#SROCC

Unpacking SROCC: Impacts and risks for global marine biodiversity and fisheries

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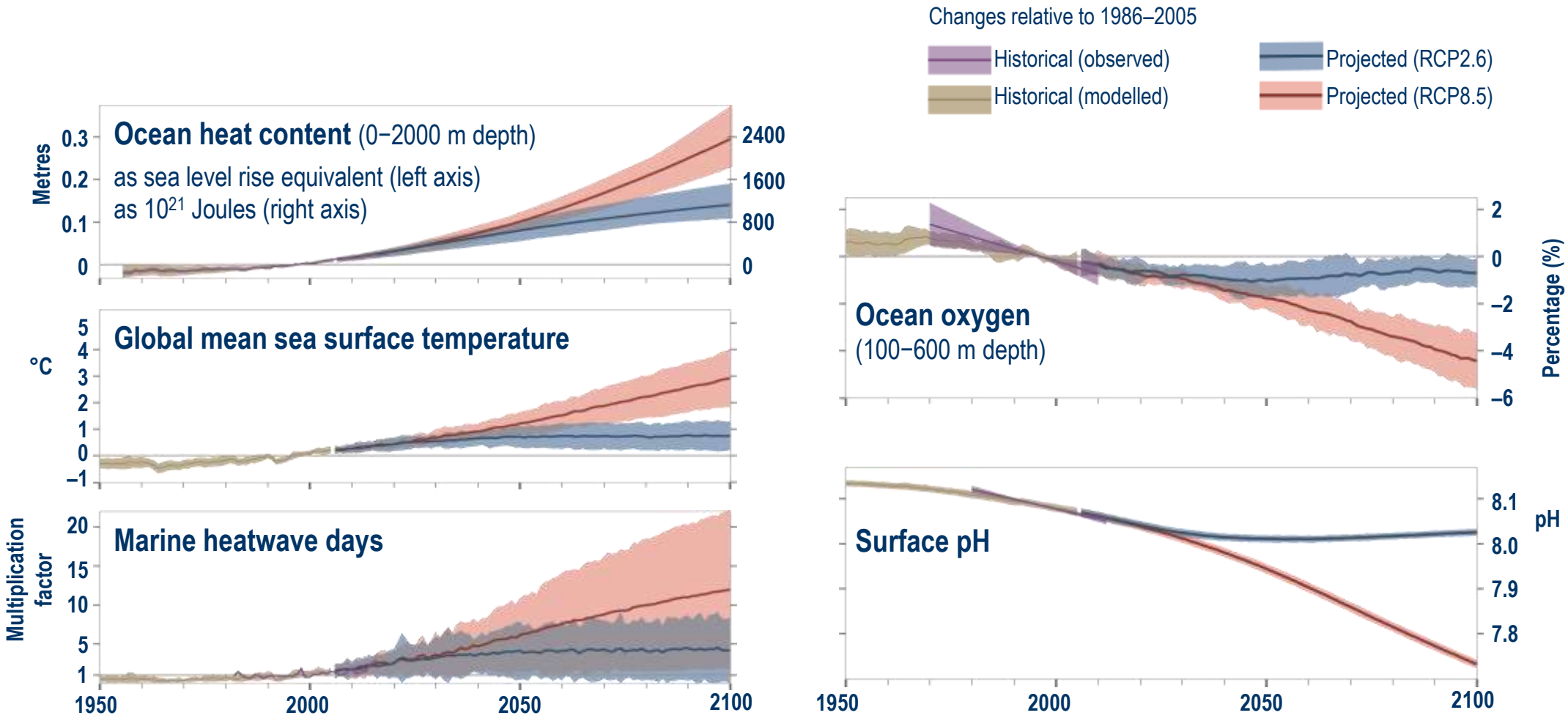
Carbon emissions from human activities are causing ocean warming, acidification and oxygen loss

- The **ocean warming** trend documented in the IPCC Fifth Assessment Report (AR5) **has continued**
- Since 1993 the **rate of ocean warming** has **increased**
- Globally, **marine heatwaves have doubled** in frequency and become longer lasting, more intense and more extensive
- The ocean has taken up 20-30% of total anthropogenic CO_2 emissions since the 1980s causing surface **ocean pH** to **decline**
- The ocean has **lost oxygen** over the upper 1000m

The ocean is projected to transition to unprecedented conditions



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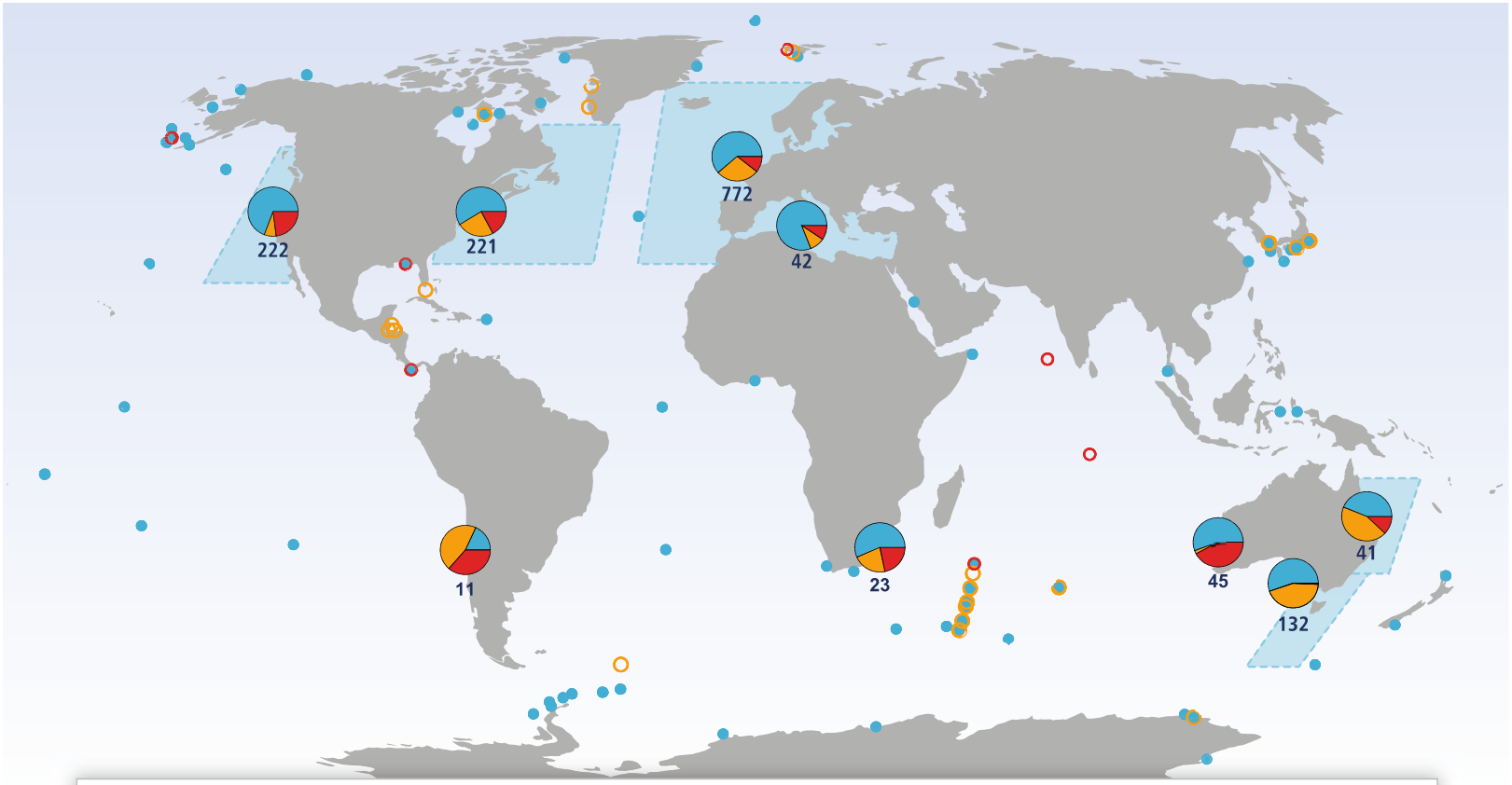
Response of species and ecosystems to climate change have been observed from every ocean region



AR5 WGII

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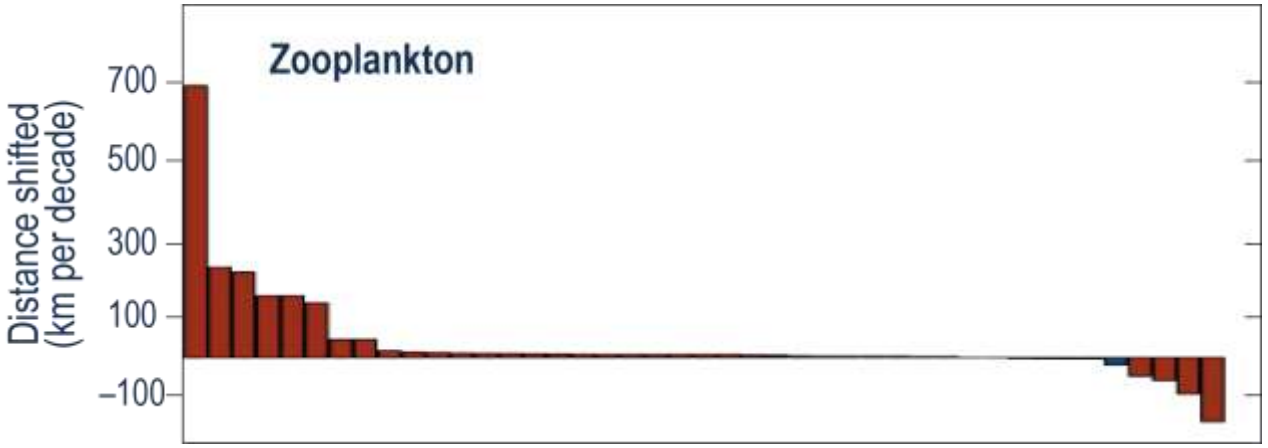
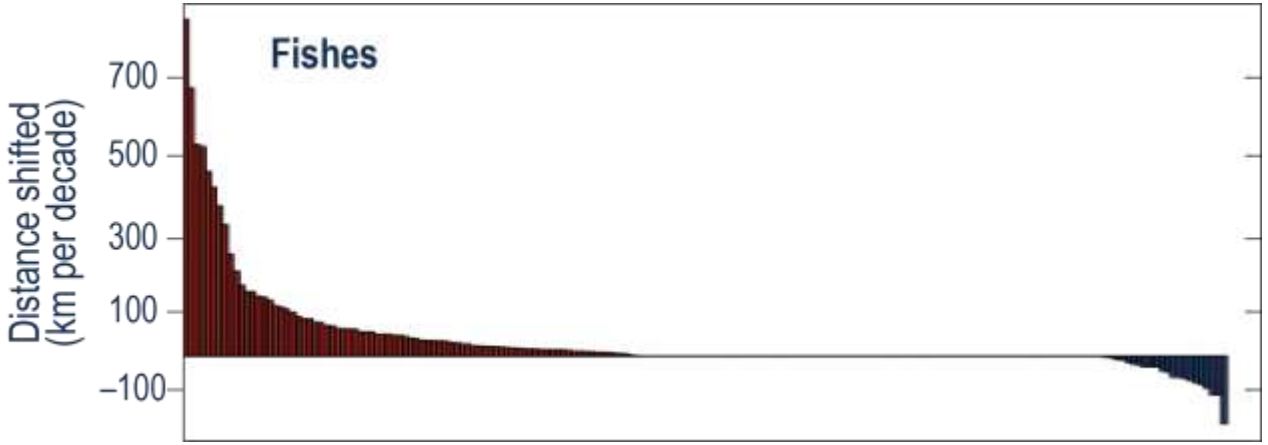
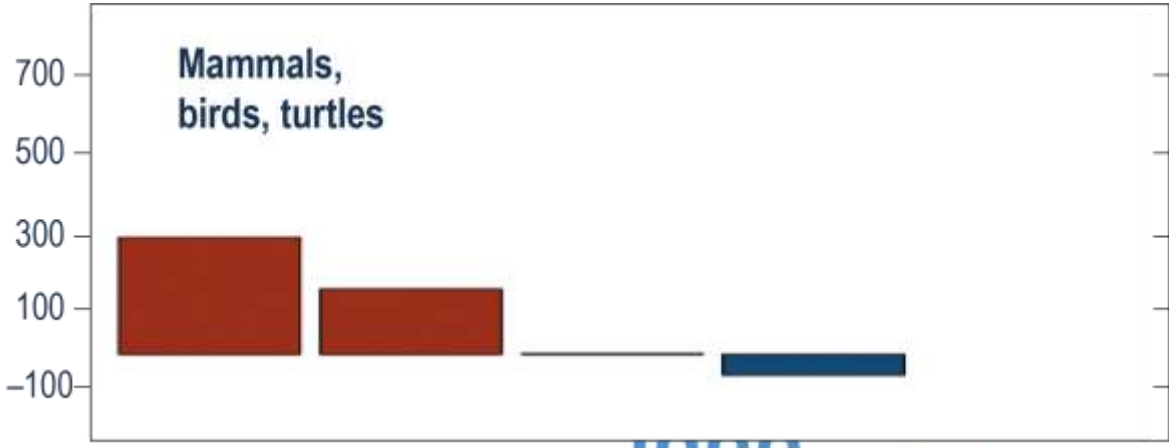
Many marine species across various groups have undergone shifts in geographical range consistent with warming







Species in upper 200m
Average shift rate:
52 km per decade

Individual records of shifts

Individual records of shifts

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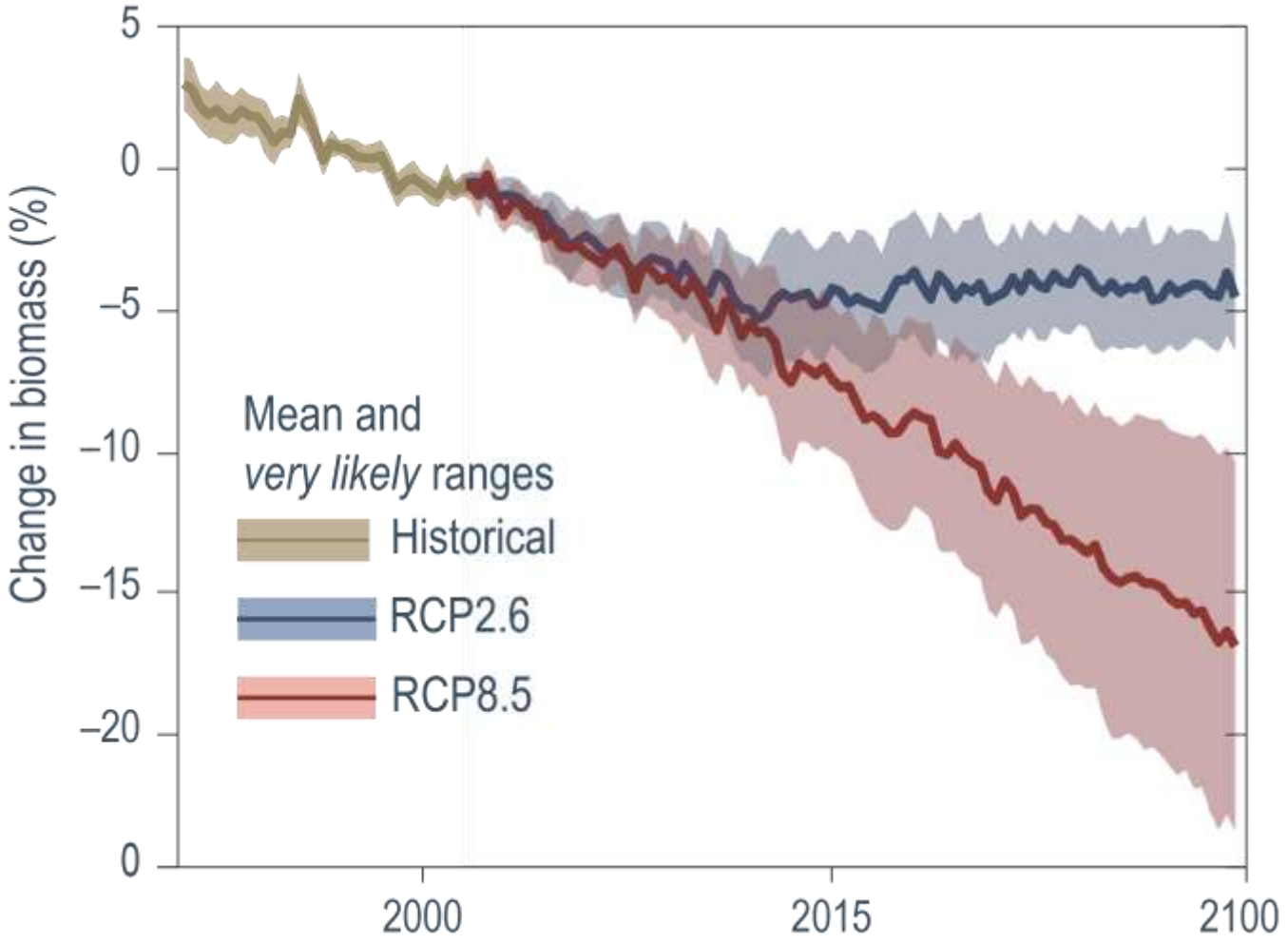
Observed shifts in species composition, abundance and biomass production of ecosystems, from the equator to the poles.

- **Life** is **specialized** on limited **temperature ranges**
- In some marine ecosystems, **species are impacted** by both the effects of **fishing and climate changes.**
- Altered interactions between species have caused **cascading impacts** on **ecosystem structure and functioning.**
- Global warming and biogeochemical changes have already contributed to **reduced fisheries catches in many regions**

Future ocean warming and changes in net primary production alter ecosystem biomass, production and community structure.



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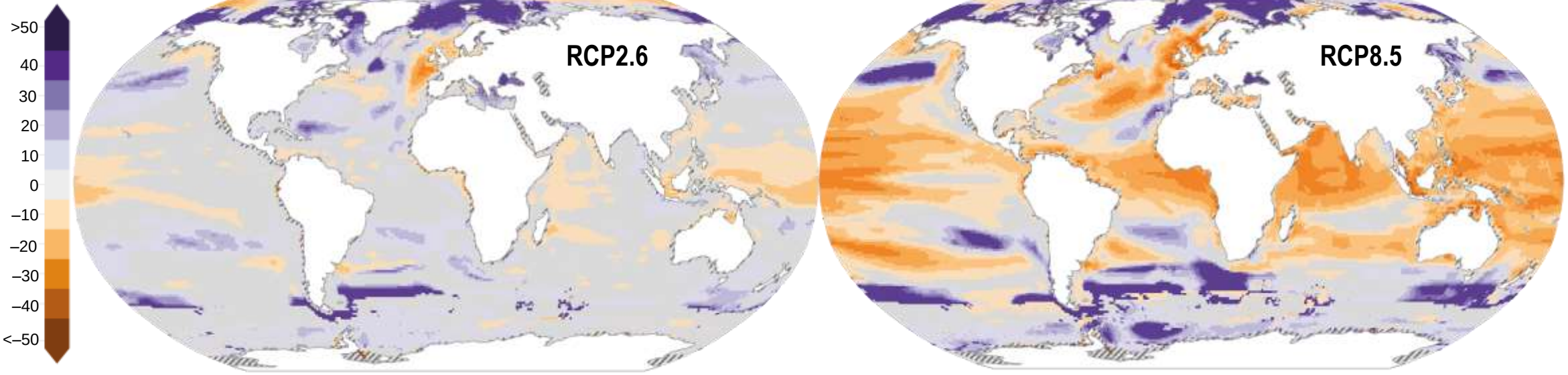
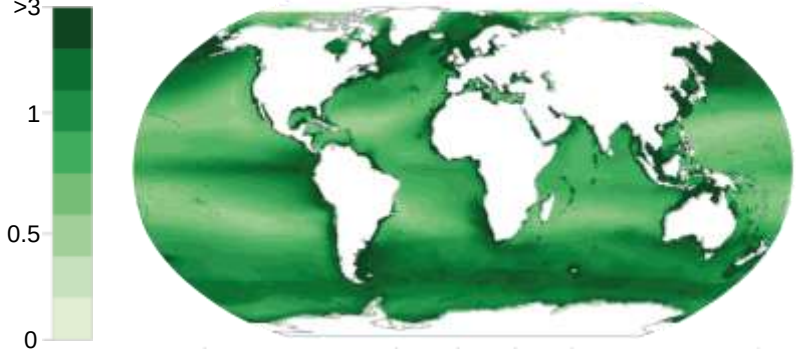
Future regional changes in animal biomass
including fish and invertebrates

Percent change Average by 2081–2100, relative to 1986–2005



Baseline Value in normalized index (1986–2005)



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Model disagreement

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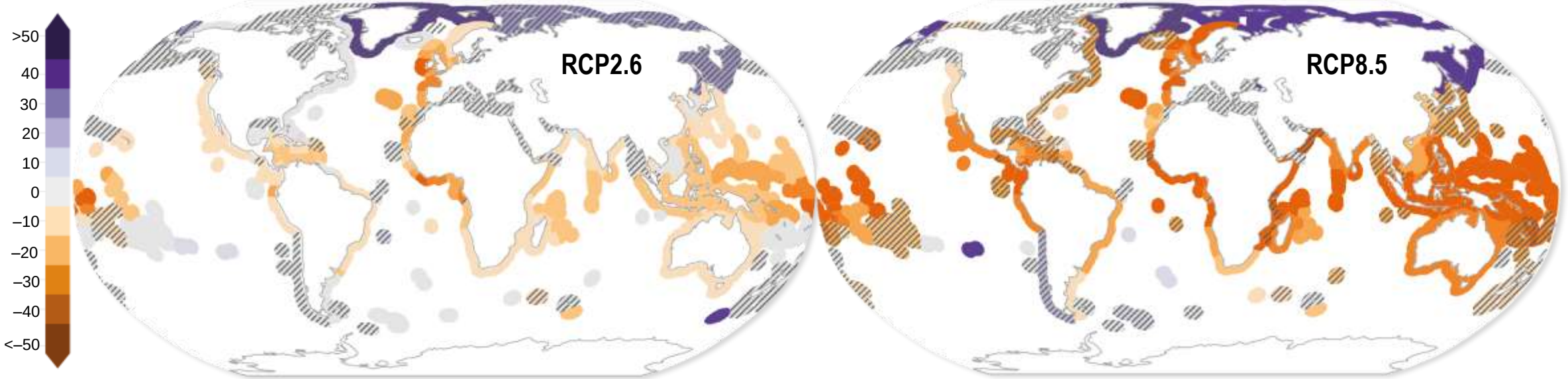
Future regional changes in maximum fisheries catch potential (in shelf seas)

RCP8.5

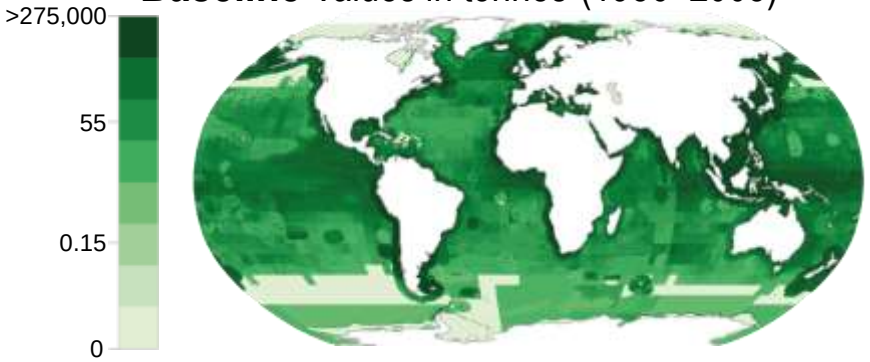
Global decrease 20.5-24.1%

Tropical regions up to 50% decrease

Percent change Average by 2081–2100, relative to 1986–2005



Baseline Values in tonnes (1986–2005)



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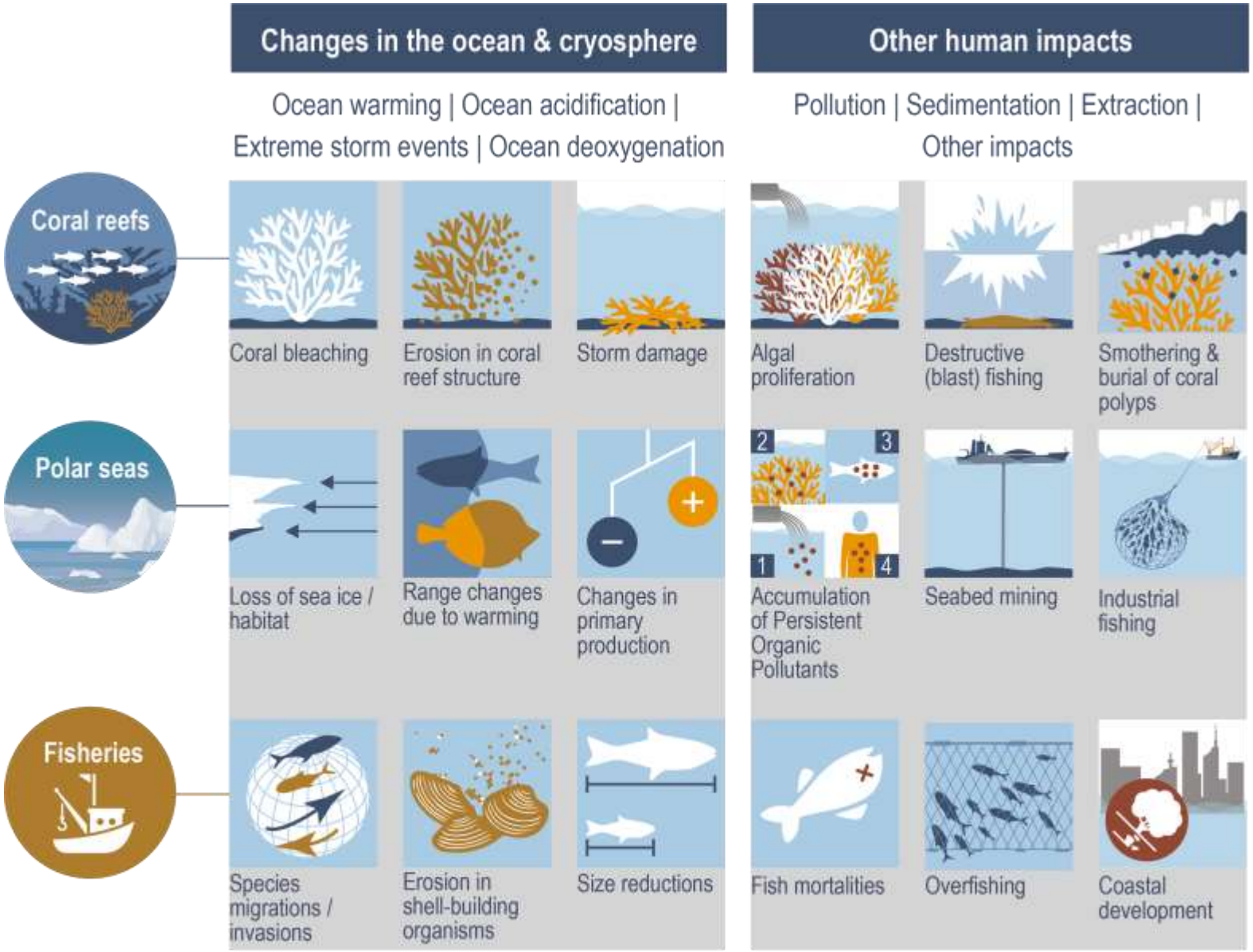
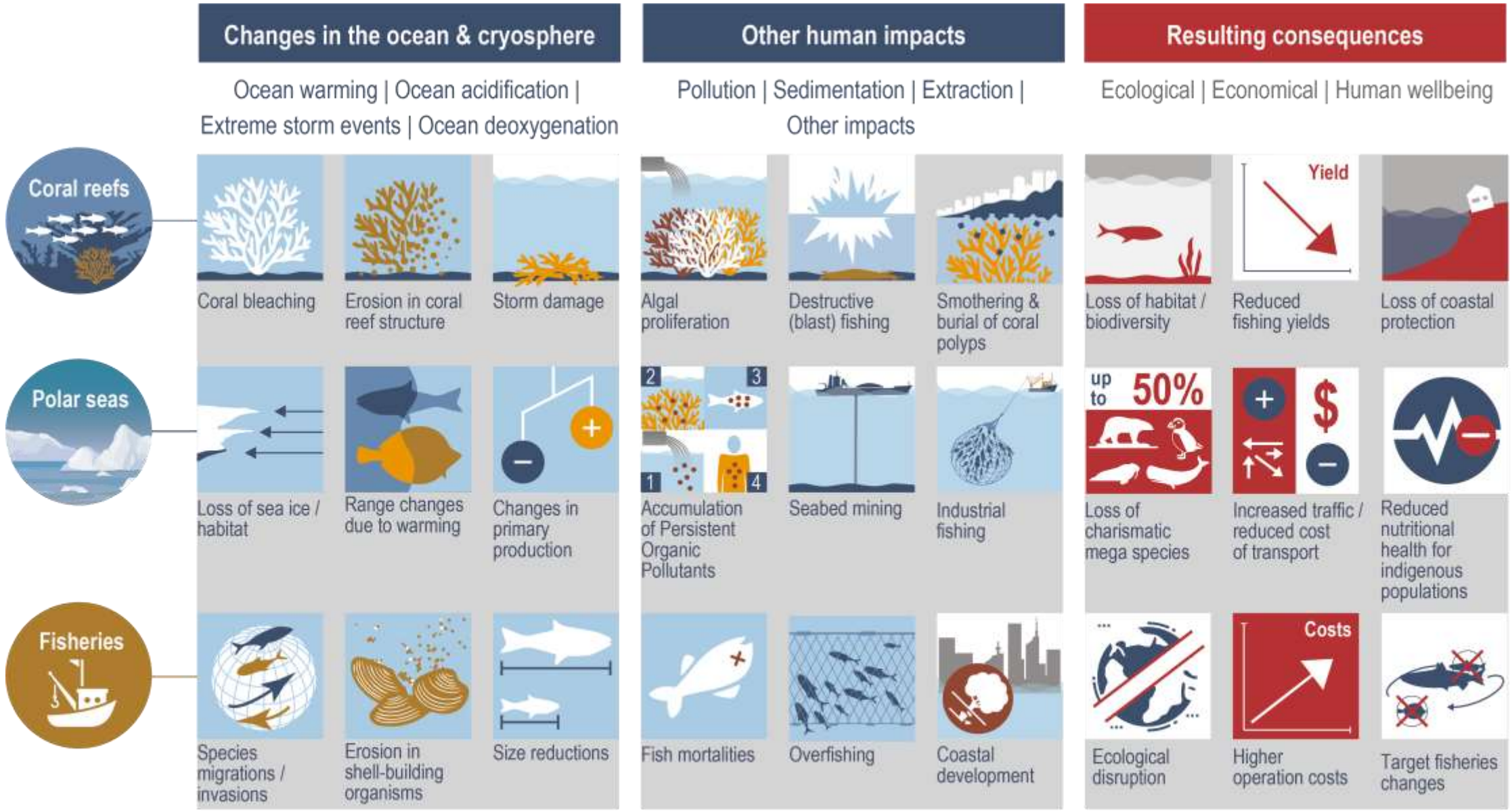
Risks from future changes in marine species distribution and production to 2100

- The **biomass of fish** and **catch potential decline** on average, with regional increases
- This has **positive and negative impacts** on **catches, economic benefits, livelihoods, and local culture**
- **Communities** (eg Arctic, Small Island Developing States) that depend highly on seafood may **face risks to nutritional health and food security**
- **Challenges to fisheries governance** are widespread under RCP8.5 with regional hotspots such as the Arctic and tropical Pacific Ocean


Changes in the ocean & cryosphere
Ocean warming | Ocean acidification |
Extreme storm events | Ocean deoxygenation
Coral reefs
Coral bleaching
Erosion in coral reef structure
Storm damage
Polar seas
Loss of sea ice / habitat
Range changes due to warming
Changes in primary production
Fisheries
Species migrations / invasions
Erosion in shell-building organisms
Size reductions


Changes in the ocean & cryosphere
Ocean warming | Ocean acidification |
Extreme storm events | Ocean deoxygenation
Other human impacts
Pollution | Sedimentation | Extraction |
Other impacts
Coral reefs
Coral bleaching
Erosion in coral reef structure
Storm damage
Algal proliferation
Destructive (blast) fishing
Smothering & burial of coral polyps
Polar seas
Loss of sea ice / habitat
Range changes due to warming
Changes in primary production
2
3
1
4
Accumulation of Persistent Organic Pollutants
Seabed mining
Industrial fishing
Fisheries
Species migrations / invasions
Erosion in shell-building organisms
Size reductions
Fish mortalities
Overfishing
Coastal development



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Strengthening response options

- **Reducing other pressures** such as pollution and habitat modification
- **Policy frameworks** for fisheries management, including strengthening responsiveness, and **networks of protected areas**
- **Strengthening precautionary approaches**, such as rebuilding overexploited or depleted fisheries, and responsiveness of existing fisheries management strategies
- Nature-based adaptation such as **ecosystem restoration**
- Connections with **local knowledge and indigenous knowledge**
- Such approaches bring **multiple benefits** for biodiversity, humans and, in some circumstances, climate mitigation

The more decisively and earlier we act, the more able we will be to address unavoidable changes, manage risks, improve our lives and achieve sustainability for ecosystems and people around the world – today and in the future.

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