Climate Change & Commercial Fisheries in Stonington, CT

Gulf of Maine Research Institute

INTRODUCTION

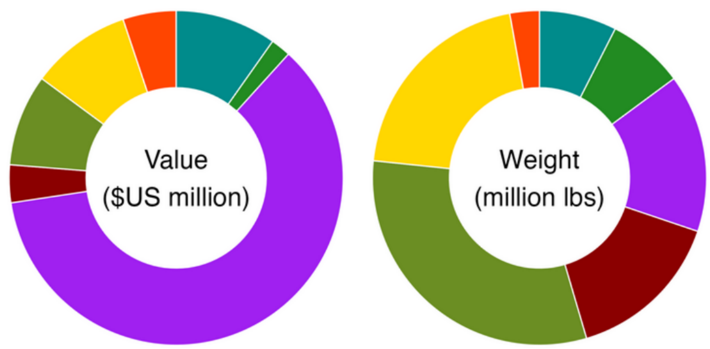
Climate change is altering the physical and chemical characteristics of our ocean and affecting marine ecosystems and fisheries. As environmental conditions continue to change, fishing communities may be affected by changes in the distribution and availability of species. This report summarizes the current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

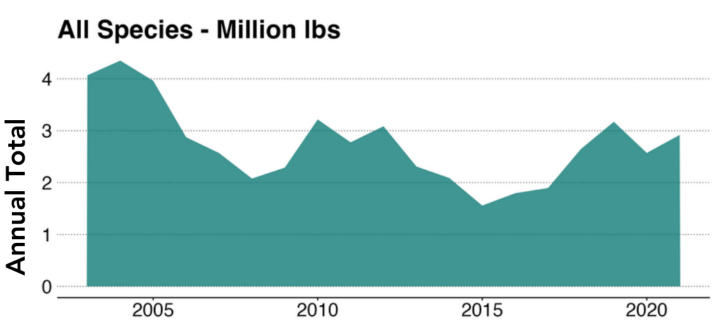
WHAT IS LANDED HERE?

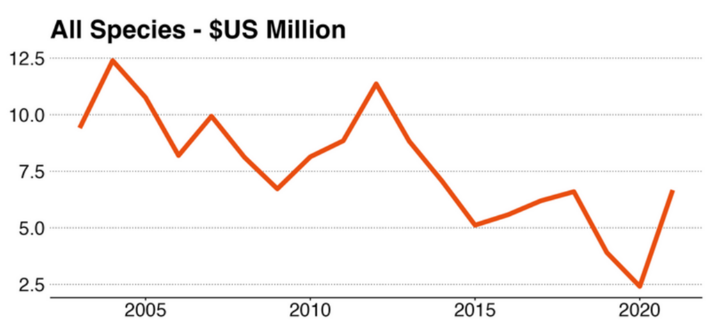
A diverse mix of commercially harvested species are landed in Stonington, representing an annual average of 2.4 million pounds valued at $6.4 million from 2012-2021.* Sea scallop was the highest value species landed, contributing $3.9 million on average per year. Longfin squid was the highest volume species landed, with nearly 492,000 pounds on average coming into Stonington each year. Total landings in Stonington have experienced phases of growth and decline, with periods of high landings in the mid-2000s, early 2010s, and late 2010s. The value of landings has generally declined over time, aside from a few high years in 2004 and 2012.

Species	Annual Average Value	Annual Average Volume
Sea scallop	$3,880,012	367,597 lbs
Summer flounder	$624,669	180,128 lbs
Longfin squid	$620,350	492,862 lbs
American lobster	$328,334	68,700 lbs
Scup	$232,166	367,085 lbs
Silver hake	$123,492	177,739 lbs
Other	$564,747	749,686 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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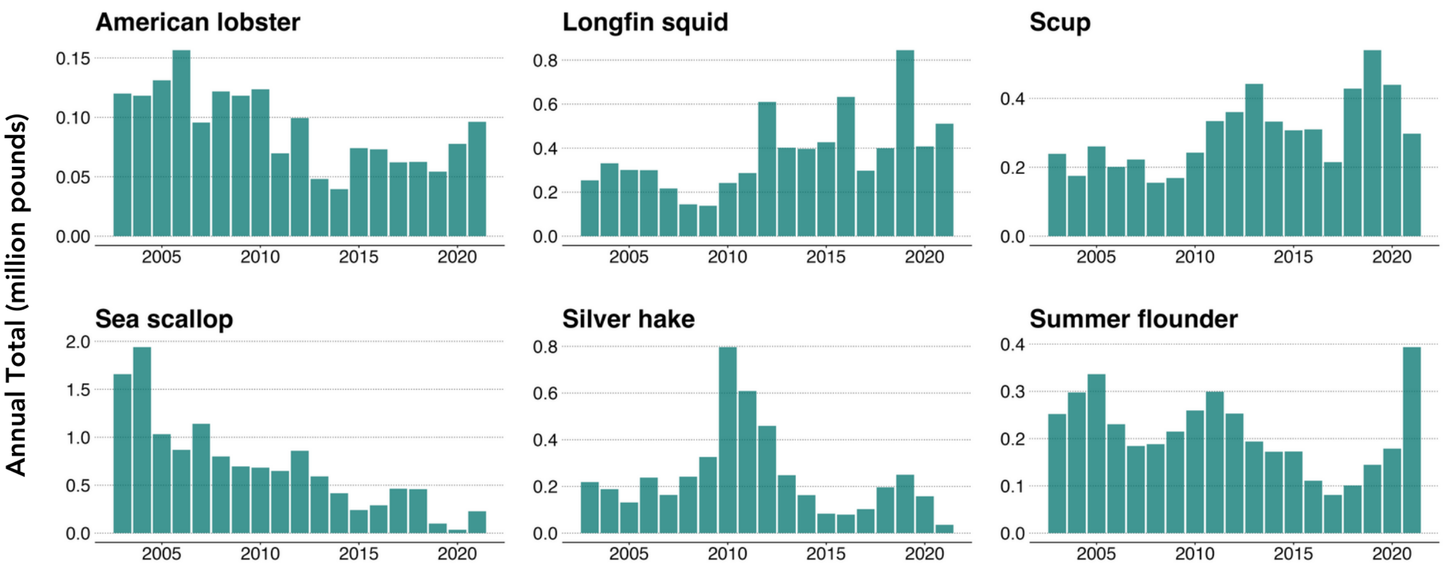
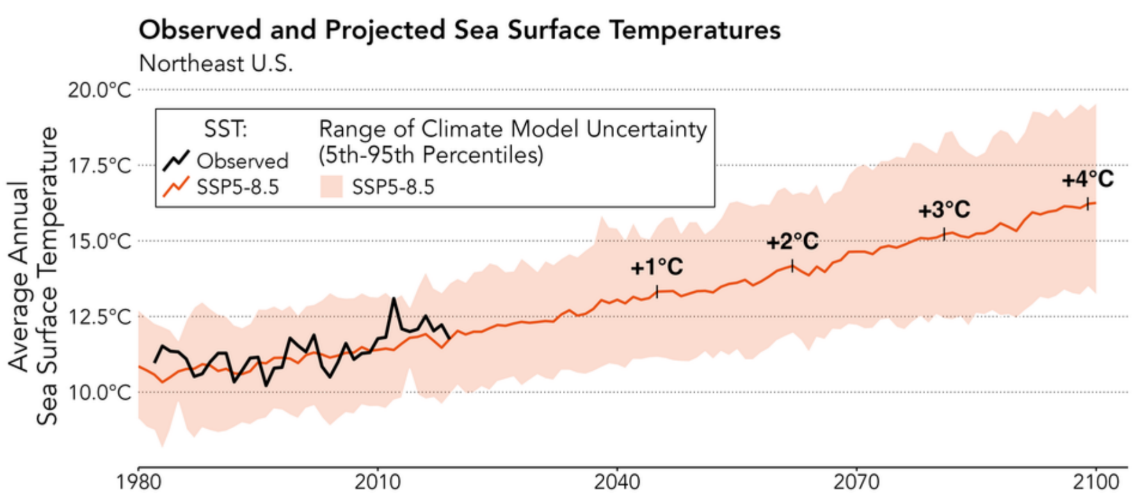
LANDINGS OVER TIME

Landings of lobster in Stonington generally declined throughout the 2000s and early 2010s but have increased in recent years. Longfin squid landings have generally fluctuated around 300,000 pounds, with a few spikes in 2012, 2016, and 2019. Scup landings generally increased after 2010, however landings of sea scallops have been trending downward since 2004. Silver hake landings increased in the early 2010s but otherwise fluctuated around 100,000 to 200,000 pounds. Summer flounder landings were generally higher before 2010 than after, with low landings in the mid- to late-2010s before a high-landings year in 2021.



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.



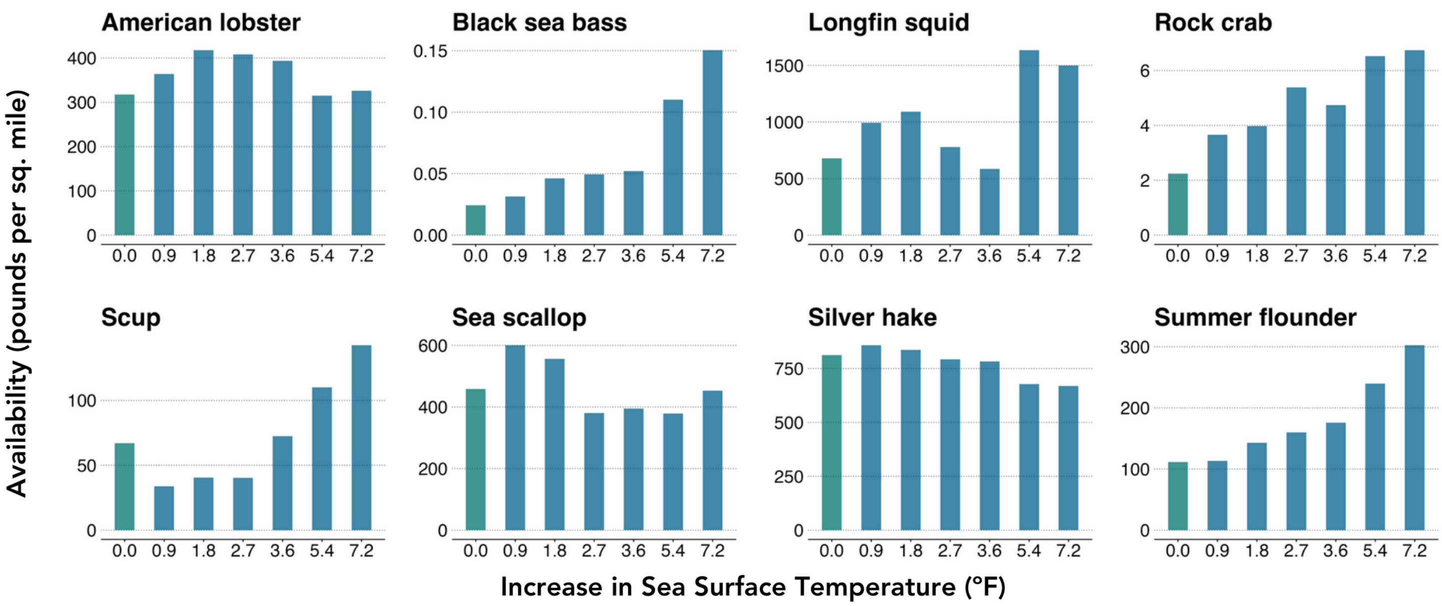
Temperature Crossing Points

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. Black sea bass, rock crab, and summer flounder may increase with increasing temperatures. Lobster, sea scallop, and silver hake may increase with initial warming but may experience declines at high levels of warming; conversely, scup availability may decline at low warming levels and increase as warming progresses. Longfin squid availability is projected to vary at different warming levels.



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

- Shifting fishing locations
- Shifting harvested species
- Diversifying livelihood (alternative fisheries, aquaculture, non-fishing jobs)

Industry Actions

- Improving product handling
- Developing supply chain capacity
- Diversifying markets and building consumer demand

Management Measures

- Reassessing quota allocations
- Altering permit access and availability
- Developing adaptive reference points
- Applying dynamic and ecosystem-based management

Community Initiatives

- 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	−0.2%	−4.1%	−29.4%	−41.2%
American lobster	14.5%	31.4%	23.8%	−0.9%
American plaice	−4.6%	−7.5%	−15.1%	−19.1%
Atlantic cod	−0.3%	36.0%	51.6%	33.2%
Atlantic halibut	8.5%	3.5%	5.0%	−1.6%
Atlantic herring	18.4%	8.1%	−20.6%	4.6%
Atlantic mackerel	22.2%	41.3%	73.6%	64.2%
Black sea bass	29.2%	90.5%	114.4%	353.6%
Butterfish	−0.3%	−8.9%	16.1%	−3.8%
Deep sea red crab	−12.0%	−11.2%	−27.7%	−11.5%
Haddock	−3.1%	21.9%	21.5%	−31.9%
Hagfish	43.9%	112.2%	96.3%	45.2%
Jonah crab	16.0%	−1.3%	1.2%	−30.5%
Little skate	−41.8%	−40.0%	−35.4%	−33.2%
Longfin squid	46.5%	60.9%	−13.8%	141.1%
Monkfish	−12.6%	−20.5%	−38.6%	−42.2%
Ocean quahog clam	−37.3%	−9.9%	41.7%	−44.7%
Pollock	−8.5%	12.5%	3.1%	−11.2%
Red hake	31.0%	24.2%	7.3%	−6.0%
Rock crab	63.2%	77.4%	111.4%	191.2%
Sand lance	−40.0%	−41.9%	−43.1%	−49.2%
Scup	−49.5%	−39.6%	8.0%	64.1%
Sea scallop	31.0%	21.3%	−13.8%	−17.4%
Shortfin squid	−47.0%	−21.8%	−34.7%	−14.1%
Silver hake	5.7%	3.1%	−3.6%	−16.5%
Smooth skate	−12.1%	−18.2%	−13.5%	−10.3%
Spiny dogfish	−74.1%	−71.7%	−69.7%	−70.0%
Summer flounder	1.7%	28.3%	57.7%	115.0%
Thorny skate	−20.8%	−14.3%	−21.4%	−36.2%
White hake	−18.0%	−4.0%	8.6%	11.9%
Windowpane	10.3%	38.7%	25.6%	45.2%
Winter flounder	7.9%	10.2%	13.7%	2.6%
Winter skate	−45.7%	−49.1%	−40.3%	−33.2%
Witch flounder	−2.8%	−25.1%	−31.4%	−28.9%
Yellowtail flounder	−33.5%	−38.2%	−49.1%	−44.4%

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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