Climate Change & Commercial Fisheries in Stonington, ME

Gulf of Maine Research Institute

INTRODUCTION

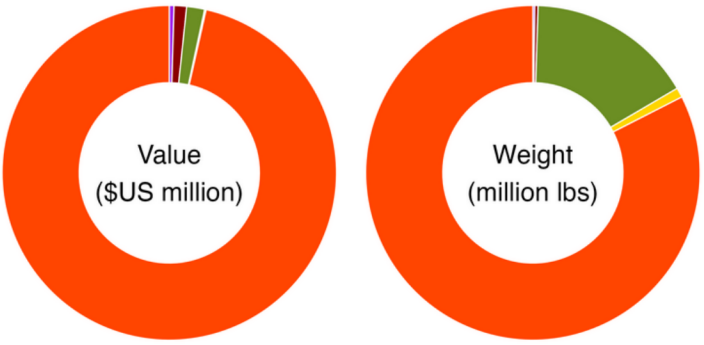
Climate change is altering the physical and chemical characteristics of our ocean and affecting marine ecosystems and fisheries. As environmental conditions continue to change, fishing communities may be affected by changes in the distribution and availability of species. This report summarizes the current status of fisheries in Stonington 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.

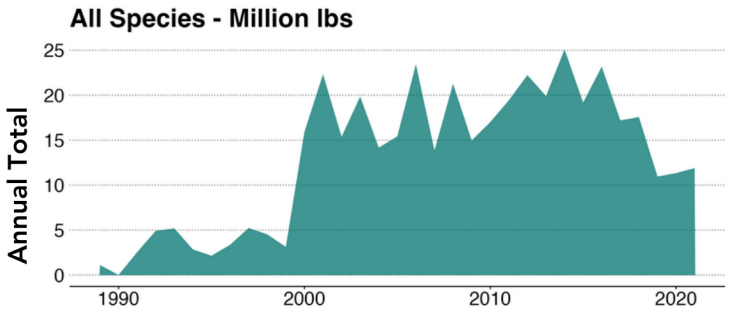
WHAT IS LANDED HERE?

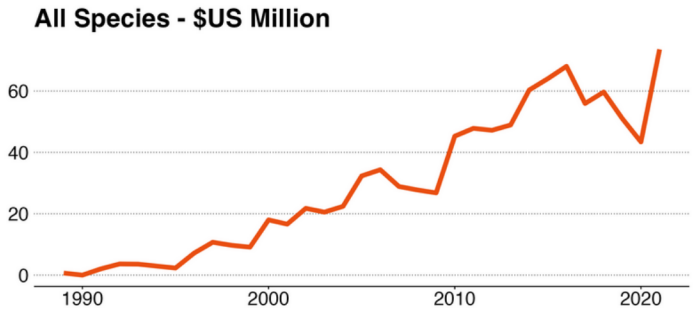
Commercial fishing vessels in Stonington landed an annual average 17.8 million pounds of shellfish and finfish, valued at $57 million per year from 2012-2021.* American lobster was the primary species landed, representing an average 14.7 million pounds and valued at $55.2 million per year on average. While lobster dominates commercial landings in Stonington, other species landed include sea scallop, softshell clam, Cancer crabs (i.e., rock crab, Jonah crab), Atlantic herring, and Atlantic menhaden. The total volume of commercial landings in Stonington jumped from 3 million pounds in 1999 to 15 million in 2000 and has fluctuated between 15 and 25 million pounds most years since. The total value of commercial landings have been steadily increasing, surpassing $70 million in 2021.

Species	Annual Average Value	Annual Average Volume
American lobster	$55,178,643	14,727,938 lbs
Sea scallop	$691,081	56,394 lbs
Soft clam	$259,677	32,699 lbs
Cancer crab	$80,725	166,558 lbs
Other	$992,717	2,868,797 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.

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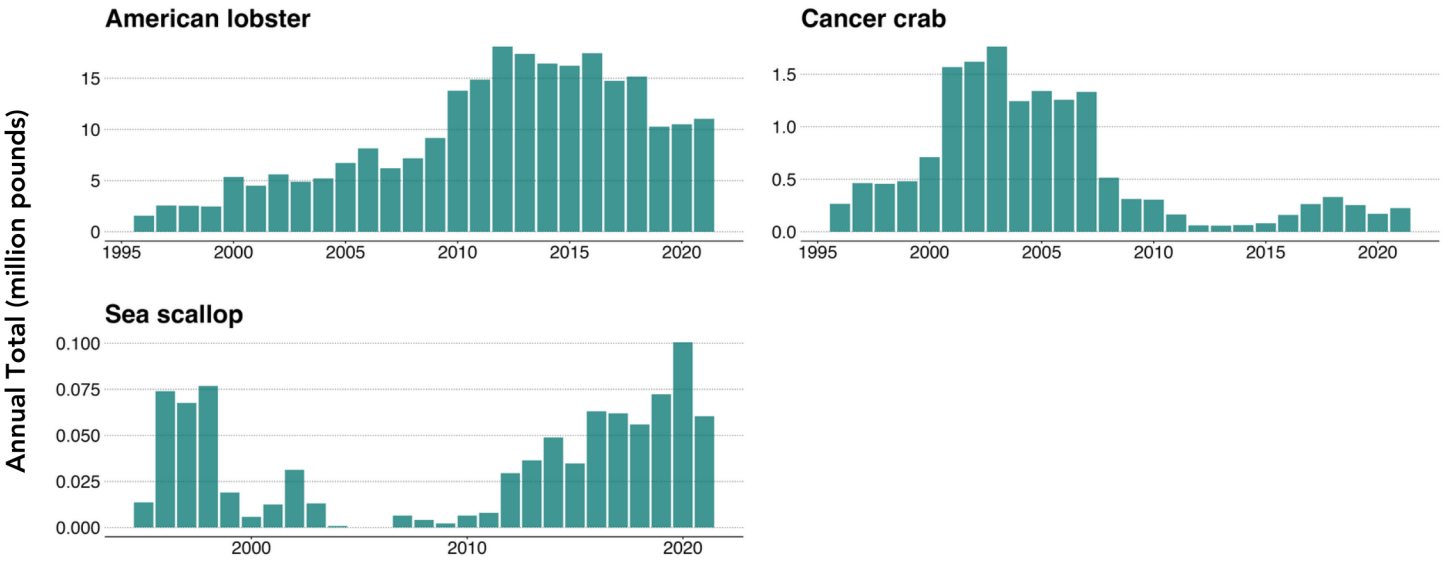
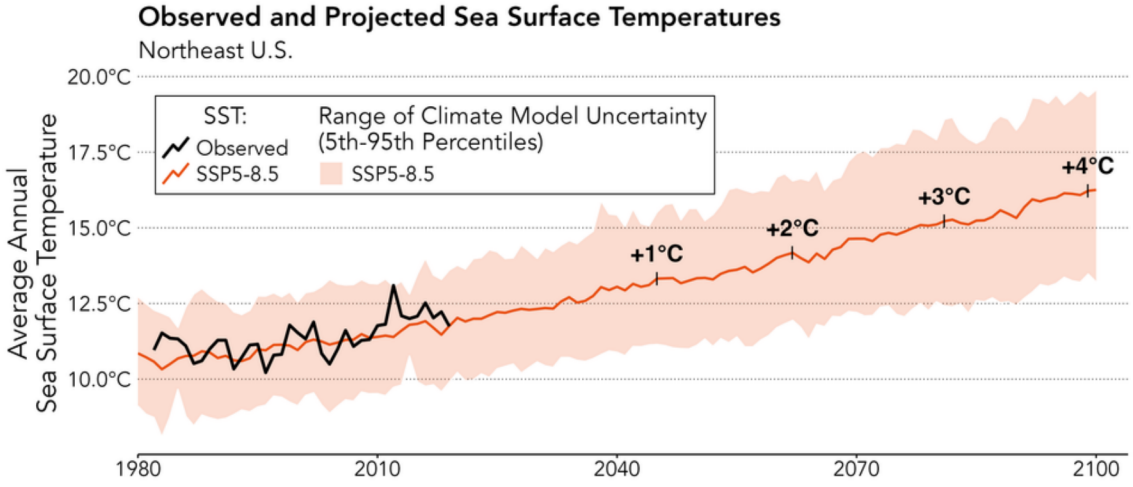
LANDINGS OVER TIME

Lobster landings in Stonington were steadily increasing from 1995 to 2016, surpassing 15 million pounds from 2012 to 2016 and in 2018. Lobster landings dropped to around 10 million pounds since 2019. Crab landings peaked in 2003 and decreased substantially after 2007, averaging around 200,000 pounds since then. Scallop landings were low between 2000 and 2010 but have been increasing in recent years to levels similar to the late 1990s.



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.



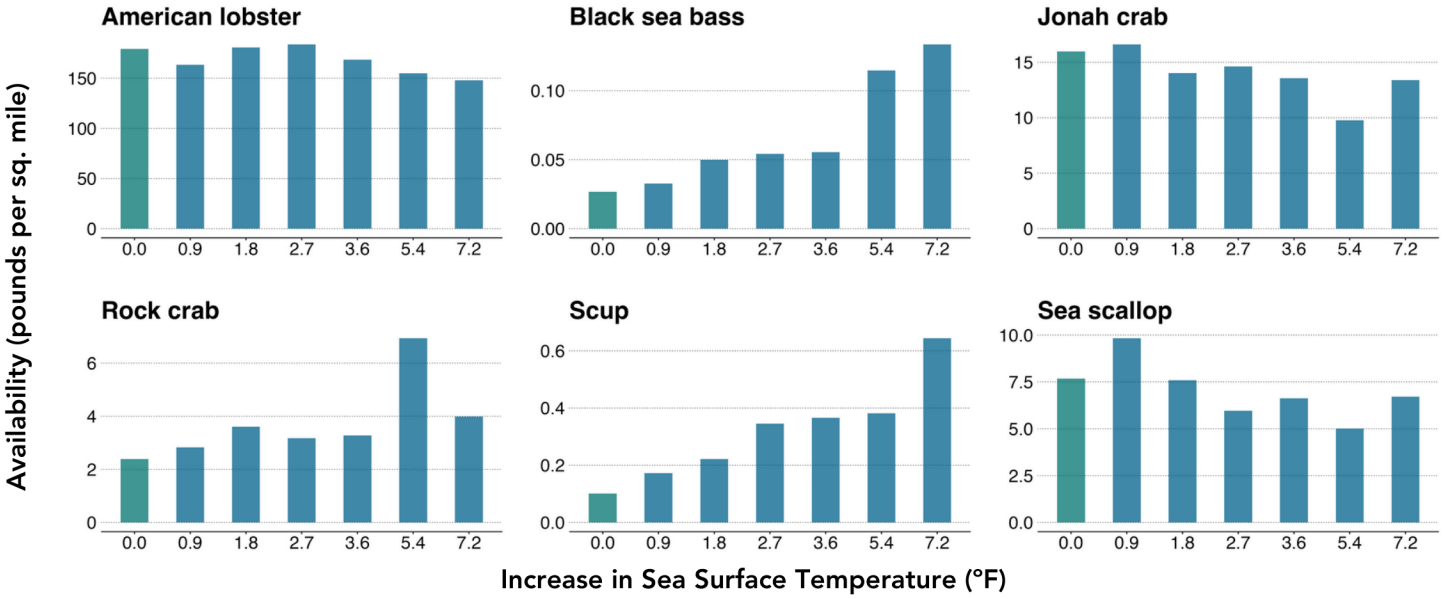
Temperature Crossing Points

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 Stonington. The availability of black sea bass, scup, and rock crab is projected to increase under warmer conditions. Lobster, Jonah crab and scallop show modest changes that 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 Stonington

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	−17.5%	−18.5%	−44.8%	−54.6%
American lobster	−9.0%	0.8%	−6.0%	−13.6%
American plaice	−4.8%	−7.7%	−14.0%	−14.2%
Atlantic cod	0.7%	24.3%	27.6%	46.8%
Atlantic halibut	6.6%	−4.1%	−11.1%	−14.0%
Atlantic herring	5.1%	0.4%	−19.0%	−1.7%
Atlantic mackerel	28.1%	42.9%	61.5%	49.9%
Black sea bass	22.7%	87.1%	108.0%	330.1%
Butterfish	−9.9%	−5.6%	8.4%	40.0%
Deep sea red crab	−24.8%	−30.1%	−43.0%	−43.8%
Haddock	40.8%	35.1%	54.1%	2.6%
Hagfish	75.6%	85.1%	83.9%	73.8%
Jonah crab	3.9%	−12.2%	−15.2%	−38.9%
Little skate	−12.6%	−20.7%	−16.4%	6.3%
Longfin squid	31.4%	24.3%	−16.1%	102.3%
Monkfish	13.9%	−5.2%	−14.4%	−23.9%
Ocean quahog clam	−34.7%	7.3%	54.1%	−54.6%
Pollock	−25.5%	−14.4%	−24.4%	−35.9%
Red hake	36.5%	17.3%	21.4%	4.0%
Rock crab	18.5%	51.3%	37.6%	190.9%
Sand lance	−18.1%	12.3%	16.0%	53.6%
Scup	70.4%	119.4%	262.2%	277.3%
Sea scallop	28.0%	−1.2%	−13.8%	−34.8%
Shortfin squid	−37.2%	−14.5%	−1.7%	9.7%
Silver hake	5.6%	38.9%	18.6%	21.4%
Smooth skate	−2.4%	−7.2%	−13.6%	−8.6%
Spiny dogfish	6.2%	−24.5%	−30.1%	−31.4%
Summer flounder	26.7%	54.7%	89.1%	140.1%
Thorny skate	−8.7%	−6.7%	−22.9%	−31.5%
White hake	−16.3%	−15.8%	−6.2%	−3.2%
Windowpane	23.1%	54.7%	42.5%	51.4%
Winter flounder	22.9%	34.2%	29.7%	0.5%
Winter skate	−6.5%	−3.5%	1.6%	24.4%
Witch flounder	−15.9%	−40.3%	−44.1%	−41.9%
Yellowtail flounder	−22.2%	−23.3%	−43.6%	−41.1%

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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