



Friday, May 23, 2008 - Page updated at 01:42 AM

Permission to reprint or copy this article or photo, other than personal use, must be obtained from The Seattle Times. Call 206-464-3113 or e-mail [resale@seattletimes.com](mailto:resale@seattletimes.com) with your request.

## Acidified seawater showing up along coast ahead of schedule

By Sandi Doughton  
Seattle Times science reporter

Climate models predicted it wouldn't happen until the end of the century.



NOAA PMEL

Christopher Sabine, of NOAA's Pacific Marine Environmental Laboratory in Seattle, works with an instrument that collects seawater samples off the West Coast.

### Senate hearing on ocean acidification

Sen. Maria Cantwell, D-Wash., will hold a field hearing in Seattle on Tuesday on "Climate Change and Ocean Acidification: Impacts on Puget Sound." The hearing will be from 10 a.m. to noon in the Seattle Aquarium's Puget Sound Great Room. For more information, call Cantwell's office at 206-220-6400.

So a team led by Seattle researchers was stunned to discover that vast swaths of acidified seawater already are showing up along the Pacific Coast as greenhouse-gas emissions upset the oceans' chemical balance.

In surveys from Vancouver Island to the tip of Baja California, reported Thursday in the online journal Science Express, the scientists found the first evidence that large amounts of corrosive water are reaching the continental shelf — the shallow sea margin where most marine creatures live.

Off Northern California, the acidified water was only four miles from shore.

"What we found ... was truly astonishing," said oceanographer Richard Feely, of the National Oceanic and Atmospheric Administration's (NOAA) Pacific Marine Environmental Laboratory in Seattle. "This means ocean acidification may be seriously impacting marine life on the continental shelf right now."

All along the coast, the scientists found regions where the water was acidic enough to dissolve the shells and skeletons of clams, corals and many of the tiny creatures at the base of the marine food chain. Acidified water also can kill fish eggs and a wide range of marine larvae.

"Entire marine ecosystems are likely to be affected," said co-author Debby Ianson, an oceanographer at Fisheries and Oceans Canada.

Though it hasn't received as much attention as global warming, ocean acidification is a flip side of the same phenomenon. The increase in atmospheric carbon dioxide from power plants, factories and cars that is raising temperatures worldwide also is to blame for the increasing acidity of the world's oceans.

Normally, seawater is slightly alkaline. When carbon dioxide from the atmosphere dissolves into the water, it forms carbonic acid — the weak acid that helps give soda pop its tang. The process also robs the water of carbonate, a key ingredient in the formation of calcium carbonate shells.

Since the Industrial Revolution, when humans began pumping massive amounts of carbon dioxide into the atmosphere, Feely estimates the oceans have absorbed 525 billion tons of the man-made greenhouse gas — about one-third of the total released during that period.

By keeping some of the carbon dioxide out of the atmosphere, the oceans have blunted the temperature rise due to global warming. But they've suffered for that service, with a more than 30-percent increase in acidity.

The acidified water does not pose a direct threat to people. "We're not talking battery acid here," said co-author Burke Hales, an oceanographer at Oregon State University.

On the pH scale, which measures acidity, strongly alkaline materials such as oven cleaner measure about 13. Hydrochloric acid has a pH of 1. Seawater usually measures around 8.1. The most acidic water the scientists found off the Pacific Coast measured 7.6 on the pH scale. The numerical difference may seem slight, but it represents a threefold increase in acidity, Hales said.

Until now, researchers believed the most acidified water was confined to the deep oceans. Cold water, which holds more carbon dioxide, sinks. Deep waters also are naturally high in carbon dioxide, which is a byproduct of the decay of plankton.

Feely and his NOAA colleague Christopher Sabine previously have shown that zones of acidified water are growing and moving closer to the surface as the oceans absorb more man-made carbon dioxide.

During surveys on the Pacific Coast last year, a team including Feely and Sabine discovered the natural upwelling that occurs along the West Coast each spring and early summer is pulling the acidified water onto the continental shelf.

"I think this is a red flag for us, because it's right at our doorstep on the West Coast," said Victoria Fabry, a biological oceanographer at California State University, San Marcos, who was not involved with the study. "It's telling us that we really need more monitoring to figure out what's going on."

Climate scientist Ken Caldeira, of the Carnegie Institution at Stanford University, said the finding underscores the limitations of computer models.

"This is another example where what's happening in the natural world seems to be happening much faster than what our climate models predict," he said.

And there's worse to come, the scientists warn.

A network of currents shuffles ocean water around the globe. The acidified water upwelling along the coast today was last exposed to the atmosphere about 50 years ago, when carbon-dioxide levels were much lower than they are now. That means the water that will rise from the depths over the coming decades will have absorbed more carbon dioxide and will be even more acidic.

"We've got 50 years worth of water that's already left the station and is on its way to us," Hales said. "Each one of those years is going to be a little bit more corrosive than the one before."

*Sandi Doughton: 206-464-2491 or [sdoughton@seattletimes.com](mailto:sdoughton@seattletimes.com)*

Copyright © 2008 The Seattle Times Company