Warming, Overfishing, Plastic Pollution Destroying Ocean Life: Scientists

'If we don't do something quickly, the oceans in 50 years won't look like they do today,' scientist warns in an interview with SolveClimate News

By Lisa Song, SolveClimate News Jun 29, 2011

A coral reef off the coast of Florida/Credit: PMC 1stPix

The state of the oceans can best be likened to a case of multiple organ failure in urgent need of intervention, suggests the most comprehensive analysis yet of the world's marine ecosystems.

Global warming, overfishing and plastic pollution are wreaking havoc at an unprecedented rate on marine life, reported scientists at a recent meeting of the International Program on the State of the Ocean (IPSO).

The impacts of climate change — acidifying oceans, coral bleaching and habitat loss — are the biggest cause of decline in ocean health, and the hardest to solve, some researchers told SolveClimate News in interviews.

Global warming will "swamp everything," said Tony Pitcher, a professor of fisheries from the University of British Columbia who attended the meeting. 'The effects are all around ... If we don't do something quickly, the oceans in 50 years won't look like they do today."

The workshop brought together 27 scientists from six countries and represents the first time in at least a decade when experts from separate fields — geochemists, geophysicists, pollution experts, fishery biologists and climate change scientists — gathered to share their assessment of the oceans.

"These people don't usually talk to each other very much so getting them together ... was quite a special occasion," said Pitcher.

But the scene was far from celebratory. "In each kind of science, the experts were reporting that somewhere in the world the worst-case scenario was already present," he told SolveClimate News.

The Next Great Extinction

Climate scientists continue to report that atmospheric levels of CO2 are rising at an accelerated rate, spelling trouble for the oceans. Seas absorb the heat-trapping gas, which makes them more acidic.

Acidity of the world's oceans has increased 30 percent since the Industrial Revolution, said Bärbel Hönisch, a professor of earth science at Columbia University who did not attend the workshop. Ocean acidification stresses corals, shellfish and other organisms with effects that ripple through the marine food chain.

Adding to that ocean stress is overfishing, the IPSO assessment said. The large and long-lived species in fisheries worldwide — and in the South China Seas in particular — are "virtually fished out," Pitcher explained.

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When added together, conditions may be ripe for the next great extinction similar to the five mass extinctions that have occurred throughout Earth history. "That was the comparison that was made," said Pitcher. "Certainly the rate of change in the chemistry of the oceans is greater than in some of the ancient extinctions."

Hönisch was more cautious. We won't wipe out ocean life, she predicted, but toxic algal blooms will thrive in the absence of large fish and other organisms threatened by extinction.

"The question for me has always been, do we care about the fish that are commercially interesting?" Hönisch asked. "Do we care about what we have today?"

The Climate Change Threat

Climate change is the oceans' greatest threat, said Daniel Pauly, a fisheries professor from the University of British Columbia who also attended the seminar.

As oceans heat up, there is less mixing of warm water near the sea surface and colder water near the bottom, he told SolveClimate News. That decreases the amount of available oxygen in the water column; less oxygen means less life overall.

Oxygen depletion, acidification and warmer temperatures are "a deadly mixture," Pauly said, and is almost certain to exacerbate other risks.

Coral reefs are particularly vulnerable, said Alex Rogers, lead author of the IPSO report and professor of conservation biology at the University of Oxford.

Extreme Weather and Coral Bleaching

The underwater reef formations, often called the rainforests of the sea, are built by tiny animals called coral polyps that create limestone formations by constantly taking calcium carbonate out of the sea.

Coral reefs are the most diverse ecosystems in the ocean housing millions of species, Rogers told SolveClimate News. They provide ecosystem services such as food, coastal protection, tourism and recreation that are worth up to $375 billion dollars per year, he said.

Corals live off the microscopic algae that dwell inside their tissues. Elevated water temperatures can cause coral bleaching, a whitening of corals that occurs when they expel algae. Corals eventually die, erode and collapse from continuous bleaching.

Charles Sheppard, a professor in the School of Life Sciences at the University of Warwick and a workshop participant, said that an increase of 1 degree Celsius over about 10 weeks is enough to trigger bleaching.

"It's the extremes that do the killing," he explained. Average temperatures in the oceans have increased about half a degree Celsius since the 1970s, he said, but it's the weeks of extreme heat that kill off corals for good.

Corals must also live with increasing acidity.

As oceans become more acidic, corals have to spend more energy to deposit the limestone. "It's just a harder environment for them to live in," said Sheppard. "If you add that to temperature rise — which also adds stress — the two together is bad news."

Dying coral reefs don't just destroy ecosystems: Reefs protect coastlines by reducing storm surge and erosion.

Many of the atolls in Polynesia and Micronesia are made of corals, said Sheppard. In healthy corals, the growth of new limestone outpaces natural erosion of the coral. When the reefs die off, the islands will erode away.

"Corals are among the most threatened organisms on the planet," said Pitcher. Between the bleaching, overfishing, the dynamiting of coral reefs to kill fish and mining of coral for construction material, "corals will probably disappear from the planet in 40 years," he said. "It's kind of scary when you think that 200 million people depend on coral reefs for their livelihoods."

Poor countries that rely on fish as their main protein source — and which are expected to be hardest hit by climate change — are most at risk, said Rogers.

Developing nations in the tropics also face overfished seas, while surviving fish in these regions are moving to cooler waters as the climate warms.

Overfishing Easier to Solve

Climate Science Links

U.S. Government

- NASA: Eyes on the Earth
- National Climatic Data Center
- National Snow and Ice Data Center
- National Science Foundation
- NOAA Climate Service
- NOAA Paleoclimatology
- EPA's Climate Change Page
- Global Change Research Program
- Goddard Institute for Space Studies
- Navy Task Force on Climate Change
- USDA Climate Change Research Ctr
- US Forest Service Publications
- DOE: Office of Climate Change Policy

International

- Intergov'tal Panel on Climate Change
- UN Framework Convention (UNFCCC)
- UN Environment Programme (UNEP)
- Met Office: Hadley Centre (UK)
- UK Gov't Climate Change Page

Academic, Non-Governmental

- AAAS Climate Change Resources
- American Geophysical Union
- American Meteorological Society
- Oxford University
- Columbia University Earth Institute
- Scripps Institution of Oceanography

Compared to climate change, overfishing is relatively easy to solve, said Pitcher. Canada and the U.S. are among the better countries in terms of fisheries management. Both nations use quotas to limit their catch, but their management methods need to be improved, he said.

"Fisheries are about managing people rather than fish," said Pitcher. The UN has a voluntary code of conduct for responsible fisheries that takes into account aspects of sustainability. Fishers who use bottom trawlers, for instance, would score lower than those who use regular nets.

In addition, said Pitcher, most governments only survey the populations of fish that humans eat. "But fish live in a natural ecosystem," he said. "They eat things. and things eat them," adding that it's important to also monitor the health of non-marketable fish.

Pauly supports the expansion of marine reserves where fishing is banned. Only about 1 percent of the seas are protected, he said, versus 10 percent of continents in the form of national parks and other reserves.

"We accept that there must be [protected] parks on land. We don't conceive the need for that in the water. When [scientists] say we need 10 percent of the oceans protected, you get a howl from the fishing industry."

Most fish stocks live in "exclusive economic zones," said Pauly — designated areas for signatory countries of the United Nations Convention on the Law of the Sea that allow fishing and mining within 200 miles of their coastlines. These coastal areas make up 40 percent of the oceans.

Countries are reluctant to create marine reserves, largely because "we cannot wrap our minds around the oceans being fragile and inaccessible to us," he said. "The fishing industry isn't perceived as something that can change the structure of life in the ocean ... Most people picture fishermen going out in small boats to brave the elements."

In reality, giant commercial trawlers are responsible for 40 to 60 percent of the world's catch. The scale and might of these trawlers compared to the fish is "like hunting rabbits with tanks," said Pauly.

"Fisheries' problems are relatively cheap to fix," said Pauly. But if we keep stalling, he warned: "It's going to be a problem that's not fixable."

Managing Plastic Pollution

Another relatively manageable problem is chemical pollution from plastics, said Pitcher, which aggravates the effects of other toxic pollutants.

Over time, pieces of plastic get ground down to microscopic particles and ingested by filter-feeding organisms such as clams, krill and some fish and sharks. Pitcher said this in itself isn't catastrophic, but endocrine disruptors like flame retardants stick to plastic and get eaten by the organisms. With time, those toxins make their way up the food chain.

We have a fair track record of restricting certain marine pollutants, said Pitcher.

One success story over the past 20 years is the reduction of anti-fouling paint layered on the bottom of ships to prevent barnacle growth. Once scientists realized the paint was releasing large amounts of lead into the water, many countries passed legislation to limit its use.

Even if marine plastic pollution is drastically reduced, it's impossible to reverse the ocean's deteriorating waters without curbing overfishing and the emissions that cause climate change, Sheppard said. "It's the combination which does so much harm."

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