Climate Change & Commercial Fisheries in New Bedford, MA

Gulf of Maine Research Institute

INTRODUCTION

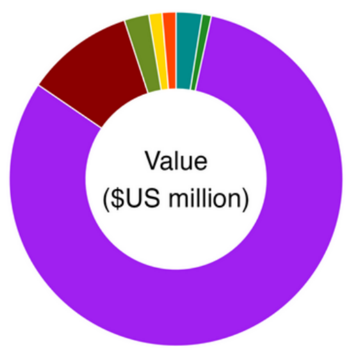
Climate change is altering the physical and chemical characteristics of our ocean and affecting marine ecosystems and fisheries. As environmental conditions continue to change, fishing communities may be affected by changes in the distribution and availability of species. This report summarizes the current status of fisheries in New Bedford and shares information on changes in harvested species that may occur in the future. Used alongside the Climate Adaptation Resource Hub for Fishing Communities, this report provides information for understanding potential impacts on a fishing community, which can be used to consider ways to adapt to a changing climate.

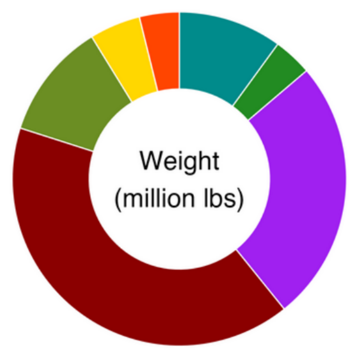
WHAT IS LANDED HERE?

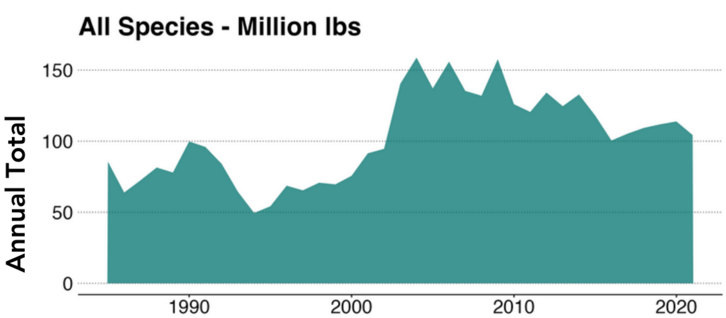
Commercial fisheries in New Bedford landed an annual average of 115 million pounds of primarily shellfish and some finfish valued at an average $398 million per year spanning 2012 to 2021.* Sea scallop was the most economically valuable species landed, contributing 29.4 million pounds and $323 million per year on average. Surf clams also made substantial contributions, with landings averaging 11.5 million pounds per year, valued at an average of $10 million per year. Ocean quahog clams represented 13 million pounds and were valued at $9.5 million annually on average. While the overall economic value of landings in New Bedford has been increasing, the total volume has varied over time. Landings experienced a decline in the early 1990s but recovered by the early 2000s and peaked in 2009 at 157 million landed pounds.

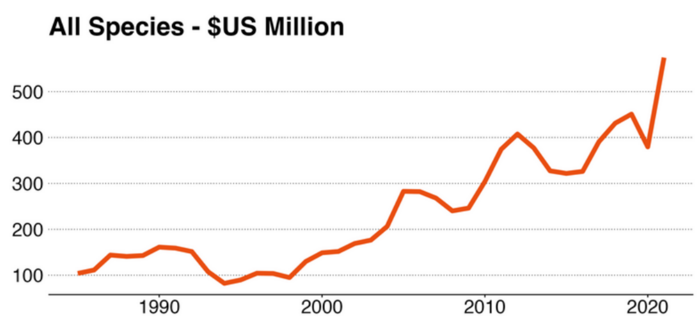
Species	Annual Average Value	Annual Average Volume
Sea scallop	$323,425,719	29,376,429 lbs
Surf clam	$10,053,607	11,581,833 lbs
Ocean quahog clam	$9,559,937	13,022,296 lbs
Haddock	$5,339,254	4,447,544 lbs
Jonah crab	$5,104,652	5,694,387 lbs
Silver hake	$3,524,941	4,314,809 lbs
Other	$41,658,538	47,041,071 lbs

Above are the annual average value and volume for the top species landed at this port in each year from 2012-2021.







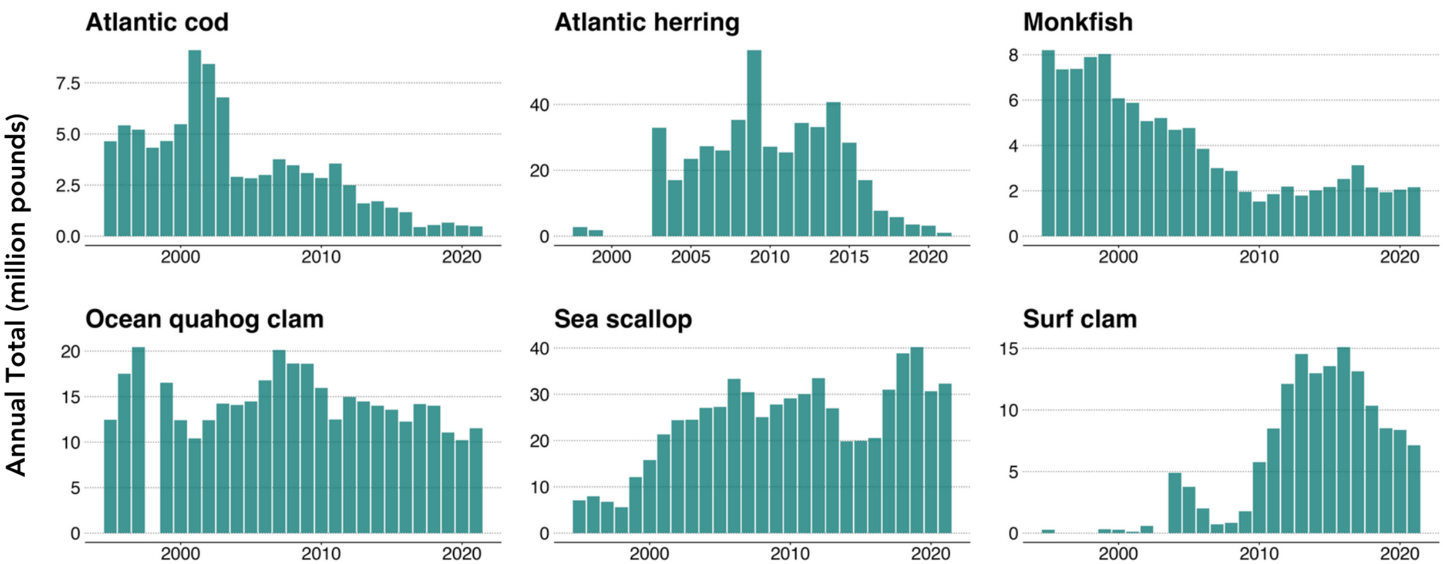


*Landings data were provided by NOAA Fisheries' Greater Atlantic Regional Fisheries Office. Due to confidentiality restrictions, some data may not be fully representative of the historical landings at a given location.

This report was developed through projects led by the Gulf of Maine Research Institute with funding from the National Oceanic and Atmospheric Administration's Climate Program Office under awards NA15OAR4310120 and NA19OAR4310384. Please contact Kathy Mills (kmills@gmri.org) for more information or questions.

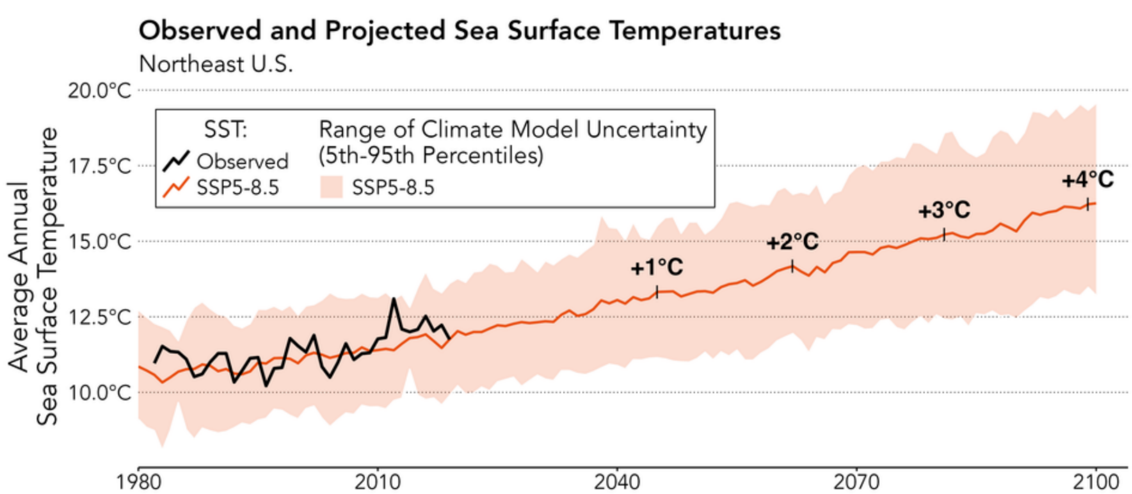
LANDINGS OVER TIME

Apart from a small surge in the early 2000s, landings of Atlantic cod in New Bedford have been declining. Atlantic herring landings spiked in 2009 and again in 2014 and have been declining since. Monkfish landings were high in the early 2000s and steadily declined until 2010, before experiencing a small recovery and remaining relatively stable since. Ocean quahog landings have varied between 10 and 20 million pounds, with high landings in the mid 1990s and late 2000s. Scallop landings have exceeded 20 million pounds since the early 2000s, with landings at the lowest levels during 2014-2016 and at the highest during 2018-2019. Surf clam landings increased during the early 2010s but have been declining since 2016.



OUR CHANGING CLIMATE AND WARMING WATERS

Greenhouse gas emissions around the world are a primary contributor to the warming the planet has been experiencing over the past century. This warming affects the health and distribution of species that support fisheries in coastal communities. Scientists around the world use a common set of scenarios to project climate impacts into the future. These scenarios represent multiple global social and economic development patterns paired with different levels of greenhouse gases in Earth's atmosphere. The scenario representing the largest build-up of greenhouse gases, labeled SSP5-8.5, indicates global average temperatures will warm by approximately 4°C (7°F) above pre-industrial levels by the end of this century. We use this scenario to understand how species may respond to changes in ocean temperatures in the Northeast U.S. relative to those experienced during 2010-2019. These species projections allow us to explore different potential futures of fisheries and support decisions now that can buffer the severity of future climate change impacts on fishing communities.



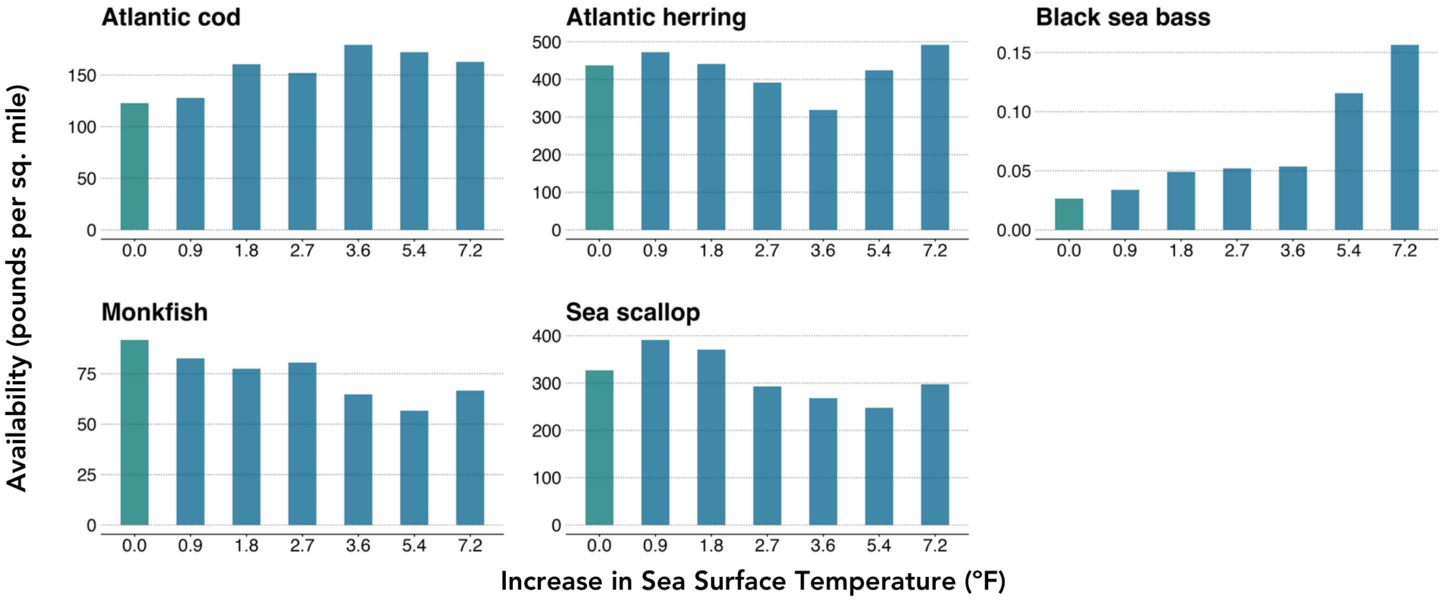
Temperature Crossing Points

Based on SSP5-8.5 Climate Projections

Celsius	Fahrenheit	As soon as
0.5°C	0.9°F	2034
1.0°C	1.8°F	2045
1.5°C	2.7°F	2056
2.0°C	3.6°F	2062
3.0°C	5.4°F	2081
4.0°C	7.2°F	2099

FUTURE CHANGES IN AVAILABILITY

As the abundance and distribution of certain species changes with warming waters, communities may need to respond to ensure the continuity of the fishing industry. By combining historical species observations with future climate information, we can estimate how the availability of certain species may change, and what new opportunities may emerge. Availability is given here as the total estimated weight of a particular species of fish in a given area, as modeled from bottom trawl survey data. Warming ocean temperatures may affect the availability of some commercial species in the waters near New Bedford. The availability of Atlantic cod and black sea bass may increase with increasing ocean temperatures, while monkfish are projected to decline. Atlantic herring and sea scallop availability may vary with different levels of warming.



EMERGING OPPORTUNITIES AND ADAPTATION OPTIONS

Harvesting emerging species and diversifying catch are some ways individual harvesters can adapt to changing fisheries. In the table below, we outline other potential adaptation options spanning the different scales of the fishery system. As the climate continues to change, new impacts will take shape, requiring re-evaluation and revision of goals in order to respond to climate change. For more information on adaptation options in fishing communities, please visit the Climate Adaptation Resource Hub for Fishing Communities.

Individual Harvester Actions	Industry Actions
• Shifting fishing locations • Shifting harvested species • Diversifying livelihood (alternative fisheries, aquaculture, non-fishing jobs)	• Improving product handling • Developing supply chain capacity • Diversifying markets and building consumer demand
Management Measures	**Community Initiatives**
• Reassessing quota allocations • Altering permit access and availability • Developing adaptive reference points • Applying dynamic and ecosystem-based management	• Maintaining and securing shoreside infrastructure • Improving transportation networks • Developing local seafood initiatives • Conducting vulnerability and resilience assessments • Using early warning monitoring • Community adaptation and resilience planning

Projected Changes in Species Availability in New Bedford

Values represent percent change in modeled species availability at potential levels of warming relative to *2010-2019* baseline conditions. Species in gray had low availability *(<5 lbs/sq. mile)* during the baseline period.

	Increase in Sea Surface Temperature			
Species	0.9°F	1.8°F	3.6°F	5.4°F
Acadian redfish	−4.8%	−6.6%	−33.4%	−48.8%
American lobster	−8.2%	3.5%	−2.7%	−15.5%
American plaice	−4.5%	−5.1%	−13.3%	−17.0%
Atlantic cod	4.1%	30.6%	45.9%	40.0%
Atlantic halibut	1.9%	−0.1%	−2.7%	−15.1%
Atlantic herring	8.1%	0.8%	−27.1%	−3.0%
Atlantic mackerel	27.1%	48.3%	80.8%	65.1%
Black sea bass	27.9%	84.9%	102.4%	335.9%
Butterfish	−0.8%	−10.8%	18.4%	−2.6%
Deep sea red crab	−19.9%	−15.3%	−34.6%	−26.1%
Haddock	−16.9%	10.1%	2.6%	−28.3%
Hagfish	38.6%	83.6%	71.8%	32.7%
Jonah crab	14.4%	−10.7%	−5.8%	−35.4%
Little skate	−37.1%	−38.2%	−33.6%	−28.6%
Longfin squid	39.7%	57.1%	−16.4%	149.7%
Monkfish	−9.9%	−15.6%	−29.4%	−38.2%
Ocean quahog clam	−33.7%	−7.9%	29.6%	−50.6%
Pollock	−15.6%	−1.3%	−6.8%	−25.9%
Red hake	31.2%	21.8%	8.0%	−3.3%
Rock crab	66.9%	72.9%	93.6%	170.1%
Sand lance	−37.1%	−49.4%	−57.3%	−55.4%
Scup	−41.9%	−26.7%	24.4%	106.9%
Sea scallop	19.7%	13.4%	−18.0%	−24.2%
Shortfin squid	−43.3%	−19.3%	−28.0%	−13.7%
Silver hake	−5.4%	−6.2%	−10.2%	−24.3%
Smooth skate	−20.3%	−23.8%	−20.3%	−18.1%
Spiny dogfish	−71.1%	−71.3%	−70.1%	−72.1%
Summer flounder	0.5%	23.1%	51.6%	109.3%
Thorny skate	−16.6%	−12.4%	−18.0%	−30.1%
White hake	−22.0%	−15.6%	4.2%	−4.0%
Windowpane	12.3%	34.5%	30.4%	46.3%
Winter flounder	8.2%	11.0%	17.7%	7.6%
Winter skate	−33.0%	−33.5%	−23.1%	−18.4%
Witch flounder	−5.5%	−25.8%	−32.8%	−31.1%
Yellowtail flounder	−26.6%	−30.9%	−41.5%	−37.3%

MAKING SENSE OF CLIMATE PROJECTIONS AND SPECIES DISTRIBUTION MODELS

The species results shown here were developed using a spatio-temporal species distribution model, which can estimate the current and future distribution of marine species through time and space. The model uses projected regional sea surface and bottom temperature data from the globally coordinated Coupled Model Intercomparison Project (CMIP6) and species data from bottom trawl surveys conducted by the Northeast Fisheries Science Center and the Department of Fisheries and Oceans. Estimated species biomass densities are then averaged over an area fished by vessels from the port of interest. This enables us to interpret local changes in availability of a species at a specific time or temperature.

LEARN MORE

For more information regarding climate change, species distribution change, fisheries adaptation options, and adaptation barriers and enablers, please visit:

gmri.org/adaptationhub

ASK QUESTIONS

For specific questions regarding your community, contact Kathy Mills at:

kmills@gmri.org

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