Climate change may be stoking stronger winds, altered oceans

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The specter of an ocean floor littered with dead shellfish, rock fish, sea stars and other marine life off the Oregon coast spurred Mark Snyder, a climate change expert, to investigate whether California's coast faced a similar calamity.

It could, the University of California Santa Cruz earth scientist said, citing climate change, which some scientists believe is responsible for stronger and more persistent winds along the coast. There's no debate that windier conditions drive more upwelling of nutrient-rich deep ocean waters.

At normal levels, this upwelling sustains the abundance of marine life, but too much of these rich waters leads to a boom-and-bust cycle that ultimately creates ocean "dead zones" with little or no oxygen. Marine life that can't swim or scuttle away from these lethal zones suffocate.

To assess future wind and upwelling scenarios along the California coast, Snyder and his colleagues at UC Santa Cruz ran climate simulations for two time periods. One spanned from 1968 to 2000, verifying the accuracy of the modeling. The second simulated the region's estimated climate from 2038 to 2070, using the Intergovernmental Panel on Climate Change "high-growth" emissions projections. Snyder said he chose the high emissions scenario because today's are exceeding earlier IPCC estimates.

The results showed increases in wind speeds of as much as 2 meters per

second, a 40 percent increase from current wind speeds, which now average 5 meters per second, Snyder said.

The change in wind speeds is already happening, Snyder said. California winds have been growing in strength in the past 30 years.

Snyder said he knows his hypothesis needs more research, so he'll know whether to continue pursuing it or to discard it. The latter is unlikely, he said, given the new cycle of dead zones on the Oregon and Washington coasts that started in 2002.

"It was just chance they found the dead zones in Oregon," Snyder said, describing how fishers reported to marine scientists an alarming number of dead or dying crabs they were pulling up in traps.

"It's quite possible these areas could be off the California coast," he said.

After the Oregon fishers reported their sickly catches, and divers described seeing bottom-dwelling fish in high waters or schools of fishes massing near an invisible wall - behind which was low-oxygen water - scientists from Oregon State University, along with state and federal marine experts, began investigating.

That year, and in years since, researchers have sent down a robot equipped with a video camera to record the carnage. They've also deployed a fleet of robotic "gliders" to maintain constant vigil on oxygen levels and other conditions along the Oregon coast, as well as a sophisticated monitoring buoy.

The worst year recorded was 2006, with the dead zone near the coast spreading from southern Oregon into Washington, where dead fish and crabs washed up on beaches along the Olympic Peninsula. Less severe dead zones returned in 2007.

"We've seen areas that are carpeted with dead marine life," said Oregon State marine ecologist Francis Chan. One video image stuck in his mind: A large dead sea star that must have been decades old, rotting in the water. Marine life such as that, which adhere to rocks most of their lives, can't scurry away from suffocating waters, he said. "It was pretty striking."

In normal years, winds blowing from north to south drive upwelling in the spring and summer months off the Pacific Coast. These strengthened winds drive surface waters offshore, making room for deeper, nutrient-rich waters to surface, where sunlight triggers a heavy growth of phytoplankton, the bottom rung of the marine food chain.

But when the winds don't slacken and upwelling persists, excess phytoplankton blooms. When the uneaten plankton dies and sinks to the ocean floor, bacteria consuming it deplete the oxygen in the water.

Like so many other climate change projections, the scientists know they can't definitely point to greenhouse gases as the sole culprit behind windier conditions along the coast. But no other explanation fits, given the historical patterns of winds and upwelling, according to a primer from Oregon State on hypoxia, the technical term for oxygen depletion in waters.

A phenomenon called El Nino, which cycles in and out, doesn't explain it, or what's known as decadal oscillations, Chan said. "They're not at play here," Chan said. "So something else is likely at play."

Other scientists aren't convinced that wind-driven upwelling is occurring off the California coast. It is known that oxygen levels have been declining in deeper waters since 1984, when researchers started monitoring it in California coastal waters.

"That's something we're seeing along the California coast," said Frank Schwing, an oceanographer with the Southwest Fisheries Science Center in Pacific Grove.

Although large bodies of oxygen-poor water far offshore are normal, the rapid expansion of these waters is not. And scientists link it, in part, to climate change, Schwing said.

These offshore low-oxygen waters in California differ from dead zones in Oregon. The latter are close to shore, where they've never been seen before, and they're killing sea life. Such die-offs haven't been seen in California.

"If you drive up Highway 101, you're not going to look far off to see dead zones," said Chan, with Oregon State. "They're less than a mile from the surf zone." But the expansion of these large volumes of hypoxic water far off the California coast does increase the odds they could reach the coastline, Schwing said. It also narrows the band of oxygen-rich surface waters far offshore that can sustain life.

"The implication is it's easier to create these hypoxic events," Schwing said.

For Chan, the phenomenon drives home the sensitivity and dynamism of the ocean, which responds swiftly to atmospheric changes.

"We shouldn't be seeing these big changes, not in something as simple as oxygen levels on our coast," he said. "And we're seeing these big flips."

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