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Oceans failing acid test

Rising CO2 levels alarm scientists

By LES BLUMENTHAL
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WASHINGTON – Seven hundred miles west of Seattle at Ocean Station Papa, a first-of-its-kind buoy is monitoring a looming environmental catastrophe in the Pacific.

Forget about sea levels rising as glaciers and polar ice melt and increasing water temperatures affect global weather patterns. As the oceans absorb more carbon dioxide and other greenhouse gases, they are gradually becoming more acidic.

Some scientists fear the change may be irreversible.

At risk are sea creatures up and down the food chain, from the tiniest phytoplankton and zooplankton to whales, from squids to salmon to crabs, coral, oysters and clams.

"Everything points to dramatic effects," said Richard Feely, an oceanographer with the National Oceanic and Atmospheric Administration in Seattle. "There are suggestions the entire ecosystem could change over time."

The oceans are already 30 percent more acidic than they were at the beginning of the Industrial Revolution, as they currently absorb 22 tons of carbon dioxide a day. By the end of the century, they could be 150 percent more acidic.

Originally, scientists thought the oceans could be one of the solutions to the buildup of greenhouse gases, as they absorb about one-third of the carbon dioxide emitted worldwide.

But scientists now know that the fundamental chemistry of the oceans has changed, and the possible impacts seem to grow more nightmarish as research accelerates.

"It seems like it is a one-way street, and that is alarming," said Steven Emerson, a professor of oceanography at the University of Washington. "The pH of the oceans could be lowered permanently."

Emerson was the lead scientist on the team that built the buoy at Ocean Station Papa, where weather measurements have been taken since the 1940s. The 10-foot-diameter buoy is equipped with an array of sensors that, among other things, measure the amount of carbon dioxide being absorbed by the North Pacific and the pH, or acid levels, of the ocean. Anchored in water 5,000 feet deep, the buoy relays its information to onshore scientists via satellite.

Of all the oceans in the world, the North Pacific could be most vulnerable to acidification.

As the oceans' deepest waters circulate around the globe, they eventually arrive in the North Pacific, where they rise near the surface before again plunging deep to continue their global journey. The water when it arrives in the North Pacific is already acidic from the carbon produced by decaying organic material during its 1,000-year journey from the North Atlantic, through the Indian Ocean and across the Pacific, said Feely.

As it surfaces, or upwells, in the North Pacific, the water absorbs more carbon dioxide from the air. Cold water absorbs more carbon dioxide than warm water.

"The older water is in the Pacific, the newer water is in the Atlantic," Feely said. "There's 10 percent more carbon dioxide in the Pacific than in the Atlantic."

CONCERNS ABOUT FISHERIES

Corrosive water between 600 and 700 feet deep has already been detected off the continental shelf of Washington, Oregon and Alaska, Feely said.

"It's butting right up against the coast," he said. "The concern is when it gets to the continental shelf, what it will do to the fisheries."

The increasing acidity can eat away at the shells of crabs, oysters, clams and nearly microscopic organisms known as krill and pteropods.

It also inhibits calcification, the process in which these animals rebuild their shells. Without shells, most of the animals would likely die.

Krill and pteropods are a major food source for juvenile salmon, herrings, pollock, cod, mackerel and other fish.

"When you start messing with the lower end of the food chain, it can dramatically affect the higher end of the food chain," Feely said.

Squids are sensitive to higher acidity, which affects their blood circulation and respiration. Colonies of coral, including those in tropical waters and those found deep off the Northwest coast, could disappear.

Feely said that between 500 million and 1 billion people worldwide depend on fish for survival. Their lives would be directly impacted if fish populations declined sharply.

Eventually, the acidification will reach into inland waters, affecting oyster beds and clamming areas.

"The North Pacific is the most sensitive, and the impacts will be most significant there," said Jim Murray, a chemical oceanographer at the University of Washington. "It will likely affect Puget Sound. It needs monitoring."

CONGRESS, STATES CONSIDER ACTION

Earlier this month, the Senate Commerce Committee passed a bill co-sponsored by U.S. Sen. Maria Cantwell, D-Wash., that would create a comprehensive ocean acidification research and monitoring program.

A similar measure, co-sponsored by Washington state Democratic Reps. Brian Baird of Vancouver and Jay Inslee of Bainbridge Island, has been introduced in the House.

Cantwell said she expects her Oceans, Atmosphere, Fisheries and Coast Guard subcommittee of the Commerce Committee will hold hearings in the Northwest on ocean acidification early next year.

"It's a little-known fact, not widely understood, but it is clear our oceans are suffering," Cantwell said.

Meanwhile, a San Francisco environmental group, the Center for Biodiversity, has asked 10 states, including Washington, to declare their coastal waters "impaired" under the Clean Water Act because of rising levels of acidity. Such a move could clear the way for the states to regulate carbon dioxide emissions.

"Though we believe the science is there, the political will may not be there," said Miyoko Sakashita, a lawyer for the Center for Biodiversity. "At least this will raise awareness among policy makers."

In addition to Washington, the others states receiving petitions were Oregon, California, Alaska, Hawaii, Florida, New York, New Jersey, Maine and Delaware.

Washington state is reviewing the petition, but more data must be collected before it can make a determination, said Sandy Howard, a spokeswoman for the state Department of Ecology.

Howard also cautioned that states have jurisdiction over coastal waters only up to three miles offshore. Further out, the federal Environmental Protection Agency has jurisdiction.

Though cuts in carbon dioxide and other greenhouse gas emissions might slow or reverse global warming, scientists say it could take thousands of years or longer to reverse the increased acidity of the oceans.

"For all practical purposes, this is permanent," said Emerson, the UW oceanography professor. "That's not true of temperature. But with ocean acidification, the time scales are long."