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Profiles

by Brad Warren

Ocean Acidification:

Richard Feely shows how it might kill the fishing business



Richard Feely is a patient man. For two decades, the soft-spoken chemical oceanographer has been telling people that carbon dioxide from tailpipes and smokestacks is mixing into the sea, acidifying the water, and possibly threatening life in the oceans.

For years, hardly anyone listened. "This was considered a geochemical problem," Feely explains. But Feely had good reasons to persist. The ocean's last big splurge on CO₂-fueled acidification was 55 million years ago. That catastrophe — caused by volcanic eruptions and possibly by disturbance of vast undersea gas deposits — triggered a mass extinction of marine organisms.

"It took the oceans over 100,000 years to recover," Feely told me when I visited his office at NOAA's Pacific Marine Environmental Lab (PMEL) in Seattle.

Feely and a small cadre of U.S. and international researchers labored to prove the danger. Eventually they demonstrated that the ocean is becoming chemically hostile to many of its inhabitants — especially in Alaska and the Pacific Northwest.

I first encountered troubling accounts of ocean acidification in science publications a few years ago. The findings began making real headlines in 2005, when Victoria Fabry, a biologist at California State University San Marcos, showed that seawater from the Gulf of Alaska was caustic enough to dissolve the shells of tiny creatures called pteropods — a major food source for salmon, cod, pollock, herring, and many other species. Soon after, Feely and Chris Sabine at PMEL amassed 77,000 measurements of CO₂ at sea, working with scientists around the world. Their work proved just how rapidly fossil fuel emissions are acidifying the ocean.

Every day, 22 million tons of CO₂ sink into the sea, reacting with seawater to produce carbonic acid. The oceans soak up enough CO₂ every five days to outweigh the entire year's catch of wild fish for the entire planet. Fossil fuel emissions make up 90 percent of this acidifying flux.

Below 100 meters, the ocean off Alaska is now so caustic — and so depleted of calcium carbonate by the resulting acid — that some shellfish and zooplankton species begin to "dissolve while they're alive," according to Feely. Off the Northwest coast, the same dismal conditions prevail below 200 meters. And throughout the ocean, this caustic "horizon" is now rising at a rate of one meter per year.

If CO₂ emissions continue their unregulated

increase, Feely and his colleagues predict these caustic conditions will fill the North Pacific all the way to the surface by 2050. The pace of acidification is accelerating with emissions. "By the end of this century, it will have increased 150 percent," Feely says.

For fishermen, acidification's hazards include one insidiously indirect effect: The acid depletes the rich soup of calcium carbonate in seawater. This undercuts the supply of a key nutrient at the foundation of the food web. Most calcifying organisms — corals, zooplankton, clams, urchins, even king crabs — rely on this calcium soup for raw material to build and repair themselves. As acidification steals their calcium supply, these organisms literally start dissolving. Many die outright. Survivors weaken. The swimming and scuttling shelled creatures lose their knack for hunting, evading predators, and reproducing. Add enough CO₂ to the water and squid start asphyxiating, followed by fish. Salmon farmers used to stun fish before slaughter with a burst of CO₂.

Sound like trouble to you? In December, Congress called for a National Research Council study on ocean acidification. Let's hope they don't dawdle.

In 25 years of covering the fish biz and grappling with its issues, I've never seen a threat like this one. The flux of CO₂ into the oceans has no silver lining. Unchecked, it will destroy most of the world's seafood supply.

Feely and colleagues are organizing a two-day workshop on acidification at the University of Washington on April 23 and 24. I've prepared a paper on how acidification affects commercially important fish and shellfish, and I will be giving a talk at the workshop. With help from Feely, retired NMFS biologist Gary Stauffer, and other colleagues, I am also launching a project to research and inform the seafood industry about this problem and possible solutions, including legislation already backed by several Fortune 500 companies.

Want more information? E-mail me at wordworks9@earthlink.net. Check the UW Climate Impacts Group Web site for details on the workshop: www.cses.washington.edu/cig. ■

Brad Warren is a former editor of this magazine. He writes a regular column concerning provocative people and important issues.



NOAA oceanographers Richard Feely and Chris Sabine with a ship-deployed buoy.

Brad Warren photo