THE SONEVA DIALOGUE

BACKGROUND BRIEF

Climate change: adapting to a 1.5-degree C world

Climate change is modifying the Earth's ecosystems and processes at an unprecedented speed and scale, with direct implications for fisheries and aquaculture production. Although the global seafood industry has a unique ability to adapt to such changes, it should also play an important role in supporting strong and effective global climate policies.

Overview

Climate change will influence ecosystems, business opportunities and food security, in the near and distant future. Although the exact implications are still unclear, existing scenarios underline the importance of implementing the existing global climate agreement and of improved governance of seafood production. Climate change further emphasizes the need for developing an ability to adapt and transform towards sustainability in the face of change.

How is climate change impacting marine ecosystems?

Man-made climate change is altering the oceanographic and atmospheric conditions that regulate marine systems[1]. Among others, climate change is resulting in a long-term rise of sea levels, melt of sea-ice and modification of water temperatures, which influence the movement and distribution of marine animals, towards either the poles or greater depths[2].

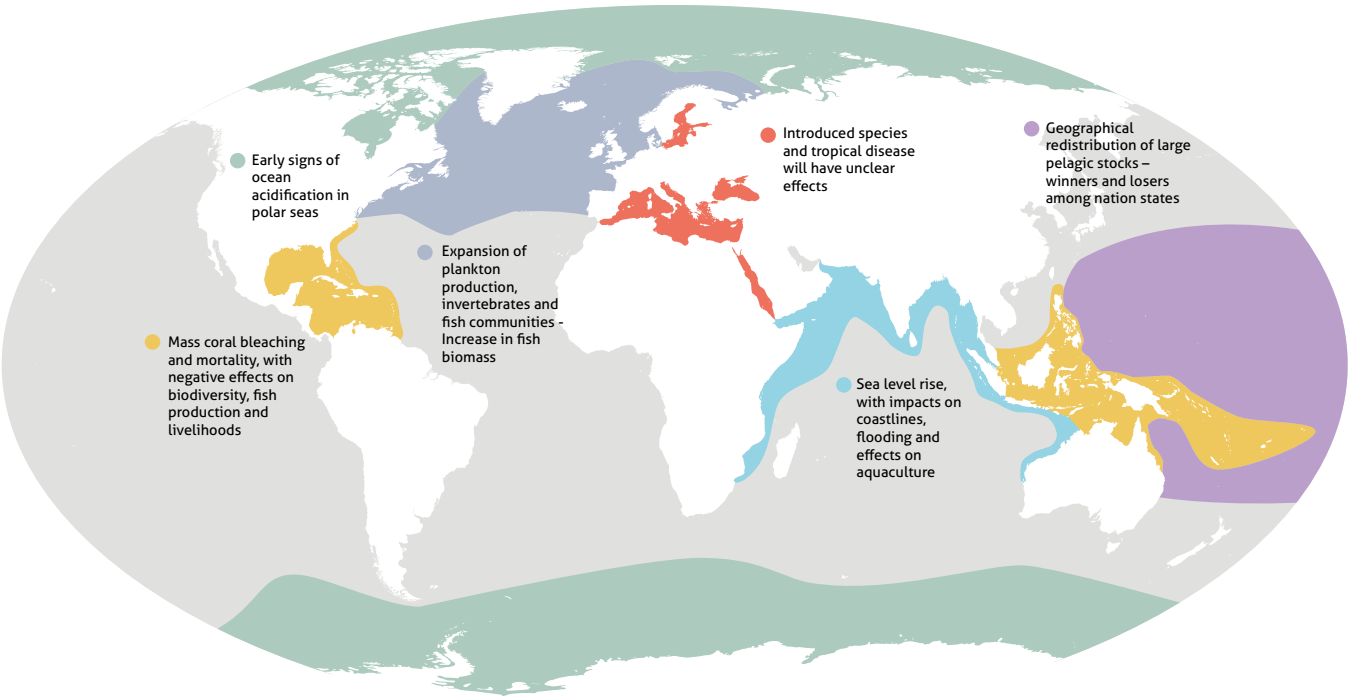

Figure 1: Regional changes in the physical system and associated risks for natural and human-managed systems. Major ocean regions are indicated as examples. Modified from Gattuso et al. 2015[6].

Climate change poses risks for food production

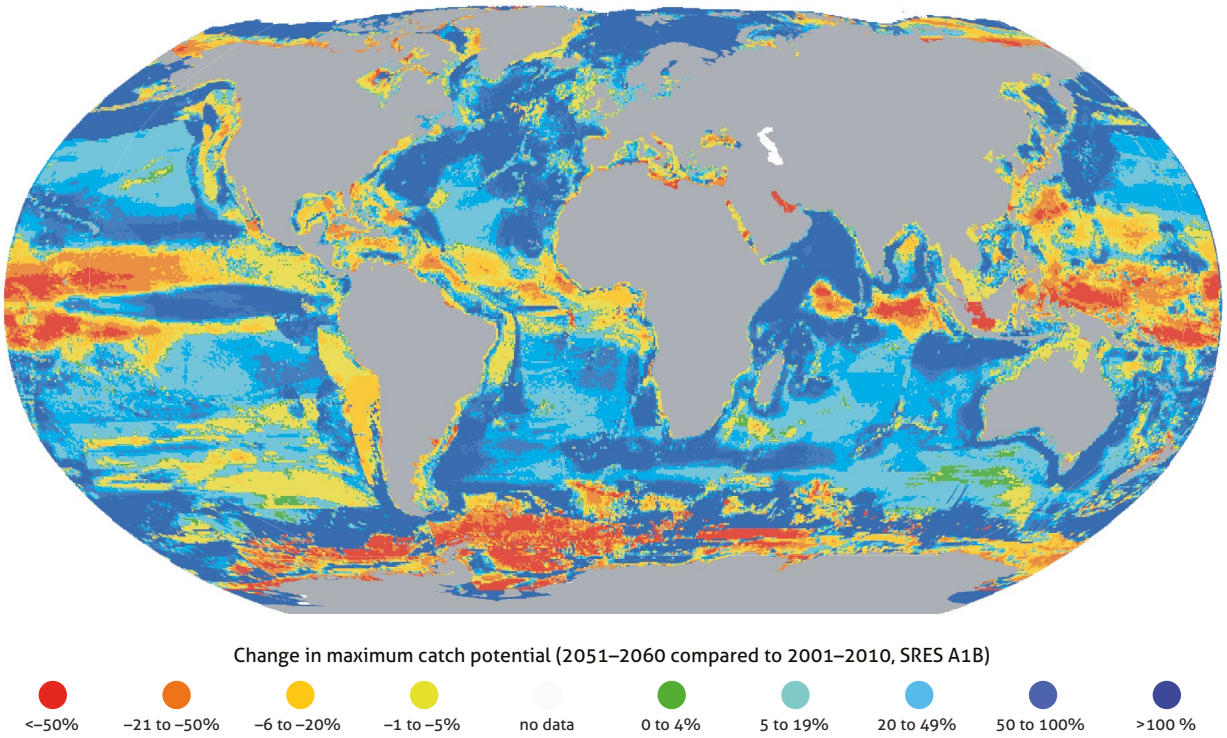

Figure 2: Changes in maximum catch potential under climate change scenarios [10].

Changes in ocean chemistry, such as a decrease in oxygen levels or an increase in ocean acidity, will further influence the amount of suitable habitats and have direct negative impacts on marine organisms[3]. Ocean acidification is already affecting marine seafood, in particular species that have calcareous structures directly exposed to the ocean, such as bivalves. The extent of the impacts of further reduction of ocean pH is unclear, but preliminary analysis and laboratory experiments suggest that ocean acidification represent a substantial threat to the way marine ecosystems operate.

Climate change is also expected to decrease overall productivity of the oceans[4], but with large regional variations. Polar regions, for instance, will display higher productivity due to increased primary production and longer growing seasons following the retreat of sea ice. Observations from the Barents Sea illustrate this point, where changing oceanic conditions, combined with management interventions, have resulted in a major increase in abundance of Barents Sea cod[5].

New insights on the risks of tipping points

An increased understanding of the dynamics of ecosystems and species migration patterns is leading to new insights about how species may adapt to relatively small changes in environmental conditions. However, once changes exceed critical tipping points, shifts in abundance and productivity may occur abruptly.

Two different mitigation scenarios illustrate this point. A business-as-usual scenario (+3.2 degrees in temperatures in 2100) contrasted to a low CO2 emissions scenario (+1.2 degrees) indicates a substantial increase in the risk of dramatic negative impacts, likely generating a number of tipping points in sea grass beds, mangrove forests and coral reefs[6] with significant social and ecological consequences for the communities and sectors that depend upon those (Figure 1).

Ocean warming, deoxygenation and acidification are likely to have most substantial effects in tropical regions, where large-scale coral bleaching may become an annual event for most reefs[7]. Due to lower productivity, catches in tropical regions are predicted to decrease substantially (Figure 2). Not only will these changes influence global fisheries, but they will also impact the availability of ecosystem services of vital importance to the wellbeing of coastal communities.

Sharing benefits and burdens, delivering on promises

Climate change will lead to a re-distribution of resources, often from a developing South to a developed North. Such change has substantial implications for poor developing countries, but also for the production portfolios and strategies of globally operating seafood companies. A new study estimates that climate change could lead to losses of revenues for the global fishing industry totaling $10 billion annually by 2050[8]. Similarly, ocean acidification is expected to impact shellfish production with considerable costs[9].

While projected long-term change in average conditions (temperature, sea ice extent, pH and oxygen levels) underlines the importance of strategic planning,

the predicted increase in frequency and intensity of extreme events (El Niño, hurricanes, floods) emphasizes the importance of building resilience to also cope with sudden shocks and disturbances.

Only a drastic reduction of anthropogenic CO2 emissions will enable the oceans to maintain their essential economic and nutritional contributions. Effective reduction of carbon dioxide in the atmosphere critically relies on the Paris Agreement. Transnational corporations directly dependent upon the dynamics of marine ecosystems, represent an important stakeholder, whose lobbying and engagement towards governments is critical to ensure that they deliver on their promises.

Clockwise from top left: Bleached corals on Indonesian reef (B Christensen/Azote); hurricane Hugo making landfall in South Carolina, USA in September 1989 (NOAA); ships traveling through ice in the Arctic (NOAA/CC BY 2.0); and Dry soil in Pampa, Bolivia (OIKOS/CC BY-NC-ND 2.0).

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