

Energy and Environment

Air pollution doesn't just make breathing harder for humans. In the Pacific, fish are choking, too.

By **Darryl Fears** May 16, 2016

In the Pacific Ocean, billions of tiny creatures are literally eating our air pollution.

The pollution starts out as an enormous cloud generated by industries in east Asia near Japan, China, the Koreas and Russia. For decades it has formed and floated into the coastal Pacific, where currents carry it thousands of miles away in a pattern that flows around Hawaii into the warm water tropics. That's where phytoplankton go to town on the excess iron and nitrogen in the pollution.

Normally, dining tropical phytoplankton — the foundation of a food web on which all life there depends — are good because the activity actually creates oxygen near the water's surface, as a new study released Monday explains. But as they gorge themselves on excess nutrients, they create organic matter that sinks into the deeper ocean and is feasted on by microscopic bacteria. That's bad because the latter sucks away oxygen in warm ocean water that has less to start with.

"Many living organisms depend on oxygen that is dissolved in seawater," said Taka Ito, an associate professor at the Georgia Institute of Technology and the lead author of the study published in *Nature Geoscience*. "So if it gets low enough, it can cause problems, and it might change habitats for marine organisms."

That's one way of saying it's likely killing them by the thousands, worsening the problem of overfishing by lowering the potential catch of seafood on which much of the world depends, particularly on the coasts.

Researchers have known for a long time that excess dust is falling on ocean coasts and that air pollution is making that problem much worse. But the study's co-author, Athanasios Nenes, another Georgia Tech professor, said it is the first to show that strong currents carry it to the deep.

"People never thought that it gets transported thousands of miles away," Nenes said in an interview Sunday. The only way to stop the process, he said, is to "control emissions of sulfur and nitrogen" as air pollution for factories and power plants — an

effort that the leaders of 170 nations agreed to undertake at climate talks in Paris last year, knowing it faced enormous political challenges.

Low-oxygen “hypoxic events” known as dead zones often occur near coasts. But Nenes said what’s happening in the Pacific is bigger and more scary. “We’re talking about a vast amount of deep ocean water being turned into a dead zone.”

A recent article in National Geographic described the effect on a particular fish that many people know and love. Marlin, a majestic and athletic deep-ocean predator normally leaps high in the air just for kicks, even though they “can outweigh a polar bear,” Craig Welch wrote.

“Marlin can hunt in waters a half mile down, and sailfish often head to deep waters too,” Welch noted. “Yet in more and more places around the world, these predators are sticking near the surface, rarely using their formidable power to plunge into the depths to chase prey. The discovery of this behavioral quirk in fish built for diving offers some of the most tangible evidence of a disturbing trend: Warming temperatures are sucking oxygen out of waters even far out at sea, making enormous stretches of deep ocean hostile to marine life.”

Welch quoted William Gilly, a marine biologist with Stanford University’s Hopkins Marine Station, who noted that “200 meters down, there is a freight train of low-oxygen water barreling toward the surface.” There’s a lot of talk about issues affecting the ocean, he added, but “this one hasn’t gotten much attention.”

Oxygen depletion was already identified by scientists as a problem in the era of global warming because warm water holds less of it. But since the 1970s, it was happening more rapidly in the tropical Pacific, faster than rising temperatures could explain. Like other scientists, Ito and Nenes were vexed by these plummeting levels. So they started a mission of discovery.

They developed a model that looked at the atmospheric chemistry and ocean circulation, according to a university statement. The model mapped how “polluted, iron-rich dust that settles over the Northern Pacific gets carried by ocean currents east toward North America, down the coast and then back west along the equator.”

The pair kept an eye on water temperature, varying ocean currents and oxygen levels and found a link. From that they drew a grim conclusion: “If the pollution continues to supply excess nutrients, the process of the decomposition depletes oxygen from the deeper waters, and this deep oxygen is not easily replaced.

“Like us breathing in oxygen and exhaling CO₂, the bacteria consume oxygen in the subsurface ocean, and there is a tendency to deplete more oxygen,” Ito said, explaining the findings of the study.

“The scientific community always thought that the impact of air pollution is felt in the vicinity of where it deposits,” said Nenes. “This study shows that the iron can circulate across the ocean and affect ecosystems thousands of kilometers away.”

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