

Phosphorus Found to Be Another Culprit in Gulf of Mexico's 'Dead Zone'

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A research boat gathers seawater samples in the Gulf of Mexico to test for nutrient levels. Credit: Quay Dortch

Nitrogen is flowing down the Mississippi River and into the Gulf of Mexico faster than it can be consumed by floating microscopic plants called phytoplankton, increasing the size of the "dead zone" off the Louisiana coast. The findings, based on analysis of data gathered in 2001, are published online this week in the journal *Environmental Science and Technology*.

Because of the increased nitrogen levels, phytoplankton blooms are growing, and the Gulf's hypoxia zone -- an area lacking enough oxygen to sustain most life -- is getting bigger.

"In a pristine system, nutrients would flow down the river and into the Gulf, and there would be limited phytoplankton growth and no hypoxia," said James Ammerman, co-author of the paper and a biological oceanographer at Rutgers. "Heavy use of fertilizers containing nitrogen and phosphorus in the agriculture of the Mississippi Valley has thrown the system out of balance."

According to Ammerman, phytoplankton need both nitrogen and phosphorus to grow. Because they require a 16-to-1 ratio of nitrogen to phosphorus, phytoplankton usually run out of nitrogen first; most coastal surface waters have ratios lower than 16-to-1.

"There is now so much nitrogen in the Gulf that even though phytoplankton consume it faster than they consume phosphorus, they can't get rid of it fast enough, and it's the phosphorus, instead of nitrogen, that runs out first and becomes the limiting nutrient," Ammerman said.

This research shows the complex interactions of "nitrogen and phosphorus, river water inputs and timing, and coastal circulation and salinity as they interact to fuel biological productivity in the Gulf of Mexico," said Philip Taylor, Director of the National Science Foundation's (NSF) Biological Oceanography Program. "Multiple nutrients are implicated in the problems in the Gulf, and need to be considered in solving those problems."

The research was funded by NSF and the National Oceanic and Atmospheric Administration (NOAA).

Scientists have been measuring the flow of nutrients down the river since the 1950s, and the "dead zone," first noticed as a seasonally recurring feature in the late 1980s, has since doubled in size to an area larger than New Jersey.

"There are models that suggest hypoxia wasn't a problem there before the 1970s," Ammerman said." Data indicates occasional hypoxic events going back to the 19th century, but only in years of extremely high freshwater flow."

Jason Sylvan of the Rutgers University Institute of Marine and Coastal Sciences in New Brunswick, N.J., is the lead author of the paper. He and Ammerman are joined as co-authors by Quay Dortch, of the Louisiana Universities Marine Consortium and NOAA; Wendy Morrison, also of the Louisiana Universities Marine Consortium; Alisa Maier Brown of Louisiana State University; and David Nelson of Oregon State University.

Source: NSF

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