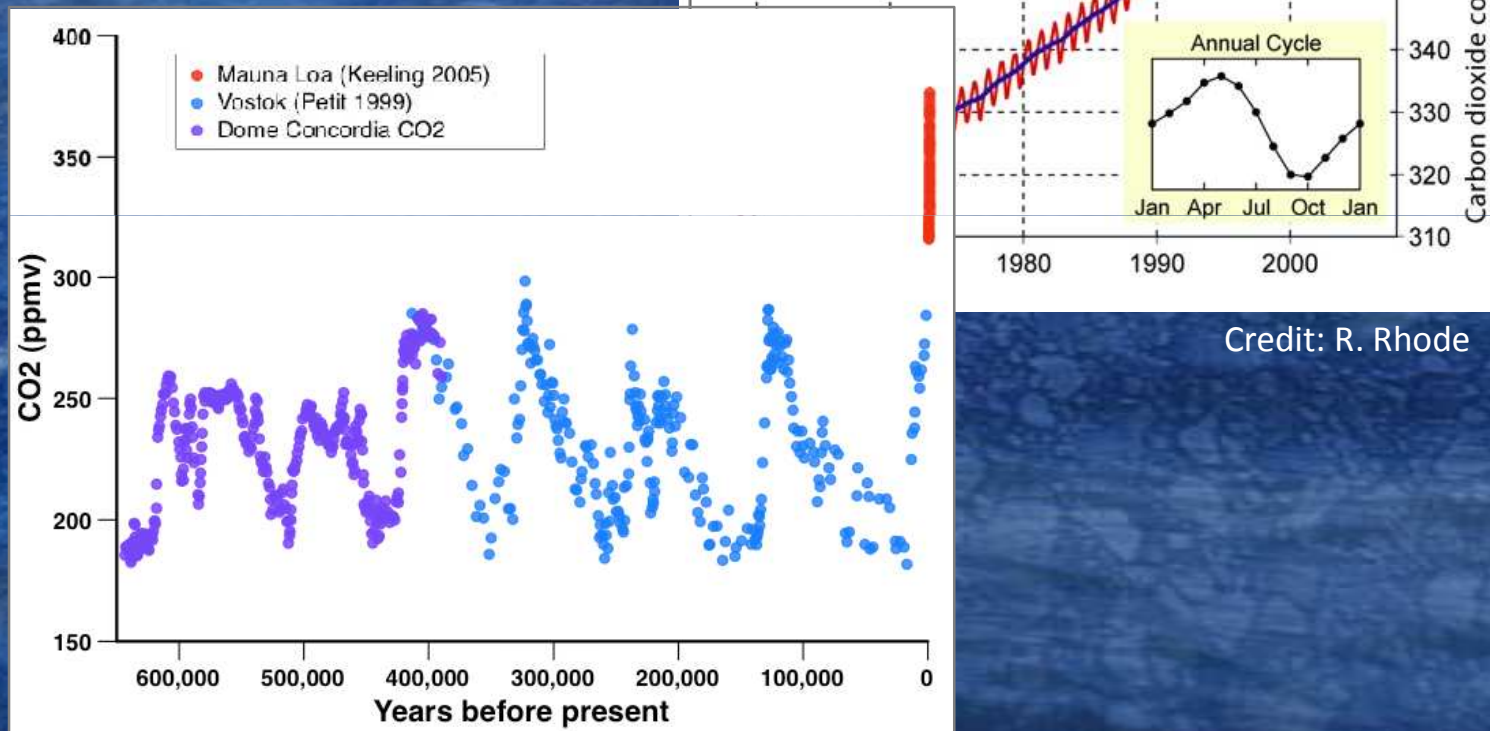
MA-RE

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Southern Benguela.
State indicators and
short-term trends

Context!

- Long-term monitoring & baseline data are vital



Credit: R. Rhode

www.geo.cornell.edu after Petit *et al.* 1999 & Siegenthaler *et al.* 2005

What now?

- Long-term monitoring
- Baseline data
- Cohesive research efforts



Acknowledgements

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