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Computer model sheds light into climate change impact on fisheries

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By Responsible Seafood Advocate

New dataset reveals how decades of atmospheric changes impact fisheries, aiding climate change predictions and mitigation

Scientists at the U.S. National Science Foundation National Center for Atmospheric Research (NSF NCAR) have combined advanced computer models to understand how atmospheric conditions affect the ocean, and how this impacts the growth of tiny ocean organisms and the fish that eat them. This has produced a detailed global dataset spanning decades, which can help predict how a warming climate might impact fisheries and support sustainable management.

“We are really excited to make this ocean dataset available,” said Kristen Krumhardt, NSF NCAR scientist who led the work. “There are so many questions that could be answered.”

Atmospheric conditions significantly affect the ocean, which absorbs a large portion of carbon dioxide and atmospheric warming. However, ocean models often run at low resolution and don't include important details about ocean features or biogeochemistry. This limits their ability to provide useful information about fisheries. Understanding ocean productivity, which influences phytoplankton growth, is crucial for fisheries research.



A new dataset reveals how decades of atmospheric changes impact fisheries, aiding climate change predictions and mitigation. Photo by [Adiprayogo Lemena \(https://www.pexels.com/photo/school-of-fish-swimming-underwater-7826494/\)](https://www.pexels.com/photo/school-of-fish-swimming-underwater-7826494/).

For their new study, scientists used a high-resolution version of the Community Earth System Model (CESM2) to simulate the ocean from 1958 to 2021. They recreated past atmospheric conditions and used an updated model, MARBL, to track the growth of different types of phytoplankton and zooplankton. This detailed data was then used in another model, FEISTY, which helps predict how climate changes affect fish populations.

A banner for Best Seafood Practices. On the left, there is a photo of a fisherman in a yellow protective suit and mask handling fish. In the center, a fishing boat is shown on the ocean. To the right, the text reads "A comprehensive solution for the wild seafood supply chain." Below this text is a list of three benefits: "Crew rights", "Food safety", and "Environmental responsibility", each with a checkmark icon. On the far right is the Best Seafood Practices logo, which consists of a stylized eye icon and the text "Best Seafood Practices". Below the logo is a "LEARN MORE" button with a right-pointing arrow.

(<https://bspcertification.org/>).

The FEISTY model sorts fish into two main types: demersal fish that feed on the seafloor, and pelagic fish that live in the upper water. Pelagic fish are divided into smaller forage fish, like anchovies, and larger fish, like tuna. This model helped the researchers see how long-term atmospheric changes likely affected different fish populations.

“We reconstructed what the ocean would have done given what was happening in the atmosphere,” Krumhardt said. “We were able to validate the results through a number of means including looking at satellite images that give us information about phytoplankton blooms and analyzing fish catch records over time.”

The dataset resulting from the project is freely available to the research community and could be used to answer various questions, Krumhardt said, including looking at how marine heatwaves, ocean acidification and changes to sea ice might have affected fisheries in the past. The dataset will help researchers understand how climate affects fisheries and improve forecasting for their future in a warmer world.

[Read more here \(https://news.ucar.edu/132973/school-new-data-about-how-climate-impacts-fisheries\)](https://news.ucar.edu/132973/school-new-data-about-how-climate-impacts-fisheries).

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