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## 'Dead Zones' Appear In Waters Worldwide

New Study Estimates More Than 400

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In the latest sign of trouble in the planet's chemistry, the number of oxygen-starved "dead zones" in coastal waters around the world has roughly doubled every decade since the 1960s, killing fish, crabs and massive amounts of marine life at the base of the food chain, according to a study released yesterday.

"These zones are popping up all over," said Robert Diaz, a professor at the Virginia Institute of Marine Science who led the study, published online by the journal *Science*.

Diaz and co-author Rutger Rosenberg of the University of Goteborg in Sweden counted more than 400 dead zones globally, ranging from expansive ones in the [Baltic Sea](#) and the [Gulf of Mexico](#) to small ones that episodically appear in river estuaries. Collectively, they cover about 95,000 square miles.

Low oxygen, known as hypoxia, is in significant measure a downstream effect of chemical fertilizers used in agriculture. Air pollution, including smog from automobiles, is another factor. The nitrogen from the fertilizer and the pollution feeds the growth of algae in coastal waters, particularly during summer.

The result is feast-then-famine: The algae eventually die and sink to the bottom, where the organic matter decays in a process that robs the bottom waters of oxygen. The ensuing die-off of marine life cuts down on the productivity of commercial fisheries. The "biomass" missing because of depleted oxygen in the [Chesapeake Bay](#), Diaz estimated, is enough to feed half the number of crabs that are commercially harvested in a typical year.

Hypoxia has been seen for decades in such places as the Chesapeake, Lake Erie, the Gulf of Mexico and Long Island Sound, but Diaz's comprehensive survey of the scientific literature and government reports has identified many new zones, including in the Florida Keys, [Puget Sound](#) and tidal creeks in the Carolinas.

"We're saying that hypoxia is now everywhere, it seems," Diaz said. "Human activities really screwed up oxygen conditions in our coastal areas."

A few hypoxic ecosystems have improved in recent years because of better management of pollutants. The Indian River in Florida has shown signs of recovery. Dead zones in New York's [Hudson River](#) and East River have disappeared, the study found. Globally, however, only 4 percent of the dead zones are improving.

The study is the latest alarm sounded by scientists and environmentalists about deteriorating oceans and watersheds. Douglas N. Rader, chief ocean scientist for the Environmental Defense Fund, said the chaos in the planet's nitrogen cycle is not only creating dead zones but also inciting the spread of toxic

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organisms, such as the pfiesteria that has appeared in recent years in the Chesapeake.

"The next big challenge, after global warming, is going to be addressing the massive upset of the world's nitrogen cycle," Rader said.

Earlier this week, the [Proceedings of the National Academy of Sciences](#) published online a study warning of "mass extinction in the oceans with unknown ecological and evolutionary consequences."

The author, Jeremy Jackson, a professor at the [Scripps Institution of Oceanography](#), contends that global warming, overfishing, invasive species, habitat destruction and agricultural runoff are creating oceans crammed with algae and jellyfish -- a process he calls "the rise of slime."

"We have utterly failed to appreciate the magnitude of the problem," Jackson said yesterday. "The oceans are out of sight and out of mind."

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