



Fish Guts May Shed Light on Mystery of Upper Ocean's Chemistry

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By Alex Morales

Jan. 15 (Bloomberg) -- Fish guts may hold the answer to a mystery that's puzzled ocean chemists for decades: Why seawater becomes more alkaline the deeper you go.

Ocean waters become more alkaline, or less acidic, as carbonates produced by plankton dissolve. The chemical compounds typically don't break down until a depth of several kilometers where the pressure is enough, said Rod Wilson, lead author of a study today in the journal **Science**. The ocean's alkalinity increases by about 4 percent in the first kilometer, his team said.

"That left a mystery of what's causing this increasing alkalinity in the surface layers," Wilson, a fish biologist at the University of Exeter, southwest England, said in a telephone interview. His team found fish produce a more soluble form of carbonate in their gut that can dissolve in shallower waters.

United Nations scientists **warned in 2007** that man-made carbon-dioxide emissions threaten to acidify the oceans as they absorb increasing amounts of the gas. Wilson's findings suggest fish may have a role to play in offsetting some of this effect by adding a source of alkalinity in their excretions. Alkalis neutralize acids.

"Given that fish are probably involved in replenishing that alkalinity in the surface layers of the ocean, then fish carbonate might help the oceans absorb more CO₂," Wilson said. "It may be in the right direction but we don't know if it's quantitatively large enough to buffer the increased acidity brought on by higher CO₂ absorption from the atmosphere."

More Acidic Oceans

University of Chicago scientists said in November that oceans are acidifying 10 times faster than predicted, threatening to damage coral reefs and shellfish.

Increasing temperatures and higher CO₂ uptake by oceans may also raise the ability of fish to produce carbonates, according to today's study. The fish produce the carbonate by combining carbon dioxide in their own system with calcium ions they drink from the seawater, Wilson said.

"If you put fish in water that has higher CO₂ in it, it raises the CO₂ in their blood and that in turn we predict would cause them to produce more calcium carbonate," Wilson said. At the same time, higher temperatures heighten the metabolism, further increasing carbonate production, he said.

Up to 15 percent of carbonates found in the oceans may come from fish, the scientists said. That may be a "big surprise" to ocean chemists who were previously unaware that fish produced the material at all, Wilson said. While fish are expected to decline in numbers with global warming, carbonate production may still go up, he said.

"On an ecosystem scale, the ecologists tell us that if you increase the temperatures by 1 or 2 degrees Celsius, you might see a slight decline in fish biomass," Wilson said. "That's probably balanced by the increase in temperature and the fact that this increases the metabolism of the fish."

"Overall, we predict that, if anything, calcium carbonate might just go up a bit in a future scenario of increasing temperature and increasing CO₂," the researcher said.

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