

Warming waters a major factor in the collapse of New England cod, study finds

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This image shows cod fishing in the Gulf of Maine. Credit: Gulf of Maine Research Institute

For centuries, cod were the backbone of New England's fisheries and a key species in the Gulf of Maine ecosystem. Today, cod stocks are on the verge of collapse, hovering at 3-4% of sustainable levels. Even cuts to the fishery have failed to slow this rapid decline, surprising both fishermen and fisheries managers. For the first time, a new report in *Science* explains why. It shows that the cod collapse is in large part due to rapid warming of the ocean in the Gulf of Maine - 99 percent faster than anywhere else on the planet.

The rapid warming is linked to changes in the position of the Gulf Stream and to climate oscillations in the Atlantic and the Pacific. These factors add to the steady pace of warming caused by global climate change. In the face of already depleted cod stocks, [fisheries](#) managers in 2010 had placed a series of restrictions on harvesting this key Gulf of Maine species, but even strict quota limits on fishermen failed to help cod rebound.

"Managers kept reducing quotas, but the cod population kept declining," said Andrew Pershing, Chief Scientific Officer of the Gulf of Maine Research Institute (GMRI) and lead author of the study. "It turns out that warming waters were making the Gulf of Maine less hospitable for cod, and the management response was too slow to keep up with the changes."

Pershing and colleagues from GMRI, the University of Maine, Stony Brook University, the Bigelow Laboratory for Ocean Sciences, and NOAA's Earth System Research Laboratory, including the Cooperative Institute for Research in Environmental Sciences at the University of Colorado Boulder, found that increasing water temperatures reduce the number of new cod produced by spawning females. Their study also suggests that warming waters led to fewer young fish surviving to adulthood.

The models used by managers over the last decade to set the quotas for cod did not account for the impact of rising temperatures, leading to quotas that were too high. Fishermen stayed within their quotas, but still took more fish than the population could sustain.

"This creates a frustrating situation that contributes to mistrust between fishermen, scientists, and managers," says Pershing. "The first step toward adapting fisheries to a changing climate is recognizing that warming impacts fish populations."

According to the report, recovery of Gulf of Maine cod depends on sound fishery management and on future temperatures. Cod are a coldwater species, and the Gulf of Maine is at the edge of their geographic range. As the ocean warms, the capacity of the Gulf of Maine to support cod will decline, leading to a smaller population and a smaller fishery.

The study shows the risk of not including temperature in fisheries models, especially for stocks like Gulf of Maine [cod](#) that are at the edge of their range. The warmer our climate gets, the less fisheries managers can rely on historical data.

More information: "Slow Adaptation in the Face of Rapid Warming Leads to the Collapse of Atlantic Cod in the Gulf of Maine," by A.J. Pershing et al. www.sciencemag.org/lookup/doi/10.1126/science.aac9819

Provided by Gulf of Maine Research Institute

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