

Dead zones off Oregon and Washington likely tied to global warming, study says

Low-oxygen areas that show scant signs of sea life have expanded. 'We seem to have crossed a tipping point,' a scientist says.

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NEWPORT, ORE. -- — Peering into the murky depths, Jane Lubchenco searched for sea life, but all she saw were signs of death.

Video images scanned from the seafloor revealed a boneyard of crab skeletons, dead fish and other marine life smothered under a white mat of bacteria. At times, the camera's unblinking eye revealed nothing at all -- a barren undersea desert in waters renowned for their bounty of Dungeness crabs and fat rockfish.

"We couldn't believe our eyes," Lubchenco said, recalling her initial impression of the carnage brought about by oxygen-starved waters. "It was so overwhelming and depressing. It appeared that everything that couldn't swim or scuttle away had died."

Upon further study, Lubchenco and other marine ecologists at Oregon State University concluded that that the undersea plague appears to be a symptom of global warming. In a study released today in the journal *Science*, the researchers note how these low-oxygen waters have expanded north into Washington and crept south as far as the California state line. And, they appear to be as regular as the tides, a lethal cycle that has repeated itself every summer and fall since 2002.

"We seem to have crossed a tipping point," Lubchenco said. "Low-oxygen zones off the Northwest coast appear to be the new normal."

Although scientists continue to amass data and tease out the details, all signs in the search for a cause point to stronger winds associated with a warming planet.

If this theory holds up, it means that global warming and the build-up of heat-trapping gases are bringing about oceanic changes beyond those previously documented: a rise in sea level, more acidic ocean water and the bleaching of coral reefs.

Low-oxygen dead zones, which have doubled in number every decade and exist around the world, have a variety of causes.

A massive dead zone off Louisiana is created each spring by a slurry of nutrient-rich farm runoff and sewage that flows out the Mississippi River, causing algae to bloom riotously, die and drift to the bottom to decompose. Bacteria then take over. In the process of breaking down the plant matter, they suck the oxygen out of the seawater, making it unable to support most forms of sea life.

Off Oregon, the dead zone appears to form because of changes in atmospheric conditions that create the oceanic river of nutrient-rich waters known as the California Current.

The California Current along the West Coast and the similar Humboldt Current off Peru and Benguela Current off South Africa are rarities. These powerful currents account for only about 1% of the world's oceans but produce 20% of the world's fisheries.

Their productivity comes from wind-driven upwelling of nutrient-rich waters from the deep. When those waters reach the surface and hit sunlight, tiny ocean plants known as phytoplankton bloom, creating food for small fish and shellfish that in turn feed larger marine animals up the food chain.

What's happening off Oregon, scientists believe, is that as land heats up, winds grow stronger and more persistent. Because the winds don't go slack as they used to do, the upwelling is prolonged, producing a surplus of phytoplankton that isn't consumed and ultimately dies, drifts down to the seafloor and rots.

"It fits a pattern that we're seeing in the Benguela Current," said Andrew Bakun, a professor at the University of Miami's Pew Institute for Ocean Science who wasn't part of the Oregon study. "It's reasonable to think these hypoxic and anoxic zones will increase as more greenhouse gases build up in the atmosphere."

The Benguela Current has seen sporadic dead zones. There, rotting clumps of algae have also released clouds of hydrogen sulfide gas that smell like rotten eggs and poison sea life. Residents along the coast of South Africa and Namibia have

witnessed waves of rock lobsters crawl onto shore to escape the noxious gases.

Bakun considers the Benguela, the world's most powerful current, to be a harbinger of changes in other currents. His theory is that warm, rising air over the land makes upwelling more frequent and more intense. The phenomenon, he said, is complicated by decades of heavy fishing that has reduced schools of sardines to a tiny fraction of their former abundance.

Not enough fish remain to consume phytoplankton before it dies and settles on the bottom, creating an anoxic dead zone.

Crab fishermen were the first to take note of Oregon's dead zone. Al Pazar recalls his alarm in 2002 when he pulled up his traps and found something seriously amiss.

"It was a good amount of crabs," Pazar said. "But they were dead, or dying or very, very weak. Those that we managed to keep alive didn't survive for long."

The fishermen called Oregon State, which dispatched a boat of researchers to investigate.

"It was a big mystery," Lubchenco said. "We didn't know what was killing them."

Fishermen found other oddities. As they pulled up their crab traps, they found baby octopuses, about the size of silver dollars, inching their way up the lines toward the buoys floating on the surface.

"I'd tell my crewmen, be careful with these cute little things," said Dennis Krulich, a longtime fisherman in Newport. "Peel them off the rope, and we'll put them back."

Only later did he realize that these babies were coming up from oxygen-depleted waters that hover near the seafloor, climbing to save their lives. "In 30 years of crabbing, I'd never seen anything like it before, Krulich said. "It's spooky, this dead-zone thing."

The size of the zone has fluctuated over the years. In 2006, it was the largest ever measured, covering an expanse slightly larger than Rhode Island.

Last year, it was smaller but detected over a longer stretch of coastline.

To make sure the phenomenon was actually new, Oregon State marine ecologist Francis Chan reconstructed data from water sampling at 3,100 stations dating to 1950.

He found that low-oxygen areas have long existed in deeper waters, but there was virtually no evidence until recently of hypoxic waters in prime fishing waters, which extend down to 165 feet.

"It's pretty clear this is unprecedented," Chan said. "It's never been detected since we began to measure oxygen levels."

So far, the seasonal dead zones, which begin as early as June and wrap up in September, have not hurt the crab fishery, which mostly operates in the winter. Many crabs and fish manage to flee the low-oxygen area. And fishermen have learned to set their traps in the wasteland of the previous year's dead zones, to catch crabs that return to feed on the detritus of all the suffocated animals.

Scientists say seafood caught in low-oxygen zones is not harmful to eat.

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