Temperature rising:
Climate Change & Healthy Oceans

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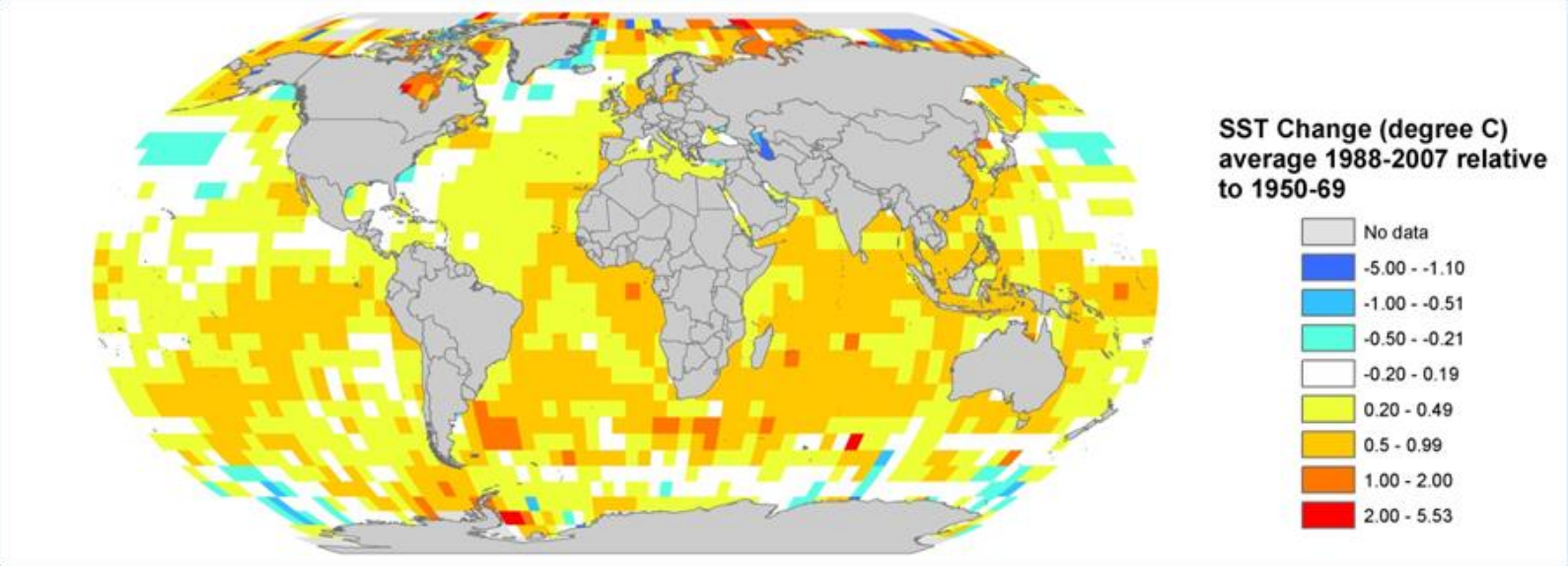
Fisheries Economics Research Unit

Ocean warming, acidification and deoxygenation



The ocean has become:

- **warmer** (an increase in average temperature of 0.2^{o}C at the top 300 m of the ocean between the 1950s and1990s);
- with **less sea-ice** (summer Arctic sea ice extent is decreasing at 7.4% per decade);
- **more acidic**;
- **less oxygenated** in some area, **higher sea level**, **changes in primary productivity**.

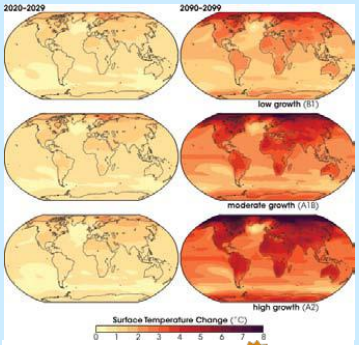
Climate change biophysical impacts

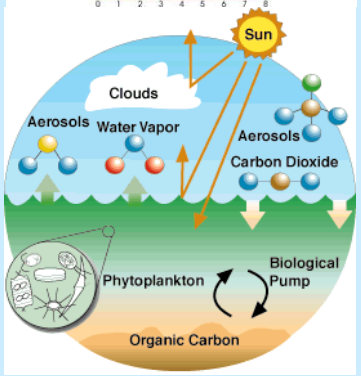
Physical change in the ocean

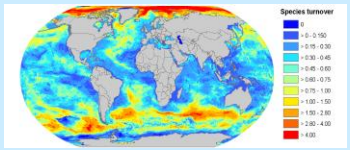
- ↑ SST;
- retreat of sea ice;
- ↑ acidification;
- ↑ coastal hypoxic & oxygen min. zone;
- ↑ sea surface level.

Biological / ecological change in the ocean

INDIVIDUAL	• Physiology; • Growth; & • Body size.
POPULATION	• Distribution; • Abundance; & • Recruitment.
COMMUNITY	• Species composition; • Invasion/extinction.
ECOSYSTEM	• Productivity; & • Species interaction.

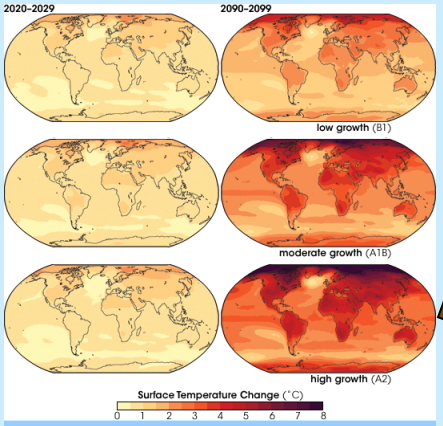




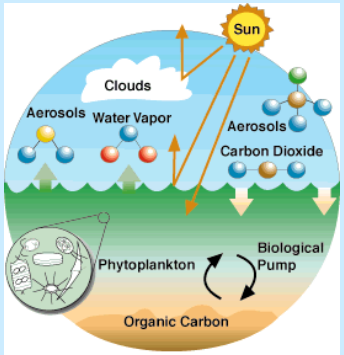


Cheung *et al.* (2010); Hoegh-Guldberg and Bruno (2010); Brander (2010)

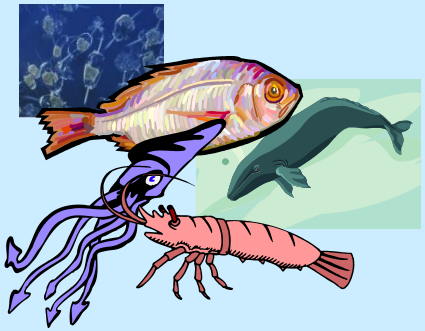
Climate change: ocean conditions and productivity are changing



Change in climate/ocean conditions



Primary productivity



Ecology

Conservation

Jobs

Fisheries

Climate change implications

- It will result in changes in the following:
  - Catches;
  - Food security;
  - Income to fishers;
  - Wellbeing of coastal communities;
  - Fishing revenues;
  - Cost of fishing;
  - Profits to fishing companies;

Sumaila *et al*. (2011) *Nature Climate Change*

An example:
impact BC's staple seafood prices

- 7 of B.C.'s 10 staple fish species will likely decline in supply;
- Sockeye salmon shows the highest potential decrease in catch at 21%;
- A 15% & 10% declines in sablefish and chum supplies, respectively.

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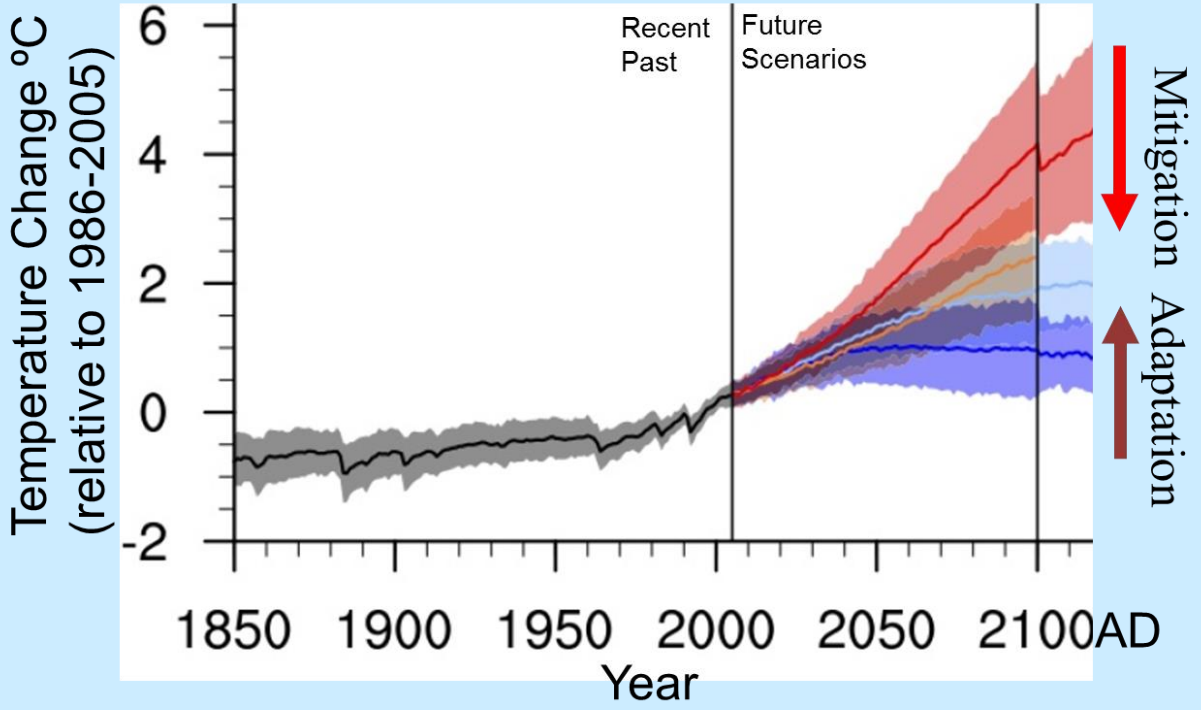
An example:
impact BC's staple seafood prices

- 70% increase in price per pound of sockeye salmon by 2050;
- A net increase in cost to British Columbians for our 10 staple seafood species is ~ $110 million a year (2015 dollars).

We have two main solutions

- **Mitigation** (reduce our GHG emissions);
- **Adaptation** (increase our resilience to climate change):

"Mitigate to avoid what you can't adapt. Adapt to what you can't avoid."



IPCC 2013 AR5 WGI Chap. 12 Fig. 12.5

Solutions – Private actors (individuals, businesses, NGOs)

- Never forget our common home: the environment; the ocean:
  - As voters;
  - As consumers: eat only sustainable fish;
  - As corporate citizens: make conscious effort to reduce carbon footprint.

Solutions - Governments

- Work to immediately & substantially reduce CO2 emissions;
- Strengthen current management of Canada's three oceans and freshwater systems:
  - Fully implement the Ocean's Act;
  - Restore and implement the Fisheries Act.

Solutions - Governments

- Meet SDG 14, in particular, 14(5) by protecting at least 10 per cent of these systems to increase resilience;
- Work with the private sector to reduce the incidence of oil spills and other pollutants in these systems to the barest minimum possible.

Thanks for your attention

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Thanks to WWF Canada for organizing this meeting

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