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Acidic Oceans Affecting Food Fish

CO2 Pollution Threatens The "Biological Underpinnings of Civilization"

By Dan Shapley

Carbon dioxide emissions could shake "the biological underpinnings of civilization" as increasingly acidic water undermines the oceanic food web, according to fresh research from the Pacific Ocean off Alaska.

The research shows that increasingly acidic Pacific water will affect king crabs and a snail that is a favorite food of Pacific salmon. How disruptions in the ocean food web could ultimately harm these and other popular food species is still uncertain.

Oceans had until recently been viewed as a great savior of the climate, because they have absorbed about one third of the carbon humans have emitted, buffering what would otherwise have been a greater warming of the atmosphere. But scientists have in recent years begun studying the consequences of oceanic carbon storage -- a 25 percent increase in acidity since pre-industrial times.

The scientific endeavor is still young, with many unanswered questions. But results have shifted from showing that the ocean has grown more acidic to showing how that acidification is affecting ocean life, including species important for human food.

"We're starting to see now a real connection to fisheries," said Christopher Sabine, a National Oceanographic and Atmospheric Administration scientist involved in the North American Carbon Project's effort to understand the role of carbon in the oceans.

Victoria Fabry, a biological oceanographer at the University of California, has found that the shells of pteropods -- a set of 32 planktonic snails sometimes called sea butterflies -- dissolve in acidic water, and that the layer of water acidic enough to do so is slowly expanding from the depths toward the surface as the ocean absorbs more carbon. If carbon dioxide emissions continue unabated, surface water could be corrosive to shells by between 2050 and 2100, depending on different emissions scenarios.

Pteropods are widely consumed by a variety of ocean life, including several species of salmon. More than 60 percent of a salmon's diet can be pteropod, according to the research of Katherine Myers, the principle investigator for the University of Washington's High Seas Salmon Research Program. How acidification affects pteropods, and in turn salmon, will be the subject of future research.

"We know the chemistry of it very well, and with a great deal of certainty, but what the ecological impacts will be on fisheries, on overall productivity, regional productivity, we simply do not know," Fabry said. "This is a case where we do need additional research."

The importance of pteropods to a popular food fish like salmon gives the acidification research a sense of urgency: The effects of acidification could creep up the food chain.

"And we're at the top," said Thomas Lovejoy, the executive director of the H. John Heinz III Center for Science, Economics and the Environment. He made his remarks at a Wildlife Trust lunch, and in an interview with The Daily Green.

Lovejoy called the acidification of the oceans "the most profound environmental change I've encountered in my professional career," and said the consequences for ocean life are "shaking the biological underpinnings of civilization."

New research also shows that acidification is having effects on king crabs, though the lead scientist on that project, Jeff Short of the National Oceanographic and Atmospheric Administration, said he was withholding details until his research has been peer-reviewed and published.

The vanguard research has been conducted as scientists try to quickly come up to speed on the role of carbon in the oceans. Conferences in recent weeks have allowed scientists to share results and frame goals for future research.

A grade school science experiment can demonstrate how carbon dioxide makes water acidic. Blow into a glass of water with a straw, creating bubbles of breath -- largely made up of carbon dioxide - and the pH of the water will drop. Still, the wholesale acidification of the oceans, "really sort of snuck up on everyone in the scientific community," Lovejoy said.

The stakes are potentially huge. Tens of thousands of species -- representing the first critical link or two on the food chain -- use calcium carbonate to construct shells. Different species produce different forms of calcium carbonate, with pteropods and corals among those that produce a form that is highly susceptible to corrosive conditions.

"We're not at the panic stage, obviously, but it certainly is a concern, and there's a direct link to CO2 emissions, which is very important, because it's something that humans have control over, and we can change that if we want to," Myers said. "Whereas global warming has both natural and anthropogenic [human] causes, it looks like there's a fairly direct link between acidification and carbon emissions by humans."