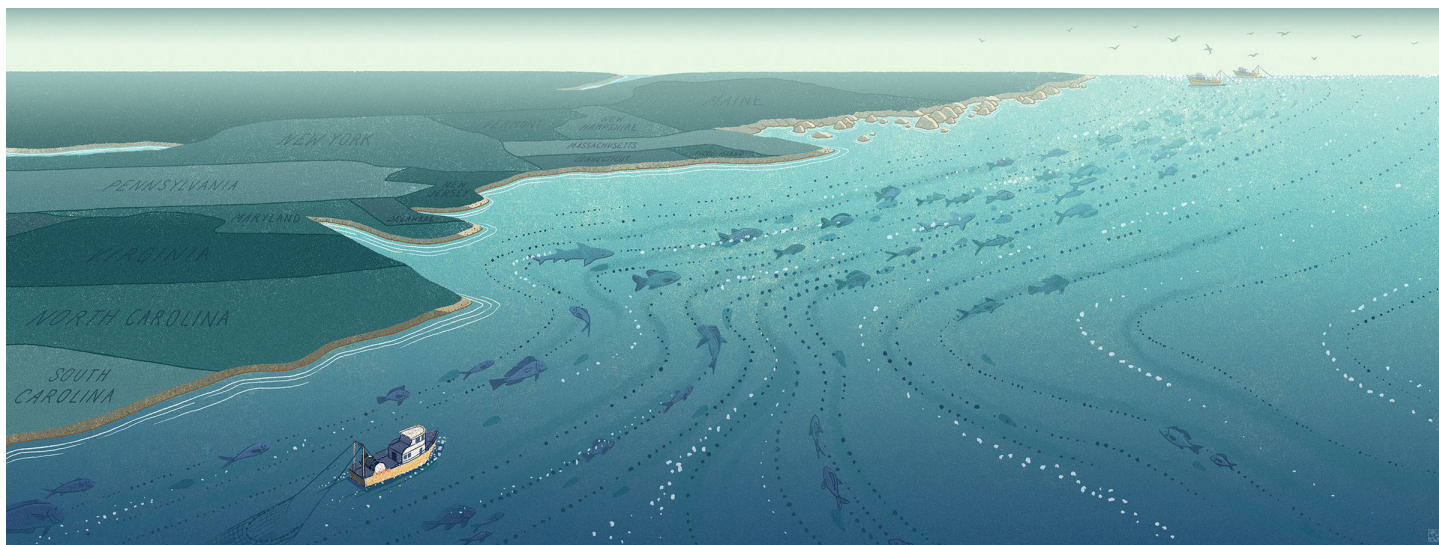


FACT SHEET

DON'T GET LEFT BEHIND: MODERNIZING FISHERIES SCIENCE FOR CLIMATE RESILIENCE

Our nation's fisheries are engines of our coastal economies, and their success depends on data-intensive science. Accurate science is what allows managers to avoid overfishing, maintain sustainable fisheries, and protect our ocean ecosystems. But climate change is upending fisheries science and threatening to undermine decades of work spent rebuilding fish populations and managing them sustainably. We urgently need to invest in modernizing fisheries science to keep up with the changing environment in which they live. Only by upgrading our scientific infrastructure will we be able to achieve resilient fisheries and strong coastal communities in the face of climate change.

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Fish on the move: Warming waters are forcing marine life to relocate to cooler waters.

CHANGING OCEANS AND FISH ON THE MOVE

Climate change is transforming our oceans—making waters warmer, more acidic, depleted of oxygen, and prone to deadly algae blooms.¹ Marine heat waves, which can weaken or reshuffle entire underwater communities, send tremors through the ocean food web with increasing regularity.²

Our fisheries are dramatically changing in response. Fish are fleeing northward and moving further offshore, seeking cooler waters. Over the past 40 years, more than 70 percent of commercially valuable fish species along the Atlantic coast have moved northward or into deeper water.³ Summer flounder, for example, that were once abundant off North Carolina are now more common off New Jersey.⁴



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With recent advances in ocean research technologies and computing abilities, we are poised for a revolution in fisheries science and marine resource management. Important tools include ship-based trawl surveys, fish identification sonar, autonomous gliders and sail drones, environmental DNA, and regional-scale ocean climate models.

The productivity of long-reliable fisheries is also changing. Some are expanding while others are shrinking. A quintessential mid-Atlantic fish, black sea bass, has expanded into New England.⁵ The American lobster fishery, on the other hand, has disappeared from Long Island Sound, forcing local fishermen to transition to Jonah crab, once considered a discard fish.⁶ And, still feeling the impacts of a large, multiyear marine heat wave known as the Blob, the fishery for Pacific cod in the Gulf of Alaska, once worth \$100 million per year, had to be closed for the first time in 2020.⁷

Unless science keeps pace with the changes, this underwater upheaval will place our fisheries—and the communities they support—at risk.

THE RISK OF FAILED STOCK ASSESSMENTS

Changing oceans present a fundamental problem for fisheries science. Scientists generally use the past to predict the future, relying on data from previous years to model what upcoming years are likely to look like. But with climate change, the past is no longer a reliable indicator of the future. With inadequate information and tools, federal fishery

scientists are struggling to track fish, predict the productivity of valuable fisheries, and forecast the next marine heat wave—let alone execute their core mandate of modeling fish populations and sustainable catch levels.

In recent years, a growing number of stock assessment models, which form the basis of catch recommendations, have been rejected in the peer review process.^a This is due in part to problems that can be attributed to climate change.⁸ When this occurs, fish population projections are unavailable, leaving federal fisheries managers with little guidance when setting catch limits. Lower confidence in management recommendations can make a fishery vulnerable to political pressures. And even when stock assessments pass peer review, those that don't account for a changing climate are less accurate and can lead to overfishing or catch levels that are below the maximum sustainable yield.

As climate change proceeds, our scientific understanding of U.S. fish stocks is likely to slip further. This risks undoing decades of hard work to rebuild our fisheries and undermining stakeholder confidence in the entire management system.

^a In recent years significant scientific uncertainty has resulted in the rejection of a number of New England groundfish stock assessments including those for Georges Bank cod, witch flounder, and winter flounder. Climate change is likely a major source of this uncertainty. Major questions also have been raised for blueline tilefish, black sea bass, and American plaice due to apparent shifts and expansions in their geographic ranges.

ADVANCING CLIMATE-SMART FISHERIES SCIENCE

These challenges can be overcome with reasonable investments in fisheries science infrastructure. Congress should seize the opportunity to jump-start climate-smart fisheries management and enhance the resilience of our coastal economy.

National Oceanic and Atmospheric Administration (NOAA) Fisheries identified two complementary priority actions for climate smart fisheries: move forward with the Climate and Fisheries Initiative and enhance in-the-water observations. These actions should receive full support from Congress.

1. **Climate and Fisheries Initiative:** The proposed Climate and Fisheries Initiative is a cross-agency effort to provide decision makers with the information and tools they need to prepare for and respond to changing oceans. Over the next five years, NOAA aims to modernize fisheries science and deliver ocean climate forecasts on time scales that are useful to fishermen and fisheries managers. By establishing regional interdisciplinary research collaboratives, the initiative will serve to connect NOAA's climate modeling enterprise with its fisheries labs, enabling the integration of climate change into fisheries management. The initiative will serve three key functions:

- Providing regional-scale ocean forecasts over time scales useful to marine resource managers and ocean-based industries
- Generating climate-informed forecasts of fisheries and marine species of interest
- Establishing decision support tools, such as risk assessments, to help managers integrate forecasts into decision making

The proposed approach would serve as a major turning point for NOAA Fisheries in its ability to provide informed advice in the face of climate change.

The Climate and Fisheries Initiative could provide key services to marine resource managers and coastal communities beyond fisheries, including early warnings for extreme events such as marine heat waves and harmful algae blooms, predictions of regional circulation patterns, and forecasts regarding melting sea ice and sea level rise. This level of scientific service would bring fishing in line with what NOAA already does for the agricultural industry. Beneficiaries of these services would include regional fisheries management councils, interstate and state marine resource agencies, fishing and aquaculture industries, and related businesses and coastal communities.

Action: Moving forward with the Climate and Fisheries Initiative

Required investment: \$40 million

Budget item: NOAA *Fisheries Science and Management:* Fisheries and Ecosystem Science Programs and Services; Increase from ~\$147 million to ~\$167 million
Office of Oceanic and Atmospheric Research: Climate Laboratories and Cooperative Institutes; Increase from ~\$75.5 million to ~\$95.5 million

2. **Enhanced fisheries surveys:** NOAA Fisheries monitors fish abundance with regular research vessel surveys. These in-the-water observations are important indicators of fishery health and are essential inputs to predictive fishery models. But with fish populations in a state of flux, many surveys need to be expanded or reevaluated to ensure that they continue to provide comprehensive information on the state of our fisheries. It is critical to address these problems and set our data-gathering programs on the right track now before they begin to produce misleading or uninterpretable information.

Updating NOAA's data collection enterprise would include enhancing routine fishery-independent surveys and biological sampling programs. Filling data gaps could involve expanding cooperative research programs, such as the Gulf of Maine Cooperative Bottom Longline Survey, which help support coastal economies by creating jobs and give fishermen a role in building the industry's resilience to climate change.

Action: Expanding observation and tracking system for U.S. fisheries

Required investment: \$25 million

Budget item: NOAA *Fisheries Science and Management:* Data Collection Survey and Assessments; Increase from ~\$175 million to ~\$200 million

Marine fisheries—the world's last major wild food system—hold enormous value to our nation. Commercial and recreational fishing industries annually support an estimated 250 billion in economic activity and 1.7 million American jobs.⁹ U.S. fishermen haul in some nine billion pounds of seafood each year, netting \$5.6 billion in sales. Sport fishermen catch an additional one billion pounds of fish.¹⁰ And working waterfronts along all our coastlines enrich the cultural identity of our seaside communities.¹¹

Climate-ready fisheries will not be attainable without consistent, adequate financial support. Without this support, we face growing stress on fisheries management and, in turn, on the foundation of many coastal communities' economies.

Endnotes

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- 11 See, e.g., NOAA Fisheries, “Fishing Community Profiles,” last updated July 3, 2019, <https://www.fisheries.noaa.gov/national/socioeconomics/fishing-community-profiles>.