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Sardines May Prevent Toxic Gas Eruptions off the California and African Coasts

Milky, turquoise-colored “dead zones,” sometimes as large as New Jersey, of rotting fish and caustic stench floating off the coast of southwest Africa, may be a sign of things to come for other areas along the coastlines of the eastern Atlantic and Pacific oceans. Toxic gas eruptions—bubbling up from the ocean floor to kill sea life, annoy human seaside residents, and may even intensify global warming—cause the dead zones. But the humble sardine may help to save the day, according to a study from the Pew Institute for Ocean Science.

In an article published in the November issue of *Ecology Letters*, authors Andrew Bakun and Scarla Weeks compare several areas around the world where strong offshore winds cause an upwelling of nutrients in the ocean and thus a population explosion of phytoplankton, the microscopic plant life that drifts through the ocean. Studying the waters off the coast of Namibia, the scientists report how the resulting overproduction of phytoplankton dies and sinks to the bottom, and how the decaying organic matter releases copious amounts of methane and poisonous “rotten egg” smelling hydrogen sulfide gas.

As methane is 21 times more effective than carbon dioxide at trapping heat in the atmosphere, the resulting climate change may intensify this upwelling process and open the possibility of even larger and more plentiful eruptions.

One action to help keep this situation from worsening, the authors say, is to avoid the overfishing of sardines, which can devour large quantities of phytoplankton.

“The region in question formerly hosted a large population of sardines that have been overfished,” says Bakun, a member of the Pew Institute and professor of marine biology and fisheries at the University of Miami Rosenstiel School of Marine and Atmospheric Science. “It is at least encouraging that a minor resurgence of sardine abundance coincided with a noticeable temporary hiatus in eruption frequency off Namibia in 2002.”

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Bakun and Weeks, from the University of Cape Town in South Africa, also warn that areas near Cape Mendocino, California, and Cape Sim, Morocco, may be dangerously close to the “tipping point,” possibly ripe for phytoplankton population explosions followed by their gaseous demise.

“This study demonstrates that overfishing one species of fish, such as sardines, can profoundly alter an entire marine ecosystem in ways that may be difficult or impossible to reverse,” says Ellen Pikitch, executive director of the Pew Institute for Ocean Sciences and an expert on fishery science and management.

Pew’s Chief Scientist Elizabeth Babcock adds, “The California sardine population has recovered somewhat since it peaked in the 1940s and was depleted by the early 1960s. We hope that the population can continue to recover as a hedge against development of such a regrettable situation on our own coast.”

The paper evaluates 16 areas around the world, including four along the Pacific coast of North America, for the risk of developing these gaseous eruptions. To learn more, visit the *Ecology Letters* website at <http://www.blackwellpublishing.com/journal.asp?ref=1461-023x>.

Bakun’s 42 years in marine science includes scientific positions with the International Indian Ocean Expedition, US National Oceanic and Atmospheric Administration’s Pacific Fisheries Environmental Laboratory, the United Nations’ Food and Agriculture Organization, France’s Institut de Recherche pour le Développement (IRD), and Columbia University’s International Research Institute for Climate Prediction.

A well-known South African scientist, Weeks has spent the past decade as the principal developer of satellite ocean color information for southern Africa.

Pew Institute for Ocean Science, in partnership with the University of Miami Rosenstiel School of Marine and Atmospheric Science, was founded in 2003 thanks to a multi-year grant from the Pew Charitable Trusts to undertake, sponsor, and promote world-class scientific activity aimed at protecting the world’s oceans and the species that inhabit them. The scientific role of the Institute is to increase public understanding of the causes and the consequences of problems affecting the marine environment. The conservation role is to promote solutions to these problems. For more information, visit www.pewoceanscience.org.

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