

New Zealand Fisheries and Climate Change

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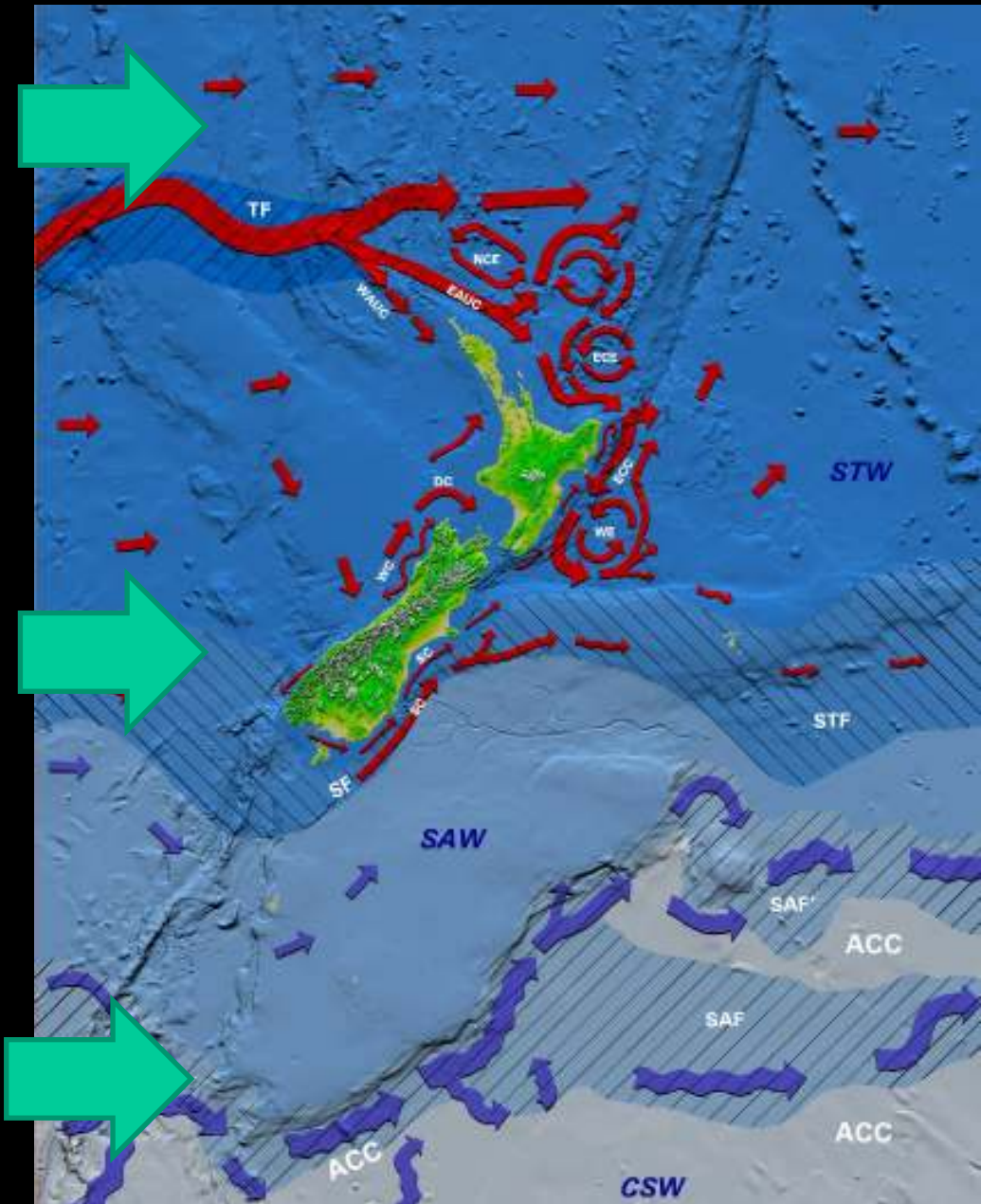
Guardian of the multitudes of Tangaroa – maximising the value New Zealanders obtain through the sustainable use of fisheries resources and protection of the aquatic environment

New Zealand is isolated



Sub-Tropical Front

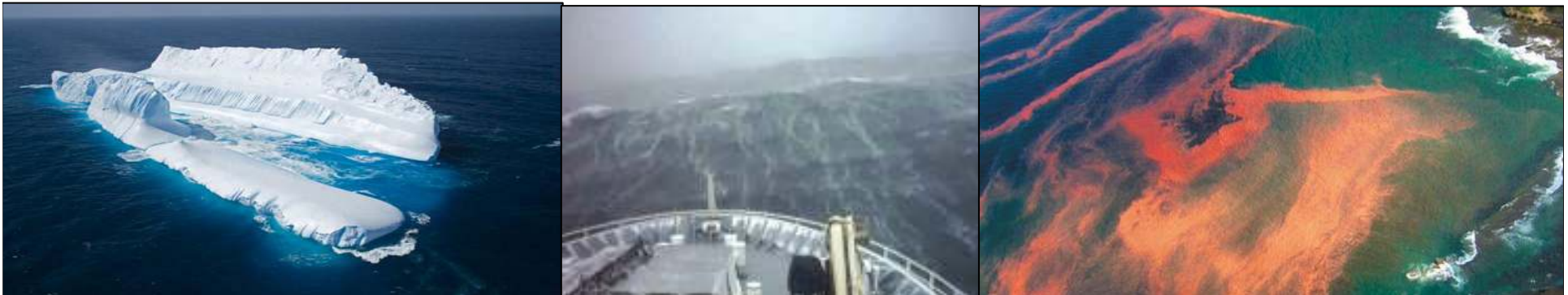
Hydrology



x

Climate drivers

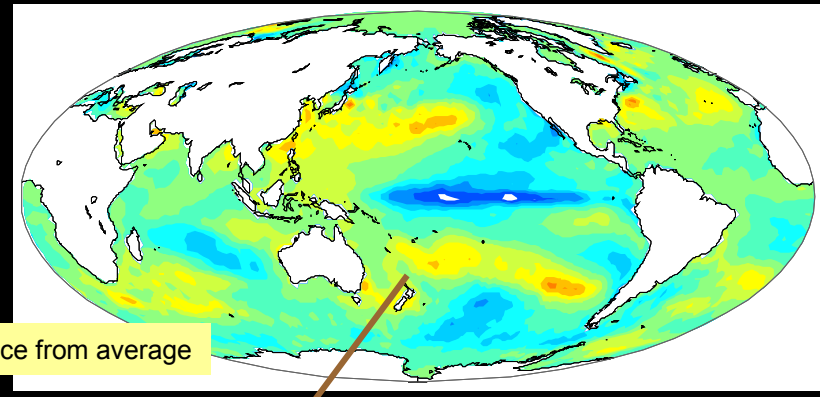
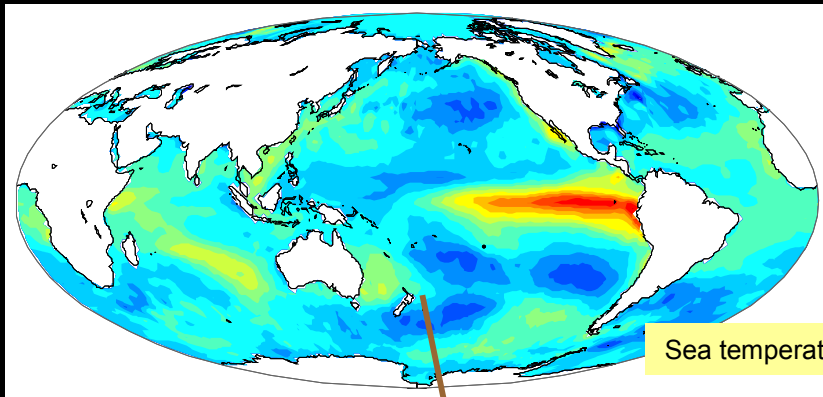
- Day to day weather/tides
- Seasons
- 1-2 year cycles
- 20-30 year cycles
- Global trends-100s of years



Climate patterns (ENSO): 1-2 year time frame

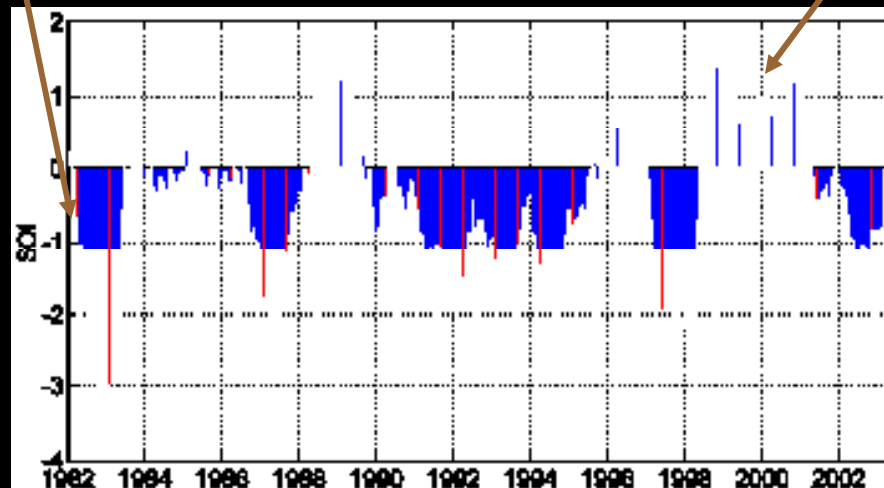
El Niño

La Niña



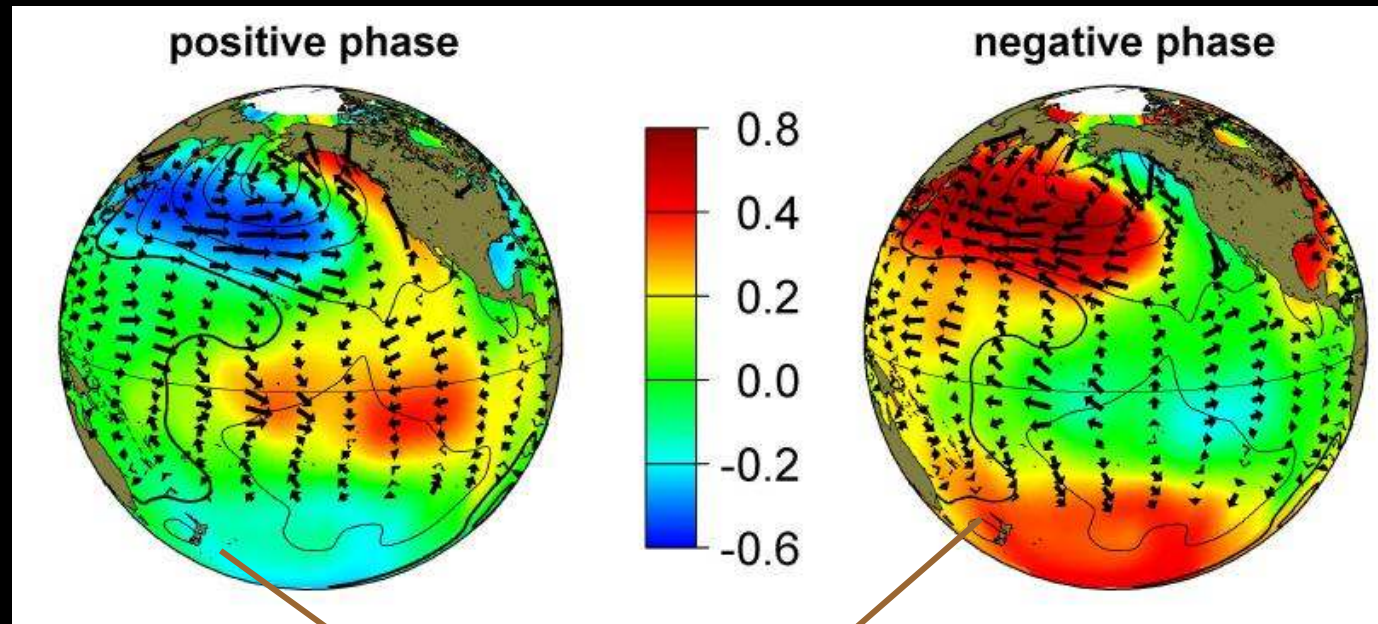
Sea temperature difference from average

- Warmer in tropics
- Cool near N.Z.
- Stronger westerlies

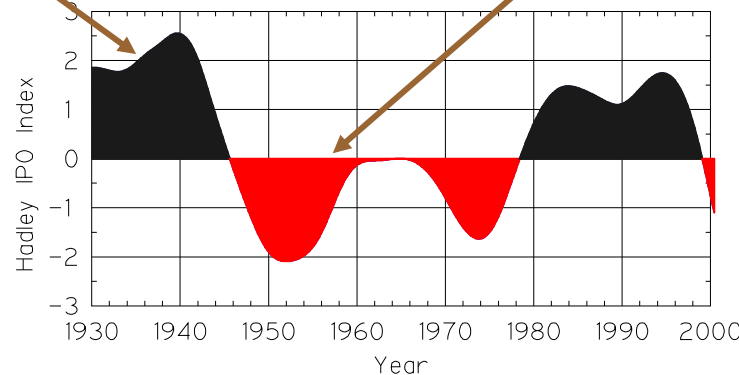


- Cooler in tropics
- Warm near N.Z.
- Weaker westerlies

Interdecadal Pacific Oscillation (IPO): 20-30 year time frame

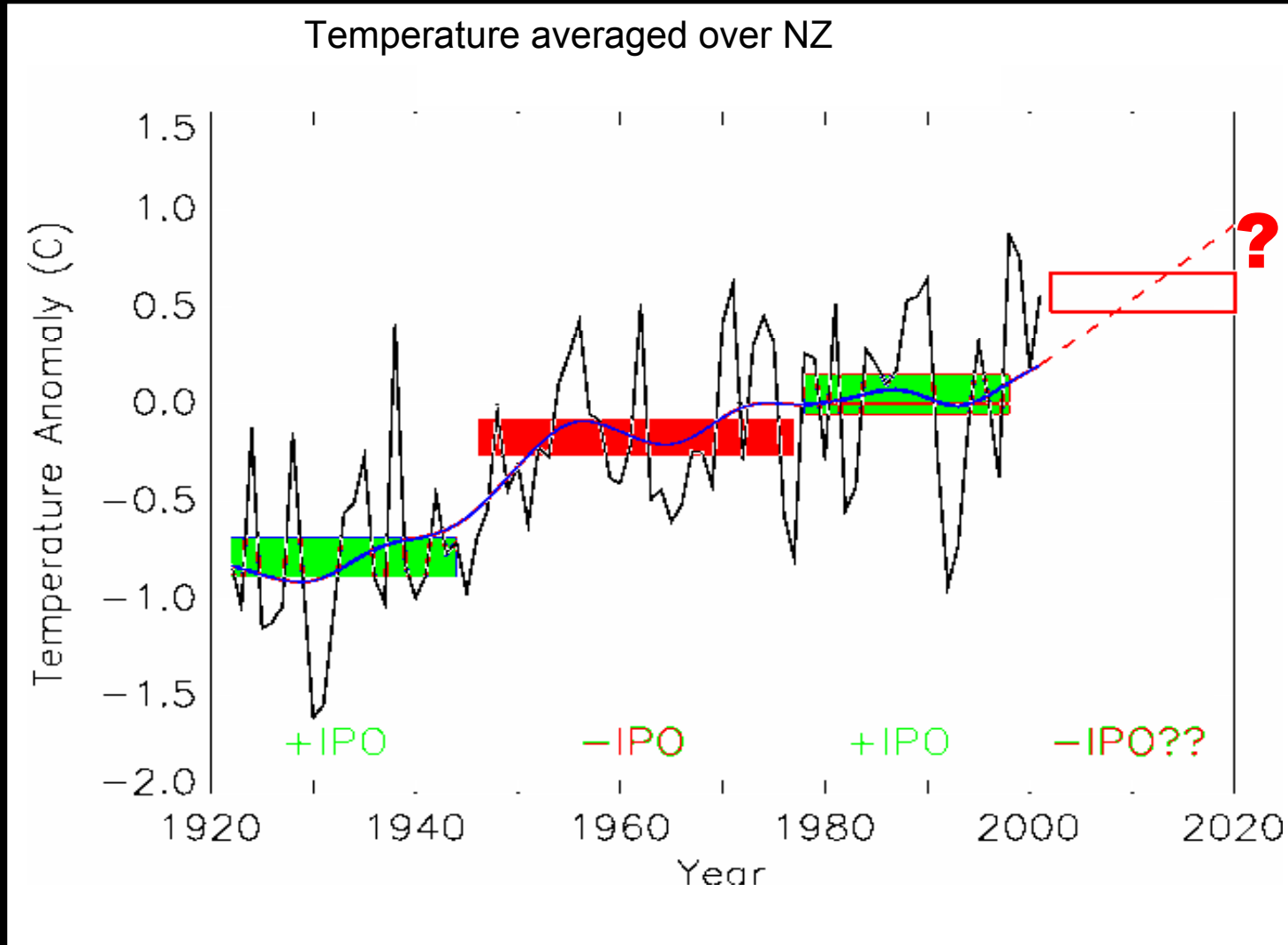


“El Niño-like”
Cooler near N.Z.
Stronger westerlies

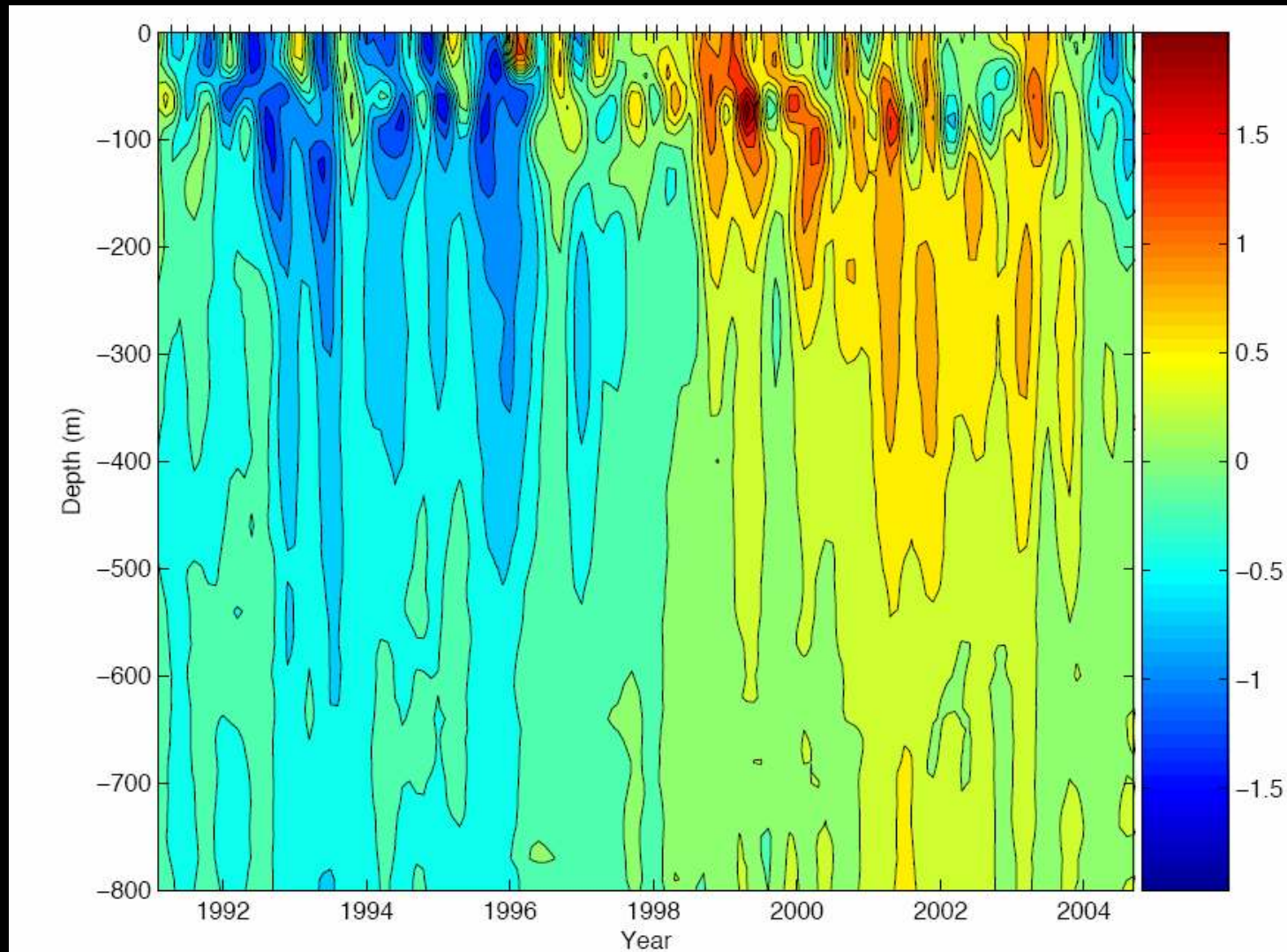


“La Niña-like”
Warmer near N.Z.
Weaker westerlies

Variability and Change



Other phenomena: Sutton et al.



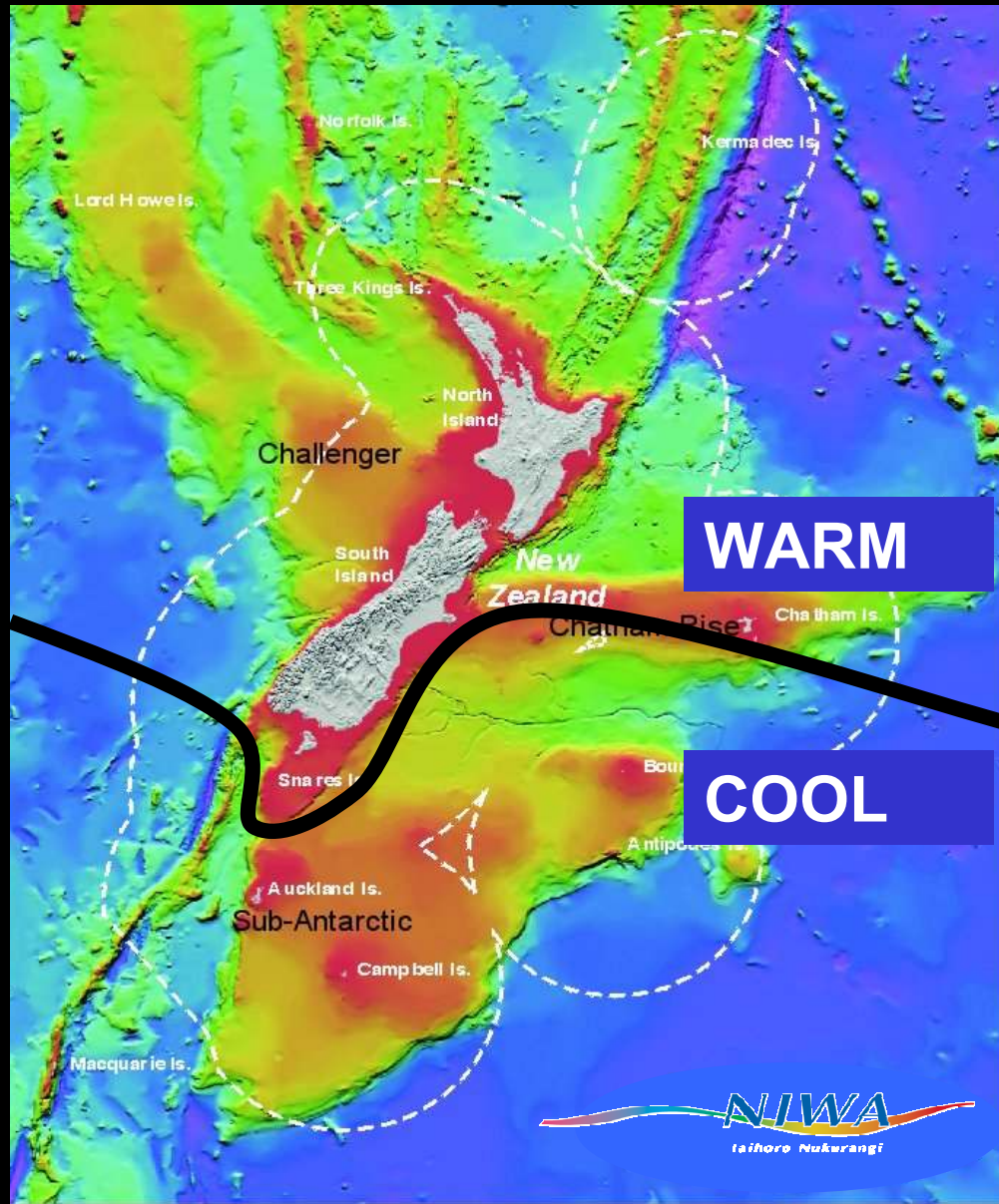
Fisheries

Coastal

- Snapper
- Flatfish
- Tarakihi
- Red cod
- Abalone
- Shellfish
- Rock lobster

Deepwater

- Hoki
- Ling
- Hake
- Orange roughy
- Squid
- Warehouse



Shallow Deep

Predictions under negative IPO

- **Rapid warming of northern waters**
- **La Nina conditions**
- **Less westerly flow**
- **No major change to STF**

- **Change in spawning-recruitment dynamics**
- **Change in abundance**
- **Shift in biomass centres of species distributions**
- **Good for snapper**
- **Bad for hoki**



Add in Climate Change

- **Increased temp. and pH**
- **Increased westerlies in longterm**
- **Reduced productivity**

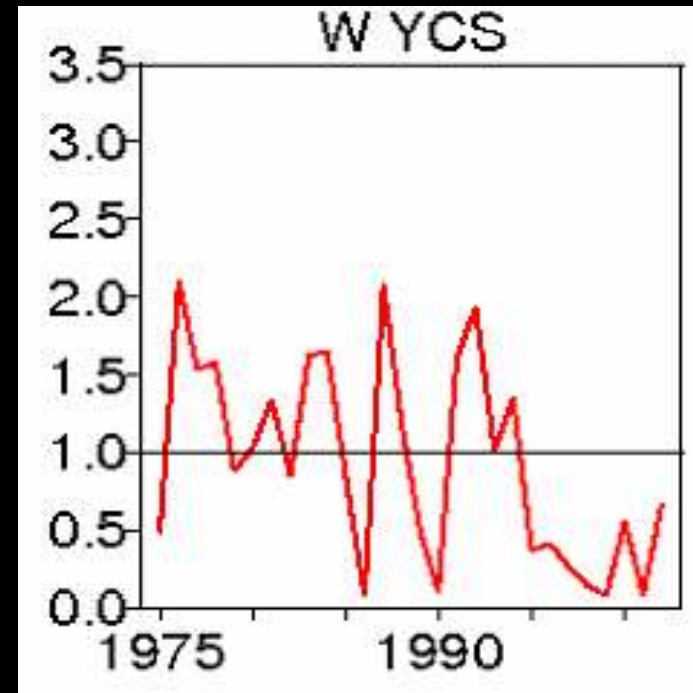
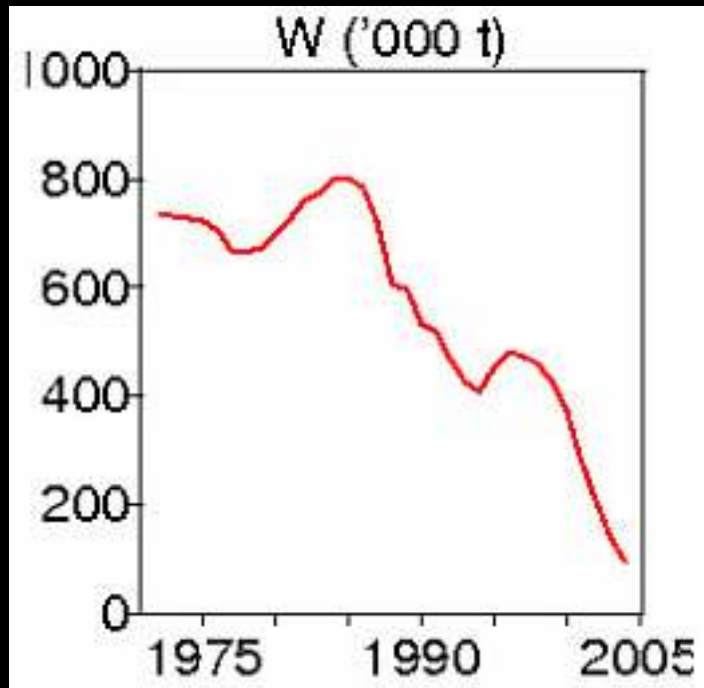
- **Increased incursions of foreign species**
- **Algal blooms**
- **Effects on biodiversity and other significant species**
- **Reduced fish productivity**



So what?

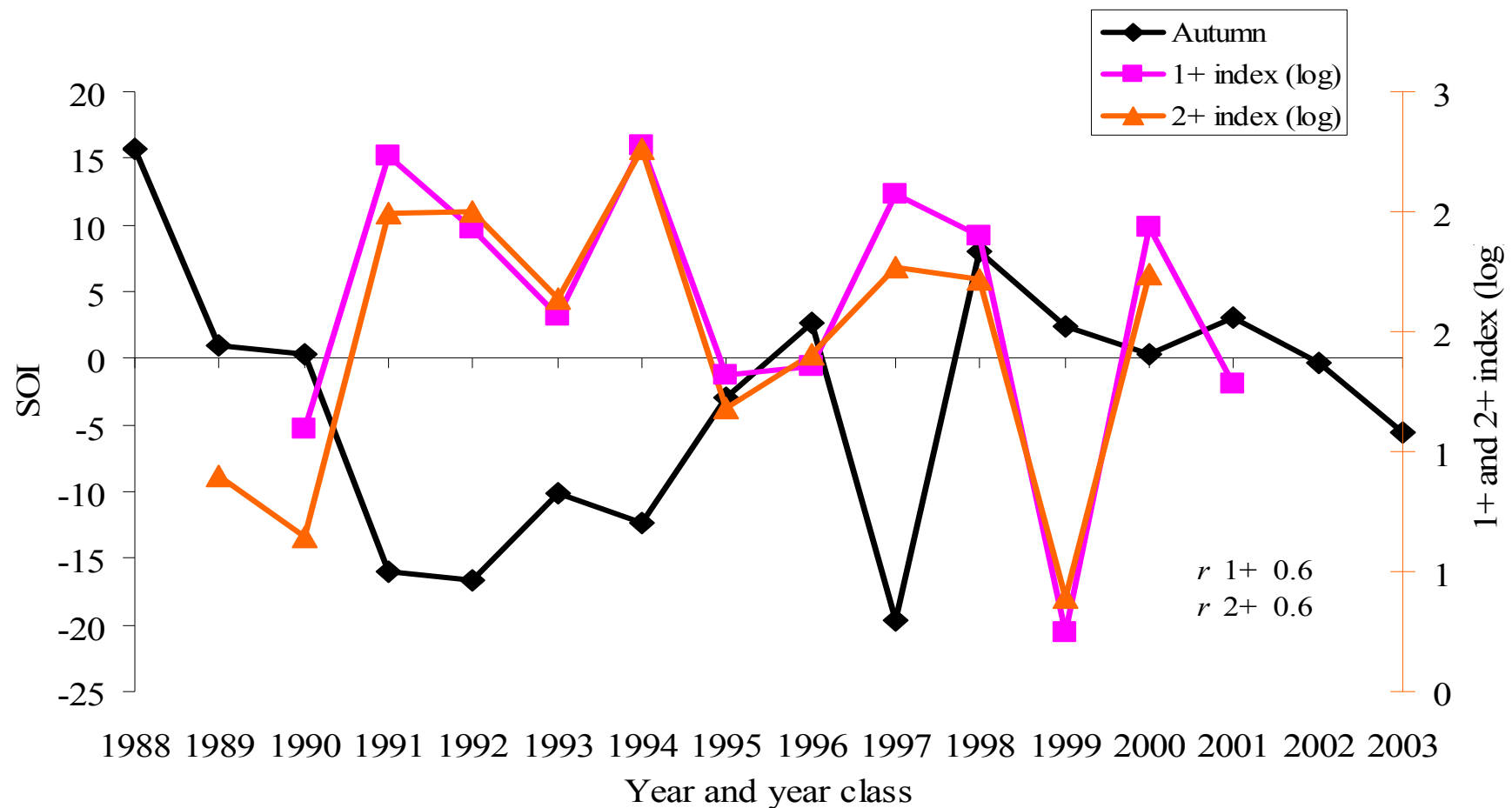
- Changes in climate lead to changes in ocean mixing, nutrient release and productivity
- This in turn leads to changes in fish distribution and abundance, and in ecosystem structure
- Understanding the links within the system provides a powerful context for interpreting changes in fish abundance with respect to exploitation rates
- Need to understand processes affecting fish abundance and yield
 - improved estimation of natural mortality and recruitment;
 - improved understanding of stock-recruit relationships and steepness;
 - improved understanding of variability in growth rates;
 - alternative views on biological reference points and risk;
 - use of indicator species to detect ecosystem changes
 - a framework for evaluating ecosystem properties and variability
- Understand how the ecosystem fits together

The decline in New Zealand's largest fishery

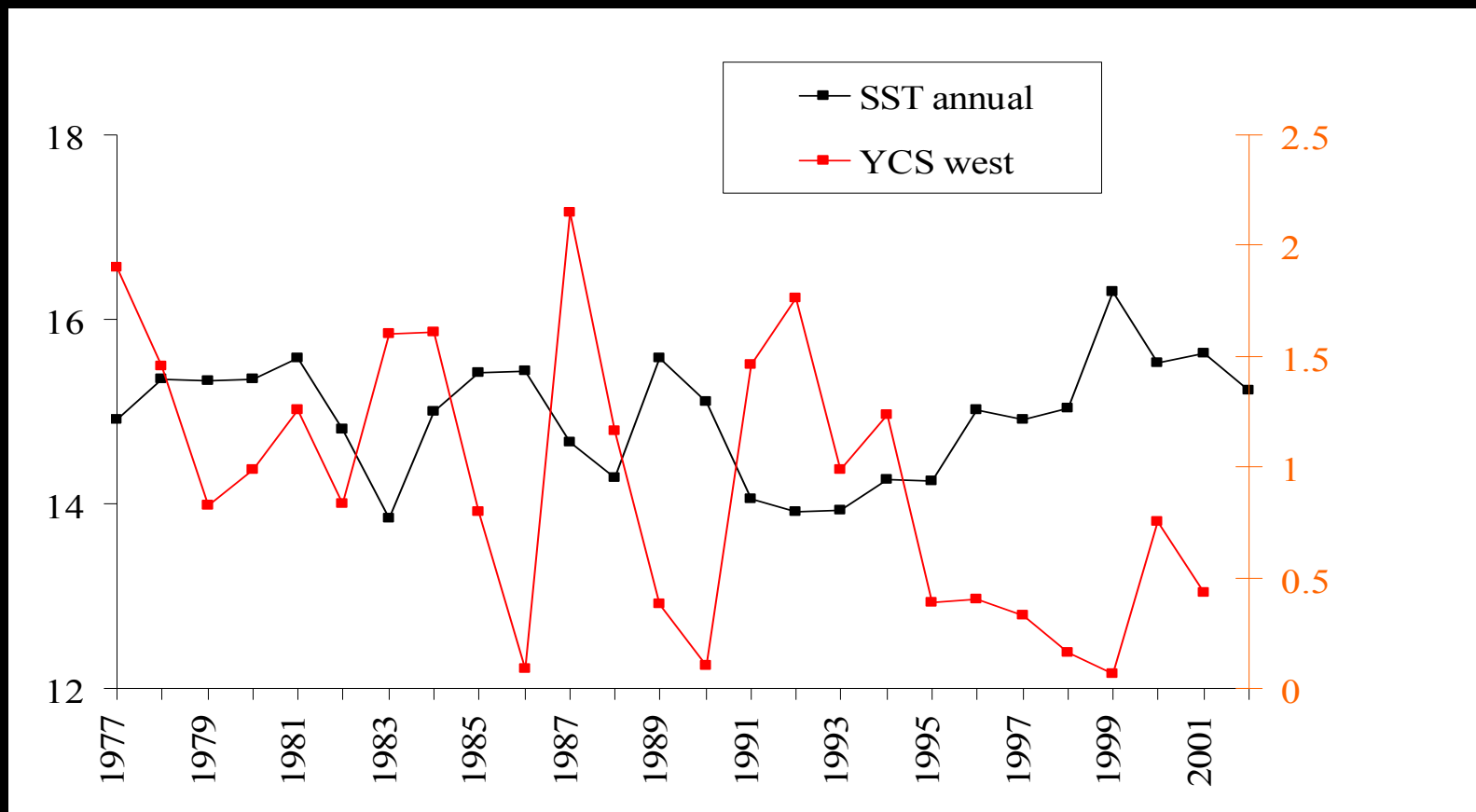


- Plunging biomass
- Poor recruitment

Survey abundance indices and ENSO



Model output hoki YCS



How can we minimise climate change impact?

- **Explore existing data for relationships and drivers**
- **Monitor environmental indicators**
- **Monitor ecosystem indicators**
- **Monitor key fishstocks**
- **Work with Biosecurity NZ**
- **Explore options for fishery exploitation rates and keeping stocks well above Bmsy**



Current research

- **Oligotrophic system function**
- **Effects of increasing acidity on plankton**
- **Develop ecosystem indicators**
- **Monitor fish stock abundance and occurrence**
- **Research effects on fish farming, mussel farms**
- **Map biodiversity and abundance**
- **Identify toxic algal diversity**
- **CPR monitoring programme**
- **Improve utilisation of remote sense data for predictive modelling**

