

# Report: Oceans' deteriorating health nearing 'irreversible'

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A sobering new report warns that oceans face a "fundamental and irreversible ecological transformation" not seen in millions of years as greenhouse gases and climate change already have affected temperature, acidity, sea and oxygen levels, the food chain and possibly major currents that could alter global weather.

The report, in Science magazine, doesn't break a lot of new ground, but it brings together dozens of studies that collectively paint a dismal picture of deteriorating ocean health.

"This is further evidence we are well on our way to the next great [extinction event](#)," said Ove Hoegh-Guldberg, the director of the Global Change Institute at the University of Queensland in Australia and a co-author of the report.

John Bruno, an associate professor of marine sciences at the University of North Carolina at Chapel Hill and the report's other co-author, isn't quite as alarmist, but he's equally concerned.

"We are becoming increasingly certain that the world's [marine ecosystems](#) are reaching tipping points," Bruno said, adding, "We really have no power or model to foresee" the impact.

The oceans, which cover 71 percent of the Earth's surface, have played a dominant role in regulating the planet's climate. However, even as the understanding of what's happening to terrestrial ecosystems as a result of

climate change has grown, studies of marine ecosystems have lagged, the report says. The oceans are acting as a heat sink for rising temperatures and have absorbed about one-third of the carbon dioxide produced by human activities.

Among other things, the report notes:

- The average temperature of the upper level of the oceans has increased more than 1 degree Fahrenheit over the past 100 years, and global ocean surface temperatures in January were the second warmest ever recorded for that month.
- Though the increase in acidity is slight, it represents a "major departure" from the geochemical conditions that have existed in the oceans for hundreds of thousands if not millions of years.
- Nutrient-poor "ocean deserts" in the Pacific and Atlantic oceans grew by 15 percent, or roughly 2.5 million square miles, from 1998 to 2006.
- Oxygen concentrations have been dropping off the Northwest U.S. coast and the coast of southern Africa, where dead zones are appearing regularly. There is paleontological evidence that declining oxygen levels in the oceans played a major role in at least four or five mass extinctions.
- Since the early 1980s, the production of phytoplankton, a crucial creature at the lower end of the food chain, has declined 6 percent, with 70 percent of the decline found in the northern parts of the oceans. Scientists also have found that phytoplankton are becoming smaller.

Volcanic activity and large meteorite strikes in the past have "resulted in hostile conditions that have increased extinction rates and driven ecosystem collapse," the report says. "There is now overwhelming evidence human activities are driving rapid changes on a scale similar to

these past events.

"Many of these changes are already occurring within the world's oceans with serious consequences likely over the coming years."

One of the consequences could be a disruption of major ocean currents, particularly those flowing north and south, circulating warm water from the equator to polar regions and cold water from the poles back to the equator. Higher temperatures in polar regions and a decrease in the salinity of surface water due to melting ice sheets could interrupt such circulation, the report says.

The change in currents could further affect such climate phenomena as the El Nino-Southern Oscillation, the Pacific Decadal Oscillation and the North Atlantic Oscillation. Scientists just now are starting to understand how these phenomena affect global [weather](#) patterns.

"Although our comprehension of how this variability will change over the coming decades remains uncertain, the steady increase in heat content in the ocean and atmosphere are likely to have profound influences on the strength, direction and behavior of the world's major current systems," the report says.

Kelp forests such as those off the Northwest U.S. coast, along with corals, sea grasses, mangroves and salt marsh grasses, are threatened by the changes the oceans are undergoing, the report says. All of them provide habitat for thousands of species.

The polar bear isn't the only polar mammal that faces an escalating risk of extinction, the report says; penguin and seal populations also are declining.

"It's a lot worse than the public thinks," said Nate Mantua, an associate

research professor at the University of Washington's Climate Impacts Group.

Mantua, who's read the report, said it was clear what was causing the oceans' problems: greenhouse gases. "It is not a mystery," he said.

There's growing concern about low-oxygen or no-oxygen zones appearing more and more regularly off the Northwest coast, Mantua said. Scientists are studying the California Current along the West Coast to determine whether it could be affected, he added.

Richard Feely, a senior scientist with the National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory in Seattle, said the report in Science seemed so direct because one of the authors was Australian.

"Australians come at you full-bore and lay it on the line," Feely said.

Even so, he said, the condition of the oceans is indeed deteriorating.

"The combination of these impacts are tending to show they are additive," he said. "They combine to make things worse."

Asked what the oceans will be like in 50 years if trends aren't reversed, Bruno, the UNC professor, said that all the problems would have accelerated and there would be new ones. For instance, he said tens of thousands of species found only in the Pacific might migrate across the top of North America as the sea ice melts and enter the Atlantic, where they've never been.

Bruno said a 50-year time frame to consider changes in the [ocean](#) was way too short, however.

"I am a lot more worried about 200 to 300 years out," he said.

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