CLIMATE CHANGE

Ocean Impacts and Projections

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Oceans cover ~70% of the blue planet

- create half the oxygen (O_2) we use to breathe and burn fossil fuels.
- provide 20% of the animal protein consumed by more than 1.5 billion people.
- are home to diverse species and ecosystems valued in tourism
- offer rich biodiversity and resources for innovative drugs or biomechanics.
- sustain coral reefs and mangroves protecting coastlines from tsunamis and storms.
- sustain shipping of 90% of all goods the world uses.

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Climate-related isssues

Oceans play a major role in climate regulation globally:

- absorb >90% of the heat accumulating in the atmosphere → ocean warming, hypoxia
- absorb 25% of man-made CO_2 → ocean acidification

Human activities also influence ocean conditions locally:

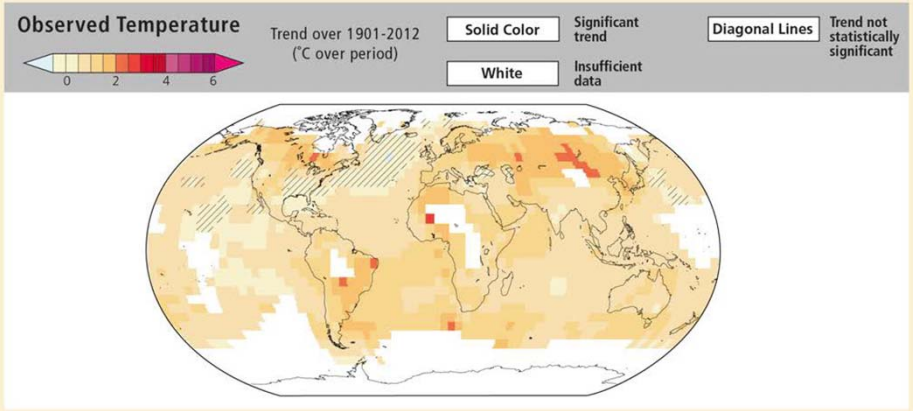
- overfishing,
- pollution, and nutrient runoff via rivers that causes eutrophication,
- generating large coastal areas of water with low oxygen levels ("dead zones")
- harmful algal blooms
- redistribution of pathogens (cholera).

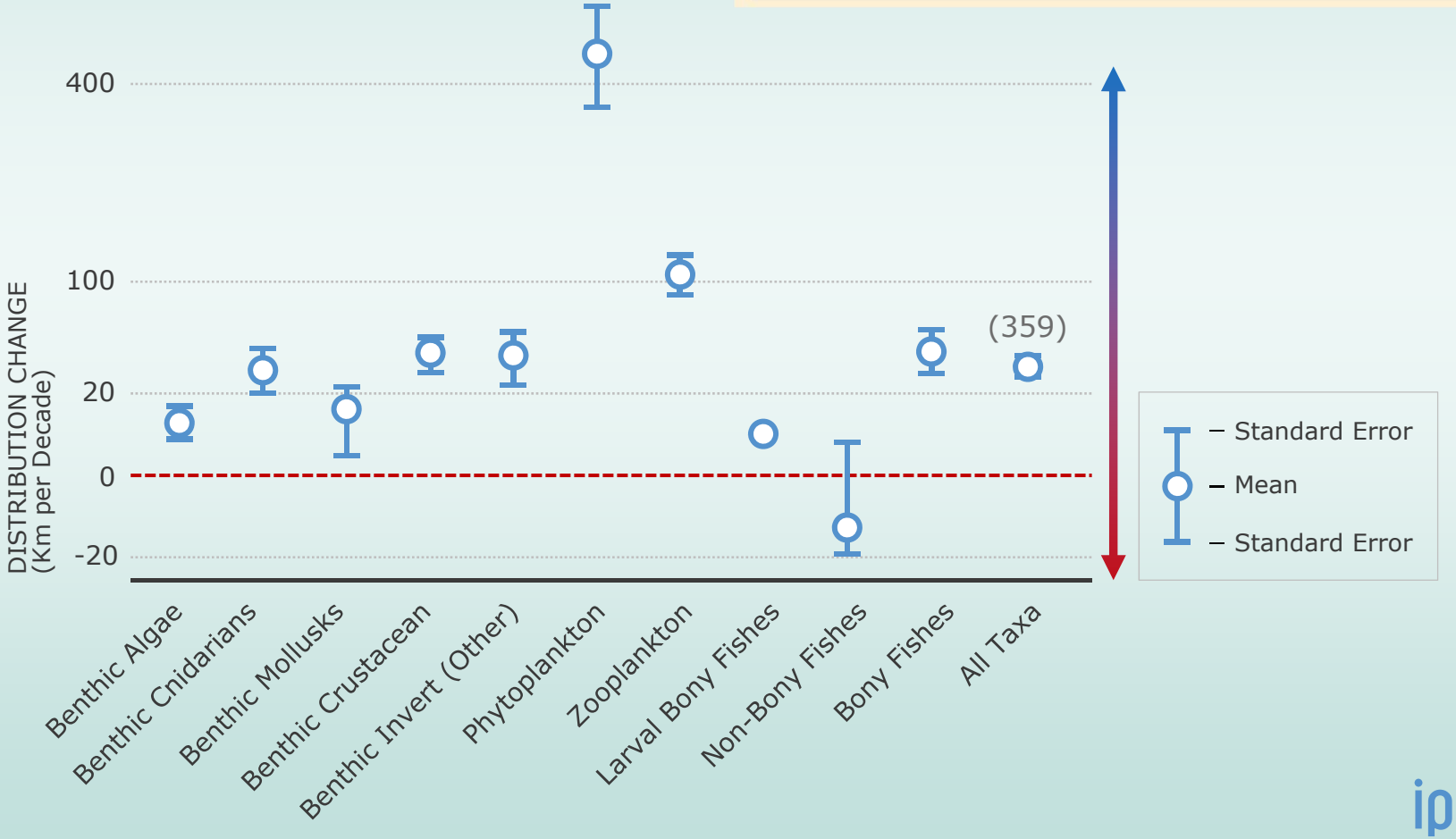
…with temperature presently being the predominant driver of ongoing global changes

OBSERVATIONS

World-wide marine species displacements due to climate change

Ocean warming as the key driver





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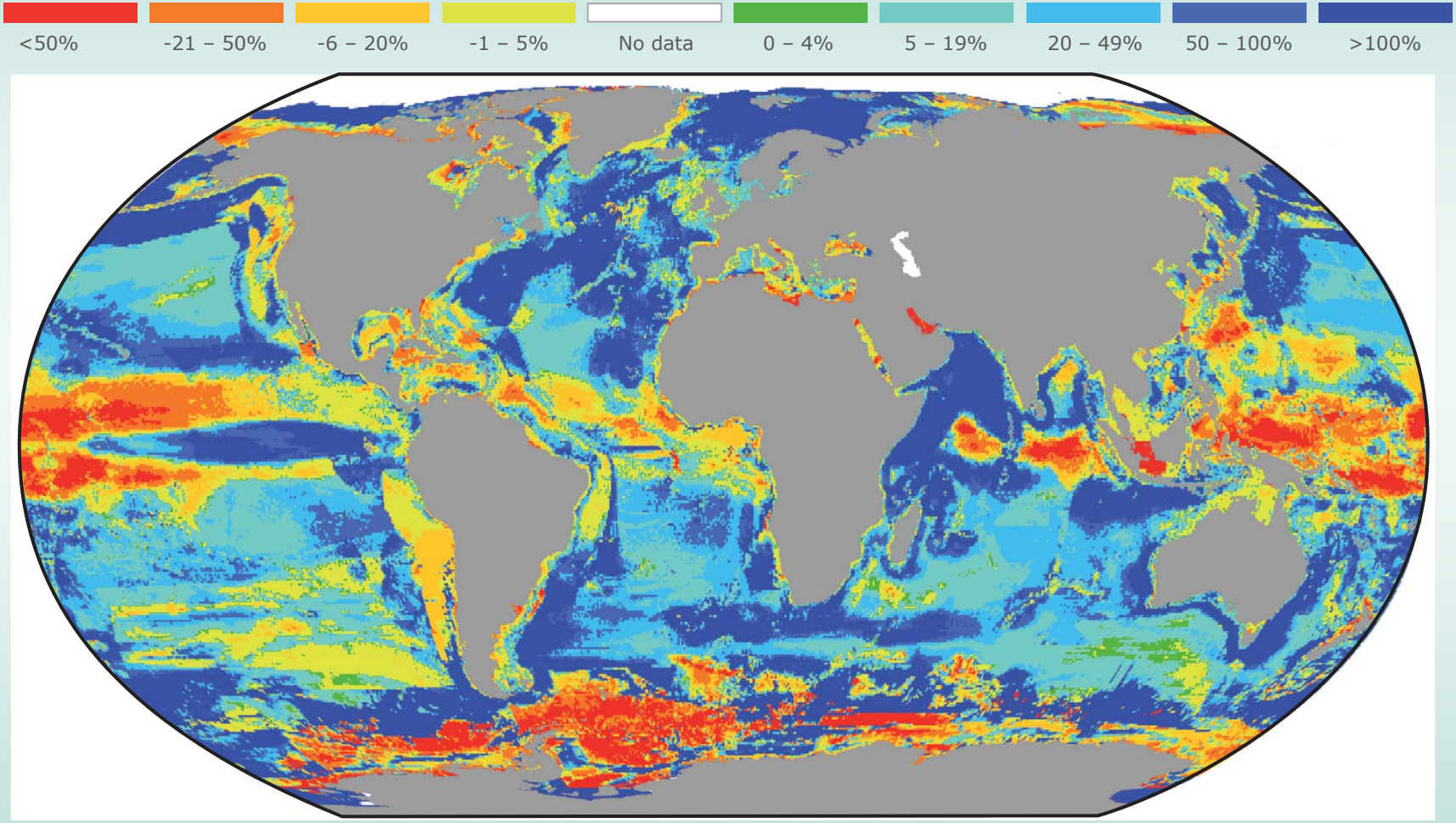
PROJECTIONS

Ocean warming 2051-60: displaced and reduced fish and invertebrate stocks

CHANGE IN MAXIMUM CATCH POTENTIAL (2051-2060 COMPARED TO 2001-2010, SRES A1B, 2°C warming)



WGII, 6-14, SPM.6

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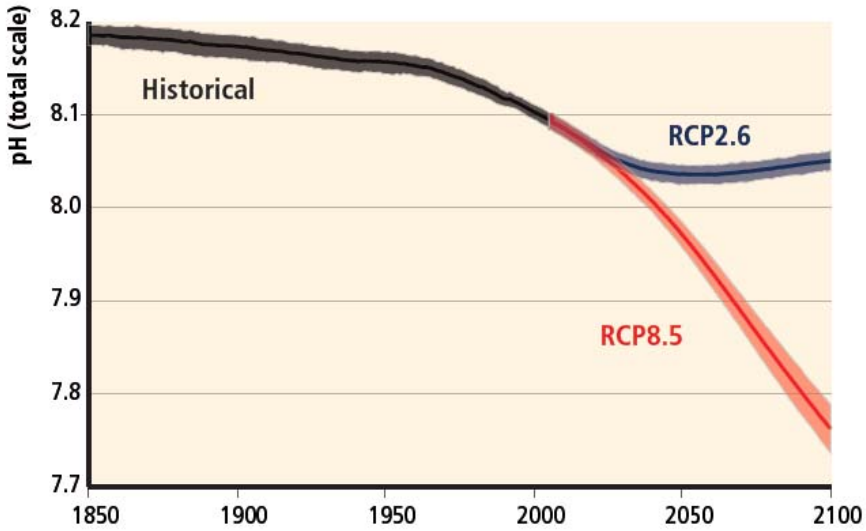
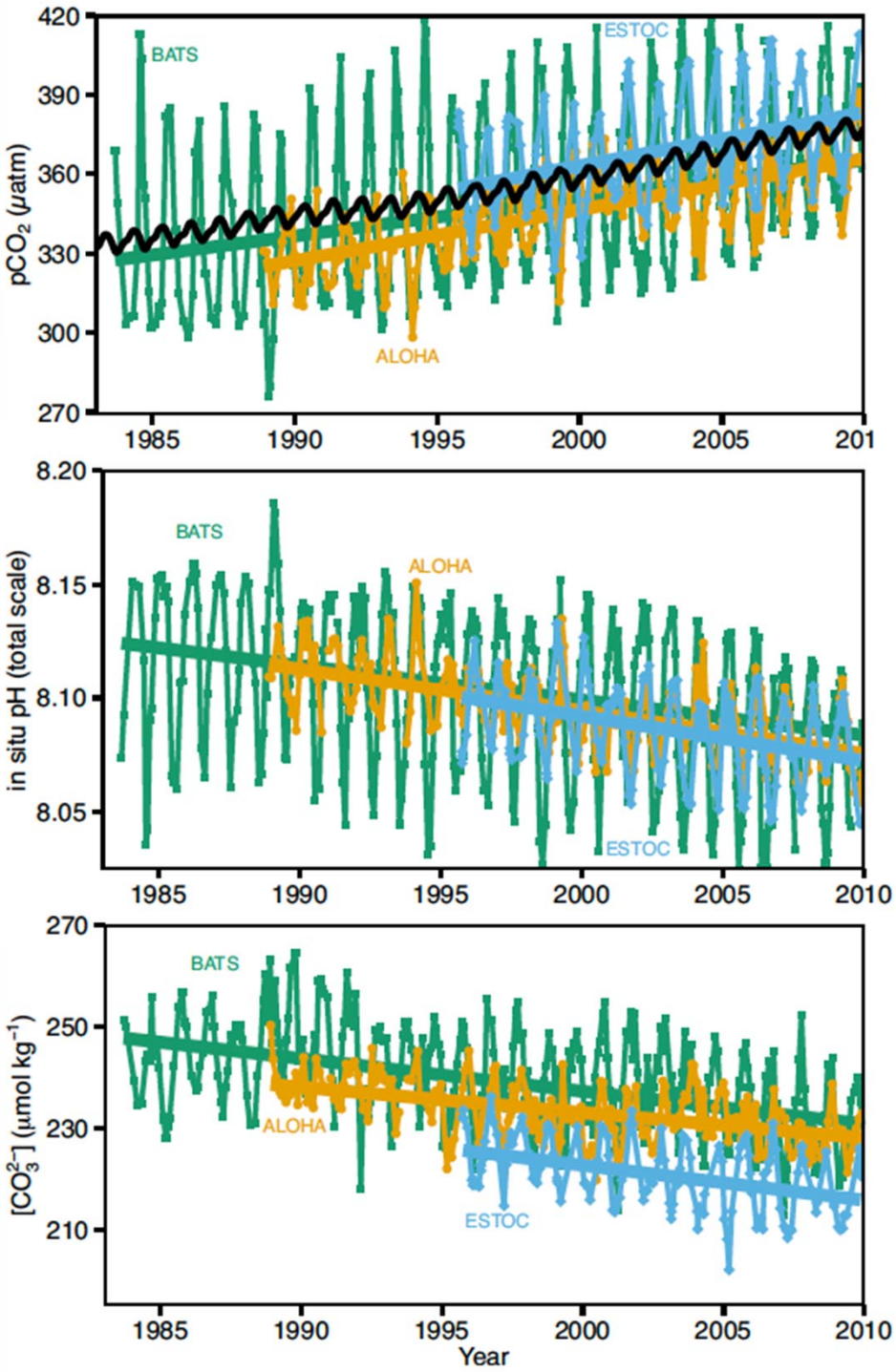
Ocean acidification

Observations ➔ **Projections**





Observations

WGI 3-18

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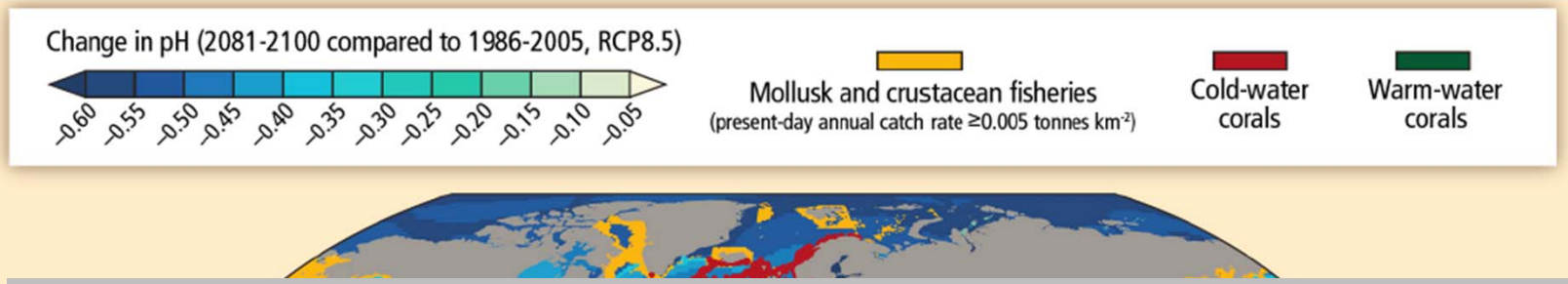
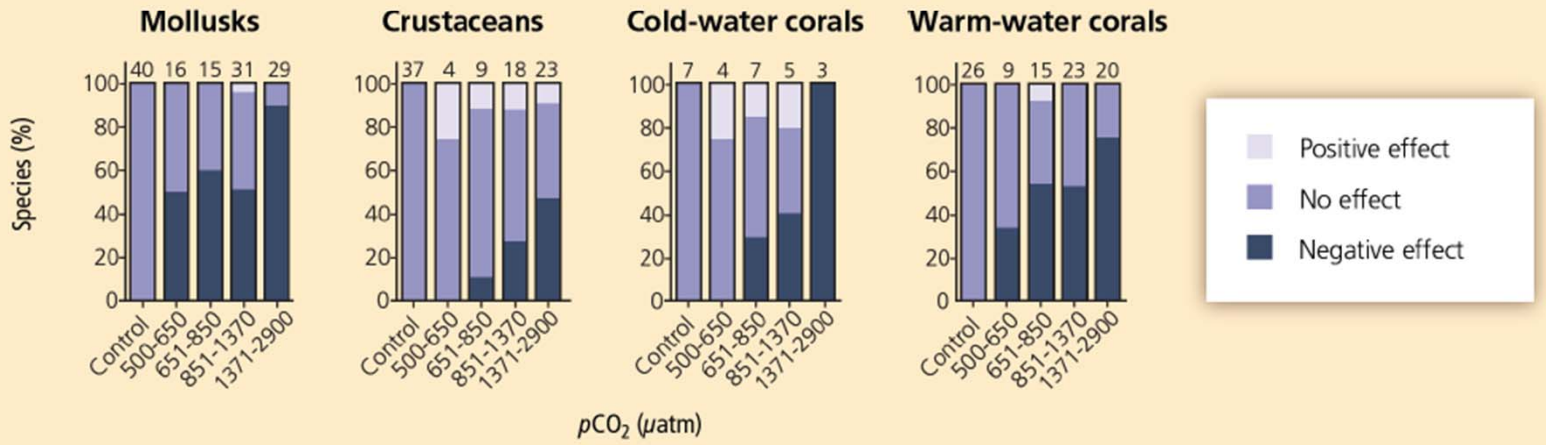
Projections: Ocean acidification, risks for mollusk and crustacean fisheries and coastal protection by coral reefs



.....risks enhanced by warming extremes

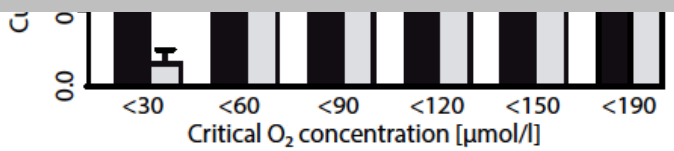


WGII, SPM.6

….. causing compression and loss of habitat to fish species

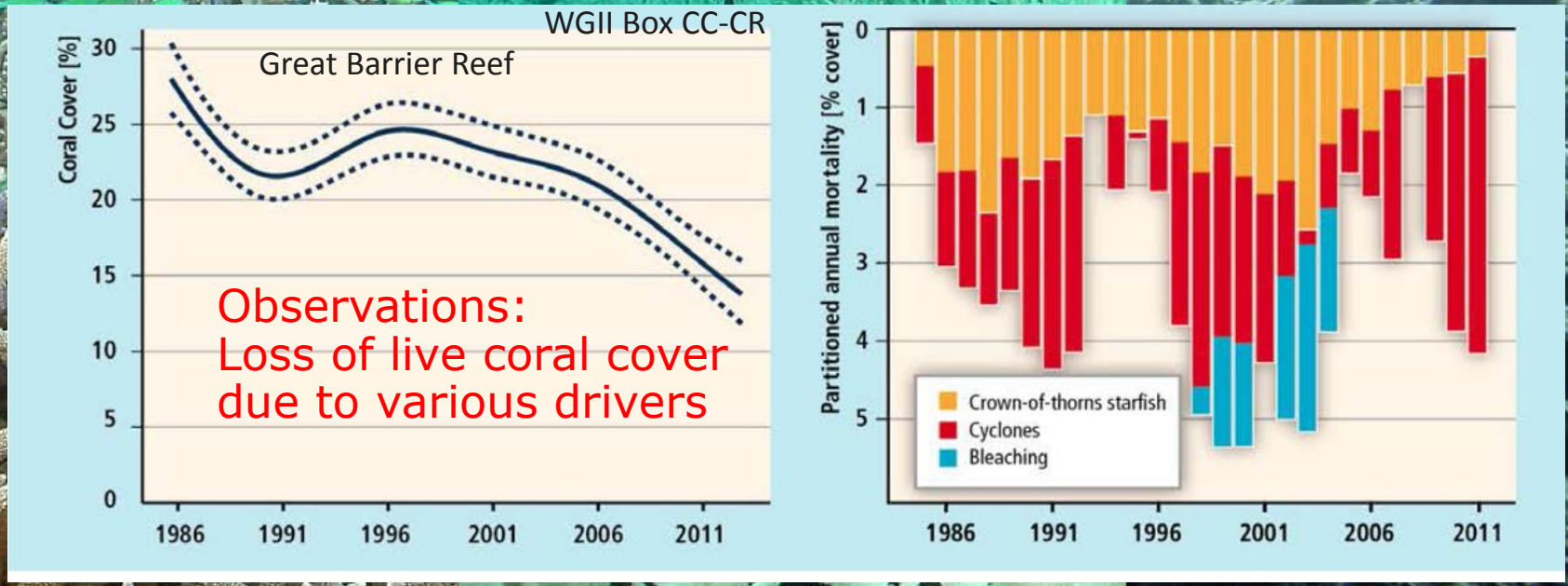
… in animals strongest impacts are expected where warming, acidification and hypoxia come together

WGI, 6-30, WGII, 6-11
D. Storch et al., 2014



Vulnerable ecosystems

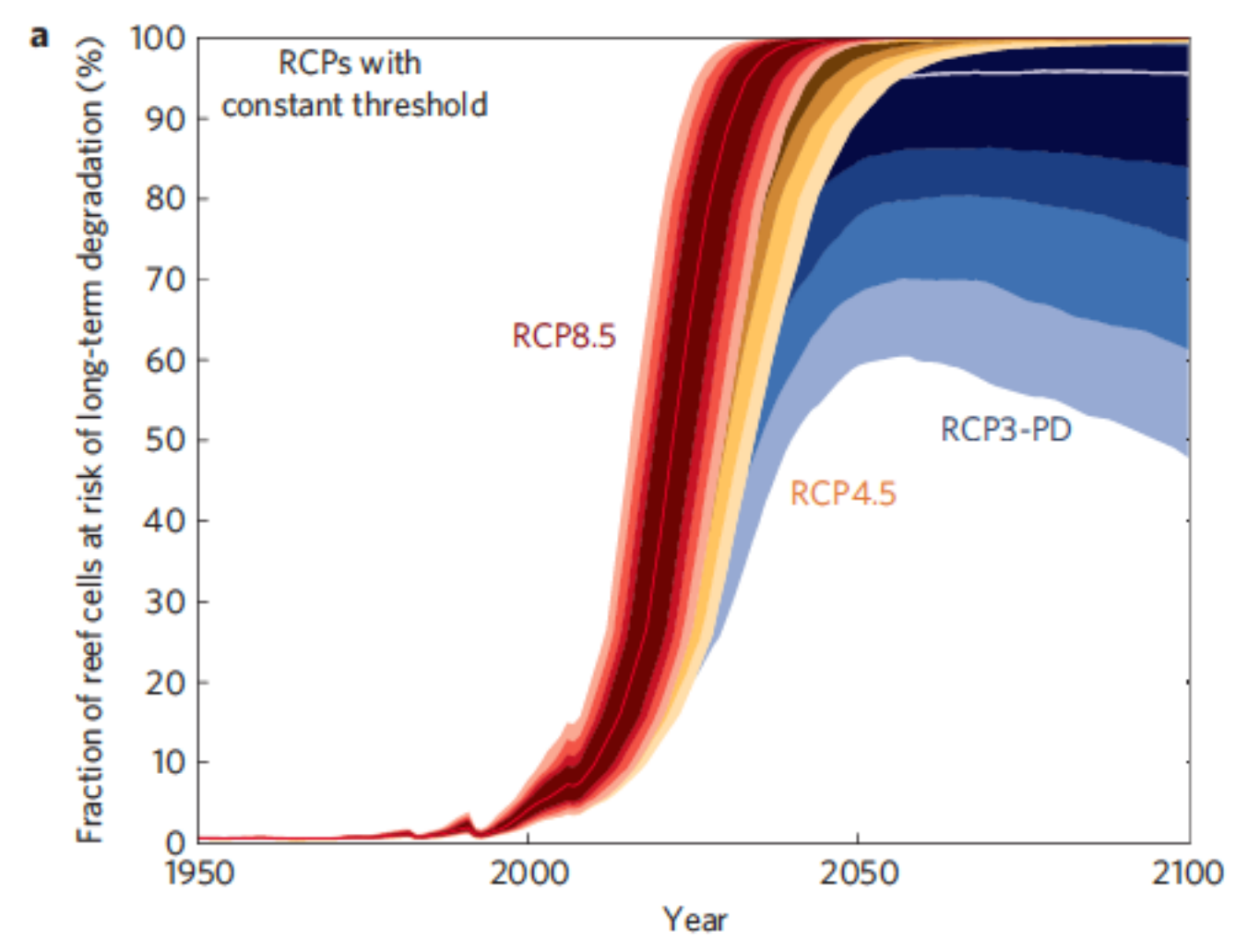
Warm water coral reefs



Verons 2009

Projections

Mitigation ...needed to minimize the marginalization of coral reefs.



Frieler et al., 2013:

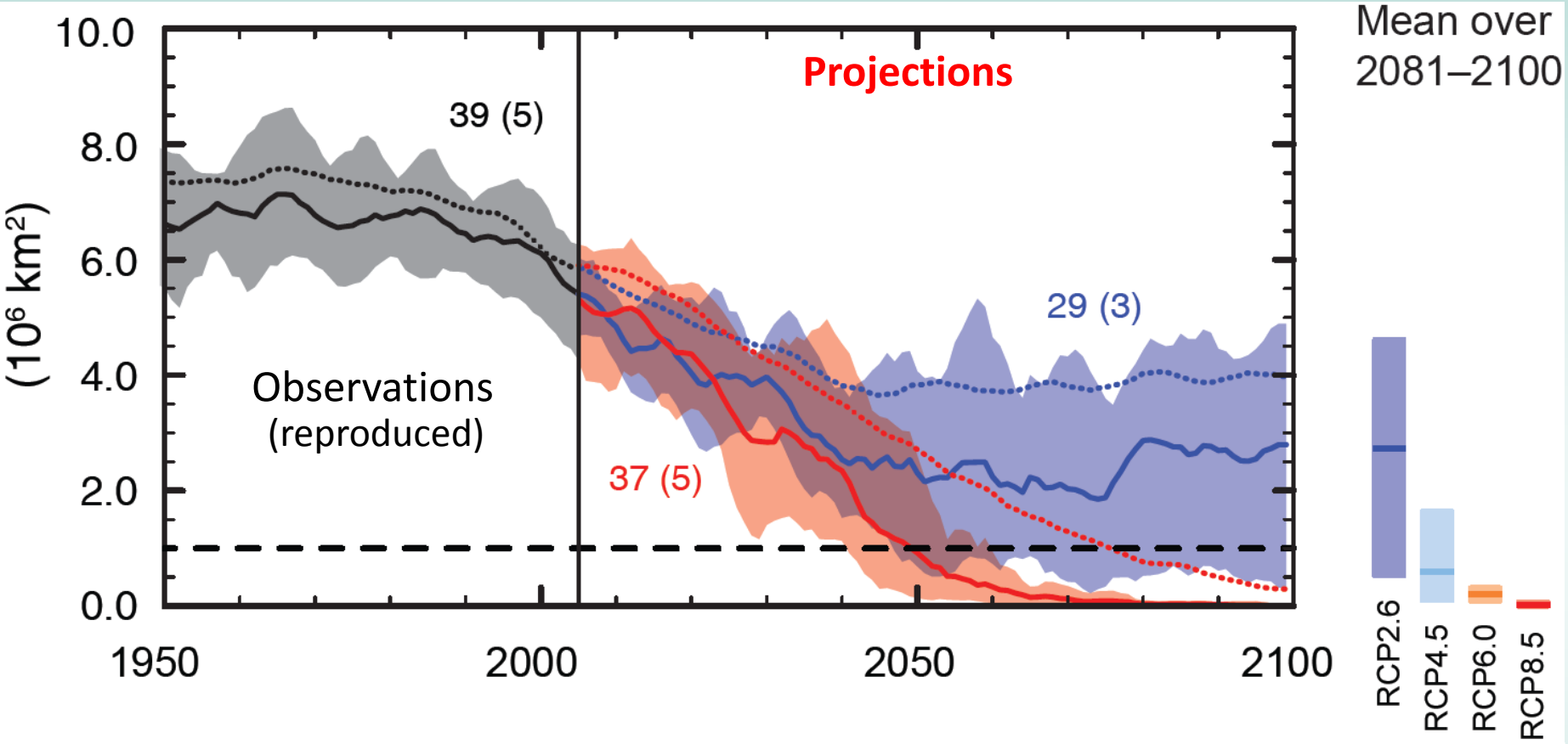
„To protect at least 50% of the coral reef cells, global mean temperature change would have to be limited to 1.2° C (1.1 – 1.4° C), especially given the lack of evidence that corals can evolve significantly on decadal timescales and under continually escalating thermal stress.“

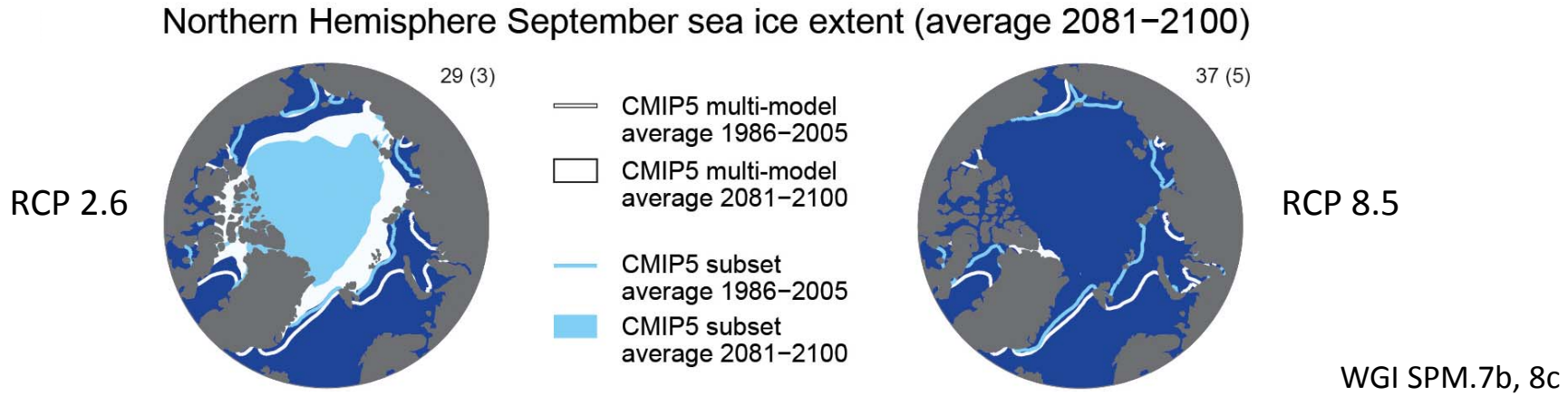
(....not yet taking ocean acidification effects into account)

WGII CC Box coral reefs


Vulnerable ecosystems
Arctic sea ice ecosystem

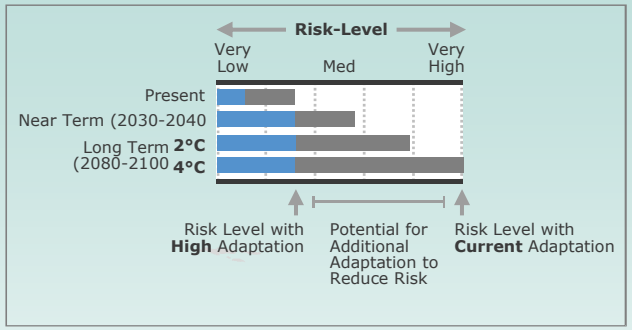
Northern Hemisphere September sea ice extent: Marginalization with continued warming

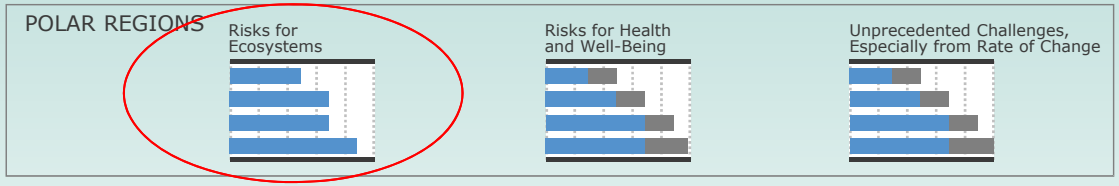


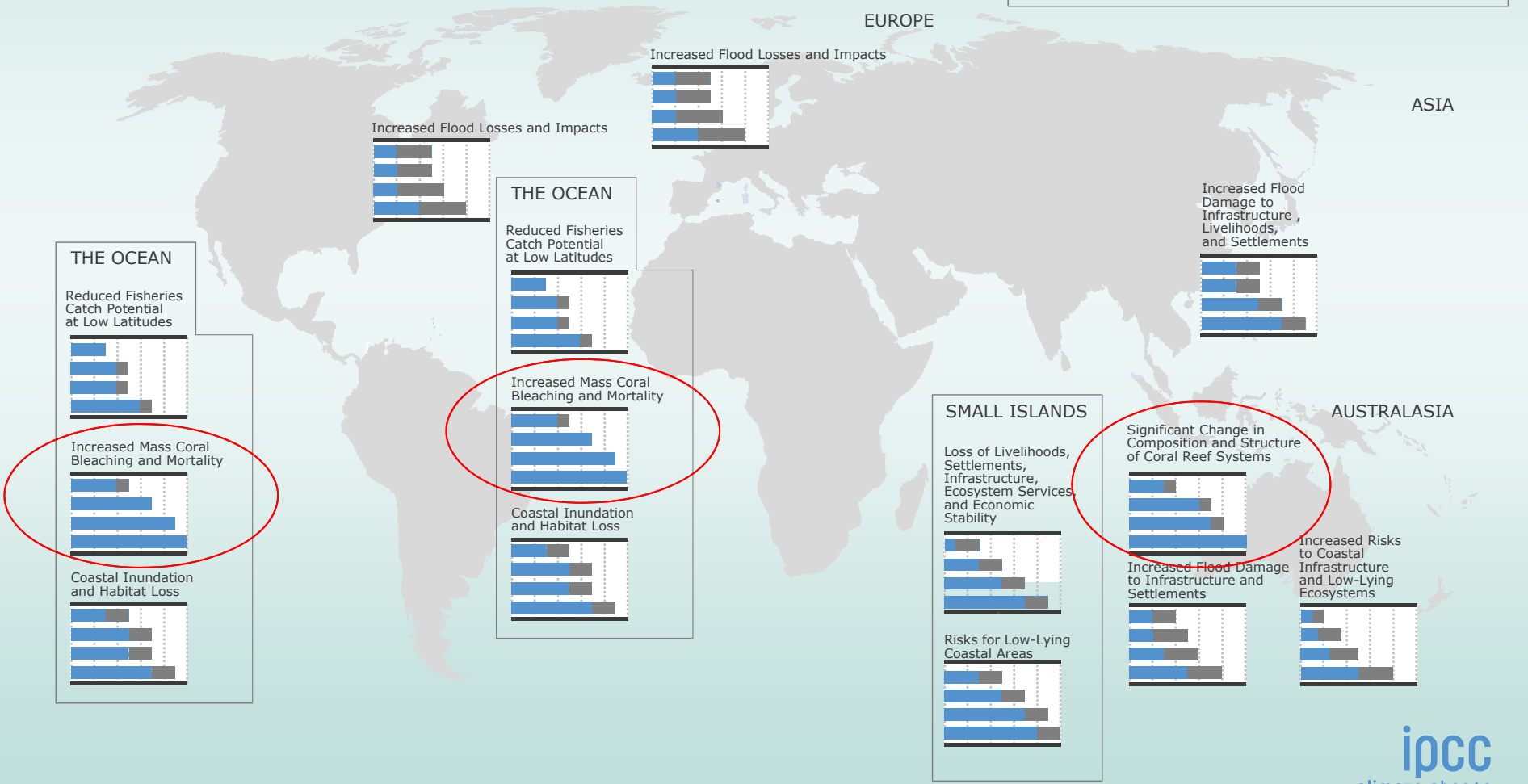


WGI SPM.7b, 8c

Risks involving the oceans, risk reduction by adaptation **very limited for some systems**







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Working Group II : Impacts, Adaptation, and Vulnerability

Thank you!

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