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# Coastal Dead Zones Are Growing

By *Unmesh Kher / TIME Magazine*

**O**ver the past two or three decades, scientists have noticed with growing alarm that vast stretches of coastal waters are turning into dead zones — patches of seabed so depleted of oxygen that few creatures, if any, can survive there. In 2004, the United Nations Environment Program (UNEP) took stock of the phenomenon — which is caused in large part by agricultural runoff — and pronounced it one of the biggest environmental problems of the 21st century. Two years later it noted that the number of identified dead zones, some of which cover thousands of square miles, had climbed from 150 to 200.

Predictably, things have gotten worse since then. Robert Diaz, an ecologist at the College of William and Mary in Virginia who helped UNEP with its numbers, reports in the current issue of the journal *Science* that today there are more than 400 known dead zones along coastlines around the world, covering roughly 95,000 sq. mi. of seabed. Some of the dead zones that Diaz and his Swedish co-author identify in their review have been around for some time, but have only recently been studied. Many others appear to be new. About 8% of them, mainly those in the Baltic and North seas, persist throughout the year, says Diaz; half, including one the size of New Jersey in the Gulf of Mexico, form mainly seasonally, typically beginning in summer after the spring thaw and receding in the fall. Overall, the researchers found that the number of new dead zones has grown exponentially over the past four decades.

That's bad news for fish — and for the people who eat them. Much of the world's fish supply is already troubled due to overfishing, dying reefs and the disappearance of marshland, mangrove forests and other coastal environments that serve as breeding grounds and nurseries for many valuable species. Biologists haven't been able to figure out how much oxygen depletion alone contributes to the decline of teetering fisheries — the question is hotly debated in marine-science circles these days — but few experts would disagree that an increase in dead zones can only be a detriment.

Indeed, severe hypoxia, as scientists refer to the phenomenon, has been linked to the collapse of fisheries in the Baltic Sea, the Black Sea (which has since recovered) and

a lobster fishery in the Kattegat, a patch of the North Sea between Denmark and Sweden. Other headline examples exist as well, but, more often, hypoxic waters have a relatively subtle impact on fish. "Most of the effects of low oxygen on fish stocks are what we call 'sub-lethal,' " says Diaz. "It doesn't kill the fish but stresses them. It affects their growth, it reduces their reproductive output, and makes them more susceptible to disease."



Dead zones are created when excess nitrogen and other pollutants in ocean water promote large blooms of algae and phytoplankton on the surface. The nitrogen gets there in a couple of ways: through river water filled with fertilizer from farm runoff and from air polluted with tailpipe and smokestack emissions. When the algae die and sink to the ocean floor, bacteria there break them down, while consuming pretty much all of the available oxygen in the water. The bacteria also proliferate wildly, taking over the ecosystem and exacerbating the oxygen depletion. If conditions like strong currents, which are common in summer, prevent oxygen-rich water from the surface from mixing with lower layers, bottom-dwelling animals like lobsters, crabs and flounder in that area either flee or die. Relatively immobile animals such as oysters, clams and worms are particularly susceptible to annihilation. Such deaths take the bottom out of the marine food chain, helping to create sustained dead zones.

The best way to prevent this from happening would be to reduce the amount of nitrogen introduced into the ocean. The technology already exists to do that. If, for example, farmers in the upper part of the U.S. were given a financial incentive to plant crops like winter wheat, rather than leaving their fields fallow after the fall harvest, says marine ecologist Robert Howarth of Cornell University, much of the nitrogenous fertilizer that would normally get washed into waterways by spring thaws could instead be absorbed into winter grain crops. Measures of this sort, if uniformly implemented, could all but eliminate the Gulf of Mexico's famously ballooning dead zone.

Such changes to farm management [aren't likely to be cheap or easy to implement](#). But, as Diaz's study suggests, the consequences of inaction might prove infinitely more expensive. "The oceans are vast and they cover most of the Earth's surface," notes Howarth. "But what people mostly care about in the oceans is largely in these coastal areas. That's where the most productive fisheries are, and where people recreate. And that's where people are overfishing, and where dead zones are developing."

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