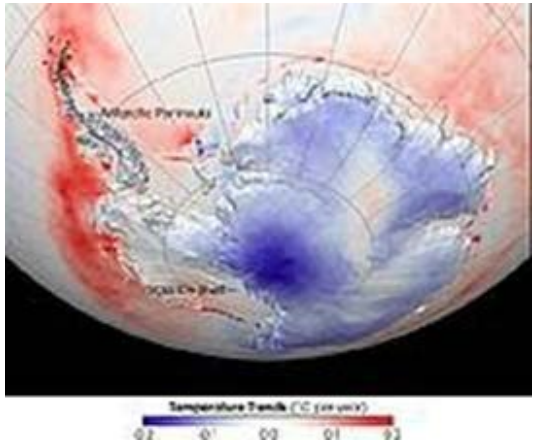
Klimamarin 2016

Carl Gustaf Lundin
Director, Global Marine and Polar Programme
IUCN (Switzerland)

16 November 2016

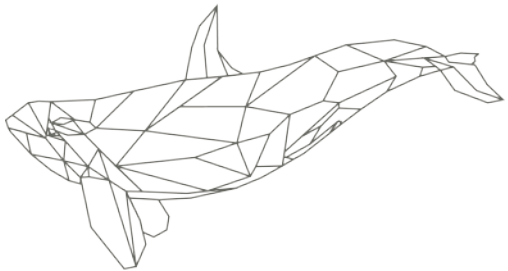






IUCN-International Union for the Conservation of Nature

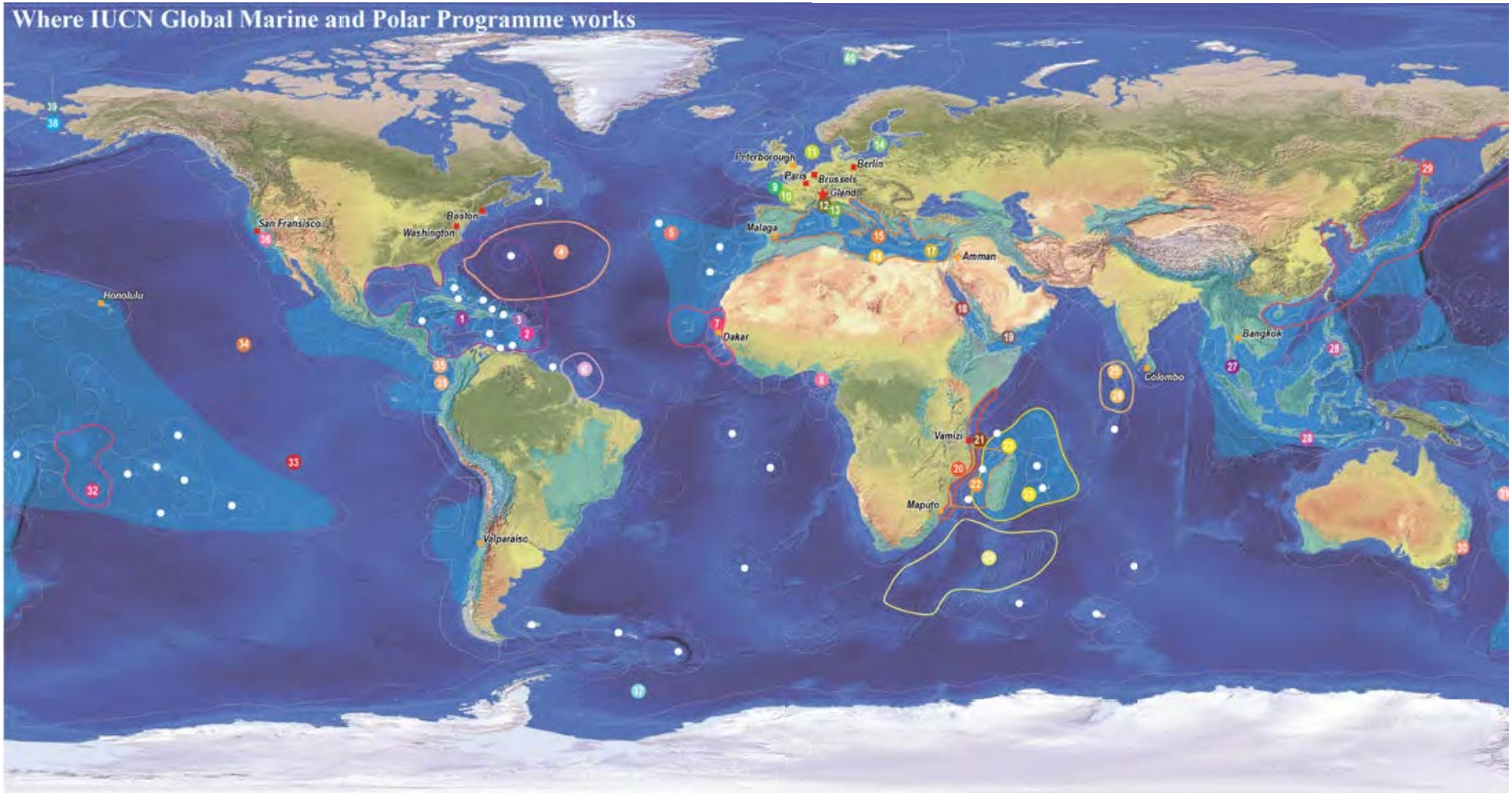
- Founded in 1948, IUCN is the world's largest global environmental organization
- A unique **democratic** Union with nearly 1,300 State and NGO Member organizations in 160 countries
- The leading provider of the **latest knowledge** about biodiversity, with more than 15,000 experts and scientists.
- The only environmental organization with official **Observer Status** at the **United Nations** General Assembly
- A neutral forum with vast outreach and unique convening power
- Famous for: **The IUCN Red List of Threatened Species™ ,** UNESCO – Natural World Heritage, CITES (Convention on International Trade in Endangered Species) , WWF …



10 Broad Areas of Marine and Polar Work

- Climate change mitigation & adaptation
- Coastal Livelihoods
- Conserving Threatened Species
- Coral Reefs
- Energy / Industry partnerships
- Fisheries and Aquaculture
- Managing Marine Invasive Species
- Marine Protected Areas
- Ocean Governance / High seas
- Polar Conservation

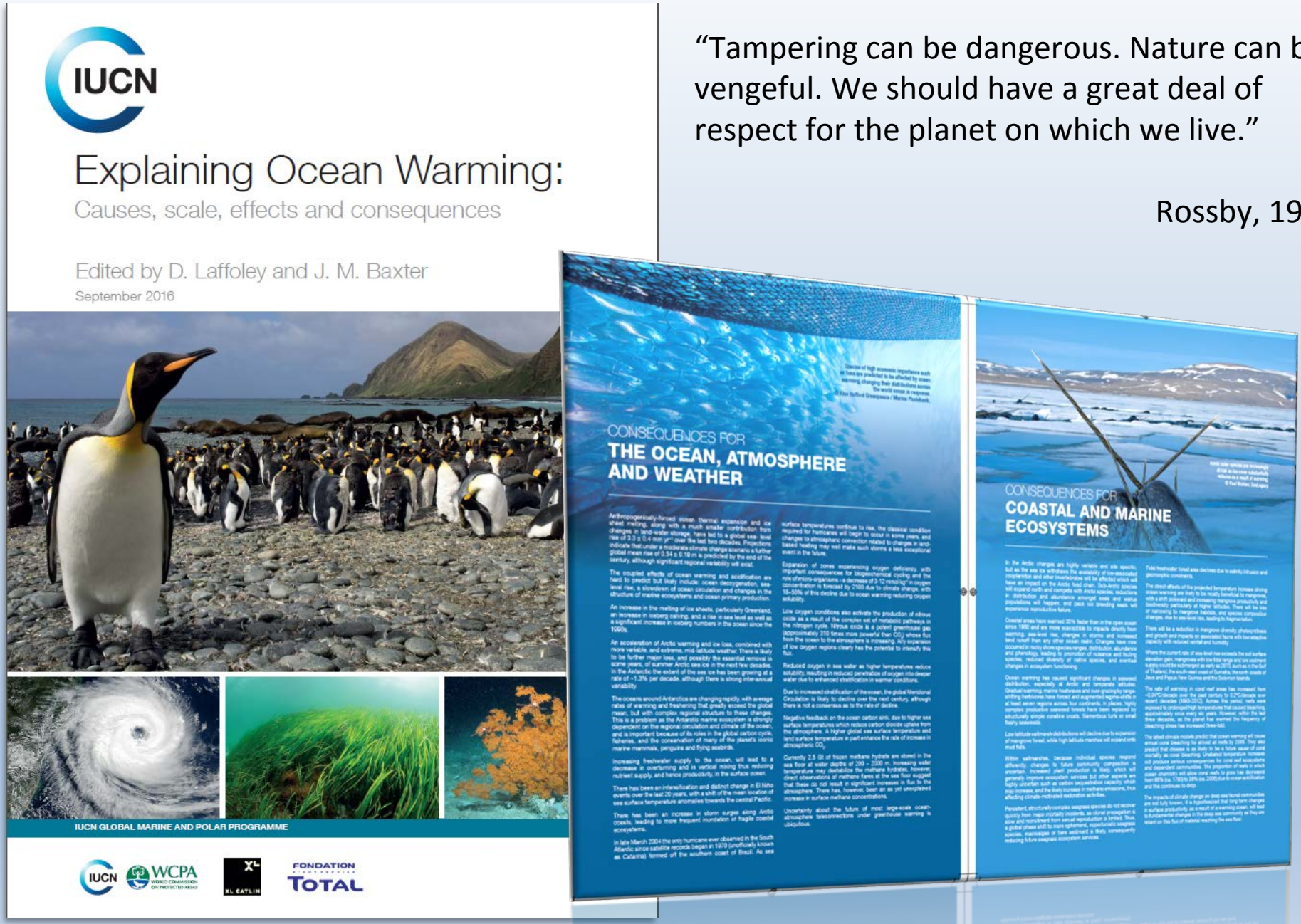
Marine & Polar Programme
Where we work



40 professionals operating in 18 countries & marine regions

Outline of the Presentation

1. The Report on Ocean Warming
2. Shifts on Ocean Temperature
3. What are the effects of Ocean Warming
4. The case in the Arctic
5. Findings and Conclusions



"Tampering can be dangerous. Nature can be vengeful. We should have a great deal of respect for the planet on which we live."

Rossby, 1956


Australian Government
Department of the Environment and Energy
Australian Antarctic Division


ACE
CRC
ANTARCTIC CLIMATE
& ECOSYSTEMS CRC


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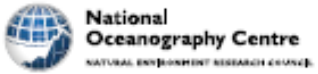



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Where the Oceans Have Been Colder and Hotter Than Average



Average temperatures from each decade compared with the 20th-century average.

Sources: National Oceanic and Atmospheric Administration

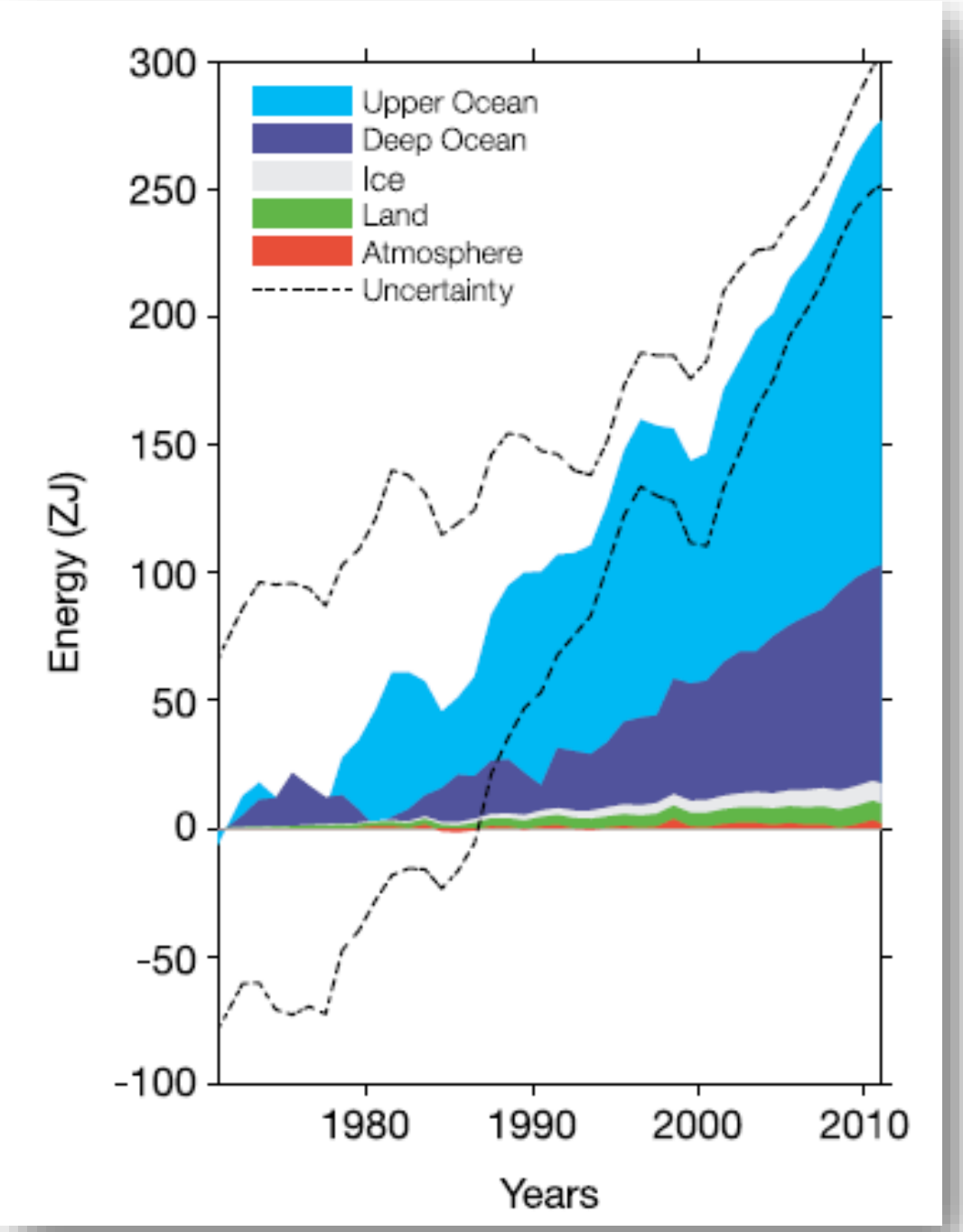
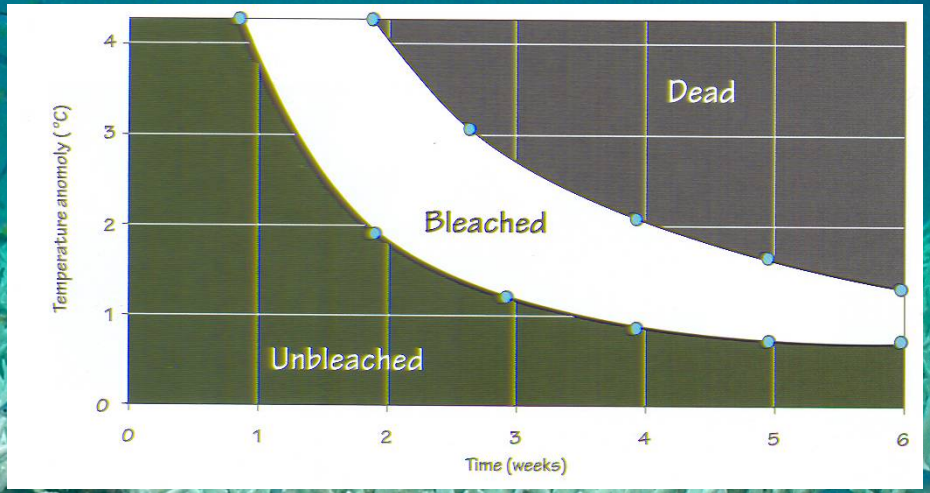

Upper Ocean
Deep Ocean
Ice
Land
Atmosphere
Uncertainty
Energy (ZJ)
300
250
200
150
100
50
0
-50
-100
1980
1990
2000
2010
Years

Table 1.1 Effects, responses and interactions of ocean warming

Ocean warming effect	Current response
Changes in heat storage (Ocean Heat Content, OHC)	Increasing uptake of heat by the ocean as a response to the Earth's Energy Imbalance (EEI), buffering global warming Rising water temperatures at all depths Shallowing of the pycnocline Intensification of El Niño (ENSO) events
Changes in the strength/position of currents and heat transport.	Increased poleward heat transport in western boundary currents of the subtropical gyres Ditto in baroclinic shelf edge currents
Warming of adjacent land masses.	Warmer land surface temperatures Melting permafrost Retreating mountain glaciers and surface melting of the Greenland Ice sheet Terrestrial vegetation changing Increased extent and magnitude of forest fires
Rising sea levels due to direct thermosteric (heat expansion of water) plus other temperature related contributions from melting ice sheets and glaciers	Permanent land inundation, coastal erosion, flooding from storm surges, salt water intrusion into aquifers, loss of some coral atolls and islands.
A melting cryosphere (frozen world)	Basal melting and thinning of ice shelves in Antarctica destabilizing dammed up ice sheet glaciers Increasing overall Antarctic ice mass and sea ice Accelerated mass loss of the Greenland Ice Sheet including basal melting of marine terminating glaciers Accelerating reduction of sea ice in the Arctic and in the

Ocean warming



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Great Barrier Reef coral bleaching will kill more than half reefs in northern section, federal officials say

By political reporter Francis Keany

Posted 5 May 2016, 3:14am

Federal officials have warned more than half the coral reefs in northern sections of the Great Barrier Reef will die as a result of severe bleaching.

High water temperatures caused by the El Nino weather event have seen extreme levels of bleaching off the North Queensland coast.

Dr Russell Reichelt from the Great Barrier Reef





Poland begins logging primeval forest despite activist pleas

Animals to light up Taronga Zoo for Sydney's Vivid festival

Fox sighting by minister investigated while 'nothing done' on other sightings

AUSTRALIA VOTES

Kelp forest losses



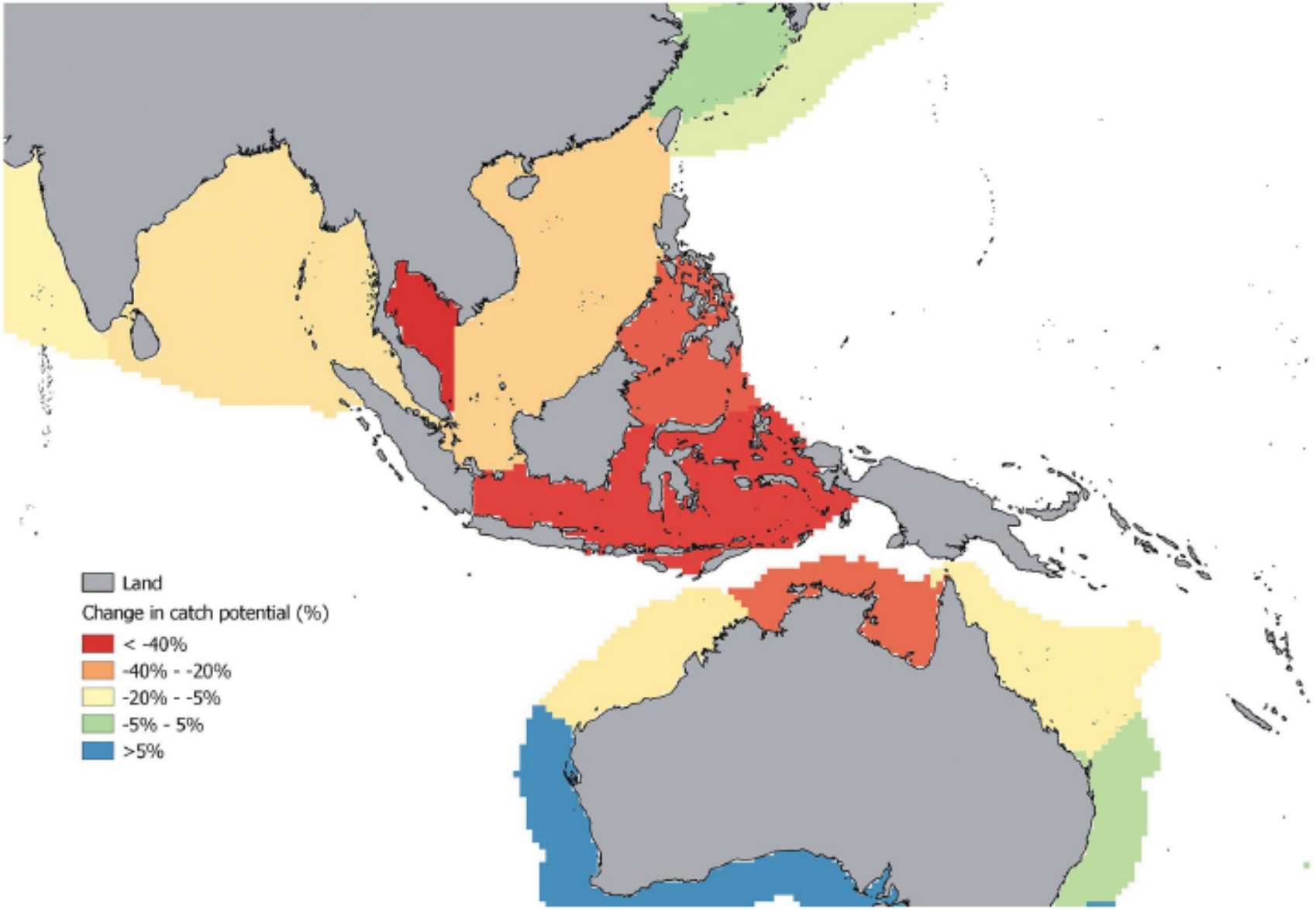


Figure 4.5.5 Multi-model ensemble projections of mean percentage changes in potential fish catch from South-east Asia by 2050, relative to recent catch levels (1971–2000), under the RCP 8.5 emissions scenario (source: Cheung *et al.*, 2016a).

A warming ocean

Since the 1970s, the Earth's ocean has absorbed more than 93% of the enhanced heating arising from human activities. This extra heat is causing changes in the ocean, which are beginning to alter species, ecosystems,and ecological processes.



Disease outbreaks

Warming water temperatures are changing the distribution of pathogens around the world. There are early signs that these changes are impacting human health.

Shifts in timing of key biological events

Changes in the seasonal availability of plankton mean that plankton food stocks are becoming more unpredictable for the marine life that feeds on them.

Global scale change

Change is being observed from polar to tropical regions, and from coasts to seabeds - not just coral reefs.

Species on the move

Plankton, jellyfish, fishes, turtles and seabirds - especially those in the tropics - are being driven to the poles to keep within favourable environmental conditions. These shifts are putting global food security at risk.

Vulnerable societies

Mangrove, seagrass and coral reef ecosystems that provide vital coastal protection and food security for seaside communities are being lost or degraded, and making people less resilient to environmental change.

Disappearing breeding grounds

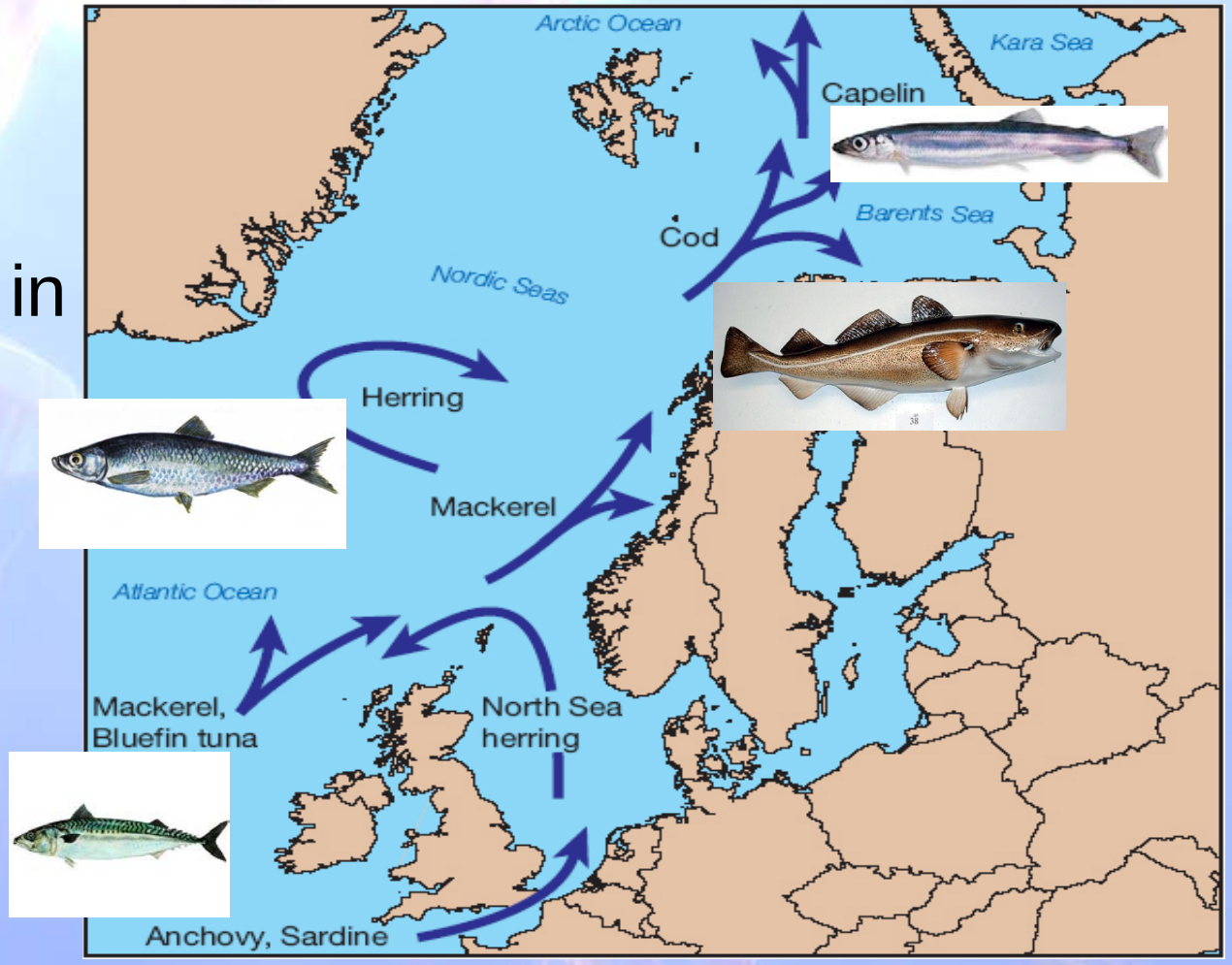
Seabirds, turtles and other species are losing breeding grounds, which is reducing their breeding success.

IUCN

Copyright: IUCN. Source: Laffoley, D., & Baxter, J.M. 2016. Explaining ocean warming: Causes, scale, effects and consequences. Full Report. Gland, Switzerland: IUCN. Icons courtesy of Diana Kleine (mangrove - rhizophora stylosa), Jane Thomas (seabird), and Tracey Saxby (fish school and plankton community), Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/imagelibrary/). Infographic design: Matea Osti, IUCN.

Shift in fish populations

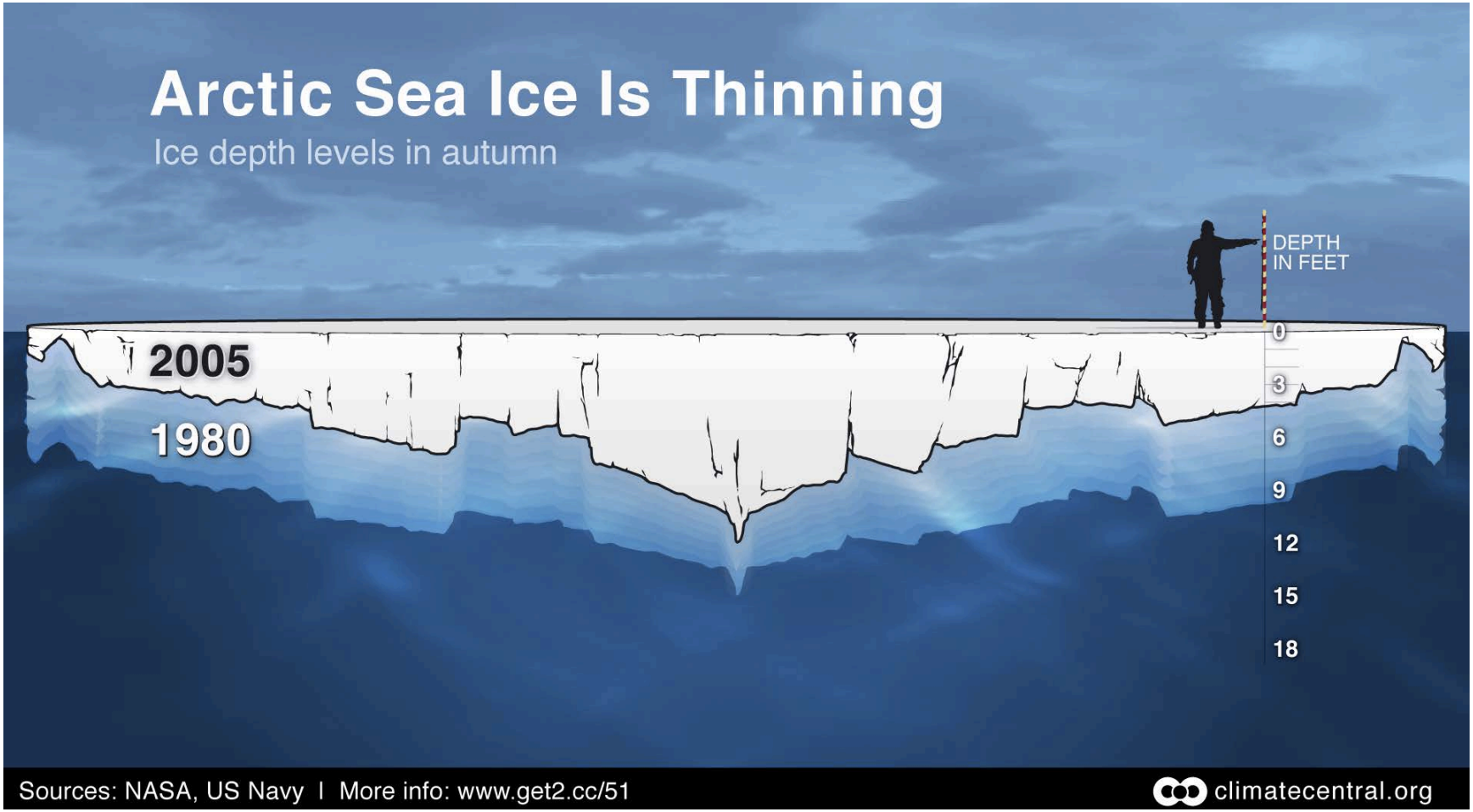
Warming temperatures causes a change in composition of plankton species, which leads to a shift of fish populations



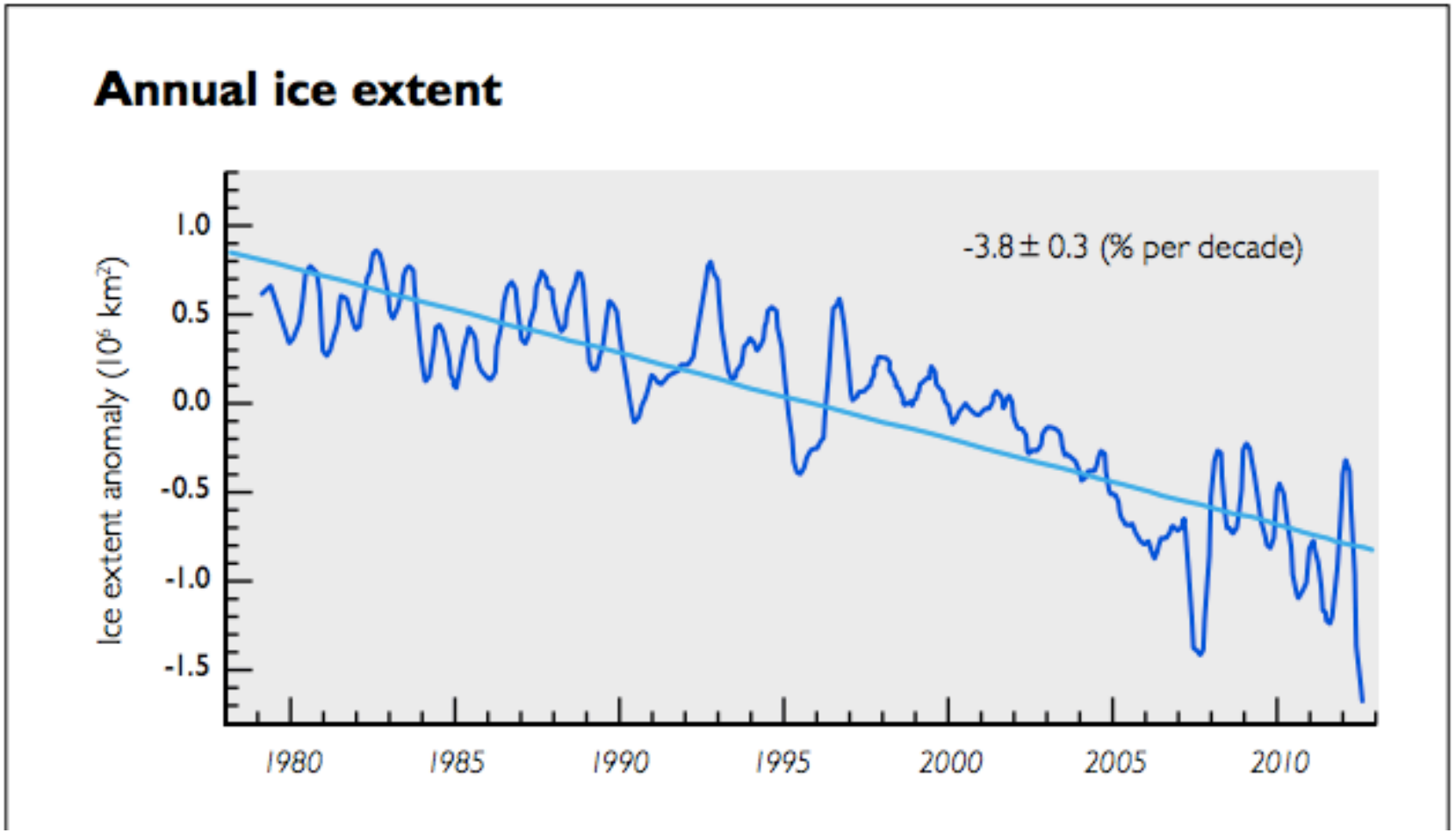
Climate Change in the Arctic Ocean



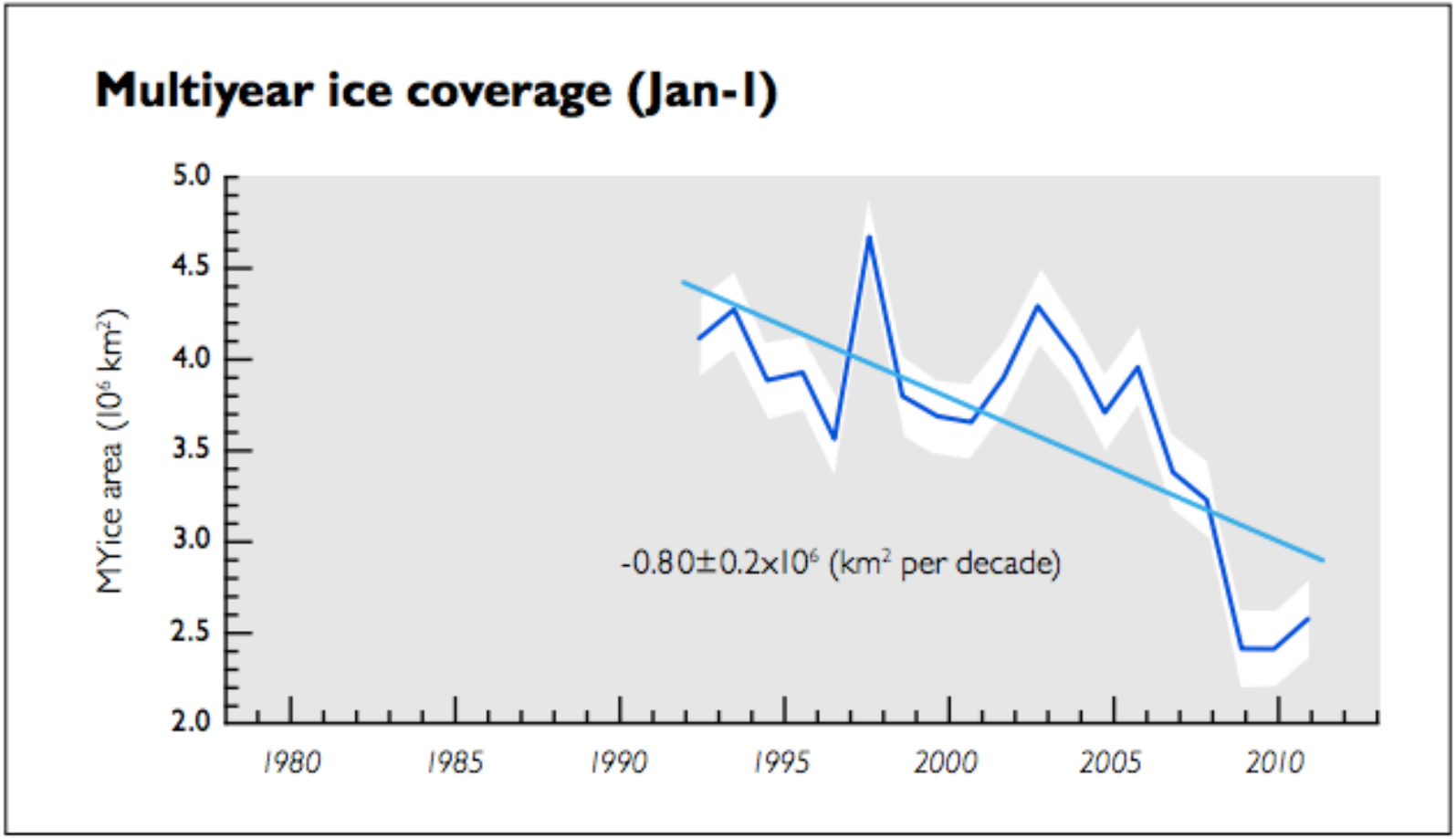
Dramatic decrease in thickness



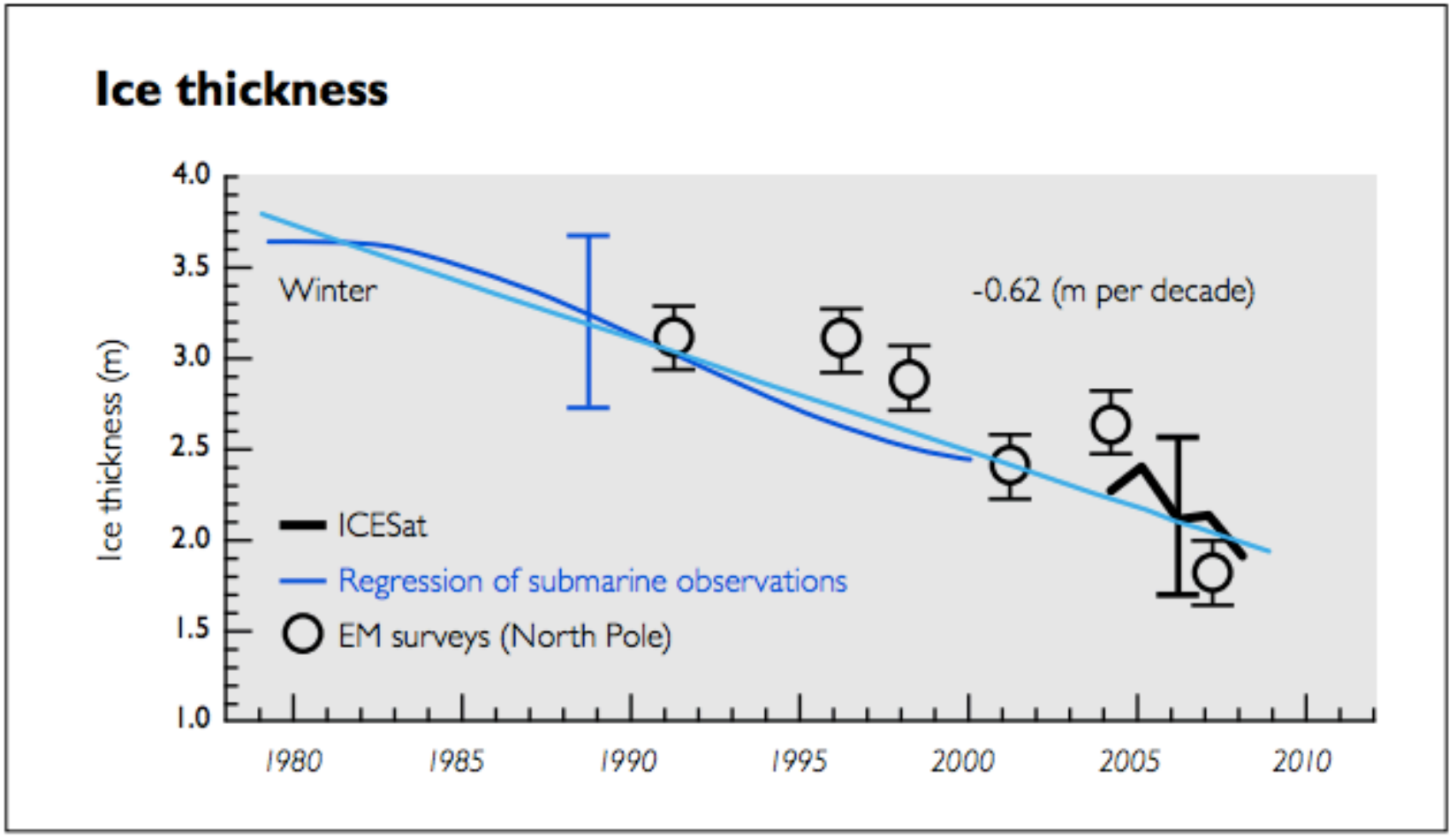
Area Covered by Ice decreasing by 4% per decade



Multiyear ice cover decreased from 4,5 to less than 3 million km^2 in the last 15 years



Multi year ice thickness is decreasing



Main Findings

- **Recognition of impact severity**. There is a need for a much greater recognition of the unequivocal scientific evidence of impacts on key marine and coastal organisms, ecosystems, and services even under the low emissions scenario.
- **Concerted joined-up global policy action for ocean protection.** There is a need to join up action across global conventions with respect to climate change and environmental protection.
- **Comprehensive protection and management**. There is a need to ensure that we rapidly fill gaps in protective regimes, such as protecting the High Seas.
- **Updated risk assessments**. A re-evaluation is needed on the risks that impacts from ocean warming and other stressors pose to humanity, to the viability of the very species and ecosystems involved, and to the provisioning of goods and services we derive from the environment.

Main Findings

- **Closing gaps in fundamental science and capability needs**. There is a need to rapidly assess science, observing and modelling capacity and their needs in light of the widespread changes happening from ocean warming and other stressors.
- **Acting quickly to keep future options open**. The concerns among the scientific community that as atmospheric CO2 increases, the options for the ocean (i.e. mitigate, protect, repair, adapt) become fewer and less effective must now be recognized.
- **Achieving rapid and substantial cuts in greenhouse gases**. Greenhouse gas mitigation at the global scale appears to be the overarching solution.

Conclusions

- Ocean Warming is affecting all parts of the ocean already
- We need to act to mitigate the negative effects
- Ocean Resilience requires shift in current uses
- Invest in Ocean Sciences
- IUCN is open to partnerships



Sunset Over an Ocean with Man's Footprint Now Detectable – Warmer, Less Diverse, Over Exploited……. And More Acidic



Oceans will become more acidic – very high certainty.

The impact on ocean food webs and ecosystems could be very serious.

The only way of reducing the impact of global ocean acidification is a substantial and urgent reduction in CO_2 emissions – very high certainty.

Mitigation will make a difference – ocean acidification argues for stabilizing CO_2 lower than 450 ppm

Thank You

Where to find the report:

https://portals.iucn.org/library/sites/library/files/documents/2016-046_0.pdf

https://portals.iucn.org/library/sites/library/files/documents/2016-046-Summ.pdf

Slides provided by: Dan Laffoley, Olof Linden and Carol Turley