OCEAN ALERT

CLIMATE CHANGE: Earth's saltwater cover may be near its limit as a home for marine life and a sink for CO_2

THE OCEANS are becoming a less efficient sink of anthropogenic CO_2, and existing levels of the dissolved gas in the Arctic Ocean are already harming organisms there, say two reports published last week.

Absolute levels of CO_2 absorbed by oceans are still increasing as human activity contributes to more release of the gas, but the rate of increase has declined, according to a study in *Nature* (**2009,** *462,* 346). The study analyzed extensive oceanographic measurements to figure out how well the oceans have acted as a CO_2 sink since the late-18th century, when industrialization began. In particular, even though oceans still absorb an increasing amount of anthropogenic CO_2, the rate by which these emissions are absorbed has dropped by almost 10% since 2000, explains Samar Khatiwala, an oceanographer at the Lamont-Doherty Earth Observatory of Columbia University and first author of the paper.

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Sea snails like the Arctic's **Limacina helicina** *are threatened by increasing levels of dissolved CO_2 and freshwater glacier melt.*

Khatiwala and his colleagues also report that as of 2008, a total of 150 billion tons of anthropogenic CO_2 had been absorbed by the world's oceans. "It's a tiny perturbation in the ocean's dissolved carbon content, but it's one that makes a big difference for atmospheric carbon," Khatiwala says. "If you took all the man-made carbon in the ocean and released it into the air, atmospheric levels of CO_2 would be 20% higher," he says.

In fact, without the oceans, the CO_2 concentration in Earth's atmosphere would already be at the 450-ppm level that models predict will lead to a 2 °C temperature increase and that climate scientists say we need to stay below to avert major climate change, Khatiwala says. "The oceans have bought us time," he adds.

But buying that time may already be coming at the expense of wildlife in the Arctic Ocean, according to a paper in *Science* (**2009,** *326,* 1098). Fiona A. McLaughlin, a Canadian government scientist at the Department of Fisheries & Oceans, in British Columbia, and her colleagues measured the concentrations of aragonite, a soluble form of calcium carbonate used by plankton and other invertebrates to build their shells. Researchers have predicted that ocean acidification due to dissolved CO_2 could damage the calcium carbonate-rich shells of some sea creatures.

The team's data reveal that levels of aragonite in the Arctic Ocean have dropped to undersaturation levels and are causing shells to dissolve. Increasing amounts of dissolved CO_2 was expected to reduce the concentration of aragonite in oceans, but McLaughlin says the problem is further exacerbated by an influx of water into the Arctic by melting sea ice. She notes that the risk posed to tiny shelled organisms has profound implications for the Arctic food web, because they form the base of that web.

"High-latitude oceans may already be at a tipping point for carbonate shell-builders," comments Justin Ries, a marine geochemist at the University of North Carolina, Chapel Hill.—SARAH EVERTS

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FOREIGN RELATIONS U.S., China pledge to cooperate on greenhouse gas mitigation

President Barack Obama and Chinese President Hu Jintao have pledged to work together to mitigate greenhouse gas emissions. The agreement falls short of fixed greenhouse gas reductions or providing a schedule, but the presidents stated their willingness to work together in preparation for next month's United Nations climate summit in Copenhagen.

In a joint statement in Beijing last week, they also announced a package of clean energy R&D initiatives and underscored the need to increase financial support for poor nations that are the most vulnerable to climate change.

According to the agreement, the nations together will provide at least $150 million over five years to fund a jointly operated clean energy research center to be based in each country. They will also conduct collaborative research to encourage clean-coal technologies, electric vehicles, renewable energy, shale-gas exploration, and new energy-efficiency technologies. And they will create a program to encourage cooperation between U.S. and Chinese companies.

Despite the joint statement's lack of specifics, Frances Beinecke, president of the Natural Resources Defense Council and an advocate for strong climate-change cuts, noted in a blog, "The fact that President Obama and President Hu Jintao met together to talk about climate change—a problem neither nation officially acknowledged just a few years ago—represents a huge leap down the path toward confronting this crisis."—JEFF JOHNSON