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Estimates of Economic Contributions and Fishing Effort for Commercial and For-Hire Recreational Fisheries in Stellwagen Bank National Marine Sanctuary

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U.S. Department of Commerce
Wilbur Ross, Secretary

National Oceanic andAtmospheric Administration
Neil Jacobs, Ph.D.
Assistant Secretary of Commerce for Environmental Observation and Prediction

National Ocean Service
Nicole LeBoeuf, Assistant Administrator (Acting)

Office of National Marine Sanctuaries
John Armor, Director

Report Authors:

Danielle Schwarzmann[1], Ryan Shea[2], Vernon R. Leeworthy[1], Scott Steinbeck[3], Chase Dato[4]

[1]NOAA Office of National Marine Sanctuaries
[2]National Marine Sanctuary Foundation
[3]NOAA National Marine Fisheries Service
[4]University of Maryland, Baltimore County

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On The Water, Stellwagen Bank National Marine Sanctuary.

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Report Availability

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Contact

Danielle Schwarzmann, Ph.D.
Senior Economist
NOAA/Office of National Marine Sanctuaries
1305 East West Highway
SSMC4, 11th Floor
Silver Spring, MD 20910
Phone: 240-533-0705
Danielle.Schwarzmann@noaa.gov

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Executive Summary

This report has been developed for Stellwagen Bank National Marine Sanctuary to support its condition report and management plan review. Commercial and recreational fisheries profiles and economic contributions from the sanctuary were identified as a critical data gap and a priority need in the characterization of the site during the condition report process. This report analyzes fishing effort and the economic contributions of Stellwagen Bank National Marine Sanctuary commercial and recreational fisheries to local and regional economies and to the livelihoods of those who depend on sanctuary fish resources from 2007 to 2016.

The results presented here support an evaluation of the status and trends of fishery-related ecosystem services in the sanctuary condition report. These results will help inform a subsequent management plan review. Ecosystem services are the benefits that people derive from the environment. The ecosystem services evaluated in this report include food supply, and consumptive recreation. Data from commercial fishing were used primarily to evaluate the status and trends of food supply. Data from for-hire charter and party boats were used primarily to evaluate the status and trends of consumptive recreation. Some information on private recreational fishing is presented in this report for 2009, but data on private recreational fishing is the sanctuary and surrounding areas are limited.

Many different activities and uses take place across Stellwagen Bank National Marine Sanctuary and the larger National Marine Sanctuary System. Profiles for commercial and recreational fishing were developed to evaluate fishing effort and economic contributions. These profiles were then peer-reviewed and presented in this report to provide data and information to sanctuary management, partners, and stakeholders. For commercial fisheries, profiles include: ex-vessel landings measured by pounds and value (also referred to as harvest revenue), the number of vessels, the species caught, the state in which landings occurred, and the gear types used. For the for-hire recreational fisheries, profiles include: the number of vessels, the number of trips, the number of person-days, the landing state, the top species, and the quantity of species caught. Profiles varied across sites and uses based upon the availability of data.

A special analysis was conducted to determine the fishing effort and economic contributions of the overlap of the Western Gulf of Maine Closure Area with the sanctuary. This overlap area, which makes up 22% of Stellwagen Bank National Marine Sanctuary, is called the sliver. The sliver (and the Western Gulf of Maine Closure Area) has been closed year-round, to bottom tending commercial gear since 1998. This area may serve as a replenishment area for ground fish and other fish species. Charter boats, party boats, and recreational vessels are able to fish in the Western Gulf of Maine Closure Area. Analyzing this closed area provides insight into the increased economic output of for-hire party and charter fishing that rely on this area as a refuge from commercial bottom-tending mobile-gear fishing. Key findings are presented below. More information on the data used, methodologies, special analyses, and other findings are presented in the full report. The figure below shows the different spatial extents analyzed in this paper.

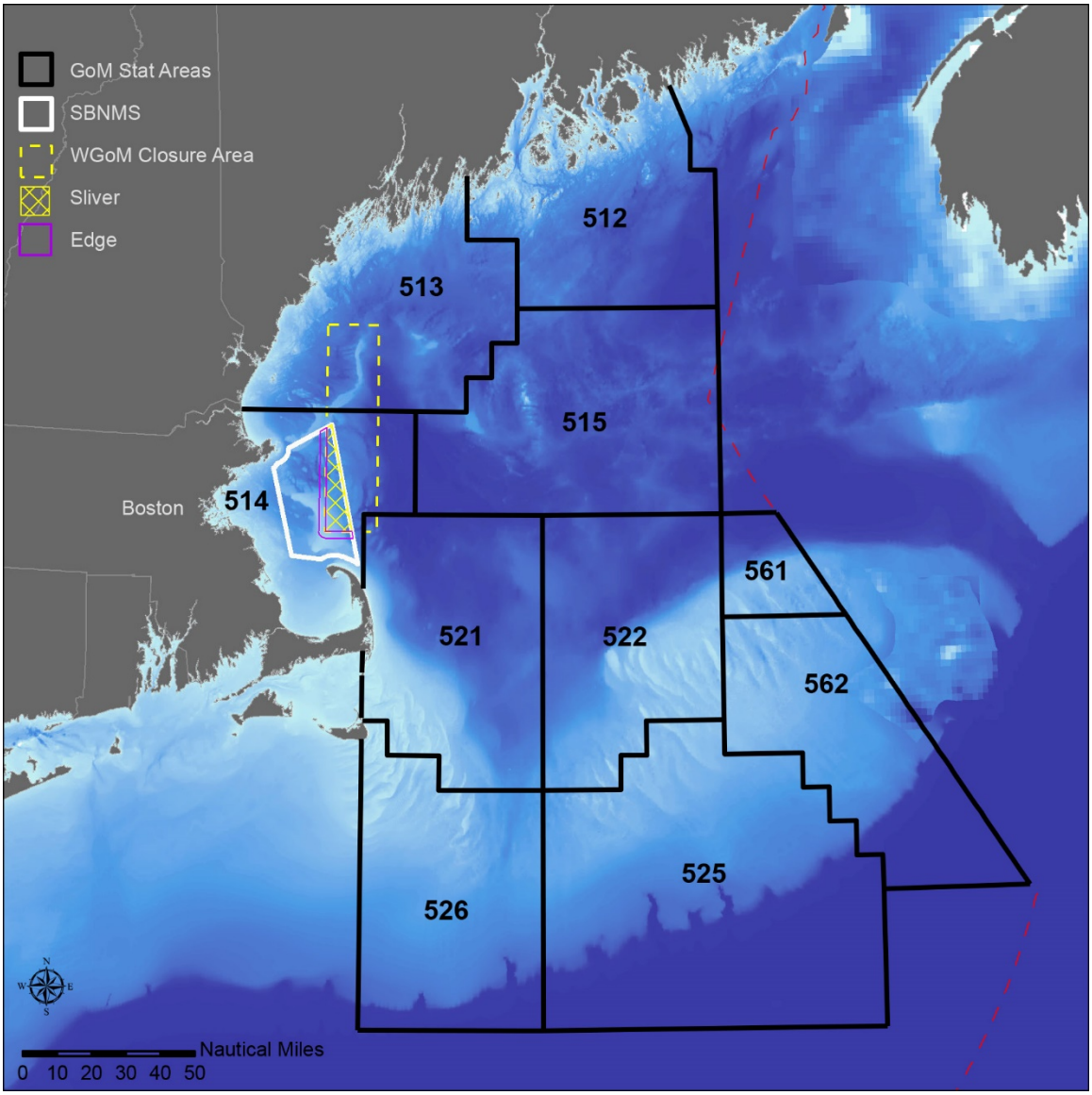

Figure ES.1 NOAA Fisheries statistical areas of commercial and recreational fishing vessels reporting activity within Stellwagen Bank National Marine Sanctuary. Image: M. Thompson/NOAA Commercial Fishing Profile

The first item analyzed in the commercial fishing section is the trend in top five species. The top five species are selected based on the total ex-vessel value of landings (or harvest revenue) from 2007 to2016. Cod, lobster, sea scallops, yellowtail flounder, and haddock ranked in the top five fish for landings value over the study period.

Key findings from the analysis of the commercial landings in Stellwagen Bank National Marine Sanctuary include:

- Cod was the number one species in terms of pounds (29.8 pounds landed) and ex-vessel value ($63.6 million) from 2007 to 2016 (study period). This finding is notable given the dramatic decline in cod beginning in 2010.

- Lobster was the second highest in terms of value, at $35.5 million landed over the study period (and 8.3 million pounds) in the sanctuary. Both lobster pounds and value displayed an increasing trend over the study period.
- Sea scallops represented the third highest species in terms of value in the sanctuary for the study (2.6 million pounds landed with a value of $33.3 million). Sea scallop landings and value also displayed an increasing trend.
- Yellowtail flounder was the fourth highest valued fishery in the sanctuary. A total of 6.5 million pounds with a value of $10.5 million was landed in the sanctuary over the 10-year study period. Yellowtail flounder landings and value showed variability over the study period, and a clear trend was not present.
- The total landings of haddock from 2006 to 2017 were 3.2 million pounds valued at $7.6 million in the sanctuary. This makes it the fifth most valuable commercial species in the sanctuary measured by the value of landings. Haddock demonstrated a declining trend in landings and value.

The types of gear used to catch fish and shellfish in Stellwagen Bank National Marine Sanctuary were analyzed to understand the different impacts on sanctuary habitats. For example, fixed gears such as lobster traps and gillnets generally have less impact on seafloor habitats than mobile gears such as otter trawls and scallop dredges.

Key findings from the analysis of gear types include:

- The highest value of landings by gear in the sanctuary was with bottom (otter) trawl, at $61.6 million (or 31.7% of landings in the sanctuary) from 2007 to 2016.
- Sink gillnet accounted for the highest catch by gear type (39.4 million pounds landed) and had a value of $50.6 million during the study period.

Key findings from the economic contributions analysis include:

- Landings in the sanctuary had an average annual value of $19.4 million for the study period.
- Further, the average annual output supported by landings in the sanctuary was $66.0 million for the study period. (Output is a measure of the total value of all goods produced.)
- The average annual income supported by commercial fishing in the sanctuary over the study period was $22.4 million.
- On average, the commercial fishing occurring within the sanctuary supported more than 700 jobs annually.

For-Hire Recreational Fishing Profile

The analysis of for-hire recreational fishing included findings for the charter fishing industry and the party boat industry. Charter boats are hired by a person or pre-formed group of people (typically six or fewer) for a set price and time. A head boat or party boat charges per person. Charters tend to be closed parties, whereas party boats are open to the public. Both are operated by a licensed captain and crew.

Key findings of charter boats:

- The top five species landed from the sanctuary on charter boats are cod, haddock, pollock, cusk, and redfish.
- Cod represented more than half (58.6%) of total charter boat landings within the sanctuary and haddock was approximately a quarter (23.0%) of total charter boat landings within the sanctuary.
- Cod and cusk showed a declining trend, redfish catch increased, and haddock and pollock demonstrated too much variability over the study period of 2007-2016 to determine a trend.
- The number of charter boats and charter boat trips increased from 2007, peaked in 2010 with 91 vessels visiting the sanctuary and 1,420 vessels trips to the sanctuary, and then declined until 2015.
- The total number of anglers increased from 2007 to 2011, peaking at approximately 8,700 anglers. The lowest number of anglers was reported in 2015 (2,909 anglers).

Key findings of party boats:

- The top five species landed from party boats are cod, haddock, pollock, cusk, and redfish. (This was the same top five as charter boat fishing.)
- Cod composed 42.5% of the total party boat landings, while haddock composed 36.5% of the total party boat landings within the sanctuary.
- Cod and cusk showed a declining trend, redfish catch increased, and haddock and pollock demonstrated too much variability over the study period of 2007-2016 to determine a trend.
- The number of party boats, party boat trips, and anglers showed variability from 2007 to 2016, but the trend showed an overall decline.

Key findings of economic contribution analysis of for-hire operations:

- Expenditures from charter boat users in the sanctuary were $2.3 million on average each year during the study period (2007-2016).
- The spending resulting from charter boat use in the sanctuary supported an average of 30 jobs, $1.7 million in income, and $3.9 million in output annually from 2007 to 2016 in the region.
- On average, each year from 2007 to 2016, party boat users spent $4.4 million to fish in the sanctuary.
- The expenditures resulting from party boat use in the sanctuary supported an average of 60 jobs, $3.3 million in income, and $7.8 million in output annually from 2007 to 2016 in the region.

Special Analyses

Economic Contributions of the Sliver to Commercial Fisheries

To determine the economic contributions of the sliver to commercial fisheries it was necessary to analyze the "edge effect," since bottom-tending commercial fishing has been prohibited inside the sliver since 1998. The edge consists of a two-nautical mile buffer on the southern and western edges of the sliver (Figure ES 1). Economic activity is generated when catchable biomass spills over into the fishable portion of Stellwagen Bank National Marine Sanctuary and anglers catch that biomass along the edge. For commercial fishing, economic activity was analyzed by assessing catch along the edge and comparing that to catch in the rest of the sanctuary. The two-nautical mile buffer along the edge makes up 12.2% of

the total sanctuary area. Select key findings of the potential effects of increased fisheries productivity resulting from the sliver are presented below. These findings are measured by examining standardized landings from the edge. More information on the data used, spatial analysis, and other key findings are presented in the report.

- Approximately 14% of the value of landings in Stellwagen Bank National Marine Sanctuary were supported by catch in the edge.
- 14.8% of the output, 17.3% of income, and 15.1% of employment supported by the sanctuary in the region were derived from landings in the edge.
- Approximately 32% of the value of haddock landings and 34% of the pounds landed in the sanctuary were from the edge.
- About 34% of the total value of pollock landed and 29% of the total landings in the sanctuary were caught in the edge.
- The number one species in terms of pounds and value in the sanctuary was cod. Approximately 11% of the landings value and pounds was derived from the edge over the study period.
- Additionally, 51.5% of the pounds of skate landed in the sanctuary were from the edge.
- Sink gillnet landings in the edge accounted for 32% and the landings value accounted for approximately 29% of the total landings pounds and value in the sanctuary.
- Bottom longline in the edge accounted for nearly 30% of the landings value in the sanctuary.

The findings suggest that for some species there a high concentration of biomass in the edge: a high proportion of spiny dogfish, pollock, and skate landings in the sanctuary occurred within the edge, which suggests an edge effect. This report does not consider habitat and habitat maps as part of the analysis, however. The conclusion is based upon total catches of species and the spatial extent of the edge within the sanctuary; the reason for the effect is not addressed by this report.

Economic Contributions of Stellwagen Bank National Marine Sanctuary Relative to the Gulf of Maine for Commercial Fisheries

In this report, the Gulf of Maine refers to the following statistical areas: 512, 513, 514, 515, 521, 522, 525, 526, 561, and 562. The rationale for analyzing a larger area is to understand how the sanctuary fits into the larger regional context. This larger area was identified by using vessel trip tickets to identify fishing vessels engaged in commercial fishing in the sanctuary; along with what other statistical areas they also reported fishing. This analysis helps to determine how much commercial fishermen rely on catches from the sanctuary.

Key findings of Stellwagen Bank National Marine Sanctuary commercial fisheries relative to the Gulf of Maine:

- The value of cod landed in the sanctuary accounted for 30.1% of the total value of cod landed within the Gulf of Maine. Cod was the number one species based upon value in the sanctuary and the third ranked species for value in the Gulf of Maine.
- Pounds of cod landed in the sanctuary accounted for 30.8% of the total pounds landed in the Gulf of Maine.
- Yellowtail flounder landed in the sanctuary accounted for 28.5% of the total value of yellowtail flounder landed in the Gulf of Maine.

- Additionally, 19.7% of the Atlantic mackerel and 17.0% of the spiny dogfish pounds landed in the Gulf of Maine were caught in the sanctuary.

Economic Contributions of the Sliver to For-Hire Recreational Fisheries

Charter boats, party boats, and recreational vessels are able to fish in the sliver (and the Western Gulf of Maine Closure Area). Analyzing this closed area provides insight into the increased economic output of for-hire party and charter fishing groups that rely on this area as a refuge from commercial fishing. An analysis of the sliver in relation to the sanctuary revealed that the sliver composes a large portion of the charter fishing effort in the sanctuary.

Key findings for charter boat fishing in the sliver:

- Approximately 33% of cod, 49% of haddock, 37% of pollock, 54% of cusk, and 41% of redfish caught in the sanctuary by charter boats were caught in the sliver.
- Additionally, 34% of spiny dogfish, 39% of wolffish, and 26% of mackerel caught within the sanctuary was landed in the sliver.
- In total, approximately 37% of all fish landed by charter boats in the sanctuary were landed within the sliver.
- Additionally, a catch per unit area (CPUA) (measured by catch per square nautical mile) analysis for charter boats was completed. For charter boats, all of the top five ranked species in Stellwagen Bank National Marine Sanctuary had a higher CPUA in the sliver than in the sanctuary. The average CPUA for the top five species in the sanctuary was 363 fish per square nautical mile in the sanctuary and 611 fish per square nautical mile in the sliver. This indicates that the sliver is a productive and profitable area.

Key findings for party boat fishing in the sliver:

- Approximately 51% of haddock, 42% of cod, 58% of pollock, and 65% of cusk landed in the sanctuary were caught in the sliver.
- Approximately 47% of all fish landed on party boats in the sanctuary were caught in the sliver.
- The average CPUA for the top five species in Stellwagen Bank National Marine Sanctuary was 226 fish per nautical square mile in the sanctuary and 487 fish per nautical square mile in the sliver. This suggests that for party boat fishing, there is a higher intensity of use within the sliver relative to the entire sanctuary.

Economic Contributions of Stellwagen Bank National Marine Sanctuary Relative to Statistical Area 514 for For-Hire Fisheries

The larger region analyzed for recreational fishing is smaller than that used in commercial fishing. Although explained in more detail in the report, recreational operators who used the sanctuary were identified using vessel trip reports. The primary statistical block for those operating in the sanctuary was statistical area 514. This analysis helps to determine the dependence of for-hire fishermen who fish in the sanctuary region (statistical area 514) on the resources in the sanctuary.

Key findings of Stellwagen Bank National Marine Sanctuary charter boat fishing relative to statistical area 514:

- The top five charter boat species measured by catch in statistical area 514 were cod, haddock, pollock, mackerel, and redfish, with 920,967, 447,902 173,575, 81,891, and 49,535 fish landed, respectively.
- More than three-quarters (77.4%) of cod, 62.4% of haddock, 68.6% of pollock, 25.5% of mackerel, and 45.2% of redfish kept from statistical area 514 were caught in the sanctuary.
- Over the study period, the number of vessels, vessel trips, and anglers declined. The average number of anglers each year in statistical area 514 for the study period was 12,414.
- Annually, 60 jobs, $3.3 million in income, and $7.8 million in output were supported on average from statistical area 514. During the study period, nearly 50% of the economic contributions from statistical area 514 were derived from landings in the sanctuary.

Key findings of Stellwagen Bank National Marine Sanctuary party boat fishing relative to statistical area 514:

- The top five party boat species measured by catch in statistical area 514 were cod, haddock, pollock, mackerel, and cusk with 653,595, 619,944, 230,784, 116,116, and 97,455 landed, respectively.
- Roughly half (49.0%) of cod, 44.3% of haddock, 27.2% of pollock, 9.0% of mackerel, and 38.8% of cusk kept from statistical area 514 were caught in the sanctuary.
- Over the study period, the number of vessels, vessel trips, and anglers declined. The average number of anglers each year in statistical area 514 for the study period was 36,603, nearly three times as many anglers as charter boat fishing.
- Annually, 178 jobs, $10.0 million in income, and $23.2 million in output were supported on average from statistical area 514. During the study period, roughly one third (33.6%) of the economic contributions from statistical area 514 were derived from landings of fish caught in the sanctuary.

The economic contributions and fishing effort derived from party boats are larger than that of charter boats. However, when looking at the percentage of statistical area 514's catch landed in the sanctuary, charter boats rely more heavily upon the sanctuary resources than party boats. Many of the top five species for charter boat anglers who use statistical area 514 were primarily caught with the sanctuary. However, none of the top five party boats species saw the majority of statistical area 514's catch landed in the sanctuary.

Summary

The table below provides a summary of the activity and the economic contributions supported by commercial and recreational fishing in the sanctuary. Overall, the activity in the sanctuary supports jobs, income, output, and fishing in the sanctuary region. Further, the report finds intensive fishing along the edge, where commercial fishing of specific species has a higher landing rates along the edge of the sliver. Additionally, charter and party boats have higher levels of effort per nautical mile in the sliver, where most commercial fishing is prohibited. Further research is warranted to determine if, in addition to catch

per unit area being higher in these areas relative to the sanctuary, there is a difference in catch per unit effort in these areas. That research should also seek to determine the extent, if any, of an edge effect.

Summary Tables of Economic Contributions from Fishing in Stellwagen Bank National Marine Sanctuary (2018$)

Commercial Fishing (2018$)					
Year	**Value of Landings**	**Output**	**Income**	**Employment**	**Vessels**
2007	$19,120,957	$68,106,486	$22,172,020	772	291
2008	$22,084,846	$79,613,129	$26,047,383	889	275
2009	$19,863,127	$70,920,053	$23,142,961	794	287
2010	$23,866,134	$83,897,820	$28,040,949	915	320
2011	$20,402,192	$70,703,207	$23,770,233	777	251
2012	$23,439,282	$79,688,040	$27,796,208	960	264
2013	$16,426,307	$53,504,452	$18,766,454	585	220
2014	$15,578,375	$49,739,232	$17,609,001	590	199
2015	$14,220,443	$44,528,071	$15,511,015	465	181
2016	$23,630,032	$75,521,606	$26,342,897	765	242
2007-2016 Average	$19,863,170	$67,622,210	$22,919,912	751	253

For-Hire Charter Boat Recreational Fishing (2018$)					
Year	**Spending**	**Output**	**Income**	**Jobs**	**Anglers**
2007	$2,383,348	$4,181,662	$1,799,831	32	6,691
2008	$2,355,209	$4,132,291	$1,778,581	32	6,612
2009	$2,815,423	$4,942,297	$2,126,974	38	7,904
2010	$3,040,542	$4,204,465	$1,809,128	32	8,536
2011	$3,108,577	$5,459,313	$2,349,205	42	8,727
2012	$2,352,716	$4,127,917	$1,776,698	32	6,605
2013	$2,049,945	$3,594,860	$1,547,429	28	5,755
2014	$2,088,412	$3,662,698	$1,576,646	28	5,863
2015	$1,036,192	$1,812,198	$780,387	14	2,909
2016	$1,530,245	$2,689,098	$1,157,278	21	4,296
2007-2016 Average	$2,276,061	$3,880,680	$1,670,216	30	6,390

For-Hire Party Boat Recreational Fishing (2018$)					
Year	**Spending**	**Output**	**Income**	**Jobs**	**Anglers**
2007	$6,583,332	$11,638,723	$5,003,580	89	18,482
2008	$4,726,804	$8,345,929	$3,588,646	64	13,270
2009	$5,060,210	$8,937,144	$3,842,717	69	14,206
2010	$4,547,635	$8,027,923	$3,451,971	62	12,767
2011	$6,253,842	$11,054,472	$4,752,534	85	17,557
2012	$4,183,241	$7,382,779	$3,174,795	57	11,744
2013	$2,319,589	$4,083,183	$1,756,608	31	6,512
2014	$3,846,985	$6,786,564	$2,918,427	52	10,800
2015	$2,535,805	$4,464,980	$1,920,739	34	7,119
2016	$4,035,414	$7,120,307	$3,061,982	55	11,329
2007-2016 Average	$4,409,286	$7,784,200	$3,347,200	60	12,379

Private Recreational Boating[1] (2018$)				
Year	**Spending**	**Output**	**Income**	**Jobs**
2009	$7,056,045	$11,872,461	$2,873,612	57
Total of Averages (2018$)				
	Spending	**Output**	**Income**	**Jobs**
Recreation	$13,741,392	$23,537,342	$7,891,027	147
All Fishing		$91,159,551	$30,810,940	898

1. This was a one-year study.

Key Words

Stellwagen Bank National Marine Sanctuary, Commercial Fishing, Recreational Fishing, Economic Contribution, Livelihoods, Local and Regional Economies

Chapter 1: Introduction

This report has been developed for Stellwagen Bank National Marine Sanctuary to support the sanctuary's condition report and management plan review. Commercial and recreational fisheries profiles and economic contributions from the sanctuary were identified as a critical data gap and priority of the site. Many different activities and uses take place across Stellwagen Bank National Marine Sanctuary and the larger National Marine Sanctuary System. To understand users, uses, and economic impacts and/or contributions, profiles are developed, peer-reviewed, and reported to provide data and information to sanctuary management, partners, and stakeholders. For commercial fisheries, profiles include pounds and value of landings, number of vessels, species caught, port of landing, and gear types used. For recreational fisheries, profiles include number of vessels, number of trips, number of person-days, state of landing, top species, and quantity of species caught.

The information in this technical report is presented in many different ways. Data are presented for both commercial and recreational fishing, by different spatial areas, and across time. Information on both fishing effort and the resulting economic contributions are also presented. A variety of data sources and statistical methods were used to generate this report. They are described below and in the relevant chapters.

Profile Development

Many different activities and uses take place across Stellwagen Bank National Marine Sanctuary and the larger sanctuary system. To understand fishing effort, users, uses, and economic impacts and/or contributions, profiles are developed, peer-reviewed, and published to provide data and information to sanctuary management, partners, and stakeholders.

For commercial fisheries, profiles include: pounds and ex-vessel value of landings (also referred to as harvest revenue), number of vessels, species caught, state of landing, and gear types used. For the for-hire recreational fisheries, profiles include: number of vessels, number of trips, number of person-days, state of landing, top species, and quantity of species caught. The information in profiles may vary across sites and uses based upon the data collected or available.

All analyses also compare how the level of effort in Stellwagen Bank National Marine Sanctuary compares to larger regions. Further, smaller regions, such as the edge or sliver (commercial and recreational fishing, respectively) were compared to the sanctuary and the larger regions.

Commercial Fishing Profile

The first item analyzed in the commercial fishing section is the trend in top five species. The top five species are selected based on the total ex-vessel value of landings (or harvest revenue) from 2007 to 2016. It is important to understand what species make up the greatest portion of landings (in terms of dollar value). This helps to understand what fish resources within the sanctuary fishermen rely on most.

The types of gear used to catch fish and shellfish in Stellwagen Bank National Marine Sanctuary were also analyzed. This is important to understand because different gear has different impacts on sanctuary

habitats. Vessel size and harvest revenue distribution are both analyzed to understand how the industry may be changing via expansion, contraction, or consolidation. For example, if the number of total vessels is decreasing, this could indicate a contraction of the industry, but if the number of larger vessels is increasing at the same time this might also indicate a consolidation to larger operations and warrant further exploration to understand why. Alternatively, if an analysis of harvest revenue distribution by number of vessels reveals that the number of vessels with relatively less revenue is increasing, while everything else remains the same, this could indicate new entrants into the industry. All of these factors are important for sanctuary managers to understand.

Other analysis in this report includes the county and state where commercial and recreational fishermen land their catch. It is important to understand where fish are being landed to appreciate where direct economic effects are likely to occur and how changes in the production (or catch) of fish may impact industries (fish processing, marinas, etc.) that depend on landings. Additionally, if the locations of landings change, this may indicate changes in local economies, such as the opportunity cost imposed by the siting of marinas and waterfront properties, warranting further investigation.

For-Hire Recreational Fishing Profile

The analysis of for-hire recreational fishing included findings for the charter fishing industry and the party boat industry. Charter boats are chartered by a person or pre-formed group of people for a set price and time. A head boat or party boat charges per person. Charters tends to be closed parties, where party boats are open. Both are operated by a licensed captain and crew.

The for-hire recreational fishing analysis considered the number of fish kept for both charter and party boats. The number of fish reported in this paper considers only the fish that were kept by recreational for-hire passengers, which is equivalent to their landings. Additionally, the annual number of vessels, vessel trips, and anglers is reported.

Private Recreational Boating

There is limited information provided in this report for recreational boating. In the most recent study available, a snapshot of the private-boating activity within Stellwagen Bank National Marine Sanctuary was estimated for 2009 (Hellin et al. 2011; Starbuck and Lipsky 2013). NOAA's Office of National Marine Sanctuaries (ONMS) and Stellwagen Bank National Marine Sanctuary have not conducted a thorough analysis of recreational boaters in the sanctuary and at the time this report was developed there were no new additional studies on recreational boating in the sanctuary.

Economic Analysis

Understanding and estimating how fishing activity contributes to local economies helps to inform management of the state of marine resources and to provide a voice to the various users of national marine sanctuaries. The primary tool used by national marine sanctuaries (and other federal agencies) to estimate these relationships is an input-output model developed by the United States Forest Service (USFS) in cooperation with the Federal Emergency Management Agency (FEMA). The model, IMPLAN, is now maintained and updated annually by MIG, Inc (Day, 2011). The software provides the mathematical algorithms to estimate the input-output model and the resulting multipliers. The model uses

the Bureau of Economic Analysis (BEA) I/O Benchmark Tables, Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages, Census Bureau's County Business Patterns, and the BEA's Regional Economic Accounts. IMPLAN is used by multiple federal agencies in addition to state and other non-governmental organizations. Economic analysis that use IMPLAN have been cited in myriad peer reviewed journals, and it serves as the basis for National Environmental Policy Act (NEPA) and other regulatory analysis.

ONMS uses IMPLAN to estimate economic contribution to the local area resulting from backward and forward linkages that cascade through ancillary industries. However, whether the analysis uses backward or forward linkages depends on the industry, activities being analyzed, and/or additional data available. Recreational activity estimates the contributions resulting from backward linkages, whereas commercial fishing analysis may estimate the contributions from forward and/or backward linkages.

Backward linkages reflect the direct connection to industries from which an industry purchases its inputs in order to provide its good or service (output). Using an example within the context of Stellwagen Bank National Marine Sanctuary, when a person visits Boston and goes whale watching in Stellwagen Bank National Marine Sanctuary they may spend money to stay at a hotel for their lodging. This direct expenditure is then used by the hotel to purchase the inputs (sheets, heat, food, labor, etc.) necessary to run a hotel. The way the money moves backwards through the economy to support the hotel is an example of backward linkages.

Forward linkages reflect how industries use the output of another industry. For example, a commercial fisherman may catch fish in Stellwagen Bank National Marine Sanctuary, then once ashore, sell the catch to a fish market, seafood processor, or restaurant. From the point of sale forward in time reflects forward linkages and traces how the output of the commercial fishermen benefit the economy. Unless modified, IMPLAN does not normally consider the contribution of commercial fish harvest to the forward links (processing and restaurants that buy seafood), but has been modified by NOAA Fisheries in order to allow these linkages to be estimated (Steinback & Thunberg 2006; Steinback 2004).

The economic contribution of commercial fisheries was estimated using an IMPLAN model that was adjusted to better represent how fish landed move through the economy. Specifically, using the vessel trip report data, exogenous gross commercial harvesting sales (e.g. direct harvesting sales) were estimated, but the model also requires exogenous estimates of how sales will change for the forward-linked wholesalers (direct wholesale sales), fish exchange/auctions (direct fish exchanges sales), and seafood processors (direct seafood processor sales). Available federal and state seafood data were used in the model to estimate how changes in harvesting sales will affect the direct sales of each of those forward-linked establishments. Thus, in the model used by NOAA's Northeast Fisheries Science Center (NEFSC), the assumption is that there are direct effects on commercial harvesters, but that there are also direct effects on wholesalers, fish exchanges, and seafood processors. The appropriate multipliers for each of those sectors is used to estimate the backward-linked indirect effects associated with changes in commercial harvesting sales and the additional backward-linked indirect multiplier effects that occur through changes in wholesaler, fish exchanges, and seafood processor sales (Steinback & Thunberg 2006; Steinback 2004).

This report analyzes economic contributions of activity. The term "economic contributions" is used to describe the number of jobs, income, output[1], value-added, and/or taxes that are supported by existing activity. The term "economic impacts" is used to describe a change in use or economic activity as a result of a shock or change to the system. In this report, the level of activity is being analyzed, and no changes to policy or management are analyzed. Therefore, the correct terminology to use is economic contribution.

Commercial Fishing Contributions

Economic contributions were estimated by NEFSC for commercial fishing. NEFSC has developed a model for estimating economic contributions using IMPLAN throughout the New England region. Their approach has been peer reviewed and used for over a decade (Steinback & Thunberg 2006). Economic contributions are measured in terms of output, employment, and income and consider both forward and backward linkages to the economy.

Recreational Fishing Contributions

As stated previously, the IMPLAN model measures backward linkages, unless adjustments are made to the model. When estimating economic contributions from recreational activity within sanctuaries, ONMS did not use the adjustments to the IMPLAN model specifications that the NEFSC uses for the recreational fishing analysis. This is because the adjustments made to IMPLAN by the NEFSC are specific to commercial fishing activity. This means only the backward linkages of activity were considered.

Using the estimates of the total number of anglers and angler expenditure profiles developed by NOAA Fisheries for Massachusetts, the total expenditures associated with recreational fishing were estimated (Lovell et al. 2013). These estimates of expenditures were then analyzed using IMPLAN to estimate the economic contribution (output, income, value-added, and employment) of recreational activity within a sanctuary.

Data Sources and Types

Commercial and for-hire recreational fishing in the sanctuary is characterized in this report through the use of NOAA Fisheries' Data Matching and Imputation System (DMIS). DMIS supports the region's quota monitoring programs by matching different data sources associated with a fishing trip. The three main data sources matched are vessel trip reports, dealer reports, and trip notifications/declarations. Vessel trip reports are the primary means of collecting catch data from commercial and recreational fishers. Other data sources include observer reports, species catch reports, and permit information. Since DMIS records do not include fishing location, vessel trip report point data were added to DMIS records from 2007 to 2016 to determine whether DMIS derived fishing activity occurred within the sanctuary.

NOAA Fisheries requires all federally permitted commercial and for-hire vessels fishing in federal waters (3-200 miles offshore) to report their catch. These reports include information on where the fishing

[1] Sales and output are often used interchangeably. NOAA Fisheries uses the term sales in the Fisheries Economics of the United States Report (NMFS 2018).

occurs, what species were targeted and caught, and the port of landing. The method for reporting the location of fishing may vary by gear type. If an operator fishes in more than one statistical area, then they must submit a vessel trip report for each statistical area where they start to haul back or retrieve gear. If the tow or the placement of fixed gear (e.g., gillnets) crosses statistical area boundaries, the area reported must be the area where the retrieval or haul back gear started (NOAA Fisheries 2019a).

Vessel trip reports are important because they provide data that inform fishery management decisions. They are used in this report to better understand the level of fishing activity taking place within and around the sanctuary. Vessel trip report data are considered a reliable estimator of commercial and for-hire recreational fishing activity at the spatial scale of the sanctuary (NOAA Office of National Marine Sanctuaries 2010; see p. 147). Data were gathered or analyzed to document and typify the spatial distribution, landings value (ex-vessel, dockside sales paid to fishers) and volume, and species composition representative of commercial fisheries in the sanctuary. Ex-vessel or landings value is the price paid to fishers upon direct sale of fish landed.

DMIS does not include data on fishers who possess only a federal lobster permit or a federal highly migratory species (i.e., bluefin tuna) permit. Specifically, the highly migratory species permit categories not included in DMIS are "general category," "angling," and "charter/headboat," which make up the majority of highly migratory species permit holders. However, highly migratory species longline permit holders are required to submit vessel trip reports and therefore are included in the DMIS data (NOAA 2019b). Highly migratory species permit holders are not required to record the exact location where a tuna was caught; rather, they are only required to list the area of the catch, which tend to be large reporting areas extending from shore out to the exclusive economic zone. NOAA Fisheries does produce an annual stock assessment report for the Atlantic and Gulf of Mexico, but the data are not collected or analyzed in a way that provides estimates for specific locations, such as Stellwagen Bank National Marine Sanctuary. Individuals holding only a federal lobster permit do not have to submit a vessel trip report and are therefore not included in DMIS. It is unknown how many individuals holding federal lobster permits do not submit vessel trip report data and are thus not included in this analysis.

Spatial Analysis

In addition to analyzing the commercial and recreational effort within Stellwagen Bank National Marine Sanctuary, there were several other spatial areas analyzed. For commercial fisheries, Stellwagen Bank National Marine Sanctuary, the "edge," and Gulf of Maine (as defined below) were analyzed. Recreational fisheries were analyzed for Stellwagen Bank National Marine Sanctuary, the "sliver," and statistical area 514. The rationale for analyzing these spatial areas is described below.

Stellwagen Bank National Marine Sanctuary

This area is analyzed to understand the level of commercial and recreational effort that occurs within the sanctuary and the resulting economic contributions. This analysis provides management with data related to the commercial and recreational fishing that occurs within the sanctuary, the level of dependency of fishers on sanctuary resources, and how fishing supports the local economies. More specifically, this analysis details the effort and economic contributions of commercial and recreational fishing reported on vessel trip reports.

Commercial Fishing Spatial Analysis

Gulf of Maine

In this report, the Gulf of Maine refers to the following statistical areas: 512, 513, 514, 515, 521, 522, 525, 526, 561 and 562. The rationale for analyzing a larger area is to understand how the sanctuary fits into the larger regional context. Although this area includes fish stocks from both New England/Georges Bank and Gulf of Maine stocks, for the purposes of this report the combination of these statistical areas is referred to at the Gulf of Maine.

Vessels that reported catch within Stellwagen Bank National Marine Sanctuary were uniquely identified. This allowed for the comparison of these unique vessel trip reports within the sanctuary compared to the Gulf of Maine (as defined in this report). The map below in Figure 1.1 indicates the spatial areas used in this analysis. The outlined statistical areas in Figure 1.2 indicate the spatial distribution of the vessels reporting activity within Stellwagen Bank National Marine Sanctuary by commercial and party/charter. This total allows impacts of commercial and recreational fishing activity in Stellwagen Bank National Marine Sanctuary to be compared against the economic activity for the broader region.

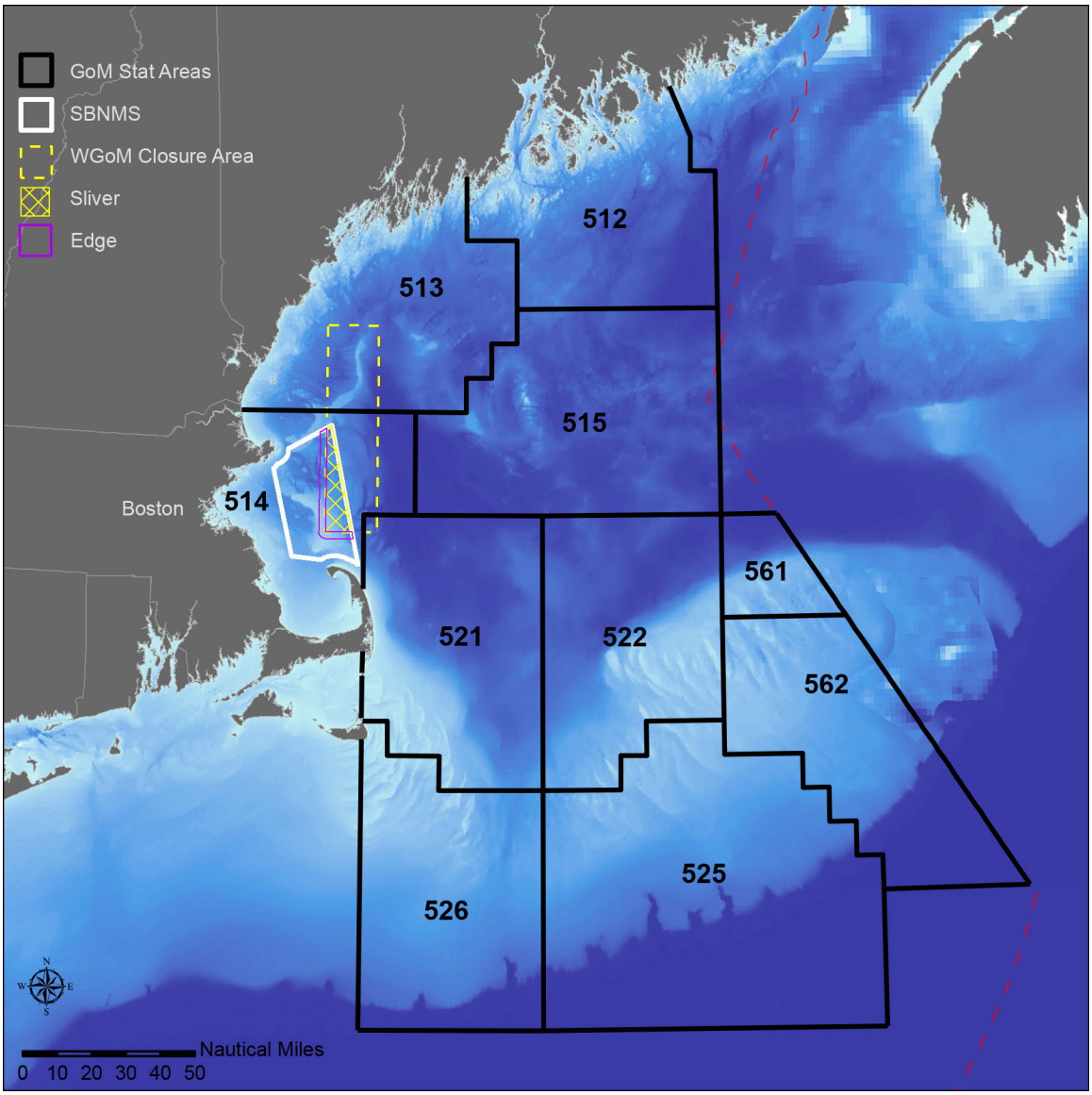

Figure 1.1 NOAA Fisheries statistical areas of commercial and recreational fishing vessels reporting activity within Stellwagen Bank National Marine Sanctuary. Image: M. Thompson/NOAA

The Edge

"The edge" consists of a two-nautical-mile buffer on the southern and western edges of "the sliver." Since 1998, the sliver has had commercial fishing gear restrictions in place. These restrictions have presumably resulted in catchable biomass (fish) spilling over into the rest of Stellwagen Bank National Marine Sanctuary. This report attempts to analyze the "edge effect," or the economic activity generated by the sliver. For commercial fishing, the economic activity was analyzed by analyzing catch along the edge and comparing that to catch in the rest of Stellwagen Bank National Marine Sanctuary. The two-nautical-mile buffer along the edge makes up 12.2% of the total sanctuary area (Figure 1.3).

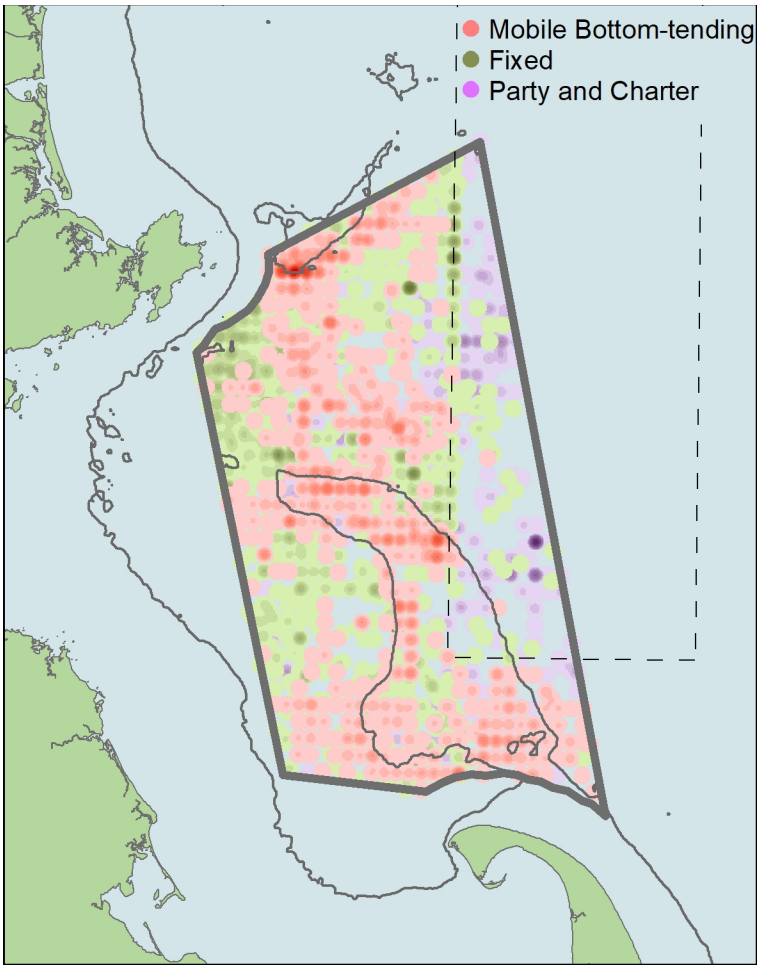

Figure 1.2 Spatial distribution of commercial and recreational for-hire fishing based on vessel trip report data in 2016. Pink circles represent commercial, mobile bottom-tending gear; green circles represent commercial fixed gear; and purple circles represent for-hire party and charter gear.

Source: Vessel trip report data – 1,000 meter search radius, Jenks Natural Breaks Symbology

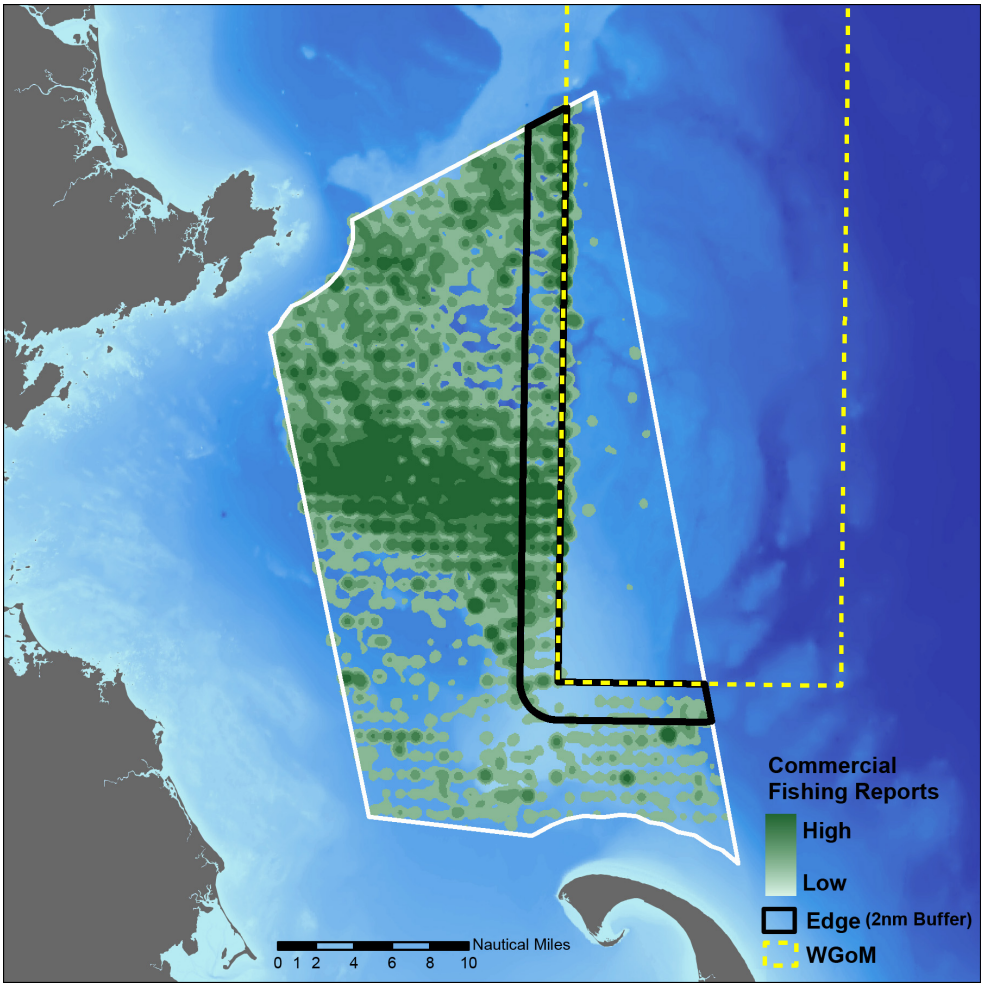

Figure 1.3 Spatial distribution of commercial fishing based on vessel trip report data in 2016. Note: the dashed polygon represents the western Gulf of Maine habitat closed area, which overlaps 22% of Stellwagen Bank National Marine Sanctuary. The area of overlap is called the sliver. The edge is the 2 nautical mile buffer around the western and southern edge of the sliver. The edge is 78 square nautical miles (12.2% of the sanctuary). Vessel trip reports of gillnet gear in the overlap area are believed to be a reporting error.

Source: Vessel trip report data – 1,000 meter search radius, Jenks Natural Breaks Symbology

Recreational Fishing Spatial Analysis

Statistical Area 514

The full extent of the area analyzed for recreational fishing is smaller than that used in commercial fishing. Although explained in more detail below, like the commercial fishing, recreational for-hire operators in the sanctuary were identified first. Then, the statistical areas the operator fished in were analyzed. The primary statistical block for those operating in the sanctuary was statistical area 514. Additionally, the commercial fishing economic contributions were estimated using a customized IMPLAN specification that has been adapted for commercial fishing activity in the New England region. However, the recreational fishing model did not use a customized version of IMPLAN. The recreational fishing analysis uses the base IMPLAN model which allows the study area for analysis to be more specific to the geography of Stellwagen Bank National Marine Sanctuary. This was done so that the

maximum spatial extent analyzed (the Gulf of Maine, or statistical area 514) is consistent with the economic models used to estimate contributions.

The Sliver

The 22% overlap of the Western Gulf of Maine Closure Area with the sanctuary is referred to as the sliver. The Western Gulf of Maine Closure Area is closed indefinitely year-round to all bottom-tending mobile gear, including bottom-tending gillnets, clam and scallop dredges, and shrimp trawls. Allowable gears include lobster pots, hagfish pots, pelagic longline, pelagic hook and line, recreational hook and line, pelagic gillnets, tuna purse seining, and midwater trawls except for shrimp (NOAA 2016). Charter and party boats and recreational vessels are able to fish in the Western Gulf of Maine Closure Area. Analyzing this closed area provides insight into the increased economic output of for-hire party and charter fishing entities that rely on this area as a refuge from commercial fishing.

The Fisheries Series

This report is the technical appendix to a series of reports and science communication products. This document presents the data used, methods, and detailed results. Once internal review is complete by ONMS, the report is then peer reviewed. The technical appendix is written for economists and subject matter experts as the primary audience. This appendix is cited within the 2020 Stellwagen Bank National Marine Sanctuary condition report and serves as the foundation for much of the economic and effort fisheries information presented in the condition report. It is likely that this technical paper will also support the management review process.

Chapter 2: Profiles of Commercial Fisheries in the Gulf of Maine

Gulf of Maine

In this report, the Gulf of Maine refers to the following statistical areas: 512, 513, 514, 515, 521, 522, 525, 526, 561, and 562. Analyzing a large area helps understand how the sanctuary fits into the larger regional context. Although this area includes fish stocks from both New England/Georges Bank and Gulf of Maine stocks, for the purposes of this report the combination of these statistical areas is referred to as the Gulf of Maine. Figure 1.1 above shows the region.

Catch by Species/Species Groups

Across the 10-year study period of 2007-2016, sea scallops were the number one ranked fishery in the Gulf of Maine on the basis of total value, accounting for $1.9 billion or 48.4% of all harvest revenue from the Gulf. This was followed by lobster at $631.7 million (16.4%), cod at $211.3 million (5.48%), Atlantic herring at $203.4 million (5.28%), and haddock at $144.6 million (3.75%). These top five species/species groups accounted for more than 79% of the 2007-2016 total harvest revenue from the Gulf of Maine (Table 2.1).

Table 2.1 Pounds and Value of Landings in the Gulf of Maine by Species, 2007-2016 Totals (2017$)

Species	Pounds	Total Value 2007-2016	%Total Value 2007-2016
Sea scallop	175,748,701	$1,865,094,849	48.42%
Lobster	140,336,890	$631,686,227	16.40%
Cod	96,775,710	$211,261,718	5.48%
Atlantic herring	1,330,120,623	$203,404,686	5.28%
Haddock	96,602,605	$144,599,664	3.75%
Pollock	114,225,533	$107,499,403	2.79%
Monkfish	34,201,312	$103,693,017	2.69%
Winter flounder	38,404,044	$81,462,894	2.11%
Silver hake	86,796,658	$60,133,526	1.56%
White hake	30,506,977	$51,513,755	1.34%
Other	504,009,171	$391,640,986	10.17%

Trends in Top Five Species Groups

Sea Scallops

From 2007 to 2016, sea scallops were ranked highest in terms of total ex-vessel value for all commercial fisheries in the Gulf of Maine. Sea scallop ex-vessel value fell in 2007 and 2008 then rose from 2009 to 2012, with a large spike in 2012 when catch rose by over 12 million pounds. Pounds landed also spiked in 2012 when it rose by more than $122 million. Since 2012, landings have declined with 9.8 million pounds

landed with a value of $135.8 million in 2016. The variation in sea scallop pounds and value in the study geography could be the result of the access area rotational program. The rotational management strategy was designed to postpone mortality of small scallops and reduce total fishing time by concentrating fishing effort on larger, more valuable areas where catch per unit effort tends to be higher (NEFMC 2008). This means that when Georges Bank is closed, scallop fishermen may relocate effort outside of the region. Value per pound of sea scallops has risen from just under $8 per pound in 2007 to nearly $14 per pound in 2016 (Figure 2.1, Table A.1). In this report, pounds of sea scallops landed are listed as their meat weight (without the shell).

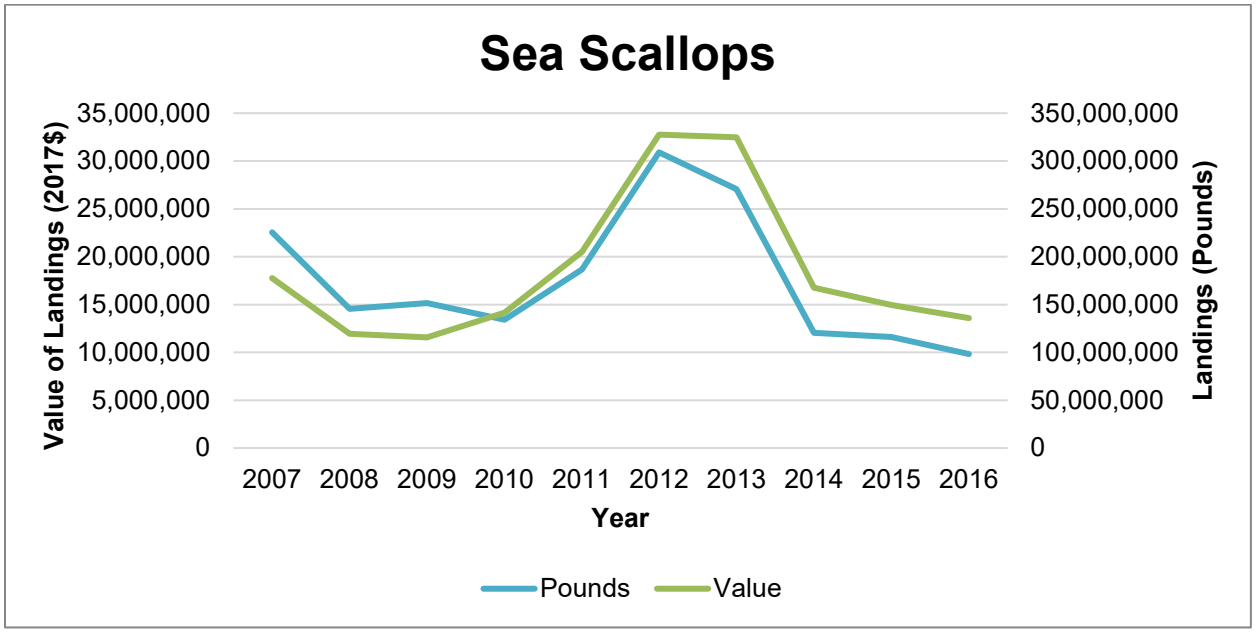

Figure 0.1 Pounds and Value (2017$) of Sea Scallops Landed in the Gulf of Maine (2007-2016)

Lobster

From 2007-2016, lobster had the second highest total value of landings in the Gulf of Maine. Lobster landings have steadily risen since 2007 with both pounds and value reaching high points in 2016. Value per pound has been variable from 2007 to 2016, with a high of $5.80 in 2007 and a low of $3.82 in 2012 (Figure 2.2 and Table A.2).

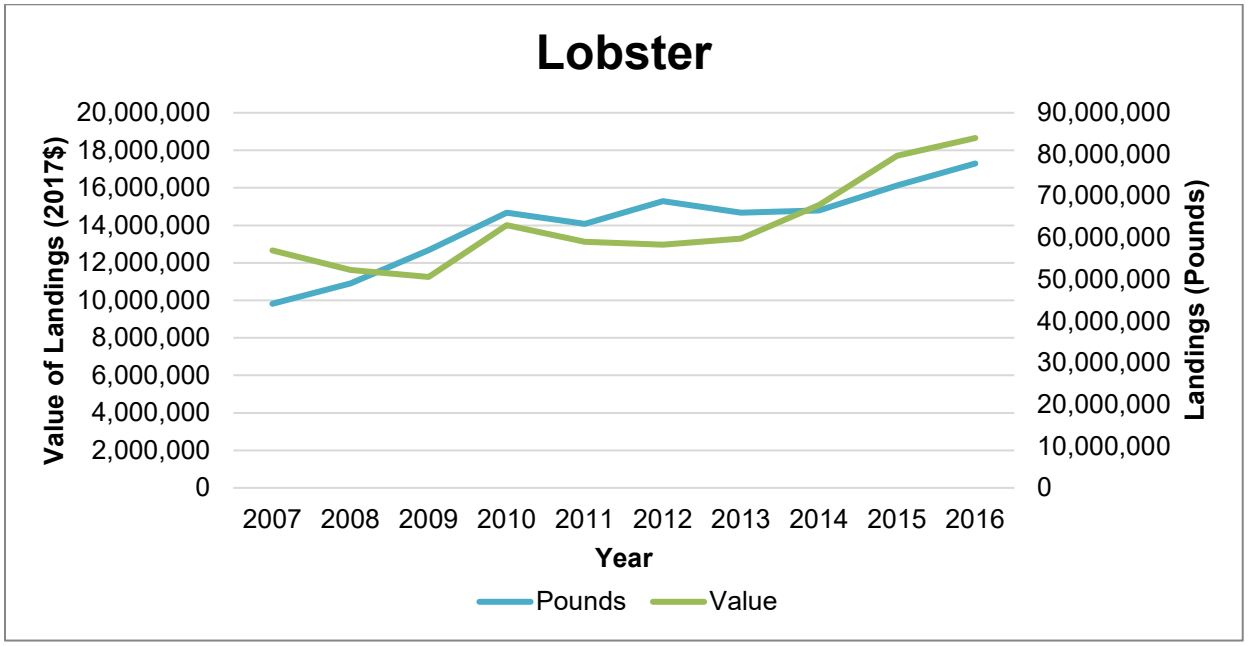

Figure 0.2 Pounds of and Value (2017$) of Lobster Landed in the Gulf of Maine (2007-2016)

Cod

From 2007-2016, cod had the third highest total value of landings in the Gulf of Maine. Landings of cod was high from 2007-2011 before steadily decreasing to a low point in 2016 with 2.2 million pounds landed at a value of $5.0 million. Value per pound of cod peaked in 2012 at $2.64 (Figure 2.3 and Table A.3).

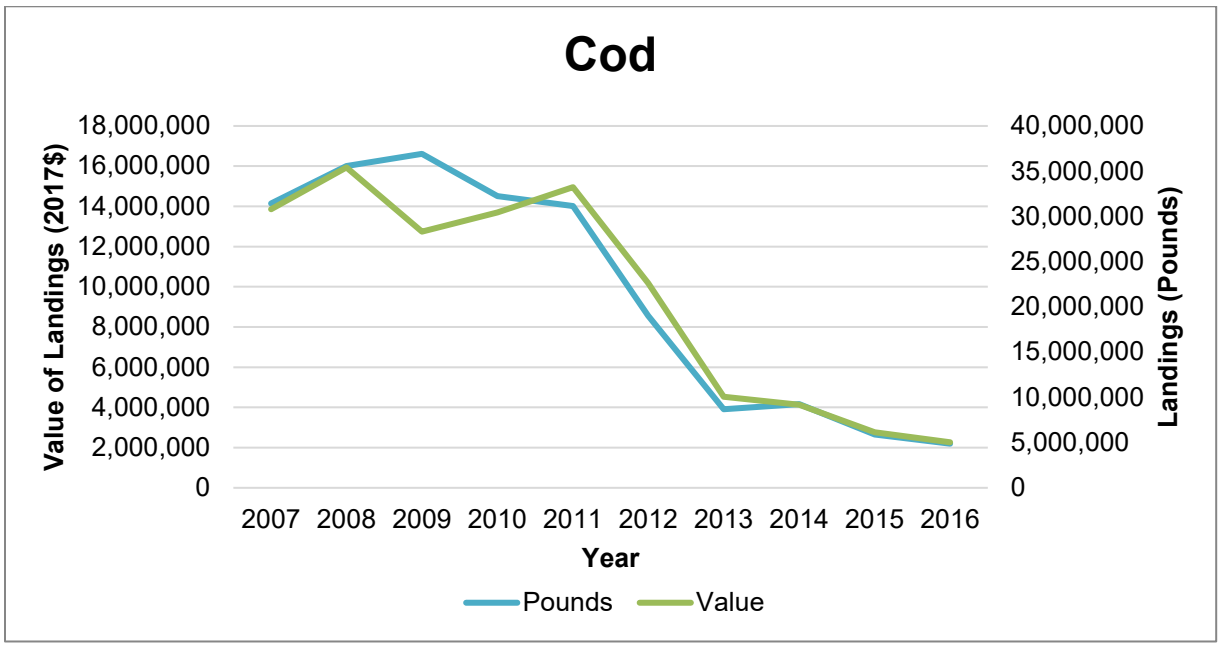

Figure 0.3 Pounds and Value (2017$) of Cod Landed in the Gulf of Maine (2007-2016)

Atlantic Herring

From 2007-2016, Atlantic herring had the fourth highest total value of landings in the Gulf of Maine. Pounds landed of Atlantic herring have been more variable than its ex-vessel value with large drops in 2010 and 2016. Value of landings have steadily risen with a high of $26 million in 2016. Value per pound of Atlantic herring was relatively constant from 2007 to2015 but then saw large increase in 2016 (Figure 2.4 and Table A.4).

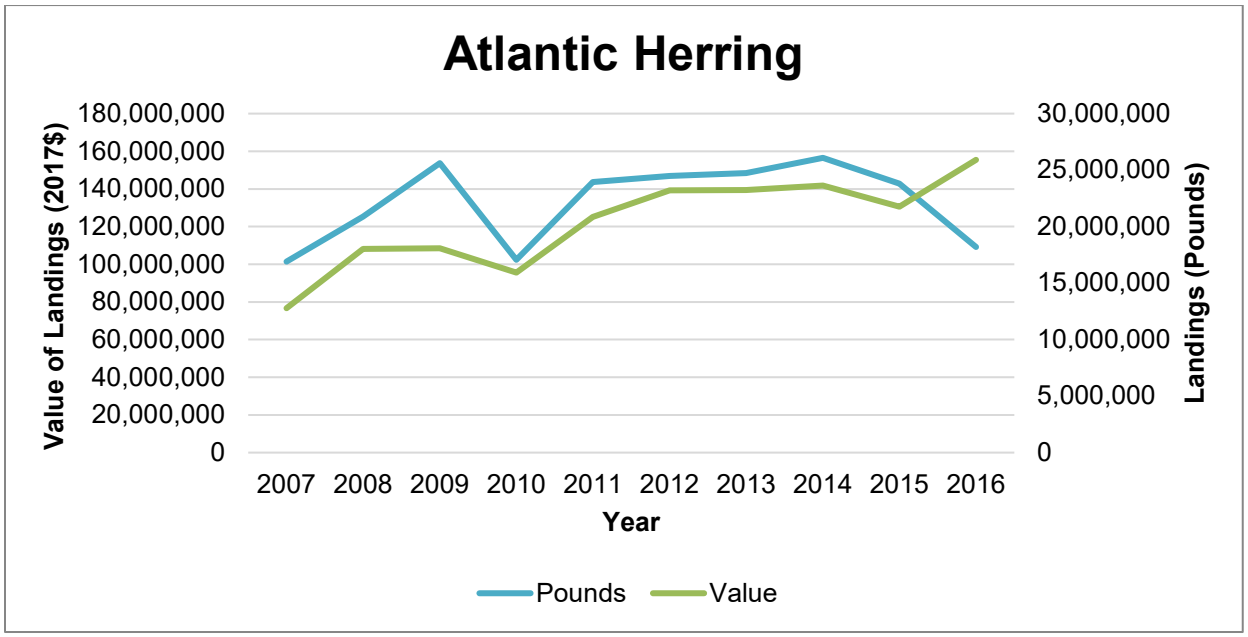

Figure 0.4 Pounds and Value (2017$) of Atlantic Herring Landed in the Gulf of Maine (2007-2016)

Haddock

From 2007 to 2016, haddock had the fifth highest total value of landings in the Gulf of Maine. Haddock landings spiked in 2010 to 18.7 million pounds and a value of $24.2 million. Both value and pounds landed fell from 2010 to 2011, with some recovery from 2014-2016. Value per pound of haddock was relatively constant from 2007 to 2016, with two notable price peaks in 2007 and 2012 when the value per pound was over two dollars (Figure 2.5 and Table A.5).

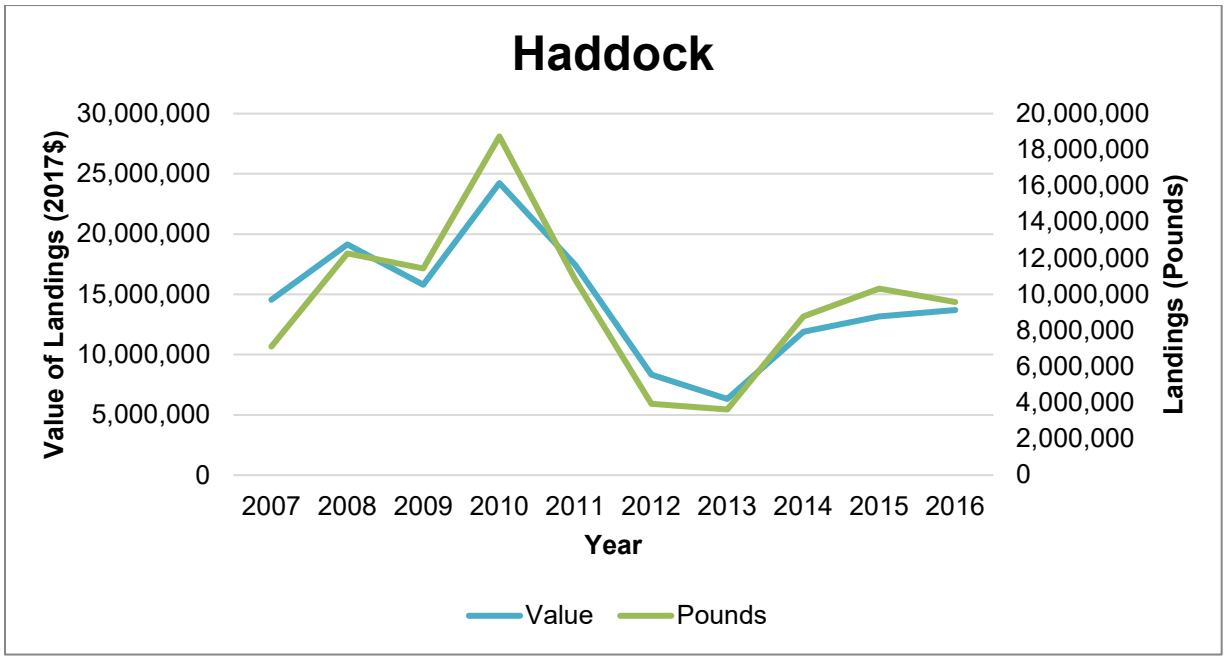

Figure 0.5 Pounds and Value (2017$) of Haddock Landed in the Gulf of Maine (2007-2016)

Catch by Gear Type

Most of the landings in the Gulf of Maine are landed using midwater pair trawls, bottom fish otter trawls, and purse seines. These three gear types account for roughly two-thirds of pounds landed in the Gulf of Maine (Table 2.2).

When considering the gear types that account for most of the value of the commercial fisheries, sea scallop dredges, bottom fish otter trawls, and lobster pots account for 81.6% of the total value landed in the Gulf (Table 2.3).

Table 2.2 Annual Landings in Pounds by Gear Type in the Gulf of Maine

Gear Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	% Total 2007-2016	Total
Midwater pair trawl	59,610,864	73,571,431	105,694,149	68,083,449	95,284,300	86,535,668	80,764,068	86,867,695	63,387,607	35,387,352	28.5%	755,186,583
Fish bottom otter trawl	72,819,021	67,348,790	66,801,192	64,919,993	63,277,462	59,142,561	53,114,577	53,383,451	52,341,522	44,449,941	22.6%	597,598,510
Purse seine	43,824,893	59,940,743	41,560,989	17,368,648	34,365,834	42,858,842	49,065,814	54,542,202	50,232,133	56,098,232	17.0%	449,858,330
Midwater otter trawl	14,225,514	8,367,518	8,770,066	16,242,919	13,690,370	17,092,926	25,470,919	26,697,166	34,201,387	28,278,101	7.3%	193,036,885
Sink gill net	20,700,154	23,833,435	23,176,268	18,110,314	18,554,958	17,255,308	10,856,353	14,185,076	10,652,772	13,643,625	6.5%	170,968,264
Lobster pots	12,018,256	12,999,402	15,003,063	17,135,728	15,464,633	17,097,264	17,936,848	19,015,495	19,569,581	20,954,128	6.3%	167,194,399
Sea scallop dredge	20,831,806	12,637,068	13,085,801	12,243,436	17,278,673	29,457,199	26,467,750	11,367,622	10,081,215	8,516,414	6.1%	161,966,984
Shrimp bottom otter trawl	8,187,624	6,570,725	4,175,516	9,704,389	7,254,693	3,343,748	541,236	78,335	70,664	50,808	1.5%	39,977,738
Bottom longline	1,895,715	1,628,040	1,915,647	2,109,033	2,042,075	2,820,645	1,234,915	3,294,023	2,960,720	6,380,617	1.0%	26,281,429
Haddock separator otter trawl	0	0	0	3,874,809	4,540,264	931,933	858,188	4,346,573	6,188,531	3,923,297	0.9%	24,663,593
Other	6,595,894	7,270,765	6,265,799	5,464,287	5,806,127	5,014,912	4,394,697	6,128,662	7,823,304	6,231,068	2.3%	60,995,515
Total	260,709,741	274,167,917	286,448,489	235,257,006	277,559,390	281,551,006	270,705,364	279,906,301	257,509,435	223,913,582	100.0%	2,647,728,230

Table 2.3 Annual Ex-Vessel Value of Landings by Gear Type in the Gulf of Maine, 2017$

Gear Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	% Total 2007-2016	Total
Sea scallop dredge	$161,454,439	$101,816,298	$97,863,450	$128,646,330	$188,689,316	$309,079,996	$315,099,694	$155,053,676	$127,176,235	$115,921,370	44.2%	$1,700,800,804
Fish bottom otter trawl	$107,404,783	$98,568,394	$82,969,373	$91,604,892	$93,383,717	$88,917,614	$73,137,602	$67,657,151	$65,837,541	$61,826,835	21.6%	$831,307,901
Lobster pots	$52,079,227	$48,731,136	$48,053,209	$61,288,887	$56,868,617	$56,258,272	$59,647,355	$68,690,743	$78,404,135	$83,014,652	15.9%	$613,036,233
Sink gill nets	$24,350,929	$29,196,194	$23,014,678	$20,946,989	$19,544,559	$16,319,054	$11,662,916	$13,680,798	$9,353,702	$9,368,302	4.6%	$177,438,121
Scallop chain-mat dredge	$16,054,167	$18,269,781	$17,520,780	$12,362,881	$16,474,962	$18,827,546	$12,060,953	$13,136,653	$10,987,754	$8,730,334	3.7%	$144,425,810
Midwater pair trawl	$7,144,095	$10,642,656	$11,524,314	$10,248,422	$13,072,191	$13,492,183	$12,003,932	$13,457,807	$9,393,303	$7,235,204	2.8%	$108,214,106
Purse seine	$6,759,022	$8,346,964	$5,769,915	$2,998,360	$5,492,589	$7,011,049	$8,254,549	$8,900,198	$8,209,307	$15,147,230	2.0%	$76,889,183
Haddock separator otter trawl	$0	$0	$0	$5,590,690	$6,754,413	$1,693,991	$1,299,599	$5,954,022	$8,058,055	$5,674,571	0.9%	$35,025,341
Midwater otter trawl	$2,116,216	$1,297,270	$1,249,230	$2,690,851	$2,286,060	$2,891,033	$4,436,376	$4,138,755	$5,539,440	$5,901,002	0.8%	$32,546,234
Shrimp bottom otter trawl	$4,565,843	$3,785,428	$2,206,852	$5,849,271	$5,748,141	$3,542,000	$694,492	$27,919	$58,585	$147,423	0.7%	$26,625,956
Other	$10,769,283	$8,802,355	$8,267,879	$9,295,243	$10,109,088	$7,302,089	$4,772,473	$6,975,977	$20,250,768	$19,135,886	2.7%	$105,681,040
Total	$392,698,003	$329,456,474	$298,439,682	$351,522,815	$418,423,653	$525,334,827	$503,069,941	$357,673,699	$343,268,825	$332,102,810	100.0%	$3,851,990,729

Vessels by Size

The number of vessels in the Gulf of Maine has generally decreased from 2007 to 2016. From 2007 to 2016, on average, vessels less than 50 feet made up the majority of vessels at 55.7%, vessels greater than 70 feet were the second largest category at 33.1%, and vessels between 50 and 70 feet were the smallest category at 11.2%.

Table 2.4 Number of Vessels by Size in the Gulf of Maine

Year	Less than 50 Feet	50-70 Feet	Greater than 70 Feet	Total
2007	766	171	437	1,374
2008	716	142	358	1,216
2009	682	125	365	1,172
2010	725	144	389	1,258
2011	635	124	384	1,143
2012	613	129	399	1,141
2013	545	121	411	1,077
2014	518	99	353	970
2015	530	105	334	969
2016	535	95	291	921
2007-2016 Average	627	126	372	1,124
Percentage of Total Vessels	55.7%	11.2%	33.1%	100.0%

The number of vessel trips in the Gulf of Maine was steady from 2007 to 2010 but has since decreased. Trips for vessels less than 50 feet follow a similar trend. Vessel trips for the other two length categories have generally decreased since 2007. For trips on vessels between 50 and 70 feet, this decrease has been steady. Trips on vessels greater than 70 feet saw a large increase in 2012 but have been overall trending downward just like the other length categories. The majority of vessel trips come from vessels less than 50 feet with an average of roughly 35,000 trips per year, followed by vessels greater than 70 feet with an average of 3,585 trips per year. The fewest trips come from vessels between 50 and 70 feet with an average of 3,549 trips per year.

Table 2.5 Number of Trips by Vessel Size in the Gulf of Maine

Year	Less than 50 Feet	50-70 Feet	Greater than 70 Feet	Total
2007	41,191	5,278	4,485	50,954
2008	41,054	4,832	3,710	49,596
2009	41,685	4,385	3,513	49,583
2010	42,409	4,419	3,598	50,426
2011	36,673	3,941	3,599	44,213
2012	35,698	3,673	4,100	43,471
2013	28,288	2,674	3,905	34,867
2014	27,715	2,141	3,162	33,018
2015	27,138	2,193	2,967	32,298
2016	28,903	1,949	2,807	33,659
2007-2016 Average	35,075	3,549	3,585	42,209
Percentage of Total Trips	83.1%	8.4%	8.5%	100.0%

Vessels by Home Port

Most of the vessels in the Gulf of Maine have their homeport in Massachusetts, which accounts for around 67% of all vessels. This is followed by Maine at 17.6%, New Hampshire at 5.6%, Rhode Island at 3.0%, and New Jersey at 3%. The remaining states account for less than 4.0% of homeport locations in total.

Table 2.6 Number of Vessels by Port of Landing in the Gulf of Maine

Year	CT	DE	MA	MD	ME	NC	NH	NJ	NY	RI	VA	Total
2007	7	0	928	1	234	2	76	46	15	47	18	1,374
2008	9	0	814	0	245	2	59	20	11	40	16	1,216
2009	9	0	786	0	225	1	66	24	9	32	20	1,172
2010	8	0	811	0	234	1	60	61	13	35	35	1,258
2011	7	0	740	0	210	1	67	54	9	34	21	1,143
2012	10	0	735	0	198	10	68	56	3	30	30	1,141
2013	5	1	710	0	178	1	62	38	10	33	39	1,077
2014	9	0	680	0	150	3	59	17	5	27	19	970
2015	4	1	693	0	158	4	53	12	7	36	1	969
2016	1	0	667	0	150	3	62	9	7	21	1	921
2007-2016 Average	7	0	756	0	198	3	63	34	9	34	20	1,124
Percentage of Total Vessels	0.6%	0.0%	67.3%	0.0%	17.6%	0.2%	5.6%	3.0%	0.8%	3.0%	1.8%	100.0%

Harvest Revenue Distribution by Number of Vessels

The amount of revenue that vessels in the Gulf of Maine generate has increased from 2007 to 2016. In 2007, 75 vessels each earned over $1 million (5.5% of all vessels) but by 2016, 91 vessels were earning over $1 million (9.9% of all vessels). (Years 2008 to 2015 can be found in Appendix A.)

Table 2.7 Harvest Revenue Distribution in the Gulf of Maine 2007 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1374	100.00%	100.00%
Greater than $1,000,000	75	5.46%	24.70%
Greater than $300,000	429	31.22%	75.78%
Greater than $200,000	608	44.25%	87.42%
Greater than $100,000	832	60.55%	95.82%
Greater than $50,000	979	71.25%	98.69%
Greater than $30,000	1040	75.69%	99.31%
Greater than $10,000	1140	82.97%	99.81%
Less than $10,000	234	17.03%	0.19%
Less than $5,000	169	12.30%	0.07%
Less than $1,000	75	5.46%	0.01%
Less than $100	16	1.16%	0.00%

Table 2.8 Harvest Revenue Distribution in the Gulf of Maine 2016

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	921	100.00%	100.00%
Greater than $1,000,000	91	9.88%	41.24%
Greater than $300,000	336	36.48%	82.96%
Greater than $200,000	437	47.45%	90.44%
Greater than $100,000	585	63.52%	97.11%
Greater than $50,000	674	73.18%	99.07%
Greater than $30,000	714	77.52%	99.55%
Greater than $10,000	768	83.39%	99.86%
Less than $10,000	153	16.61%	0.14%
Less than $5,000	116	12.60%	0.05%
Less than $1,000	53	5.75%	0.01%
Less than $100	9	0.98%	0.00%

Landings by State

Massachusetts and Maine account for the majority of the value and pounds landed from the Gulf of Maine, with over 92% of the pounds landed and around 89% of the value landed going to those states. Landings by both pounds and value peaked in 2012 and have steadily declined since (tables 2.16 and 2.17). This decline in landings could reflect a shift in fishing effort to other areas such as the Mid-Atlantic due to the rotational management of the scallop fishery.

Table 2.9 Pounds Landed by State and Year from the Gulf of Maine

State	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total
Connecticut	420,343	1,063,164	738,017	869,094	686,007	602,565	1,211,958	1,062,023	1,098,314	1,003,368	8,754,853	0.33%
Delaware	0	5,200	0	0	0	0	101,923	0	9,203	0	116,326	0.00%
Florida	160	0	0	0	0	0	0	0	0	0	160	0.00%
Massachusetts	157,595,336	164,287,733	189,180,899	141,713,023	151,123,271	156,222,207	139,958,378	152,413,209	143,378,752	123,111,278	1,518,984,084	57.82%
Maryland	96	0	0	0	0	0	0	24	0	0	120	0.00%
Maine	71,902,555	87,957,931	73,398,517	73,889,539	106,355,564	107,021,625	104,042,664	106,010,466	93,608,219	86,015,610	910,202,691	34.64%
North Carolina	61,625	124,142	0	4,803	11,412	330,408	3,769	58,471	83,015	54,987	732,633	0.03%
New Hampshire	8,783,011	8,113,247	11,766,249	10,650,666	10,157,210	9,958,310	7,041,675	6,814,267	8,749,848	5,174,362	87,208,845	3.32%
New Jersey	1,097,278	1,898,987	330,550	737,433	817,302	890,936	1,740,291	325,355	833,655	75,279	8,747,066	0.33%
New York	2,865,032	1,674,337	729,815	1,782,907	776,224	67,074	1,790,470	1,064,429	975,954	1,614,259	13,340,500	0.51%
Rhode Island	16,758,738	8,249,908	8,448,940	4,273,188	5,644,731	2,997,363	8,876,519	7,126,592	7,965,433	5,497,525	75,838,937	2.89%
South Carolina	528	0	0	0	0	0	0	0	0	0	528	0.00%
Virginia	273,565	291,241	246,214	332,841	428,718	440,932	1,155,207	146,098	34,164	18,399	3,367,379	0.13%
Total	259,758,266	273,665,891	284,839,201	234,253,495	276,000,439	278,531,419	265,922,853	275,020,934	256,736,556	222,565,068	2,627,294,122	100.00%

Table 2.10 Ex-Vessel Value of Catch Landed by State and Year from the Gulf of Maine

State	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total
Connecticut	$1,111,577	$1,772,790	$1,728,834	$976,671	$2,717,409	$987,951	$1,171,125	$1,080,155	$1,729,874	$1,025,271	$14,301,658	0.38%
Delaware	$0	$42,256	$0	$0	$0	$0	$2,121,002	$0	$438,086	$0	$2,601,345	0.07%
Florida	$488	$0	$0	$0	$0	$0	$0	$0	$0	$0	$488	0.00%
Massachusetts	$289,795,949	$249,435,093	$229,715,165	$262,003,244	$314,634,660	$422,507,145	$407,169,145	$275,346,799	$259,213,761	$250,402,202	$2,960,223,163	77.81%
Maryland	$129	$0	$0	$0	$0	$0	$0	$24	$0	$0	$153	0.00%
Maine	$44,329,229	$44,611,491	$33,903,222	$41,951,167	$43,603,476	$47,748,990	$43,865,792	$46,082,455	$45,156,904	$48,134,051	$439,386,777	11.55%
North Carolina	$300,554	$411,606	$0	$15,133	$13,666	$529,815	$20,579	$109,894	$221,467	$174,826	$1,797,541	0.05%
New Hampshire	$17,414,818	$14,805,362	$14,307,722	$17,275,054	$18,789,282	$18,005,695	$15,892,881	$16,163,820	$16,764,454	$19,156,360	$168,575,449	4.43%
New Jersey	$4,737,733	$1,445,053	$2,650,838	$8,984,137	$9,101,744	$9,150,970	$4,118,057	$2,442,442	$988,657	$116,634	$43,736,265	1.15%
New York	$3,191,343	$1,825,530	$652,143	$1,831,102	$940,584	$344,285	$1,976,563	$1,265,730	$1,169,077	$1,600,605	$14,796,962	0.39%
Rhode Island	$25,681,469	$12,496,584	$10,817,987	$8,179,185	$14,759,197	$11,521,949	$17,217,412	$10,380,572	$15,707,399	$9,896,145	$136,657,900	3.59%
South Carolina	$564	$0	$0	$0	$0	$0	$0	$0	$0	$0	$564	0.00%
Virginia	$2,086,560	$1,559,471	$1,907,714	$4,023,788	$4,430,643	$3,087,436	$3,424,415	$1,784,419	$208,449	$45,328	$22,558,224	0.59%
Total	$388,650,413	$328,405,236	$295,683,626	$345,239,482	$408,990,662	$513,884,236	$496,976,972	$354,656,311	$341,598,129	$330,551,421	$3,804,636,488	100.00%

Chapter 3: Economic Contributions of Commercial Fisheries in the Gulf of Maine

Economic Contribution Summary

The analysis here (and in chapters 5 and 7) was completed by NEFSC using IMPLAN[2], an input/output modeling software. The model has been adjusted by NEFSC to be more accurate and reflective of the way commercial fishing economic activities move through the region.[3]

Table 3.1 provides a more detailed explanation of the terminology used in this report, as defined by IMPLAN. The value of landings is the market value of the meat weight for the fishes landed within the Gulf of Maine.

Impacts/contributions are defined as direct, indirect, or induced (Table 3.2). In short, direct effects are those that occur within the sector of the expenditure. Indirect effects occur because of spending within the primary sector on goods and services from other sectors. Induced impacts/contributions result from the wage earners within the study area spending money on goods and services within the region. Added together, the indirect and induced make up what is generally referred to as "multiplier" effects.

[2] IMPLAN is an input-output platform that allows the user to estimate the economic impacts or contributions (income, jobs, value-added and output) of economic activity in a region. The software traces the flow of dollars between businesses and between businesses and final consumers.

[3] The adjustments made by Steinbeck and Thunberg (2006) allow for forward linkages to reflect how industries use the output of another industry. For example, a commercial fisher may catch their fish quota in Stellwagen Bank National Marine Sanctuary, then, once ashore, sell the catch to a fish market, seafood processor, or restaurant. From the point of sale, forward linkages trace how the output of commercial fishermen benefit the economy.

Table 3.1 IMPLAN Economic Indicators' Definitions

Indicator	Definitions and Relationships
Employment	Total annual average jobs. This includes self-employed and wage and salary employees, and all full-time, part-time, and seasonal jobs, based on a count of full-time/part-time averages over 12 months
Labor Income	Defines the total value paid to local workers within a region. Labor income is the income source for induced household spending estimations. Labor Income = Employee Compensation + Proprietor Income
Value Added	Composed of Labor Income, Indirect Business Taxes (IBT), and Other Property Type Income (OPTI), Value Added demonstrates an industry's value of production over the cost of its purchasing the goods and services required to make its products. Value Added is often referred to as Gross Regional Product. Value Added = Labor Income + IBT + OPTI
Output	The total value of an industry's production, composed of the value of Intermediate Inputs and Value Added. In IMPLAN this is typically viewed as the value of a change in sales or the value of increased production. However, annual production is not always equal to annual sales. If production levels are higher than sales, surpluses become inventory. Because inventory does not drive additional impacts in the year it was produced, in IMPLAN Direct Industry Sales = Direct Output. Output = Intermediate Inputs + Value Added

Source: Day, 2011

Table 3.2 Impact/Contribution Type Definition

Type of Impact/ Contribution	Definition
Direct Effects	The effects of spending by recreational fishermen on goods and services purchased directly from businesses located within the study area.
Indirect Effects	The result of a sector purchasing goods and services to produce their product from other industries located within the study area
Induced Effects	Results from spending of employee wages that stem from both the direct and indirect effects within the study area.

The modeled region is specific to New England, based upon commercial catch in the Gulf of Maine brought to ports of landings within New England. From 2007 to 2016, around $3.7 billion was landed at New England ports, which generated over $12.5 billion in output (a measure of the total value of all goods produced – may also be referred to as sales), $4.4 billion in income, and over nearly 103,000 full- and part-time jobs in the New England region (Table 3.3). This means that on average from 2007 to 2016, commercial fishing supported an average of $369.2 in landings value, $1,247.1 billion in output, $438.7 in income and 10,278 jobs annually.

Table 3.3 Annual Contribution by Value of Landings, Output, Income, and Employment (Gulf of Maine) (2017$)

Year	Value of Landings	Output	Income	Employment
2007	$378,332,993	$1,267,897,893	$445,279,972	10,743
2008	$323,120,927	$1,086,037,846	$380,977,479	9,283
2009	$290,411,494	$969,348,578	$340,727,222	8,086
2010	$325,612,406	$1,087,089,613	$379,662,811	9,141
2011	$394,477,785	$1,313,986,160	$462,381,463	10,978
2012	$500,771,730	$1,897,221,396	$669,054,914	15,478
2013	$485,258,806	$1,602,921,607	$561,587,915	12,841
2014	$332,033,844	$1,092,477,087	$385,603,005	8,874
2015	$338,549,170	$1,103,093,974	$389,512,490	8,797
2016	$323,858,881	$1,050,539,792	$371,849,569	8,563
Total	$3,692,428,036	$12,470,613,945	$4,386,636,841	102,784
2007-2016 Average	$369,242,804	$1,247,061,395	$438,663,684	10,278

Economic Contribution Summary by Region

The following three tables show total economic contributions in the New England region based upon where the landings occurred. The largest economic contributions occurred in New Bedford, Massachusetts (which includes all of Bristol County), followed by the non-maritime region (non-coastal counties). The primary reason the non-maritime New England area is so high is that it includes all of the non-coastal counties in five New England states. While there are no direct contributions associated with commercial fishing in the non-maritime area, this is where about 20% of the total contributions occur (from indirect and induced effects). The third and fourth largest contributions occurred in Gloucester and Boston, Massachusetts, respectively (tables 3.4, 3.5, and 3.6).

Table 3.4 Total Gulf of Maine Commercial Fishing Output Contributions (2017$) by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	RI	Seacoast CT	Non-Maritime New England	Total New England
2007	$4,368,122	$38,042,588	$44,670,325	$8,184,685	$55,751,010	$180,541,560	$169,428,647	$34,280,304	$370,125,348	$71,187,983	$41,646,532	$249,670,790	$1,267,897,893
2008	$4,411,375	$37,056,793	$44,857,422	$8,683,026	$49,981,550	$173,859,988	$148,673,542	$29,361,220	$296,233,382	$43,144,088	$36,552,917	$213,222,543	$1,086,037,846
2009	$3,321,917	$30,587,746	$33,128,687	$7,737,227	$45,707,193	$155,911,805	$134,325,594	$23,096,722	$274,880,100	$37,308,623	$32,744,917	$190,598,047	$969,348,578
2010	$3,615,111	$31,813,551	$39,442,841	$8,427,766	$52,278,595	$175,919,306	$151,831,836	$30,816,240	$309,394,020	$34,366,080	$35,651,282	$213,532,984	$1,087,089,613
2011	$5,330,440	$39,308,414	$43,314,463	$8,773,297	$58,391,682	$197,175,297	$178,176,927	$34,770,063	$395,225,316	$49,985,471	$44,717,423	$258,817,368	$1,313,986,160
2012	$6,189,404	$48,257,712	$57,683,487	$11,695,190	$75,383,810	$240,779,096	$309,398,708	$41,161,500	$590,001,154	$67,914,728	$107,218,476	$341,538,131	$1,897,221,396
2013	$4,709,693	$42,240,874	$42,732,638	$8,067,257	$53,684,302	$200,073,675	$207,356,685	$34,671,865	$580,921,122	$57,938,050	$52,587,531	$317,937,916	$1,602,921,607
2014	$3,364,228	$33,757,208	$24,494,798	$6,925,939	$46,095,759	$152,934,178	$151,471,473	$34,370,642	$348,754,322	$38,410,185	$36,032,724	$215,865,631	$1,092,477,087
2015	$4,083,063	$43,588,570	$39,828,455	$7,350,385	$50,864,408	$150,711,657	$149,702,846	$31,454,215	$322,319,683	$48,368,839	$36,998,277	$217,823,577	$1,103,093,974
2016	$4,496,402	$38,689,520	$42,114,383	$7,017,486	$55,786,958	$151,934,303	$143,054,941	$35,270,933	$294,359,855	$36,041,314	$34,385,115	$207,388,582	$1,050,539,792
Total	$43,889,754	$383,342,976	$412,267,499	$82,862,259	$543,925,266	$1,779,840,865	$1,743,421,200	$329,253,704	$3,782,214,302	$484,665,361	$458,535,194	$2,426,395,568	$12,470,613,945

Table 3.5 Total Gulf of Maine Commercial Fishing Income Contributions (2017$) by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	RI	Seacoast CT	Non-Maritime New England	Total New England
2007	$691,504	$13,253,657	$17,773,139	$2,401,337	$17,525,833	$59,526,623	$57,744,622	$13,795,996	$137,401,993	$25,415,510	$15,315,376	$84,434,383	$445,279,972
2008	$721,281	$12,963,621	$17,213,314	$2,567,733	$15,344,969	$59,734,074	$51,037,312	$11,630,873	$109,538,063	$14,502,626	$13,604,816	$72,118,796	$380,977,479
2009	$555,583	$10,975,524	$12,280,007	$2,358,486	$14,266,765	$54,256,538	$46,523,963	$8,871,745	$101,473,962	$12,488,941	$12,223,317	$64,452,392	$340,727,222
2010	$656,689	$10,556,276	$15,048,262	$2,563,387	$16,527,557	$61,636,196	$52,442,221	$12,250,072	$111,501,459	$11,176,125	$13,108,622	$72,195,946	$379,662,811
2011	$1,259,633	$13,347,060	$16,823,571	$2,617,971	$18,478,653	$67,674,360	$61,155,763	$14,000,580	$145,998,902	$16,766,494	$16,752,579	$87,505,897	$462,381,463
2012	$1,463,169	$16,543,259	$22,258,398	$3,504,456	$25,115,266	$79,705,933	$109,040,746	$16,497,275	$217,241,374	$22,352,077	$39,236,193	$116,096,767	$669,054,914
2013	$1,008,561	$14,602,863	$16,986,042	$2,432,235	$17,597,292	$63,884,878	$69,907,716	$14,403,774	$214,722,094	$19,271,032	$19,264,761	$107,506,666	$561,587,915
2014	$729,571	$12,504,580	$8,830,034	$2,138,010	$15,082,783	$51,711,930	$52,595,358	$13,843,162	$129,178,750	$12,791,422	$13,225,821	$72,971,583	$385,603,005
2015	$745,091	$15,013,115	$15,871,796	$2,187,600	$16,534,723	$51,363,108	$52,050,607	$12,432,280	$119,404,447	$16,528,379	$13,764,717	$73,616,626	$389,512,490
2016	$962,429	$13,891,642	$16,983,009	$2,052,545	$18,022,749	$53,493,825	$49,742,364	$14,220,059	$107,766,426	$11,957,263	$12,681,657	$70,075,601	$371,849,569
Total	$8,793,511	$133,651,597	$160,067,573	$24,823,760	$174,496,589	$602,987,465	$602,240,672	$131,945,816	$1,394,227,470	$163,249,869	$169,177,859	$820,974,657	$4,386,636,841

Table 3.6 Total Gulf of Maine Commercial Fishing Employment Contributions by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	RI	Seacoast CT	Non-Maritime New England	Total New England
2007	33	313	573	79	471	1,489	1,092	632	3,089	550	258	2,164	10,743
2008	32	286	599	73	430	1,552	967	519	2,400	343	230	1,851	9,283
2009	25	239	381	69	404	1,349	888	383	2,204	283	207	1,654	8,086
2010	31	251	466	81	436	1,479	1,006	545	2,520	251	221	1,852	9,141
2011	59	305	495	85	504	1,532	1,161	660	3,281	368	285	2,242	10,978
2012	73	398	631	109	638	1,769	2,020	773	4,851	529	676	3,011	15,478
2013	48	322	464	66	427	1,301	1,299	689	4,713	444	324	2,743	12,841
2014	34	257	236	61	373	1,087	1,008	608	2,836	281	224	1,869	8,874
2015	34	314	425	57	383	1,028	985	487	2,601	363	235	1,887	8,797
2016	41	284	417	55	409	1,139	938	662	2,345	259	215	1,797	8,563
Total	410	2,968	4,688	735	4,475	13,725	11,364	5,958	30,840	3,671	2,875	21,070	102,784

Chapter 4: Profiles of Commercial Fisheries in Stellwagen Bank National Marine Sanctuary

Catch by Species/Species Groups

Across the 10-year study period of 2007-2016, cod was the number one ranked fishery in Stellwagen Bank National Marine Sanctuary on the basis of total value. Beginning in 2012, NOAA Fisheries reduced the cod quota in New England. Even with the reductions, cod accounted for over $63.5 million or 32.8% of all harvest revenue from the sanctuary. This was followed by lobster at $35.5 million (18.3%), sea scallops at $33.3 million (17.1%), yellowtail flounder at $10.5 million (3.9%), and haddock at $7.1 million (3.7%). These top five species/species groups accounted for more than 75% of the 2007-2016 total harvest revenue from Stellwagen Bank National Marine Sanctuary. Table 4.1 below shows the full results.

Table 4.1 Pounds and Value of Landings from the Stellwagen Bank National Marine Sanctuary by Species 2007-2016 Totals (2017$)

Species	Pounds	Total Value 2007-2016 (2017$)	% Total 2007-2016
Cod	29,767,602	$63,570,163	32.8%
Lobster	8,319,600	$35,450,731	18.3%
Sea scallop	2,626,295	$33,250,766	17.1%
Yellowtail Flounder	6,503,692	$10,514,552	5.4%
Haddock	3,221,043	$7,579,083	3.9%
Monkfish	2,293,044	$7,106,043	3.7%
Pollock	10,602,620	$6,983,546	3.6%
Witch flounder	1,850,747	$5,541,711	2.9%
Winter flounder	2,142,136	$4,693,464	2.4%
Atlantic herring	29,005,177	$3,935,549	2.0%
Other	34,789,149	$15,448,713	8.0%

Trends in Top Five Species Groups

Cod

From 2007 to 2016, cod was ranked highest in terms of total ex-vessel value for all commercial fisheries in Stellwagen Bank National Marine Sanctuary (Table 4.1). Cod catch was high from 2007 to 2010, reaching a peak of 6.5 million pounds landed in 2009 and a peak value of over $12.8 million in 2010. However, since this peak there has been a steady decline in cod catch with a low point of roughly 67,000 pounds landed with a value of $192,000 in 2015. Cod's value per pound in Stellwagen Bank National Marine Sanctuary has generally increased from 2007 to 2016 despite notable dips in 2009 and 2014 (Figure 4.1 and Table A.6).

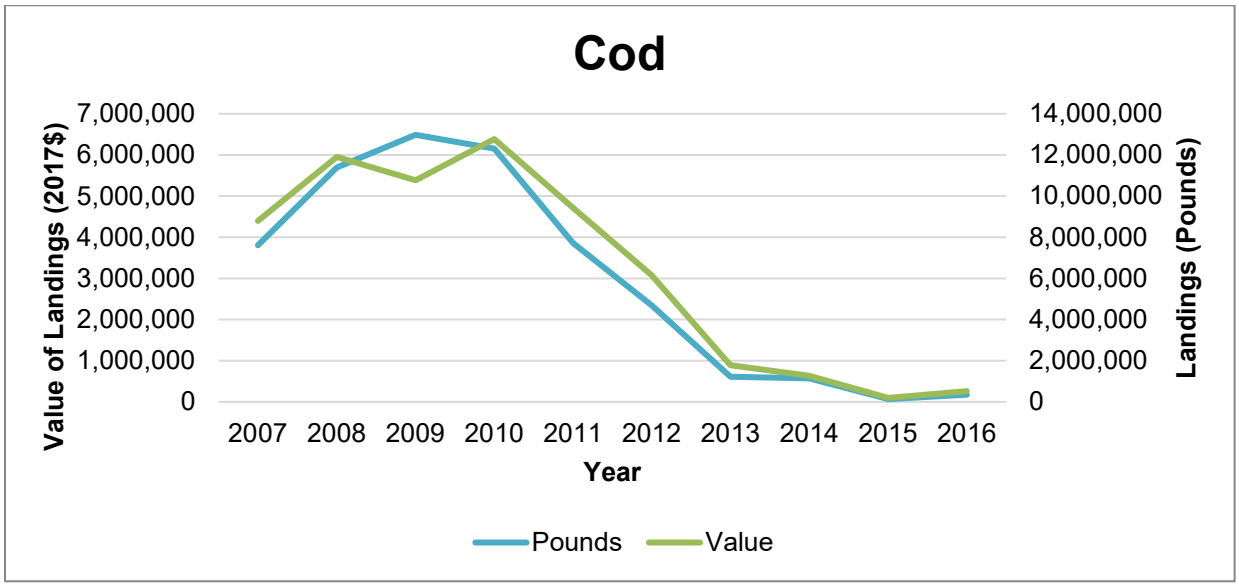

Figure 0.1 Pounds and Value (2017$) of Cod Landed in Stellwagen Bank National Marine Sanctuary (2007-2016)

Lobster

From 2007 to 2016, lobster had the second highest value of landings in Stellwagen Bank National Marine Sanctuary with a total value of $35.5 million (Table 4.1). Lobster landings have steadily increased from 2007 to 2016. Lobster reached a high point in pounds landed in 2016 with 1.3 million pounds and a value in 2015 at $5.7 million even though fewer pounds were landed in 2015 (Figure 4.2 and Table A.7). Lobster's value per pound in Stellwagen Bank National Marine Sanctuary saw a noticeable decline from 2007 to 2012 and then increased from 2012 to 2015.

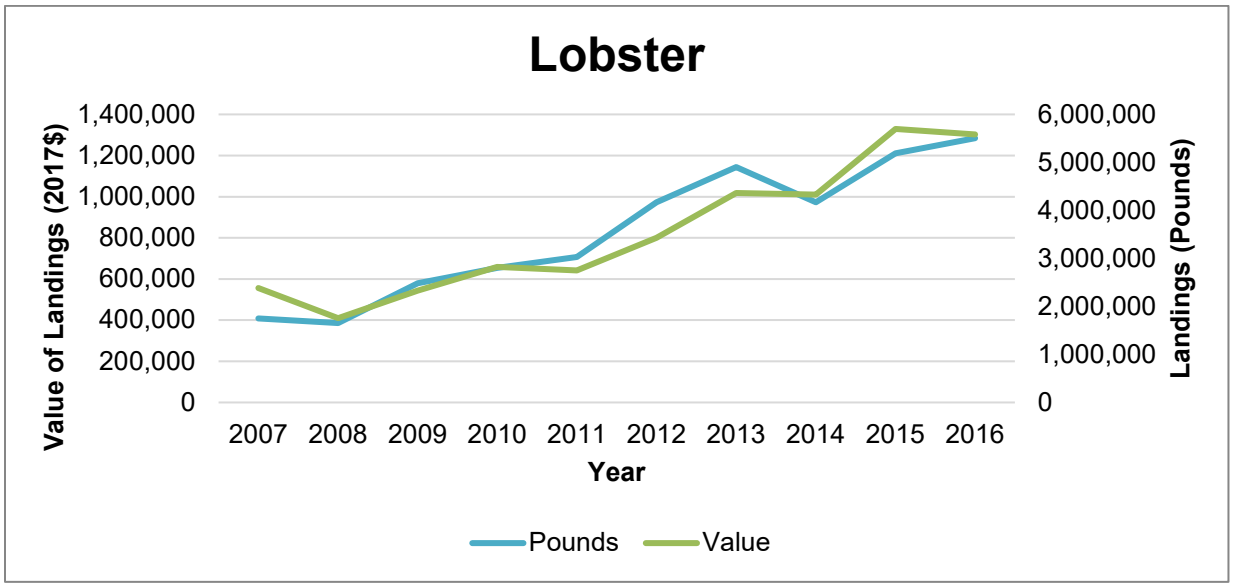

Figure 0.2 Pounds and Value (2017$) of Lobster Landed in Stellwagen Bank National Marine Sanctuary (2007-2016)

Sea Scallops

From 2007 to 2016, sea scallops had the third highest total value of landings in Stellwagen Bank National Marine Sanctuary (Table 4.1). Sea scallop landings have generally risen from 2007 to 2016 with a notably large increase in 2016, when landings rose by over 500,000 pounds and $7 million from the previous year, reaching a high point of 810,000 pounds landed and a value of $11.3 million. Value per pound of sea scallops in Stellwagen Bank National Marine Sanctuary also rose during this time period. The 2016 value per pound at $13.94 was a large increase from its lowest point in 2007 (Table 4.3, Table A.3). This rise in landings is believed to be from an increase in landings from the northwest corner of the sanctuary.

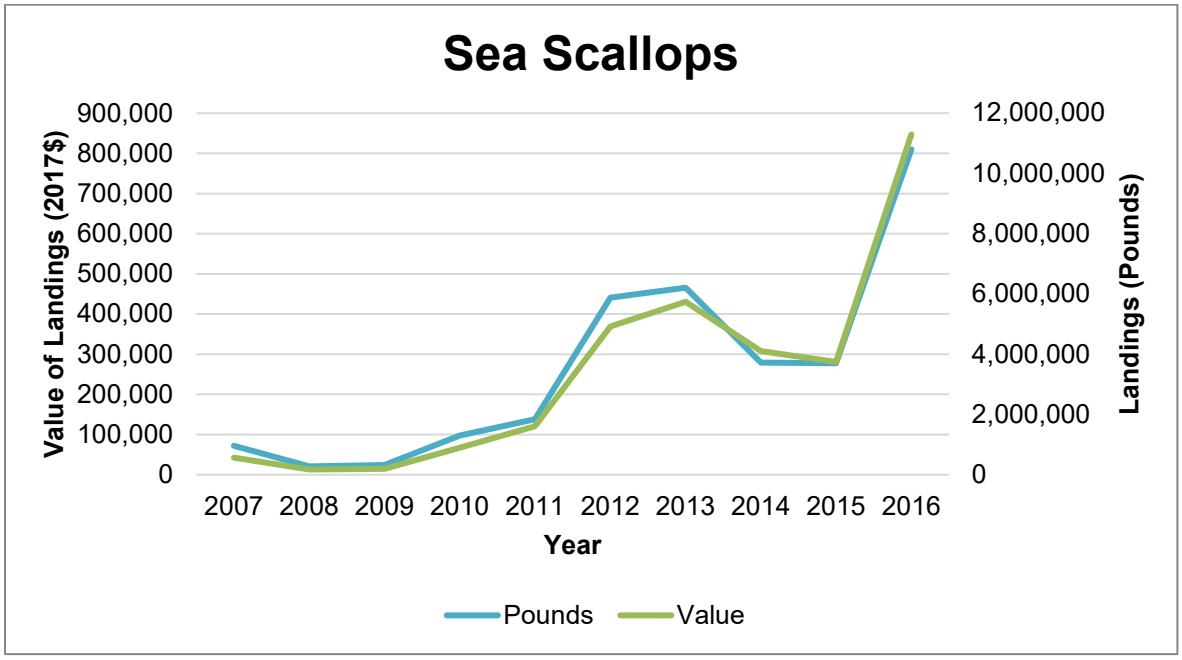

Figure 0.3 Pounds and Value (2017$) of Sea Scallops Landed in Stellwagen Bank National Marine Sanctuary (2007-2016)

Yellowtail Flounder

From 2007 to 2016, yellowtail flounder had the fourth highest total value of landings in Stellwagen Bank National Marine Sanctuary (Table 4.1). Landings increased from 2007 to 2012, and then began to decline. In 2012, both landings and value peaked at 1.2 million pounds landed and $1.7 million, respectively. In 2016 landings declined to $744,700, almost $1 million lower than its peak in 2012. Value per pound of yellowtail flounder in Stellwagen Bank National Marine Sanctuary declined from 2007 to 2014 but has recovered somewhat in 2016 (Figure 4.4 and Table A.4).

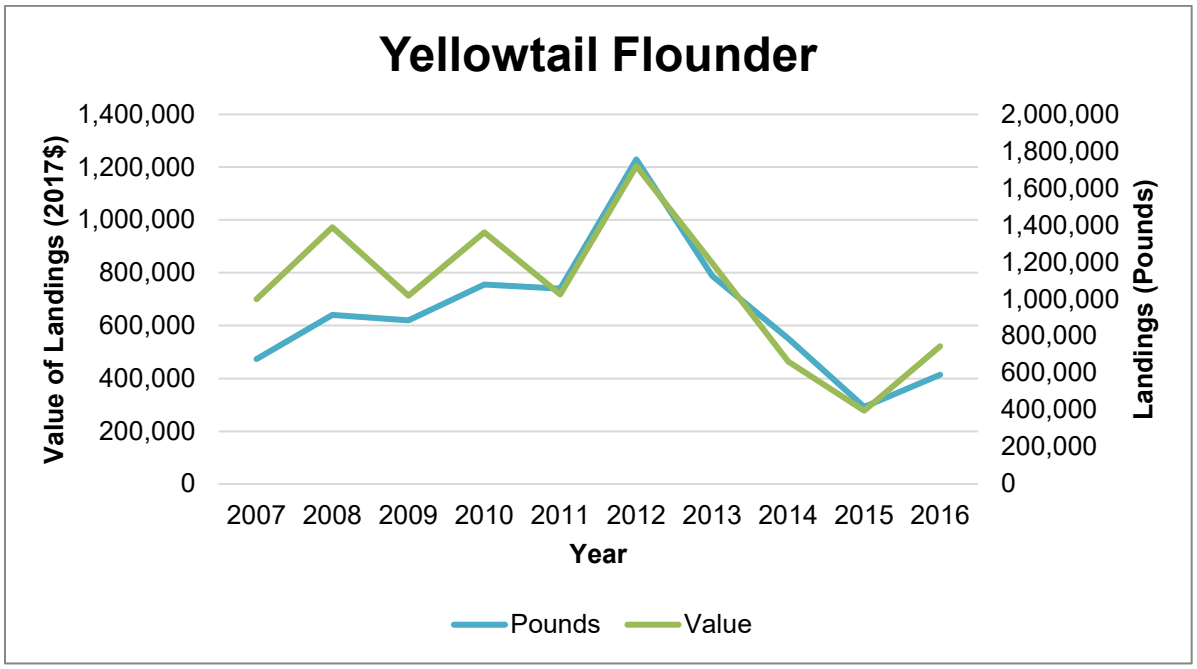

Figure 0.4 Pounds and Value (2017$) of Yellowtail Flounder Landed in Stellwagen Bank National Marine Sanctuary (2007-2016)

Haddock

From 2007 to 2016, haddock was fifth in terms of total ex-vessel value in Stellwagen Bank National Marine Sanctuary at just over $7.1 million (Table 4.1). Haddock landings generally decreased from 2007 to 2016, with sharp drops in 2008 and 2013. Value per pound of haddock was somewhat volatile from 2007 to 2016: value per pound declined from 2007 to 2009 then climbed to reach a peak of $2.97 per pound in 2013 (Figure 4.5 and Table A.5). After 2013, value per pound fell again, with its lowest point of $1.58 per pound occurring in 2016.

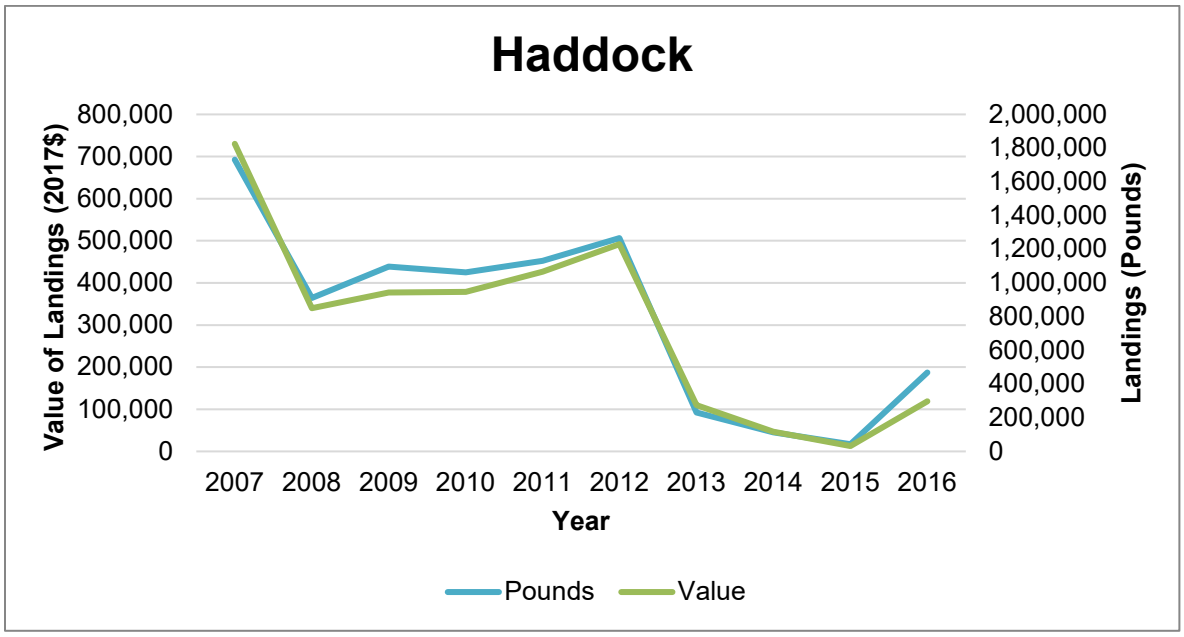

Figure 0.5 Pounds and Value (2017$) of Haddock Landed in Stellwagen Bank National Marine Sanctuary (2007-2016)

Stellwagen Bank National Marine Sanctuary Landings by Species as a Percentage of the Gulf of Maine

Landings in Stellwagen Bank National Marine Sanctuary account for a relatively large portion of the cod, Atlantic mackerel, and spiny dogfish landed in the Gulf of Maine. Around 31% of cod, 20% of Atlantic mackerel, and 17% of the spiny dogfish landed in the region comes from Stellwagen Bank National Marine Sanctuary. In terms of value of landings in the sanctuary, cod accounted for roughly 30% of the region's total value and yellowtail flounder accounted for about 29% (tables 4.2 and 4.3).

Table 4.2 Top Five Species by Landed in Stellwagen Bank National Marine Sanctuary as a Percentage of the Gulf of Maine 2007-2016 Total

Species	Total Pounds Landed in Stellwagen Bank National Marine Sanctuary	Total Pounds Landed in Gulf of Maine	Percentage of Region
Cod	29,767,602	96,775,711	30.8%
Atlantic herring	29,005,177	1,330,120,624	2.2%
Atlantic mackerel	14,371,212	73,012,576	19.7%
Spiny dogfish	12,039,396	70,735,527	17.0%
Pollock	10,602,620	140,336,890	7.6%

Table 4.3 Top Five Species by Ex-Vessel Value in Stellwagen Bank National Marine Sanctuary as a Percentage of the Gulf of Maine 2007-2016 Total (2017$)

Species	Value in Stellwagen Bank National Marine Sanctuary	Value Landed in Gulf of Maine	Percentage of Region
Cod	$63,570,163	$211,261,718	30.1%
Lobster	$35,450,731	$631,686,228	5.6%
Sea scallop	$33,250,766	$1,865,094,849	1.8%
Yellowtail flounder	$10,514,552	$36,842,558	28.5%
Haddock	$7,579,083	$144,599,665	5.2%

Landings by Gear Type

Most of the landings in Stellwagen Bank National Marine Sanctuary are landed using sink gill nets, midwater pair trawls, bottom fish otter trawls, and lobster pots. Those four gear types account for over 89.5% of the pounds landed in the sanctuary.

When considering the gear types that account for most of the value of the commercial fisheries, bottom fish otter trawls, sink gill nets, sea scallop dredges, and lobster pots account for 90% of the value landed in Stellwagen Bank National Marine Sanctuary (Table 4.4).

Table 4.4a Annual Pounds and Ex-Vessel Value of Landings by Gear Type in Stellwagen Bank National Marine Sanctuary, 2017$

Pounds	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total 2007-2016
Sink gill net	5,074,893	6,852,823	6,728,280	5,950,162	4,087,541	3,927,496	1,345,837	2,313,859	1,348,640	1,761,876	39,391,407	30.0%
Midwater pair trawl	2,488,780	231,186	1,920,922	6,084,860	996,674	3,693,455	1,705,348	10,852,903	4,190,991	3,881,172	36,046,291	27.5%
Fish bottom otter trawl	3,262,530	6,792,885	4,702,177	4,934,093	4,331,392	4,332,084	1,878,800	1,493,475	814,556	1,343,515	33,885,507	25.8%
Lobster pots	364,396	352,838	532,049	593,361	660,048	928,291	1,139,055	950,358	1,162,440	1,284,118	7,966,955	6.1%
Midwater otter trawl	27,997	0	0	439,000	0	0	0	883,800	1,241,743	2,232,681	4,825,221	3.7%
Sea scallop dredge	70,453	18,964	24,269	96,956	138,469	439,287	463,283	265,399	299,189	784,116	2,600,384	2.0%
Bottom longline	562,106	312,774	230,157	150,736	543,994	480,158	69,748	70,600	0	60,681	2,480,955	1.9%
Hand line/rod & reel	100,633	71,312	194,813	214,374	97,396	85,322	54,027	320,031	490,301	468,069	2,096,278	1.6%
Purse seine	194,900	266,500	0	0	0	858,433	0	0	0	0	1,319,833	1.0%
Shrimp bottom otter trawl	17,718	39,891	1,058	64,971	21,297	27,154	2,861	5,775	3,868	1,926	186,519	0.1%
Other	1,769	27,733	89,196	32,098	2,653	21,028	326	15,436	59,682	72,007	321,928	0.2%
Total	12,166,175	14,966,906	14,422,921	18,560,612	10,879,464	14,792,708	6,659,286	17,171,636	9,611,410	11,890,161	131,121,279	100.0%

Table 4.4b Annual pounds and Ex-Vessel Value of Landings by Gear Type in Stellwagen Bank National Marine Sanctuary, 2017$

Value	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total 2007-2016
Fish bottom otter trawl	$6,371,255	$9,593,481	$7,769,756	$9,611,977	$8,541,661	$8,516,855	$4,074,936	$2,750,167	$1,573,374	$2,779,644	$61,583,105	31.7%
Sink gill net	$7,780,980	$9,358,887	$8,338,072	$8,505,965	$5,644,284	$4,154,750	$1,655,021	$2,043,962	$1,478,630	$1,618,837	$50,579,388	26.1%
Sea scallop dredge	$554,399	$158,882	$190,777	$889,748	$1,606,455	$4,904,819	$5,712,506	$3,892,144	$3,690,401	$10,778,897	$32,379,028	16.7%
Lobster pots	$1,872,774	$1,441,676	$2,039,424	$2,518,656	$2,488,587	$3,115,913	$4,090,454	$4,002,633	$5,268,810	$5,134,368	$31,973,296	16.5%
Bottom longline	$1,510,476	$755,635	$418,180	$311,634	$1,139,710	$1,018,373	$168,056	$100,868		$77,949	$5,500,880	2.8%
Midwater pair trawl	$265,797	$35,163	$166,204	$796,570	$54,319	$583,721	$175,834	$1,668,067	$749,893	$861,882	$5,357,451	2.8%
Hand line/rod & reel	$269,967	$223,775	$365,469	$469,559	$410,413	$422,448	$154,736	$389,488	$753,067	$714,340	$4,173,262	2.2%
Midwater otter trawl	$3,275	$0	$0	$74,411	$0	$0	$0	$148,478	$295,548	$473,802	$995,513	0.5%
Chain mat scallop dredge	$0	$0	$0	$0	$0	$0	$0	$211,294	$27,057	$221,666	$460,017	0.2%
Turtle deflect scallop dredge	$0	$0	$0	$0	$0	$0	$0	$0	$0	$249,830	$249,830	0.1%
Other	$37,071	$75,528	$134,194	$147,150	$30,324	$164,324	$6,593	$4,226	$51,575	$171,568	$822,552	0.4%
Total	$18,665,995	$21,643,027	$19,422,074	$23,325,669	$19,915,754	$22,881,203	$16,038,137	$15,211,326	$13,888,354	$23,082,782	$194,074,322	100.0%

Stellwagen Bank National Marine Sanctuary Landings by Gear Type as a Percentage of the Gulf of Maine

Twenty-three percent of the pounds and 28.5% of the value landed from sink gill nets in the Gulf of Maine was landed in Stellwagen Bank National Marine Sanctuary. Around 26% of the value landed from bottom longlines in the Gulf of Maine come from Stellwagen Bank National Marine Sanctuary. This is high compared to the other top gear types in the sanctuary as none of them account for more 8% of the value or pounds landed within the region for their respective gear types (Table 4.12 and Table 4.13).

Table 4.5 Landings by Gear Type in Stellwagen Bank National Marine Sanctuary as a Percentage of the Gulf of Maine 2007-2016 Total

Gear Type	Pounds Landed in Stellwagen Bank National Marine Sanctuary	Pounds Landed in Gulf of Maine	Percentage of Region
Sink gill net	39,391,407	170,968,264	23.0%
Midwater pair trawl	36,046,291	755,186,583	4.8%
Fish bottom otter trawl	33,885,507	597,598,510	5.7%
Lobster pots	7,966,955	167,194,399	4.8%
Midwater otter trawl	4,825,221	193,036,885	2.5%

Table 4.6 Ex-Vessel Value by Gear Type in Stellwagen Bank National Marine Sanctuary as a Percentage of the Gulf of Maine 2007-2016 Total (2017$)

Gear Type	Value in Stellwagen Bank National Marine Sanctuary	Value in Gulf of Maine	Percentage of Region
Fish bottom otter trawl	$61,583,105	$831,307,901	7.4%
Sink gill net	$50,579,388	$177,438,121	28.5%
Sea scallop dredge	$32,379,028	$1,700,800,804	1.9%
Lobster pots	$31,973,296	$613,036,233	5.2%
Bottom longline	$5,500,880	$20,908,741	26.3%

Vessels by Size

The number of vessels and vessel trips was relatively constant from 2007 to 2010. Since 2010, both have declined (Table 4.14 and Table 4.15). The average number of commercial fishing vessels that fished Stellwagen Bank National Marine Sanctuary from 2007 to 2016 was 253. Vessels less than 50 feet made up most of the number of vessels and vessel trips. Vessels less than 50 feet have seen a general decline in number of vessels and trips from 2007 to 2016.

Vessels between 50 and 70 feet are the next largest category in the number of vessels and vessel trips. The number of vessels between 50 and 70 feet steadily declined from 2007 to 2015 before seeing a 62% increase in 2016. The number of vessel trips for vessels 50 to 70 feet has been more volatile although it also trends downward. There was a small percentage increase in the number of vessel trips in 2016 despite a large rise in number of vessels that year.

Vessels larger than 70 feet compose the smallest share of vessels. The number of vessels and vessel trips for vessels this length saw spikes in 2010 and 2016 with vessel trips also seeing a large increase from 2007 to 2008 despite fewer vessels.

Table 4.7 Number of Vessels by Size in Stellwagen Bank National Marine Sanctuary

Year	Less than 50 Feet	50-70 Feet	Greater than 70 Feet	Total
2007	224	51	16	291
2008	217	44	14	275
2009	225	45	17	287
2010	248	41	31	320
2011	186	38	27	251
2012	194	36	34	264
2013	162	27	31	220
2014	153	27	19	199
2015	143	21	17	181
2016	171	34	37	242
2007-2016 Average	192	36	24	253
% 2007-16	76.0%	14.4%	9.6%	100.0%

Table 4.8 Number of Trips by Vessel Size in Stellwagen Bank National Marine Sanctuary

Year	Less than 50 Feet	50-70 Feet	Greater than 70 Feet	Total
2007	7,240	1,074	108	8,422
2008	8,406	1,299	191	9,896
2009	9,665	1,191	225	11,081
2010	7,855	1,093	236	9,184
2011	5,347	897	261	6,505
2012	6,496	1,037	276	7,809
2013	4,142	600	110	4,852
2014	4,032	453	78	4,563
2015	3,557	423	66	4,046
2016	4,361	435	154	4,950
2007-2016 Average	6,110	850	171	7,131
% 2007-16	85.7%	11.9%	2.4%	100.0%

Vessels by Homeport

Over 92% of the vessels in Stellwagen Bank National Marine Sanctuary have their homeport in Massachusetts, with the trend in vessels in this state being almost identical to that of the trend in total vessels (Table 4.16). Individually, each of the remaining states account for 6% or less of homeport locations.

Table 4.9 Number of Vessels by Port of Landing in Stellwagen Bank National Marine Sanctuary

Year	MA	ME	NH	CT	NJ	RI	NY	VA	Total
2007	275	3	13	0	0	0	0	0	291
2008	244	11	15	1	1	1	0	2	273
2009	269	7	10	0	1	0	0	0	287
2010	293	7	19	0	0	1	0	0	320
2011	236	3	12	0	0	0	0	0	251
2012	241	5	17	0	1	0	0	0	264
2013	201	7	12	0	0	0	0	0	220
2014	183	7	9	0	0	0	0	0	199
2015	172	3	6	0	0	0	0	0	181
2016	223	3	14	0	1	0	1	0	242
2007-2016 Average	234	6	13	0	0	0	0	0	253

Harvest Revenue Distribution by Number of Vessels

From 2007 to 2009, wealth concentration was relatively low. In 2007 the top 20% of vessels in Stellwagen Bank National Marine Sanctuary accounted for around 65% of value (this is low for commercial fisheries, where it is often maintained that 20% of the fishermen account for 80% of the value) and only one vessel earning above $100,000. Since 2010, however, wealth concentration has risen, with the top 20% of vessels accounting for over 73% of the value in 2013 and 47 vessels earning over $100,000. Harvest revenues for years 2008 to 2015 can be found in Appendix A.

Table 4.10 Harvest Revenue Distribution 2007 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	291	100.00%	100.00%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	5	1.72%	10.07%
Greater than $200,000	29	9.97%	41.82%
Greater than $100,000	60	20.62%	65.74%
Greater than $50,000	117	40.21%	87.49%
Greater than $30,000	141	48.45%	92.48%
Greater than $10,000	202	69.42%	98.67%
Less than $10,000	89	30.58%	1.33%
Less than $5,000	72	24.74%	0.68%
Less than $1,000	29	9.97%	0.06%
Less than $100	3	1.03%	0.00%

Table 4.11 Harvest Revenue Distribution 2016 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	241	100.00%	100.00%
Greater than $1,000,000	1	0.41%	4.66%
Greater than $300,000	19	7.88%	42.41%
Greater than $200,000	40	16.60%	64.37%
Greater than $100,000	67	27.80%	80.34%
Greater than $50,000	103	42.74%	91.13%
Greater than $30,000	128	53.11%	95.57%
Greater than $10,000	166	68.88%	98.89%
Less than $10,000	76	31.54%	1.11%
Less than $5,000	55	22.82%	0.43%
Less than $1,000	17	7.05%	0.03%
Less than $100	4	1.66%	0.00%

Landings by County and States

Massachusetts accounts for over 92% of the landings in Stellwagen Bank National Marine Sanctuary, with Essex County alone accounting for more than 65% of total landings. The closest state, Maine, accounts for around 6% and the remaining states account for less than 2% (tables 4.19 and 4.20).

The ex-vessel value in Stellwagen Bank National Marine Sanctuary is similarly concentrated in Massachusetts, which accounts for almost 98% of the total ex-vessel value. Essex County contributes the most of any county, as its ex-vessel value is around $125.1 million (around 64% of the total ex-vessel value). Maine has the second highest ex-vessel value and accounts for around 1% of the total with each of the remaining states contributing less than 1%.

Table 4.12 Pounds Landed by County, State, and Year from Stellwagen Bank National Marine Sanctuary

Location Landed	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total
Connecticut	0	5,308	1,997	0	0	6,100	0	0	0	0	13,405	0.01%
New Haven	0	5,308	1,997	0	0	0	0	0	0	0	7,305	0.01%
New London	0	0	0	0	0	6,100	0	0	0	0	6,100	0.00%
Massachusetts	12,051,195	14,327,794	14,283,061	16,159,742	10,764,076	13,255,091	6,139,536	14,680,559	7,997,525	11,531,681	121,190,260	92.45%
Barnstable	407,552	521,934	445,342	729,622	894,744	665,062	242,924	247,865	349,456	353,036	4,857,537	3.71%
Bristol	465,609	39,487	1,571,919	1,325,454	1,245,419	480,308	1,014,662	4,980,913	2,776,755	2,083,407	15,983,934	12.19%
Essex	10,166,730	12,591,374	10,904,163	12,424,363	7,146,863	10,273,710	3,137,486	7,336,378	3,767,861	7,552,289	85,301,216	65.07%
Nantucket	0	0	0	407	428	600	0	0	0	0	1,435	0.00%
Norfolk	2,652	14,825	43,963	46,037	48,709	3,472	8,326	3,135	25,411	47,098	243,627	0.19%
Plymouth	875,686	866,015	1,038,177	1,128,310	691,506	978,181	873,758	1,123,128	1,042,936	1,326,886	9,944,582	7.59%
Suffolk	132,966	294,161	279,497	505,549	736,407	853,758	862,380	989,140	35,106	168,965	4,857,930	3.71%
Maryland	96	0	0	0	0	0	0	0	0	0	96	0.00%
St. Mary's	96	0	0	0	0	0	0	0	0	0	96	0.00%
Maine	12,520	367,400	14,094	1,730,374	47,347	947,440	472,994	2,447,152	1,585,803	313,776	7,938,899	6.06%
Cumberland	7,490	47,054	7,238	1,591,275	45,411	888,438	38,426	1,610,439	1,584,968	306,448	6,127,186	4.67%
Hancock	0	0	0	0	0	0	0	200,767	0	0	200,767	0.15%
Knox	0	267,956	6,341	47,004	0	1,788	433,333	630,100	269	4,449	1,391,240	1.06%
Lincoln	0	33,469	0	0	0	0	0	71	30	30	33,600	0.03%
Washington	0	0	0	43,200	0	43,200	0	0	0	0	86,400	0.07%
York	5,030	18,921	515	48,895	1,936	14,014	263	5,775	252	2,849	98,450	0.08%
Unknown	-	0	0	0	0	0	972	0	284	0	1,256	0.00%
New Hampshire	100,711	150,906	96,412	655,260	68,041	574,612	46,393	26,907	25,922	42,954	1,788,119	1.36%
Rockingham	100,711	150,906	96,412	655,260	68,041	574,612	46,393	26,907	25,922	42,954	1,788,119	1.36%
New Jersey	0	208	265	0	0	2,904	0	0	0	350	3,727	0.00%
Cape May	0	0	151	0	0	2,904	0	0	0	350	3,405	0.00%
Essex	0	0	114	0	0	0	0	0	0	0	114	0.00%
Monmouth	0	208	0	0	0	0	0	0	0	0	208	0.00%
New York	0	649	0	0	0	0	0	0	2,160	1,400	4,209	0.00%
New York	0	0	0	0	0	0	0	0	2,160	1,400	3,560	0.00%
Suffolk	0	649	0	0	0	0	0	0	0	0	649	0.00%
Rhode Island	1,255	13,344	219	15,089	0	6,562	0	17,018	0	0	53,487	0.04%
Providence	0	13,344	0	0	0	0	0	0	0	0	13,344	0.01%
Washington	1,255	0	219	15,089	0	6,562	0	17,018	0	0	40,143	0.03%
Virginia	0	97,800	0	0	0	0	0	0	0	0	97,800	0.07%
York	0	97,800	0	0	0	0	0	0	0	0	97,800	0.07%

Table 4.13 Ex-Vessel Value of Landings by County, State, and Year from Stellwagen Bank National Marine Sanctuary

Location Landed	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total
Connecticut	0	12,059	4,056	0	0	10,818	0	0	0	0	26,933	0.01%
New Haven	$0	$12,059	$4,056	$0	$0	$0	$0	$0	$0	$0	$16,115	0.01%
New London	$0	$0	$0	$0	$0	$10,818	$0	$0	$0	$0	10,818	0.01%
Massachusetts	18,392,520	21,136,409	19,209,896	22,784,135	19,725,926	22,244,219	15,778,169	14,624,213	13,394,071	22,623,531	189,913,089	97.87%
Barnstable	$896,372	$822,134	$758,793	$1,687,067	$2,834,899	$3,842,997	$1,879,588	$2,633,328	$2,275,101	$2,030,552	$19,660,832	10.13%
Bristol	$103,106	$57,900	$237,327	$303,601	$340,511	$907,217	$3,288,722	$1,204,237	$1,671,667	$7,096,445	$15,210,733	7.84%
Essex	$14,745,159	$17,798,599	$15,749,848	$17,345,717	$13,592,554	$13,965,100	$8,002,796	$8,089,148	$6,428,307	$9,363,291	$125,080,520	64.46%
Nantucket	$0	$0	$0	$1,009	$1,067	$6,452	$0	$0	$0	$0	$8,528	0.00%
Norfolk	$9,509	$34,351	$135,956	$201,272	$204,490	$15,956	$30,546	$12,881	$105,278	$193,582	$943,821	0.49%
Plymouth	$2,320,683	$2,053,893	$1,861,171	$2,175,385	$1,472,962	$2,003,355	$1,933,034	$2,172,563	$2,746,599	$2,808,008	$21,547,652	11.10%
Suffolk	$317,690	$369,532	$466,801	$1,070,085	$1,279,443	$1,503,141	$643,483	$512,055	$167,118	$1,131,654	$7,461,002	3.85%
Maryland	129	0	0	0	0	0	0	0	0	0	129	0.00%
St. Mary's	$129	$0	$0	$0	$0	$0	$0	$0	$0	$0	129	0.00%
Maine	41,911	136,757	29,767	315,848	88,685	245,889	153,200	476,546	366,628	173,135	2,028,365	1.05%
Cumberland	$13,184	$55,577	$13,746	$254,799	$86,240	$217,085	$76,950	$331,012	$361,506	$113,111	$1,523,211	0.79%
Hancock	$0	$0	$0	$0	$0	$0	$0	$27,976	$0	$0	$27,976	0.01%
Knox	$0	$37,923	$13,672	$20,860	$0	$3,838	$73,493	$116,352	$482	$34,033	$300,653	0.15%
Lincoln	$0	$20,663	$0	$0	$0	$0	$0	$254	$343	$367	$21,627	0.01%
Washington	$0	$0	$0	$7,322	$0	$7,396	$0	$0	$0	$0	$14,718	0.01%
York	$28,727	$22,595	$2,348	$32,866	$2,445	$17,570	881	$952	$1,042	$25,623	$135,049	0.07%
Unknown	$0	$0	$0	$0	$0	$0	$1,876	$0	$3,255	$0	$5,131	0.00%
New Hampshire	226,665	264,824	145,424	201,912	101,143	373,529	105,171	77,240	123,949	283,070	1,902,927	0.98%
Rockingham	226,665	$264,824	$145,424	$201,912	$101,143	$373,529	$105,171	$77,240	$123,949	$283,070	$1,902,927	0.98%
New Jersey	0	419	1,296	0	0	770	0	0	0	1,808	4,293	0.00%
Cape May	$0	$0	$1,008	$0	$0	770	$0	$0	$0	$1,808	$3,586	0.00%
Essex	$0	$0	$288	$0	$0	$0	$0	$0	$0	$0	$288	0.00%
Monmouth	$0	$419	$0	$0	$0	$0	$0	$0	$0	$0	$419	0.00%
New York	0	1,536	0	0	0	0	0	0	3,707	1,238	6,481	0.00%
New York	$0	$0	$0	$0	$0	$0	$0	$0	$3,707	$1,238	$4,944	0.00%
Suffolk	$0	$1,536	$0	$0	$0	$0	$0	$0	$0	$0	$1,536	0.00%
Rhode Island	3,971	8,241	400	22,276	0	5,978	0	33,328	0	0	74,194	0.04%
Providence	$0	$8,241	$0	$0	$0	$0	$0	$0	$0	$0	$8,241	0.00%
Washington	$3,971	$0	$400	$22,276	$0	$5,978	$0	$33,328	$0	$0	$65,953	0.03%
Virginia	0	80,039	0	0	0	0	0	0	0	0	80,039	0.04%
York	$0	$80,039	$0	$0	$0	$0	$0	$0	$0	$0	$80,039	0.04%

Chapter 5: Economic Contributions of Commercial Fisheries in Stellwagen Bank National Marine Sanctuary

Economic Contribution Summary

As explained in Chapter 3, the analysis here was completed by NOAA's Northeast Fisheries Science Center, using IMPLAN. The model has been adjusted to reflect the way commercial fishing economic activities move through the regional economy. The modeled region is specific to New England, based upon commercial catch brought to ports of landings within New England. From 2007 to 2016, around $193.9 million was harvested from Stellwagen Bank National Marine Sanctuary, which generated over $660.1 million in output, $223.7 million in income, and more than 7,000 full and part-time jobs in the New England region (Table 5.1). The average annual value of landings supported over the study period was $19.4 million, $66.0 in output, $22.4 in income, and 733 jobs.

Table 5.2 shows how Stellwagen Bank National Marine Sanctuary fits into the broader Gulf of Maine region (as defined in Chapter 1). From 2007 to 2016, the value of total landings across all species from the sanctuary was roughly 5% of the Gulf of Maine landings. Over that same period, 5.3% of output, 5.1% of income, and 7.8% of employment within the Gulf of Maine was derived from the sanctuary. The most impactful year of Stellwagen Bank National Marine Sanctuary in terms of the percentage landed from the Gulf of Maine was 2010 and the least impactful year was 2013.

Table 5.1 Annual Contributions by Value of Landings, Output, Income, and Employment (Stellwagen Bank National Marine Sanctuary) (2017$)

Year	Value of Landings	Output	Income	Employment
2007	$18,665,067	$66,482,662	$21,643,385	754
2008	$21,558,290	$77,714,959	$25,426,350	868
2009	$19,389,542	$69,229,147	$22,591,177	775
2010	$23,297,107	$81,897,492	$27,372,385	893
2011	$19,915,754	$69,017,471	$23,203,493	758
2012	$22,880,433	$77,788,084	$27,133,479	937
2013	$16,034,664	$52,228,776	$18,319,016	571
2014	$15,206,949	$48,553,328	$17,189,160	576
2015	$13,881,393	$43,466,414	$15,141,195	454
2016	$23,066,635	$73,720,988	$25,714,818	747
Total	$193,895,833	$660,099,320	$223,734,459	7,334
2007-2016 Average	$19,389,583	$66,009,932	$22,373,446	733

Economic Contribution Summary by Region

Commercial fishing in Stellwagen Bank National Marine Sanctuary has the largest contribution to the coastal regions of Massachusetts, which generate much of the output, income, and employment. The non-maritime New England (non-coastal New England) region is the second most affected region. The rest of the regions are small in comparison, generating a small minority of the output, income, and employment, respectively (tables 5.2, 5.3, 5.4, and 5.5).

Table 5.2 Percentage of Economic Contributions from the Gulf of Maine Occurring in Stellwagen Bank National Marine Sanctuary

	Stellwagen Bank National Marine Sanctuary Economic Contributions				Gulf of Maine Economic Contributions				Stellwagen Bank National Marine Sanctuary as Percentage of Gulf of Maine			
Year	**Value of Landings ($1,000s)**	**Output ($1,000s)**	**Income ($1,000s)**	**Employment**	**Value of Landings ($1,000s)**	**Output ($1,000s)**	**Income ($1,000s)**	**Employment**	**Value of Landings**	**Output**	**Income**	**Employment**
2007	$18,665	$66,483	$21,643	754	$378,333	$1,267,898	$445,280	10,743	4.9%	5.2%	4.9%	7.0%
2008	$21,558	$77,715	$25,426	868	$323,121	$1,086,038	$380,977	9,283	6.7%	7.2%	6.7%	9.4%
2009	$19,390	$69,229	$22,591	775	$290,411	$969,349	$340,727	8,086	6.7%	7.1%	6.6%	9.6%
2010	$23,297	$81,897	$27,372	893	$325,612	$1,087,090	$379,663	9,141	7.2%	7.5%	7.2%	9.8%
2011	$19,916	$69,017	$23,203	758	$394,478	$1,313,986	$462,381	10,978	5.0%	5.3%	5.0%	6.9%
2012	$22,880	$77,788	$27,133	937	$500,772	$1,897,221	$669,055	15,478	4.6%	4.1%	4.1%	6.1%
2013	$16,035	$52,229	$18,319	571	$485,259	$1,602,922	$561,588	12,841	3.3%	3.3%	3.3%	4.4%
2014	$15,207	$48,553	$17,189	576	$332,034	$1,092,477	$385,603	8,874	4.6%	4.4%	4.5%	6.5%
2015	$13,881	$43,466	$15,141	454	$338,549	$1,103,094	$389,512	8,797	4.1%	3.9%	3.9%	5.2%
2016	$23,067	$73,721	$25,715	747	$323,859	$1,050,540	$371,850	8,563	7.1%	7.0%	6.9%	8.7%
Total	$193,896	$660,099	$223,734	7,334	$3,692,428	$12,470,614	$4,386,637	102,784	5.3%	5.3%	5.1%	7.1%
2007-2016 Average	$19,390	$66,010	$22,373	733	$369,243	$1,247,061	$438,664	10,278	5.3%	5.3%	5.1%	7.1%

Table 5.3 Total Stellwagen Bank National Marine Sanctuary Commercial Fishing Output Contributions (2017$) by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	Rhode Island RI	Seacoast CT	Non-Maritime New England	Total New England
2007	$42,042	$63,650	$1,455,710	$510,287	$2,795,390	$25,284,392	$11,823,292	$1,375,644	$7,445,891	$925,345	$2,232,826	$12,528,192	$66,482,662
2008	$51,783	$104,462	$1,835,935	$611,075	$3,414,599	$30,258,735	$13,125,239	$1,279,401	$8,697,521	$1,079,405	$2,632,843	$14,623,962	$77,714,959
2009	$53,962	$40,977	$1,517,657	$500,933	$2,770,952	$26,822,630	$12,075,133	$1,186,882	$7,898,211	$995,169	$2,367,807	$12,998,833	$69,229,147
2010	$83,401	$317,915	$1,974,497	$594,206	$3,240,341	$29,926,301	$14,736,177	$2,476,092	$9,093,820	$1,225,109	$2,759,586	$15,470,049	$81,897,492
2011	$42,738	$170,452	$1,411,369	$435,361	$2,444,460	$24,185,821	$12,248,964	$3,947,781	$7,807,319	$949,647	$2,120,274	$13,253,284	$69,017,471
2012	$84,788	$376,459	$1,604,041	$451,648	$2,976,016	$25,323,379	$14,048,883	$5,328,718	$8,895,374	$1,174,977	$2,660,817	$14,862,983	$77,788,084
2013	$41,047	$261,948	$776,604	$203,403	$1,297,687	$15,503,032	$9,426,359	$2,658,135	$9,491,083	$703,442	$1,631,910	$10,234,126	$52,228,776
2014	$79,953	$569,761	$1,060,770	$211,615	$1,233,608	$14,983,675	$8,925,023	$3,670,629	$6,056,843	$757,309	$1,516,407	$9,487,736	$48,553,328
2015	$61,025	$280,199	$900,211	$142,804	$1,063,509	$12,447,946	$8,731,214	$3,224,758	$6,095,245	$638,792	$1,374,718	$8,505,994	$43,466,414
2016	$66,935	$382,418	$966,657	$256,088	$1,914,940	$19,094,741	$13,769,663	$3,389,832	$15,923,549	$1,079,353	$2,321,294	$14,555,520	$73,720,988
Total	$607,674	$2,568,241	$13,503,451	$3,917,420	$23,151,503	$223,830,651	$118,909,947	$28,537,873	$87,404,856	$9,528,548	$21,618,482	$126,520,679	$660,099,321

Table 5.4 Total Stellwagen Bank National Marine Sanctuary Commercial Fishing Income Contributions (2017$) by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	Rhode Island RI	Seacoast CT	Non-Maritime New England	Total New England
2007	$10,749	$42,319	$336,800	$95,942	$715,673	$9,071,834	$3,944,367	$620,291	$1,449,191	$295,311	$815,077	$4,245,833	$21,643,385
2008	$13,149	$66,877	$425,503	$108,836	$883,461	$11,062,004	$4,367,256	$574,443	$1,658,465	$347,536	$962,006	$4,956,815	$4,812,944
2009	$15,677	$42,694	$350,744	$85,621	$696,075	$9,647,232	$4,079,068	$510,377	$1,580,910	$316,635	$861,900	$4,404,242	$22,591,177
2010	$22,234	$85,105	$545,264	$115,540	$821,273	$11,115,819	$5,080,628	$1,113,817	$1,839,034	$389,769	$1,006,548	$5,237,354	$27,372,385
2011	$10,238	$43,953	$352,833	$71,922	$595,182	$9,047,621	$4,286,287	$1,646,412	$1,591,188	$295,536	$775,626	$4,486,695	$23,203,493
2012	$20,938	$98,428	$464,030	$90,638	$851,518	$9,727,118	$5,011,966	$2,443,593	$2,065,271	$368,512	$966,753	$5,024,715	$27,133,479
2013	$9,491	$91,651	$226,622	$40,174	$361,682	$5,892,645	$3,362,912	$1,160,568	$2,898,859	$222,138	$593,877	$3,458,397	$18,319,016
2014	$16,793	$193,679	$376,262	$43,075	$339,469	$5,711,506	$3,176,956	$1,726,485	$1,607,959	$243,454	$550,696	$3,202,827	$17,189,160
2015	$14,044	$72,630	$356,891	$33,647	$326,334	$4,548,007	$3,065,878	$1,441,942	$1,716,688	$198,519	$497,040	$2,869,576	$15,141,195
2016	$14,420	$108,514	$310,535	$66,295	$660,710	$7,134,021	$4,788,871	$1,461,054	$5,079,392	$335,375	$840,436	$4,915,196	$25,714,818
Total	$147,733	$845,850	$3,745,483	$751,690	$6,251,376	$82,957,808	$41,164,189	$12,698,983	$21,486,956	$3,012,785	$7,869,959	$42,801,650	$203,121,052

Table 5.5 Total Stellwagen Bank National Marine Sanctuary Commercial Fishing Employment Contributions by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	Rhode Island RI	Seacoast CT	Non-Maritime New England	Total New England
2007	0.7	1.3	9.8	4.0	21.9	415.5	107.3	22.7	40.1	7.4	13.7	109.3	753.8
2008	0.9	1.8	13.4	4.1	22.8	496.7	111.6	18.8	45.7	8.6	16.2	127.7	868.4
2009	0.9	1.4	10.2	3.3	18.0	440.9	102.8	17.6	43.8	8.0	14.8	113.4	775.2
2010	1.3	2.2	13.8	4.2	21.8	457.2	126.9	52.7	50.6	9.7	17.0	135.0	892.5
2011	0.7	1.3	10.1	2.9	15.5	345.9	100.4	102.0	43.6	7.2	12.9	115.7	758.3
2012	1.2	2.4	12.1	3.5	26.7	388.8	122.7	155.4	68.9	9.2	16.7	129.8	937.5
2013	0.5	2.0	6.3	1.5	9.6	205.1	89.8	65.7	85.6	5.5	10.0	89.1	570.7
2014	0.7	3.9	9.6	1.5	8.7	205.8	89.2	114.9	43.4	6.2	9.3	82.7	576.0
2015	0.6	1.7	8.1	1.1	9.6	132.9	84.6	83.2	45.1	4.9	8.5	73.9	454.2
2016	0.8	2.7	8.8	2.5	26.7	246.3	110.9	77.5	122.7	8.1	14.2	125.9	747.2
Total	6.4	17.1	75.1	19.5	130.4	2,243.8	786.3	662.3	484.1	55.5	97.3	819.4	5,397.1

Chapter 6: Special Analysis: Profiles of Commercial Fisheries in the Edge

The edge consists of a two-nautical-mile buffer on each side of the western edge of the sliver. Because the sliver has been closed since 1998 to commercial fishing and so presumably has resulted in catchable biomass spilling over into the rest of Stellwagen Bank National Marine Sanctuary, this report attempts to analyze the "edge effect" or the economic activity generated by the sliver. For commercial fishing, the economic activity was analyzed by assessing catch within the edge and comparing that to catch in the rest of Stellwagen Bank National Marine Sanctuary. The two-nautical-mile buffer along the edge is 12.2% of the total sanctuary area (Figure 1.4).

Catch by Species/Species Groups

Cod was the number one ranked fishery in the edge from 2007 to 2016 based on total value, accounting for over $7.2 million or 26.1% of all harvest value from the edge. This was followed by sea scallop at $4.3 million (15.4%), monkfish at $3.6 million (13.1%), haddock at $2.4 million (8.8%), and pollock at $2.4 million (8.6%). These top five species/species groups accounted for roughly 72% of the 2007-2016 harvest revenue from the edge (Table 6.1).

Table 6.1 Pounds and Value of Landings from the Edge by Species 2007-2016 (2017$)

Species	Pounds	Value	Percentage of Total Value
Cod	3,242,526	$7,236,523	26.10%
Sea scallop	309,868	$4,257,609	15.35%
Monkfish	1,277,967	$3,629,387	13.09%
Haddock	1,088,504	$2,430,876	8.77%
Pollock	3,048,037	$2,367,232	8.54%
Lobster	409,356	$2,087,052	7.53%
Yellowtail flounder	663,315	$1,085,270	3.91%
White hake	484,291	$844,931	3.05%
Spiny dogfish	3,265,125	$803,164	2.90%
Winter flounder	265,755	$586,088	2.11%
Witch flounder	170,179	$527,890	1.90%
Skates	1,685,722	$492,133	1.77%
Atlantic herring	2,904,923	$459,578	1.66%
American plaice	122,520	$220,681	0.80%
Atlantic mackerel	632,766	$131,208	0.47%
Bluefin tuna	14,323	$126,378	0.46%
Silver hake	134,339	$112,566	0.41%
Squid (*Loligo*)	66,783	$88,724	0.32%
Shrimp (pandalid)	92,024	$56,525	0.20%
Atlantic halibut	4,831	$38,911	0.14%
Redfish	38,022	$32,735	0.12%
Cusk	21,947	$21,937	0.08%
Atlantic wolffish	19,041	$19,389	0.07%
Bluefish	24,002	$13,300	0.05%
Hagfish	12,501	$8,154	0.03%
Rock crab	13,651	$6,977	0.03%
Sea raven	5,247	$6,889	0.02%
Scup	9,687	$5,722	0.02%
King whiting	5,944	$4,806	0.02%
Red hake	8,840	$3,648	0.01%
Sand dab flounder	5,927	$3,608	0.01%
Big eye tuna	602	$3,604	0.01%
Other	12,273	$15,455	0.06%
Total	20,060,838	$27,728,950	100.00%

Trends in Top Five Species Groups

Cod

From 2007 to 2016, cod was first in terms of total ex-vessel value in the edge (Table 6.1). Cod saw a rise in catch from 2007 to 2009, reaching a peak of roughly 678,000 pounds landed with a value of over $1.1 million. However, since this peak in landings, there has been a steady decline in cod with a low point of 18,000 pounds landed and a value of $52,700 in 2015. Cod's value per pound in the edge fell from 2007 to 2009 then increased from 2010 to 2013. From 2015 to 2016 the value per pound remained stable at $2.87 per pound (Figure 6.1 and Table A.11).

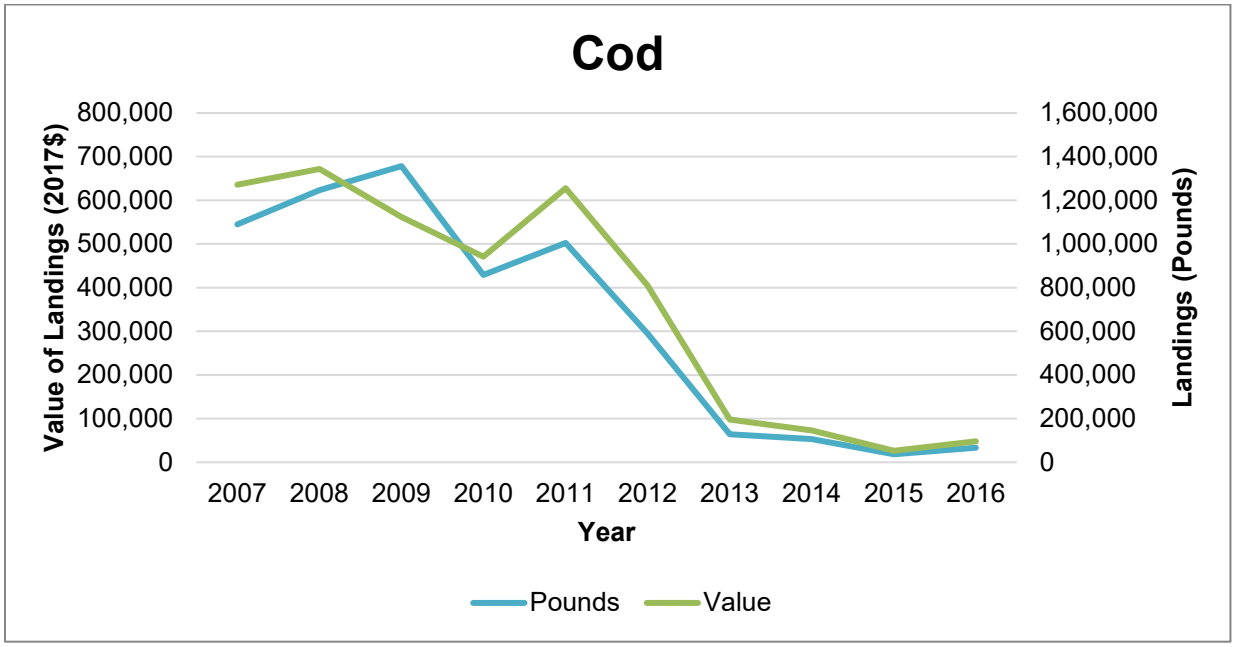

Figure 0.1 Pounds and Value (2017$) of Cod Landed in the Edge (2007-2016)

Sea Scallop

From 2007 to 2016, sea scallop was second in terms of total ex-vessel value in the edge (Table 6.1). Landings of sea scallop were erratic in the edge from 2007 to 2016. Sea scallop landings spiked in 2012 (at nearly 28,000 pounds), declined in 2013, and have been increasing since 2014. The value per pound of sea scallops landed in the edge has been steadily increasing since 2007 (Figure 6.2 and Table A.12).

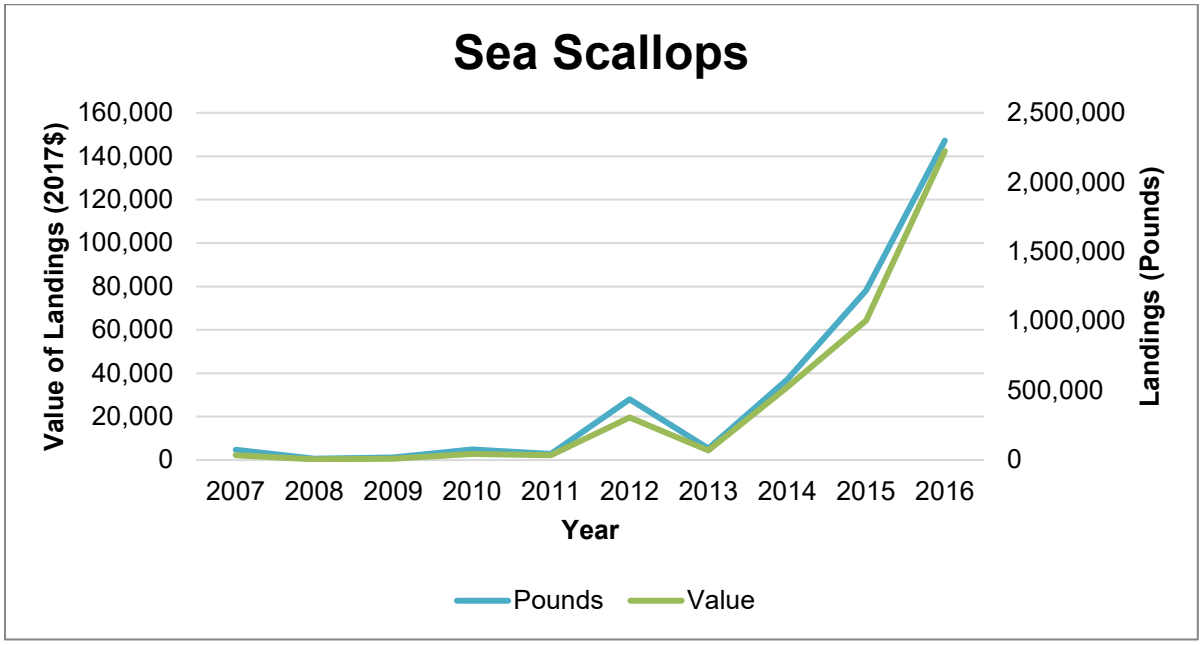

Figure 0.2 Pounds and Value (2017$) of Sea Scallops Landed in the Edge (2007-2016)

Monkfish

From 2007 to 2016, monkfish had the third highest value of landings in the edge with a total value of $3.6 million (Table 6.1). Monkfish landings declined between 2007 and 2012. The landings began to increase in 2013, and then declined again in 2016. The value per pound increased from 2007 to 2010 and then declined from 2011 to 2015 before increasing again in 2016 (Table 6.4, figures 6.5 and 6.6).

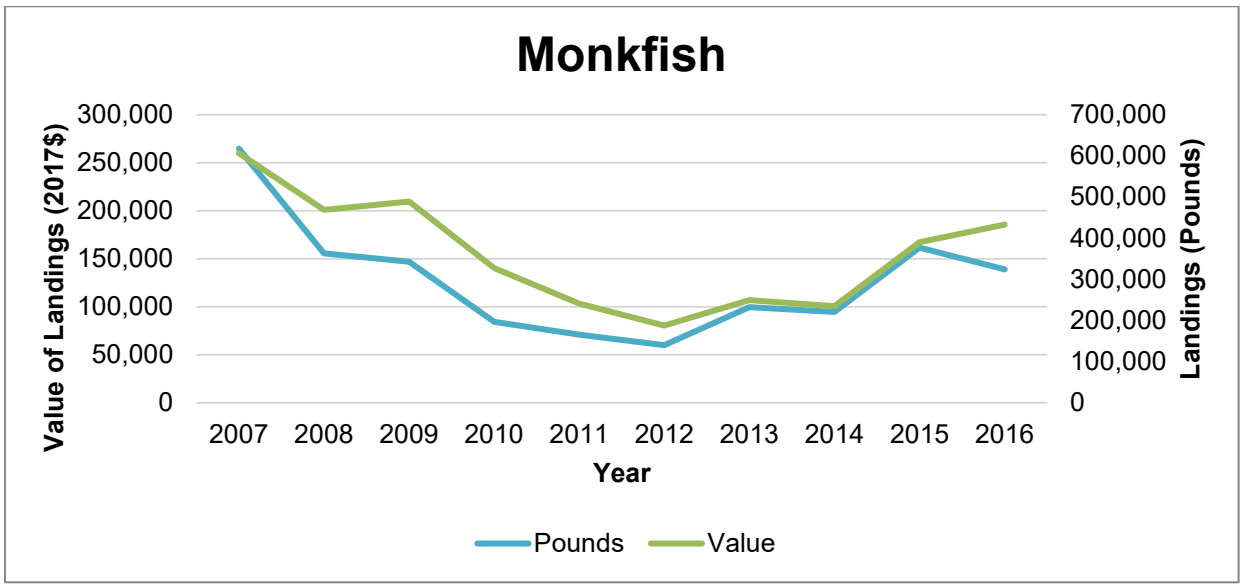

Figure 0.3 Pounds and Value (2017$) of Monkfish Landed in the Edge (2007-2016)

Haddock

From 2007 to 2016, haddock was fourth in terms of total ex-vessel value in the edge (Table 6.1). Haddock landings rose from 2008 to 2011, reaching a peak of nearly 227,000 pounds, with a value of over a half of a million dollars. However, since this time there has been a steady decline in haddock landings through 2015 with a low point of roughly 3,000 pounds, although the lowest value per pound occurred in 2016 at $1.58. Haddock's value per pound was highest in 2013 at $2.94 per pound (Figure 6.4 and Table A.14).

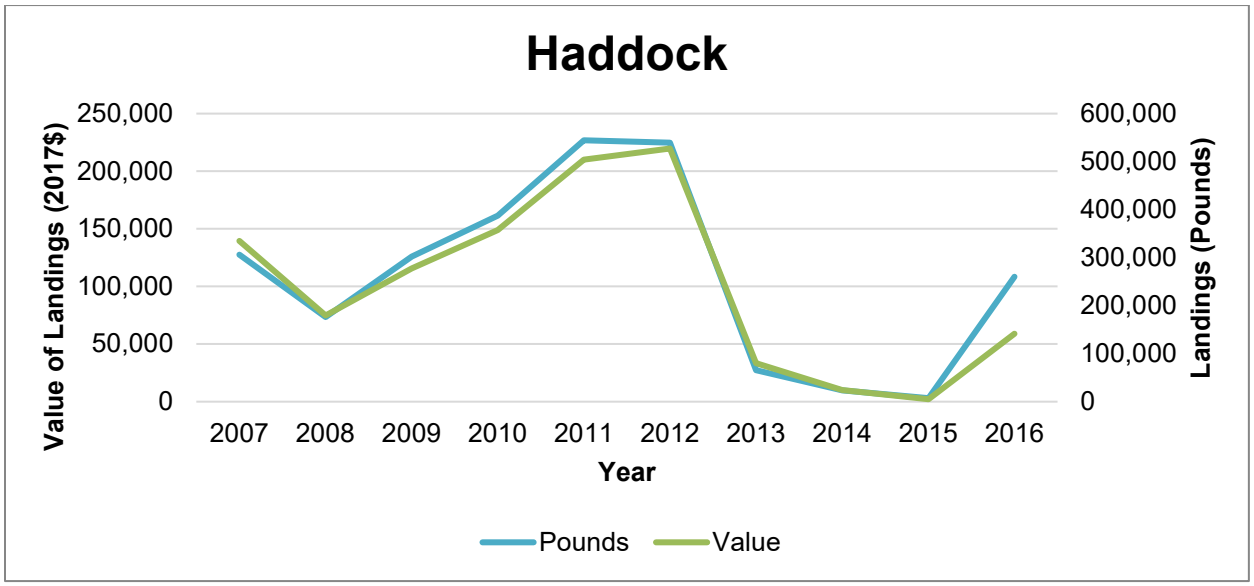

Figure 0.4 Pounds and Value (2017$) of Haddock Landed in the Edge (2007-2016)

Pollock

From 2007 to 2016, pollock had the fifth highest total ex-vessel value in the edge (Table 6.1). Landings of pollock were variable between 2007 and 2016. The highest number of pounds landed in the edge occurred in 2008 with over 860,000 pounds, and the low point was in 2016 with slightly less than 41,000 pounds. The value per pound ranged from 52 cents to $1.46 over the 10-year period. The highest value of landings occurred in 2009 and the lowest value occurred in 2016 (Figure 6.5 and Table A.15).

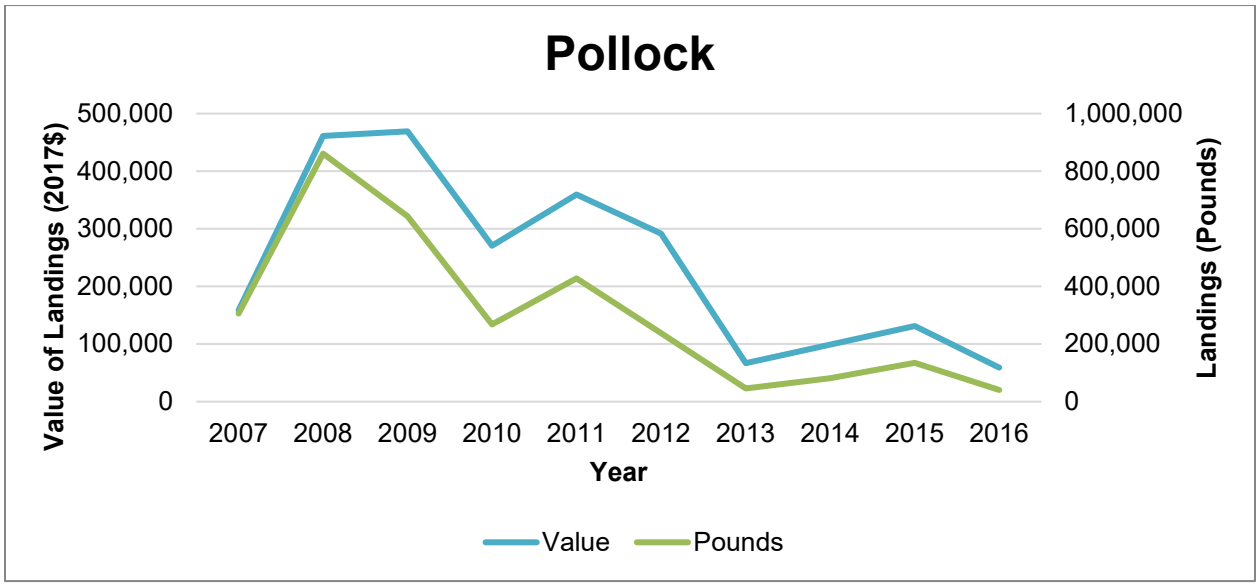

Figure 0.5 Pounds and Value (2017$) of Pollock Landed in the Edge (2007-2016)

Edge Catch by Species as a Percentage in Stellwagen Bank National Marine Sanctuary

The edge accounts for 28.7% of the pounds of pollock and almost 52% of the pounds of spiny dogfish in Stellwagen Bank National Marine Sanctuary. Monkfish landed in the edge accounted for roughly 51% of the total value of monkfish landed within the sanctuary and pollock accounted for nearly 34% (tables 6.7 and 6.8).

Table 6.2 Top Five Species Landed in the Edge as a Percentage of Stellwagen Bank National Marine Sanctuary 2007-2016 Total

Species	Pounds Landed in Edge	Pounds Landed in Stellwagen Bank National Marine Sanctuary	Percentage of Stellwagen Bank National Marine Sanctuary
Spiny dogfish	3,265,125	12,039,396	27.1%
Cod	3,242,526	29,767,602	10.9%
Pollock	3,048,037	10,602,620	28.7%
Atlantic herring	2,904,923	29,005,177	10.0%
Skates	1,685,722	3,274,024	51.5%

Table 6.3 Top Five Species by Ex-Vessel Value in the Edge as a Percentage of Stellwagen Bank National Marine Sanctuary 2007-2016 Total (2017$)

Species	Value in Edge	Value in Stellwagen Bank National Marine Sanctuary	Percentage of Stellwagen Bank National Marine Sanctuary
Cod	$7,236,523	$63,570,163	11.4%
Sea scallop	$4,257,609	$33,250,766	12.8%
Monkfish	$3,629,387	$7,106,043	51.1%
Haddock	$2,430,876	$7,579,083	32.1%
Pollock	$2,367,232	$6,983,546	33.9%

Additionally, the catch per unit area (CPUA) for the edge and Stellwagen Bank National Marine Sanctuary can be compared. CPUA is calculated by taking the landings divided by the square nautical miles (nm). The area of the sanctuary closed to bottom tending gear is 141 nm^2, the total area of the sanctuary is 638 nm^2 , and the area of the edge is 78 nm^2. Of the top 10 ranked commercial species within Stellwagen Bank National Marine Sanctuary, four had a higher CPUA in the edge than in the sanctuary. Of the top 10 commercial species in the edge, six had a higher CPUA in the edge than in the sanctuary.

Table 6.4 Catch Per Unit Area for Stellwagen Bank National Marine Sanctuary and the Edge

Stellwagen Bank National Marine Sanctuary Rank	Edge Rank	Species	Total Pounds 2007-2016 in Stellwagen Bank National Marine Sanctuary	Total Pounds 2007-2016 in the Edge	CPUA Stellwagen Bank National Marine Sanctuary	CPUA Edge	CPUA Edge> CPUA Stellwagen Bank National Marine Sanctuary	Percentage of Stellwagen Bank National Marine Sanctuary Landings Caught in the Edge
1	2	Cod	29,767,602	3,242,526	59,895	41,571	(18,324)	10.9%
2	4	Atlantic herring	29,005,177	2,904,923	45,463	37,243	(8,220)	10.0%
3	9	Atlantic mackerel	14,371,212	632,766	28,916	8,112	(20,804)	4.4%
4	1	Spiny dogfish	12,039,396	3,265,125	24,224	41,861	17,636	27.1%
5	3	Pollock	10,602,620	3,048,037	21,333	39,077	17,744	28.7%
6	11	Lobster[1]	8,319,600	409,356	13,040	5,248	(7,792)	4.9%
7	8	Yellowtail flounder	6,503,692	663,315	13,086	8,504	(4,582)	10.2%
8	5	Skates	3,274,024	1,685,722	6,588	21,612	15,024	51.5%
9	7	Haddock	3,221,043	1,088,504	6,481	13,955	7,474	33.8%
10	12	Sea scallop	2,626,295	309,868	5,284	3,973	(1,312)	11.8%
11	6	Monkfish	2,293,044	1,277,967	4,614	16,384	11,770	55.7%
16	10	White hake	754,852	484,291	1,519	6,209	4,690	64.2%

1. Denotes fishing is allowed throughout the entire sanctuary

Bolded numbers indicate that the catch per unit area was higher in the edge when compared to the sanctuary.

Edge Landed by Species as a Percentage of the Gulf of Maine

None of the top five species landed in the edge account for a large portion of the total landings for their species in the Gulf of Maine, which is to be expected given the small size of the edge relative to the Gulf of Maine (tables 6.9 and 6.10). The species that accounts for the highest percentage is cod, with 5.4% of value and 5.5% of pounds landed in the Gulf of Maine coming from the edge.

Table 6.5 Top Five Species by Landings in the Edge as a Percentage of the Gulf of Maine 2007-2016 Total

Species	Pounds Landed in Edge	Pounds Landed in Gulf of Maine	Percentage of Region
Spiny dogfish	3,265,125	63,128,270	5.2%
Cod	3,242,526	58,842,021	5.5%
Pollock	3,048,037	72,998,994	4.2%
Atlantic herring	2,904,923	1,023,669,493	0.3%
Skates	1,685,722	37,231,546	4.5%

Table 6.6 Top Five Species by Ex-Vessel Value in the Edge as a Percentage of the Gulf of Maine 2007-2016 Total (2017$)

Species	Value in Edge	Value in Gulf of Maine	Percentage of Region
Cod	$7,236,523	$134,188,643	5.4%
Sea scallop	$4,257,609	$1,529,563,105	0.28%
Monkfish	$3,629,387	$72,022,129	5.0%
Haddock	$2,430,876	$104,709,594	2.3%
Pollock	$2,367,232	$79,326,792	3.0%

Landings by Gear Type

Most of the landings in the edge were caught using sink gill nets, bottom fish otter trawls, and midwater pair trawls. Those three gear types account for over 87% of the pounds landed in Stellwagen Bank National Marine Sanctuary (tables 6.11, 6.12, and 6.13).

Most of the ex-vessel value in the edge was landed using sink gill nets, bottom fish otter trawls (fish bottom otter trawl in the table below), and sea scallop dredges. Those three gear types account for nearly 88% of the value landed from the edge.

Table 6.7a Annual Pounds and Value of Landings by Gear Type in the Edge (2017$)

Pounds	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total 2007-2016
Sink gill net	1,312,933	1,903,233	2,035,594	1,533,947	1,119,096	1,294,988	634,969	1,036,643	824,903	705,875	12,402,182	61.8%
Fish bottom otter trawl	220,033	364,591	310,480	552,512	414,565	410,384	172,397	40,212	17,561	221,769	2,724,503	13.6%
Midwater pair trawl	444,800	0	0	1,309,650	0	0	0	641,385	0	0	2,395,835	11.9%
Purse seine	0	0	0	0	0	858,433	0	0	0	0	858,433	4.3%
Bottom longline	87,016	37,199	67,848	53,306	235,363	166,348	23,301	11,590	0	15,654	697,625	3.5%
Sea scallop dredge	4,539	225	880	4,815	2,857	28,571	5,259	37,441	77,940	145,079	307,606	1.5%
Midwater otter trawl	0	0	0	0	0	0	0	0	227,600	0	227,600	1.1%
Lobster pots	11,428	3,972	4,898	7,489	3,587	6,476	19,157	29,069	56,414	42,391	184,881	0.9%
Hand line/rod & reel	28,397	6,991	26,905	19,390	16,356	4,214	972	23,185	11,353	31,992	169,755	0.8%
Shrimp bottom otter trawl	0	12,035	1,058	50,570	0	2,263	1,450	0	2,104	0	69,480	0.3%
Other, unspecified	0	6,316	3,243	3,592	0	5,942	0	0	584	3,261	22,937	0.1%
Total	2,109,146	2,334,562	2,450,906	3,535,270	1,791,824	2,777,619	857,505	1,819,525	1,218,459	1,166,020	20,060,838	100.0%

Table 6.8b Annual Pounds and Value of Landings by Gear Type in the Edge (2017$)

Value	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	% Total 2007-2016
Sink gill net	$2,266,812	$2,383,469	$2,366,474	$1,324,274	$1,430,042	$1,538,241	$785,882	$972,578	$906,722	$915,854	$14,890,347	53.7%
Fish bottom otter trawl	$456,693	$718,246	$505,140	$1,080,863	$771,234	$819,826	$368,320	$85,822	$29,548	$339,168	$5,174,860	18.7%
Sea scallop dredge	$33,806	$1,831	$7,415	$43,549	$34,395	$312,107	$69,869	$527,863	$1,000,935	$2,183,904	$4,215,673	15.2%
Bottom longline	$228,306	$89,647	$142,392	$109,034	$542,805	$393,782	$64,907	$38,319	$0	$23,769	$1,632,962	5.9%
Lobster pots	$63,882	$19,956	$24,876	$31,553	$19,131	$31,259	$67,349	$77,740	$248,274	$196,048	$780,069	2.8%
Hand line/rod & reel	$79,182	$14,581	$70,671	$38,636	$55,892	$8,362	$8,211	$40,673	$18,584	$35,835	$370,626	1.3%
Midwater pair trawl	$49,533	$0	$0	$220,318	$0	$0	$0	$93,234	$0	$0	$363,085	1.3%
Purse seine	$0	$0	$0	$0	$0	$146,963	$0	$0	$0	$0	$146,963	0.5%
Shrimp bottom otter trawl	$0	$5,501	$543	$32,259	$0	$2,625	$1,533	$0	$3,333	$0	$45,794	0.2%
Quahog/surf clam ocean dredge	$0	$0	$0	$0	$0	$0	$0	$0	$0	$42,240	$42,240	0.2%
Other, unspecified	$0	$4,065	$2,034	$11,653	$0	$2,762	$0	$0	$43,715	$2,102	$66,331	0.2%
Total	$3,178,214	$3,237,296	$3,119,544	$2,892,140	$2,853,499	$3,255,928	$1,366,071	$1,836,227	$2,251,111	$3,738,920	$27,728,950	100.0%

Edge Landings by Gear Type as a Percentage of Stellwagen Bank National Marine Sanctuary

Sink gill nets account for the second highest share of landings with 31.5% of the pounds and highest share of value at 29.4% of the value landed by sink gill nets in Stellwagen Bank National Marine Sanctuary coming from the edge. About 65% of the pounds landed using purse seine in the sanctuary were caught in the edge (tables 6.14 and 6.15).

Table 6.9 Landings by Gear Type in the Edge as a Percentage of Stellwagen Bank National Marine Sanctuary 2007-2016 Total

Gear Type	Pounds Landed in the Edge	Pounds Landed in Stellwagen Bank National Marine Sanctuary	Percentage of Region
Sink gill net	12,402,182	39,391,407	31.5%
Fish bottom otter trawl	2,724,503	33,885,507	8.0%
Midwater pair trawl	2,395,835	36,046,291	6.6%
Purse seine	858,433	1,319,833	65.0%
Bottom longline	697,625	2,480,955	28.1%

Table 6.10 Ex-Vessel Value by Gear Type in the Edge as a Percentage of Stellwagen Bank National Marine Sanctuary 2007-2016 Total (2017$)

Gear Type	Value in the Edge	Value in Stellwagen Bank National Marine Sanctuary	Percentage of Region
Sink gill net	$14,890,347	$50,579,388	29.4%
Fish bottom otter trawl	$5,174,860	$61,583,105	8.4%
Sea scallop dredge	$4,215,673	$32,379,028	13.0%
Bottom longline	$1,632,962	$5,500,880	29.7%
Lobster pots	$780,069	$31,973,296	2.4%

Edge Landings by Gear Type as a Percentage of the Gulf of Maine

None of the gear types in the edge account for a large portion of the total landings for their respective gear types in the Gulf of Maine, which is to be expected given the small size of the edge (tables 6.16 and 6.17). The gear type that accounts for the highest percentage landed is sink gill net, with 7.3% of the pounds and 8.4% of value in the Gulf of Maine derived from the edge.

Table 6.11 Landings by Gear Type in the Edge as a Percentage of the Gulf of Maine 2007-2016 Total

Gear Type	Pounds Landed in the Edge	Pounds Landed in Gulf of Maine	Percentage of Region
Sink gill net	12,402,182	170,968,264	7.3%
Fish bottom otter trawl	2,724,503	597,598,510	0.5%
Midwater pair trawl	2,395,835	755,186,583	0.3%
Purse seine	858,433	449,858,330	0.2%
Bottom longline	697,625	26,281,429	2.7%

Table 6.12 Ex-Vessel Value by Gear Type in the Edge as a Percentage of the Gulf of Maine 2007-2016 Total (2017$)

Gear Type	Value in the Edge	Value in Gulf of Maine	Percentage of Region
Sink gill net	$14,890,347	$177,438,121	8.4%
Fish bottom otter trawl	$5,174,860	$831,307,901	0.6%
Sea scallop dredge	$4,215,673	$1,700,800,804	0.2%
Bottom longline	$1,632,962	$20,908,741	7.8%
Lobster pots	$780,069	$613,036,233	0.1%

Chapter 7: Special Analysis: Economic Contributions to Commercial Fisheries from the Edge

Economic Contribution Summary

As explained in Chapter 3, the analysis in this report was completed by NOAA's Northeast Fisheries Science Center, using IMPLAN. The model has been adjusted to reflect the way commercial fishing economic activities move through the regional economy. The results are specific to the New England region, based upon the value of the commercial catch in the edge, and brought to ports of landings within New England. From 2007 to 2016, around $27.7 million was harvested from the edge, which generated over $98.0 million in output, $38.7 million in income, and 1,108 full- and part-time jobs in the New England region. Annually on average, $2.8 million in landings, $9.8 million in output, $3.2 million in income, and 111 jobs are supported from landings caught in the edge. The contribution of commercial fishing in the edge declined in 2013 to $4.9 million in output and then began to increase through 2016, peaking at $12.5 million in output (Table 7.1).

Table 7.1 Annual Contributions by Value of Landings, Output, Income, and Employment (Edge) (2017$)

Year	Value of Landings	Output	Income	Employment
2007	$3,178,214	$11,461,102	$3,569,819	128
2008	$3,235,760	$11,759,945	$3,692,073	128
2009	$3,119,539	$11,381,049	$3,520,076	126
2010	$2,892,140	$10,377,559	$3,439,931	109
2011	$2,853,499	$10,359,392	$3,294,971	117
2012	$3,255,928	$11,620,888	$3,822,532	134
2013	$1,364,195	$4,873,332	$1,582,523	53
2014	$1,836,227	$6,343,813	$2,122,455	88
2015	$2,247,405	$7,347,587	$2,518,130	99
2016	$3,738,920	$12,482,500	$4,190,628	126
Total	$27,721,826	$98,007,167	$38,690,766	1,108
2007-2016 Average	$2,772,183	$9,800,717	$3,175,314	111

Table 7.2 shows how the edge fits into the Gulf of Maine region (as defined in Chapter 1). From 2007 to 2016, the value of total landings across all species from the edge is roughly 1.0% of landings in the Gulf of Maine. The value of output, income, and employment was also roughly 1%.

When comparing the edge to Stellwagen Bank National Marine Sanctuary, roughly 14% of the landings value in the sanctuary came from the edge. In 2007, the percentage of landings relative to the sanctuary

was roughly 17%, and since then the percentage has decreased, reaching a low of 8.5% in 2013 (Table 7.3).

Economic Contribution Summary by Region

Commercial fishing in the edge has the largest contribution in Gloucester, Massachusetts, followed by Boston, Massachusetts, and then non-maritime New England (non-coastal New England). The rest of the regions are small in comparison, generating the remaining 25-30% of the economic contributions for output, income, and employment (tables 7.4, 7.5, and 7.6).

Table 7.2 Percentage of Economic Contributions occurring in Edge from the Gulf of Maine (2017$)

	Edge Economic Contributions				Gulf of Maine Economic Contributions				Percentage of the Gulf of Maine from the Edge			
Year	**Value of Landings ($1,000s)**	**Output ($1,000s)**	**Income ($1,000s)**	**Employment**	**Value of Landings ($1,000s)**	**Output ($1,000s)**	**Income ($1,000s)**	**Employment**	**Value of Landings**	**Output**	**Income**	**Employment**
2007	$3,178	$11,461	$3,570	128	$378,333	$1,267,898	$445,280	10,743	0.8%	0.9%	0.8%	1.2%
2008	$3,236	$11,760	$3,692	128	$323,121	$1,086,038	$380,977	9,283	1.0%	1.1%	1.0%	1.4%
2009	$3,120	$11,381	$3,520	126	$290,411	$969,349	$340,727	8,086	1.1%	1.2%	1.0%	1.6%
2010	$2,892	$10,378	$10,378	109	$325,612	$1,087,090	$379,663	9,141	0.9%	1.0%	2.7%	1.2%
2011	$2,853	$10,359	$3,295	117	$394,478	$1,313,986	$462,381	10,978	0.7%	0.8%	0.7%	1.1%
2012	$3,256	$11,621	$3,823	134	$500,772	$1,897,221	$669,055	15,478	0.7%	0.6%	0.6%	0.9%
2013	$1,364	$4,873	$1,583	53	$485,259	$1,602,922	$561,588	12,841	0.3%	0.3%	0.3%	0.4%
2014	$1,836	$6,344	$2,122	88	$332,034	$1,092,477	$385,603	8,874	0.6%	0.6%	0.6%	1.0%
2015	$2,247	$7,348	$2,518	99	$338,549	$1,103,094	$389,512	8,797	0.7%	0.7%	0.6%	1.1%
2016	$3,739	$12,483	$4,191	126	$323,859	$1,050,540	$371,850	8,563	1.2%	1.2%	1.1%	1.5%
Total	$27,722	$98,007	$38,691	1,108	$3,692,428	$12,470,614	$4,386,637	102,784	0.8%	0.8%	0.9%	1.1%
2007-2016 Average	$2,772	$9,801	$3,869	111	$369,243	$1,247,062	$438,664	10,278	0.8%	0.8%	0.9%	1.1%

Table 7.3 Percentage of Economic Contribution occurring in Edge from Stellwagen Bank National Marine Sanctuary (2017$)

	Edge Economic Contributions				Stellwagen Bank National Marine Sanctuary Economic Contributions				Percentage of Stellwagen Bank National Marine Sanctuary from the Edge			
Year	**Value of Landings ($1,000s)**	**Output ($1,000s)**	**Income ($1,000s)**	**Employment**	**Value of Landings ($1,000s)**	**Output ($1,000s)**	**Income ($1,000s)**	**Employment**	**Value of Landings**	**Output**	**Income**	**Employment**
2007	$3,178	$11,461	$3,570	128	$18,665	$66,483	$21,643	754	17.0%	17.2%	16.5%	17.0%
2008	$3,236	$11,760	$3,692	128	$21,558	$77,715	$25,426	868	15.0%	15.1%	14.5%	14.7%
2009	$3,120	$11,381	$3,520	126	$19,390	$69,229	$22,591	775	16.1%	16.4%	15.6%	16.3%
2010	$2,892	$10,378	$10,378	109	$23,297	$81,897	$27,372	893	12.4%	12.7%	37.9%	12.2%
2011	$2,853	$10,359	$3,295	117	$19,916	$69,017	$23,203	758	14.3%	15.0%	14.2%	15.4%
2012	$3,256	$11,621	$3,823	134	$22,880	$77,788	$27,133	937	14.2%	14.9%	14.1%	14.3%
2013	$1,364	$4,873	$1,583	53	$16,035	$52,229	$18,319	571	8.5%	9.3%	8.6%	9.3%
2014	$1,836	$6,344	$2,122	88	$15,207	$48,553	$17,189	576	12.1%	13.1%	12.3%	15.3%
2015	$2,247	$7,348	$2,518	99	$13,881	$43,466	$15,141	454	16.2%	16.9%	16.6%	21.8%
2016	$3,739	$12,483	$4,191	126	$23,067	$73,721	$25,715	747	16.2%	16.9%	16.3%	16.9%
Total	$27,722	$98,007	$38,691	1,108	$193,896	$660,099	$223,734	7,334	14.3%	14.8%	17.3%	15.1%
2007-2016 Average	$2,772	$9,801	$3,869	111	$19,390	$66,010	$22,373	733	14.3%	14.8%	17.3%	15.1%

Table 7.4 Total Edge Commercial Fishing Output Contributions (2017$) by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	RI	Seacoast CT	Non-Maritime New England	Total New England
2007	$5,769	$17,557	$242,981	$80,591	$397,696	$3,932,172	$2,453,301	$209,281	$1,424,771	$175,604	$384,542	$2,136,836	$11,461,102
2008	$12,631	$36,052	$300,352	$90,720	$451,719	$3,988,098	$2,481,390	$251,215	$1,371,964	$191,654	$399,803	$2,184,348	$11,759,945
2009	$8,566	$19,939	$255,363	$85,181	$430,052	$4,089,640	$2,141,245	$279,485	$1,402,391	$174,629	$384,261	$2,110,296	$11,381,049
2010	$12,273	$60,016	$243,428	$109,460	$401,440	$3,754,854	$1,683,358	$489,262	$1,163,041	$157,378	$351,998	$1,951,053	$10,377,559
2011	$8,261	$19,742	$237,411	$76,730	$404,669	$3,460,419	$1,662,717	$837,342	$1,221,770	$149,933	$350,564	$1,929,833	$10,359,392
2012	$32,221	$81,735	$448,538	$85,537	$568,771	$3,692,263	$1,997,073	$565,445	$1,374,260	$179,635	$417,330	$2,178,078	$11,620,888
2013	$8,923	$36,164	$177,975	$33,821	$180,207	$1,473,131	$1,056,453	$167,862	$584,173	$75,739	$164,351	$914,533	$4,873,332
2014	$8,920	$36,750	$161,387	$35,318	$206,887	$1,824,715	$1,226,342	$523,994	$796,963	$108,891	$217,946	$1,195,700	$6,343,813
2015	$8,190	$42,973	$126,530	$31,053	$148,359	$1,633,020	$1,618,904	$904,813	$1,061,600	$117,746	$231,369	$1,423,030	$7,347,587
2016	$6,254	$30,160	$163,472	$44,720	$237,630	$2,778,264	$2,603,269	$343,469	$3,265,375	$176,723	$392,989	$2,440,176	$12,482,500
Total	$112,008	$381,088	$2,357,437	$673,131	$3,427,430	$30,626,577	$18,924,052	$4,572,167	$13,666,307	$1,507,933	$3,295,153	$18,463,883	$98,007,167

Table 7.5 Total Edge Commercial Fishing Income Contributions (2017$) by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	RI	Seacoast CT	Non-Maritime New England	Total New England
2007	$1,672	$5,022	$55,584	$13,523	$93,225	$1,285,428	$805,842	$90,922	$300,192	$53,885	$139,989	$724,535	$3,569,819
2008	$3,045	$7,706	$73,972	$17,468	$109,127	$1,292,856	$855,745	$119,034	$268,863	$58,292	$145,367	$740,598	$3,692,073
2009	$2,586	$5,660	$57,721	$14,179	$102,327	$1,303,230	$715,627	$124,515	$284,301	$54,345	$139,908	$715,676	$3,520,076
2010	$2,522	$14,924	$59,378	$30,495	$95,076	$1,382,294	$547,042	$246,045	$224,785	$48,349	$128,209	$660,812	$3,439,931
2011	$2,384	$5,233	$56,019	$12,832	$98,724	$1,206,002	$544,648	$291,827	$247,601	$47,584	$127,785	$654,333	$3,294,971
2012	$9,593	$18,234	$164,820	$15,339	$160,811	$1,308,861	$684,377	$212,376	$303,564	$55,692	$151,001	$737,865	$3,822,532
2013	$1,354	$6,159	$65,607	$6,053	$43,789	$508,567	$355,191	$66,741	$136,161	$23,189	$59,849	$309,863	$1,582,523
2014	$1,786	$8,139	$51,128	$6,578	$53,611	$607,923	$409,381	$269,600	$197,773	$33,142	$78,811	$404,583	$2,122,455
2015	$1,792	$11,399	$40,043	$6,440	$39,810	$527,783	$562,715	$450,474	$277,009	$36,077	$83,689	$480,900	$2,518,130
2016	$1,663	$10,040	$45,623	$9,035	$64,493	$939,007	$896,527	$159,363	$1,043,287	$54,383	$142,137	$825,069	$4,190,628
Total	$28,395	$92,517	$669,895	$131,942	$860,994	$10,361,951	$6,377,095	$2,030,896	$3,283,536	$464,939	$1,196,745	$6,254,233	$31,753,138

Table 7.6 Total Edge Commercial Fishing Employment Contributions by Year to New England Communities

Year	Downeast ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	RI	Seacoast CT	Non-Maritime New England	Total New England
2007	0.1	0.2	1.6	0.5	2.4	62.4	27.2	3.3	7.9	1.3	2.3	18.5	127.8
2008	0.2	0.3	2.7	0.6	3.1	61.9	26.3	3.4	7.1	1.5	2.5	19.0	128.5
2009	0.2	0.2	1.7	0.6	2.8	66.1	20.0	4.5	8.0	1.4	2.4	18.3	126.0
2010	0.1	0.4	1.6	1.0	2.5	56.3	13.4	7.0	6.3	1.2	2.2	17.0	109.1
2011	0.1	0.2	1.6	0.5	2.6	50.5	13.0	21.2	6.8	1.2	2.2	16.8	116.6
2012	0.5	0.5	3.6	0.6	5.2	59.5	16.9	13.3	10.7	1.4	2.8	18.9	133.9
2013	0.1	0.2	1.8	0.2	1.3	20.6	11.3	4.4	3.3	0.6	1.0	7.9	52.8
2014	0.1	0.2	1.9	0.2	1.4	32.0	12.9	21.5	5.1	0.8	1.4	10.4	88.0
2015	0.1	0.3	1.6	0.2	1.0	22.6	19.1	33.4	6.4	0.9	1.4	12.3	99.2
2016	0.1	0.3	1.5	0.3	1.6	38.0	22.2	9.6	28.0	1.3	2.4	21.0	126.2
Total	1.7	2.8	19.6	4.8	23.8	469.7	182.3	121.6	89.4	11.5	20.4	160.2	1,108.0

Chapter 8: Recreational Fisheries Profiles in Statistical Area 514

Charter Boat Catch by Species/Species Groups

Vessels with a charter or party boat permit for the area must submit a vessel trip report that includes information on what they were fishing for and the statistical area in which the activity occurred. The sanctuary is located within statistical area 514 (Figure 2.1). Like the commercial fishing, recreational for-hire operators in the sanctuary were identified first. Then, the statistical areas the operator fished in were analyzed. The primary statistical block for those operating in the sanctuary was statistical area 514. Recreational catch is reported as the number of fish kept. The analysis for statistical area 514 is presented in this chapter, and the analysis for Stellwagen Bank National Marine Sanctuary is presented in Chapter 10.

Charter boats are chartered by a person or pre-formed group of people for a set price and time. A head boat or party boat charges per person. Charters tends to be closed parties, whereas party boats are open. Both are operated by a licensed captain and crew.

In total, from 1998 to 2016, cod was the most kept fish by charter boats in statistical area 514 with roughly 921,000 fish, or 49.3% of total fish, kept within this area (Table 8.1). This was followed by haddock at 448,000 (24.0%), pollock at 174,000 (9.3%), mackerel at 82,000 (4.4%), and redfish at 49,500 (2.7%). The top five species/species groups accounted for over 89.7% of charter boat catch from 1998 to 2016.

Table 8.1 Charter Boat Landings by Species in Statistical Area 514 1998-2016 Total

Species	Quantity Kept	Percentage of Total Fish Kept
Cod	920,967	49.3%
Haddock	447,902	24.0%
Pollock	173,575	9.3%
Mackerel	81,891	4.4%
Redfish	49,535	2.7%
Cusk	47,338	2.5%
Bluefin tuna	31,085	1.7%
Bluefish	30,883	1.7%
Wolffish	8,090	0.4%
Scup	4,985	0.3%

Trends in Top Five Species Groups (Charter Boats)

Cod

The number of cod kept by charter boat anglers rose from 1998 to 2001 with its peak at around 122,000 in 2001 (Table 8.2). Cod kept then began to fall from 2002 to 2007 but rose again from 2007 to 2010. Since 2010, the number of cod kept by charter anglers has fallen substantially with its two lowest points in 2015 (due to a recreational moratorium for cod fishing) and 2016 at 0 and 1,458 kept, respectively (Figure 8.1 and Table C.1).

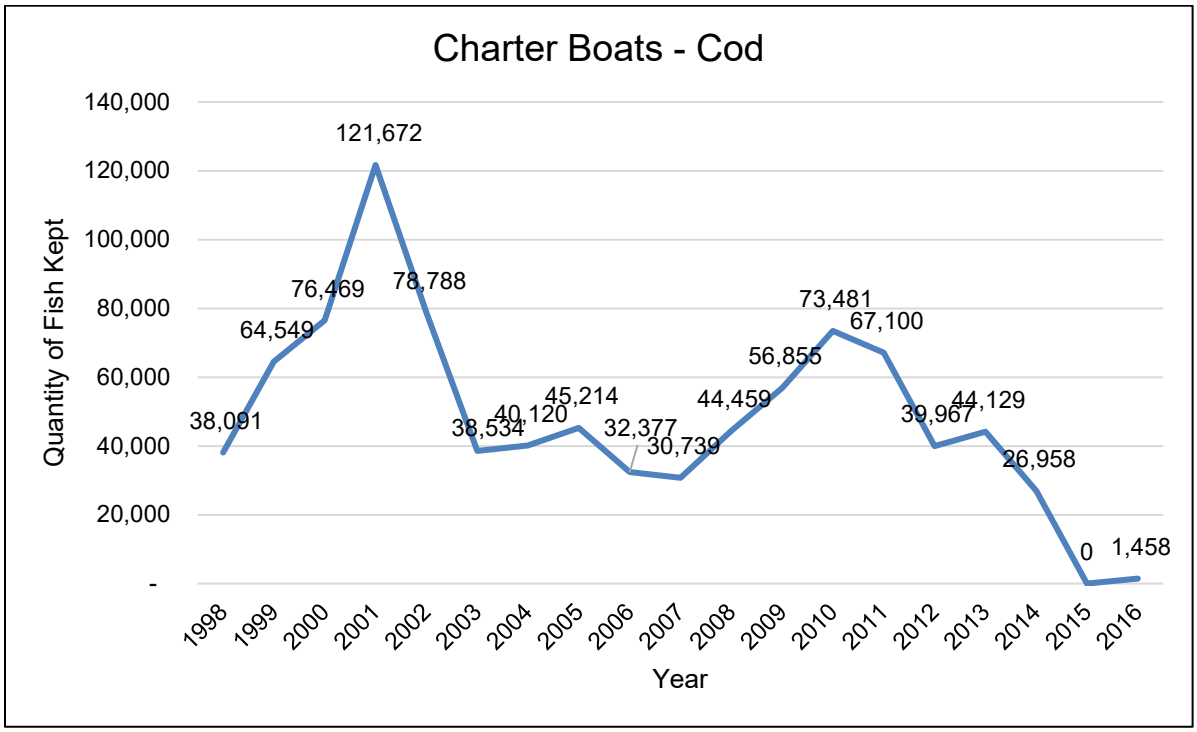

Figure 0.1 Quantity of Cod Kept by Charter Boats in Statistical Area 514 (1998-2016)

Haddock

In total, from 1998 to 2016, haddock was the second most kept species in statistical area 514 by charter boats (Table 8.1). From 1998 to 2009, haddock kept was showing an upward trend, and then started a steady decline, reaching a low point of around 10,500 kept in 2015. In 2016, the number of haddock kept in the region increased 359% from the previous year to reach a high of roughly 48,000 kept (Figure 8.2 and Table C.2).

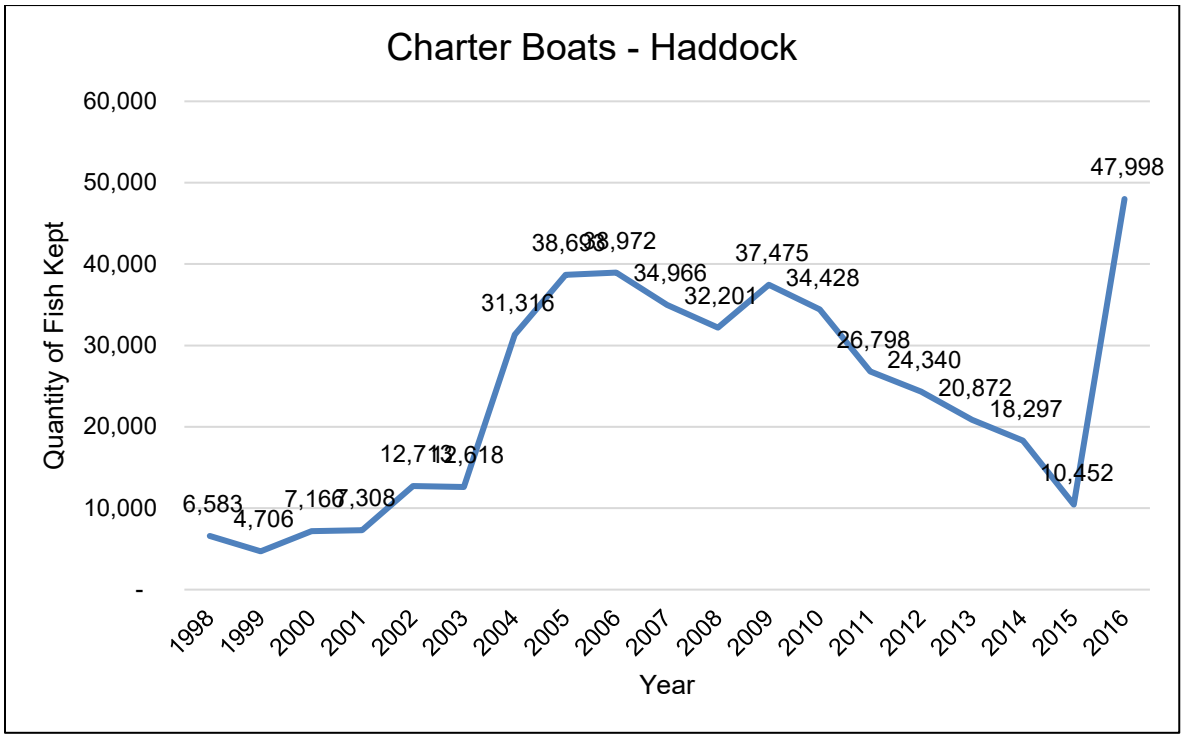

Figure 0.2 Quantity of Haddock Kept by Charter Boats in Statistical Area 514 (1998-2016)

Pollock

In total, from 1998 to 2016, pollock was the third most kept species in statistical area 514 by charter boats (Table 8.1). The number of pollock kept was variable from 1998 to 2009 before a spike in 2010, when it peaked at over 27,000 kept. The number of fish landed has since continued to decline and was roughly 5,300 kept in 2016 (Figure 8.3 and Table C.3).

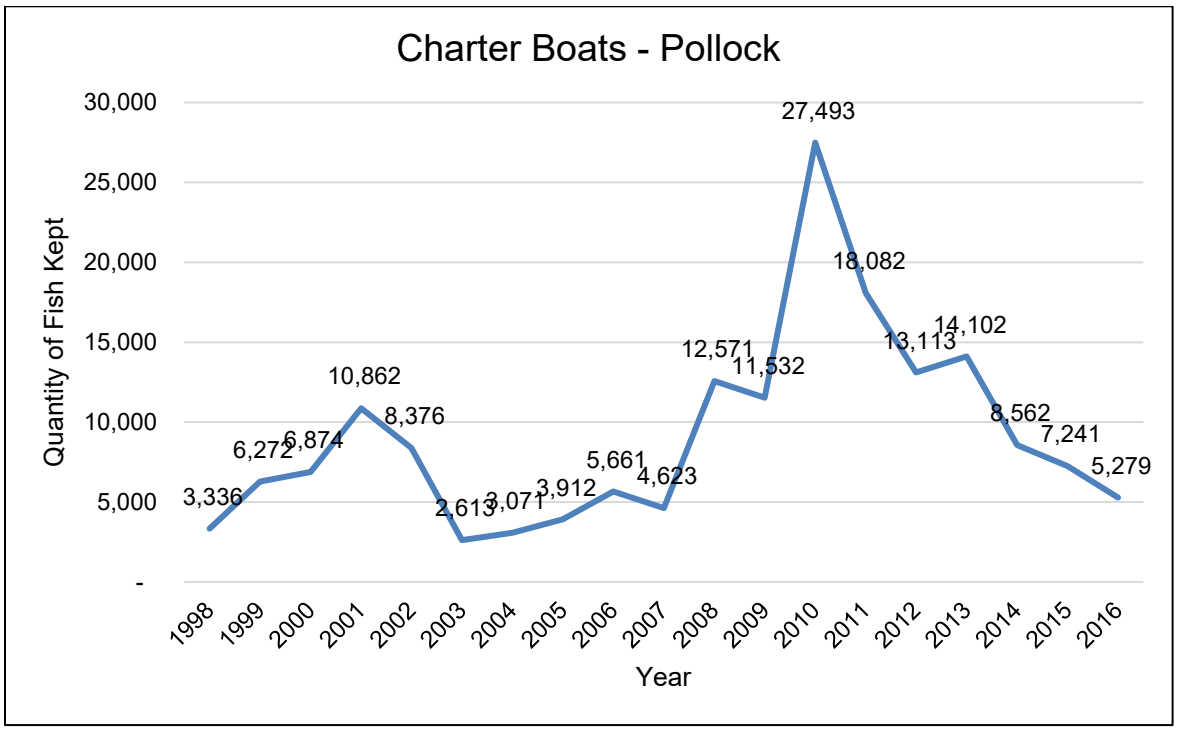

Figure 0.3 Quantity of Pollock Kept by Charter Boats in Statistical Area 514 (1998-2016)

Mackerel

In total, from 1998 to 2016, mackerel was the fourth most kept species in statistical area 514 by charter boats (Table 8.1). The number of mackerel kept was highly variable across the study period, but in general, from 2007 to 2016, there was an upward trend (Figure 8.4 and Table C.4).

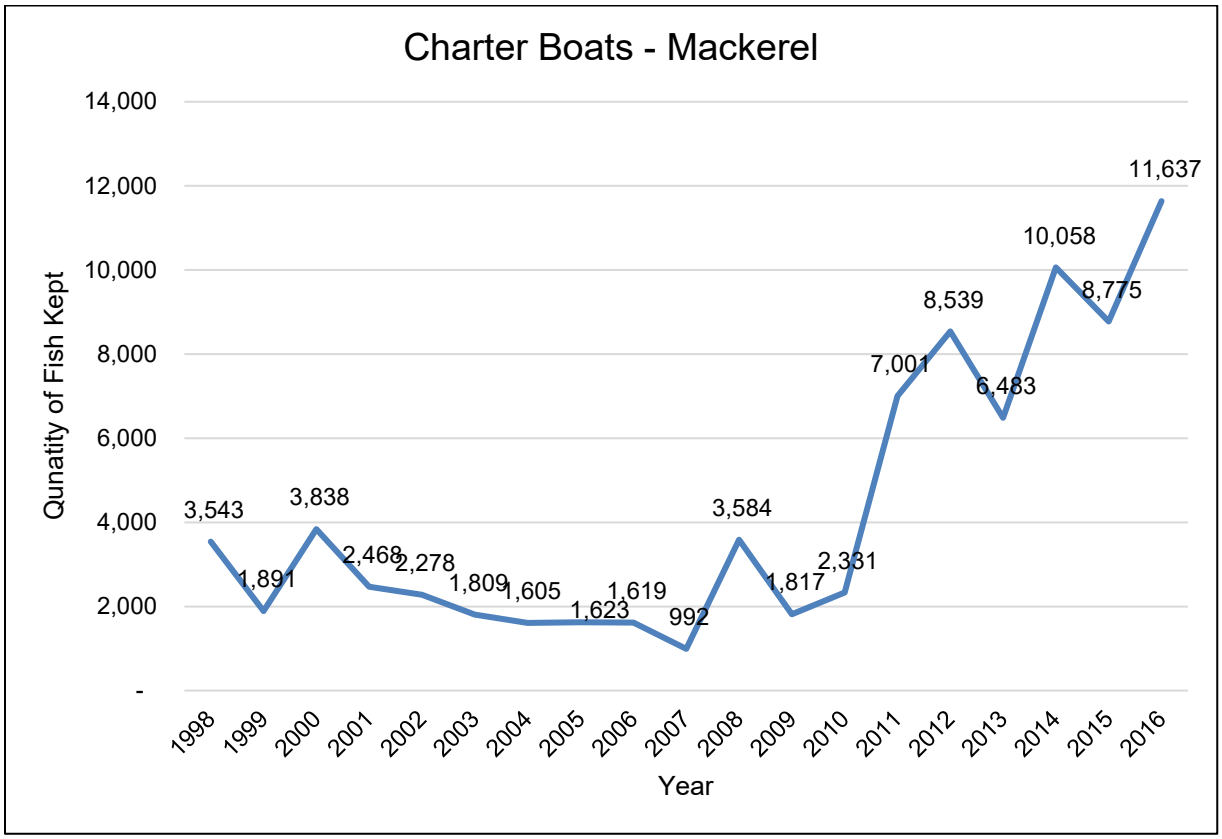

Figure 0.4 Quantity of Mackerel Kept by Charter Boats in Statistical Area 514 (1998-2016)

Redfish

In total, from 1998 to 2016, redfish was the fifth most kept species in statistical area 514 by charter boats (Table 8.1). The quantity of redfish kept was relatively low in statistical area 514 from 1998 to 2007. From 2008 to 2016, there were many peaks and valleys, with a low point occurring in 2011 at 1,600 kept and a high point in 2013 with nearly 10,800 redfish kept (Figure 8.5 and Table C.5).

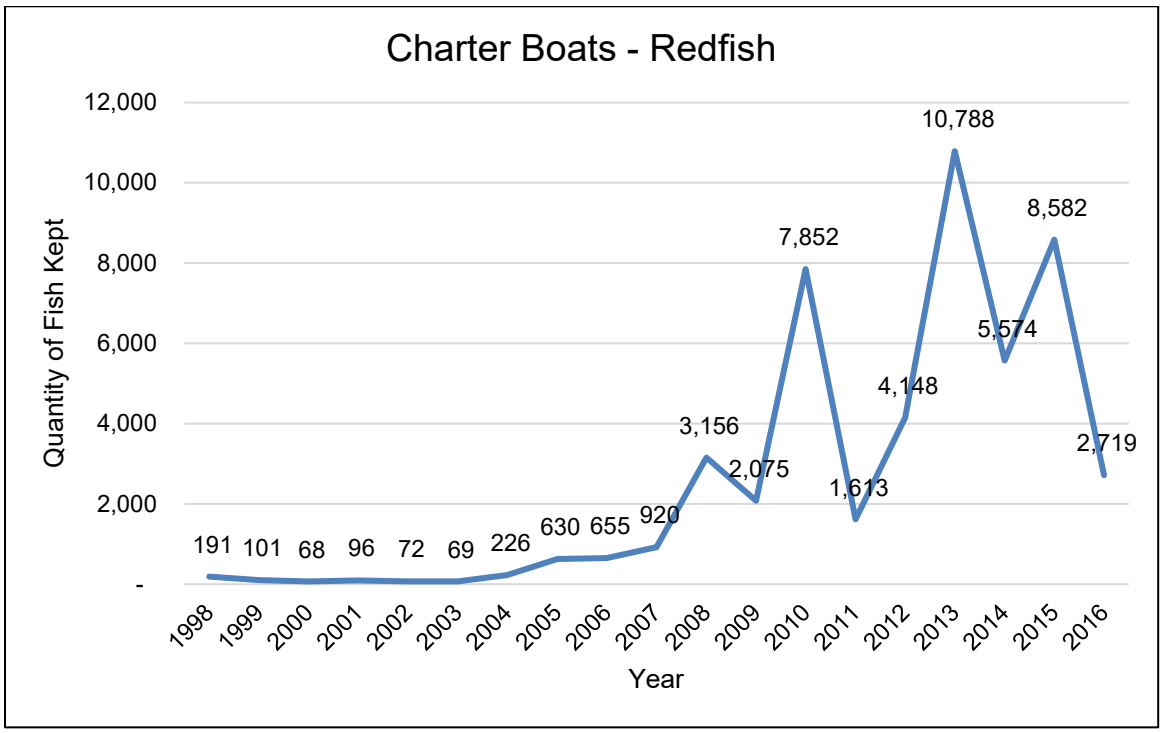

Figure 0.5 Quantity of Redfish Kept by Charter Boats in Statistical Area 514 (1998-2016)

Trends in Number of Vessels, Trips, and Anglers (Charter Boats)

The number of charter boat vessels in statistical area 514 rose between 1998 and 2011. After 2011, the number of vessels declined until the most recent year of data available, 2016 (Table 8.2 and Figure 8.6). The number of charter vessel trips followed a nearly identical trend, rising from 1998 to 2010 to reach a peak before a sharp decline from 2012 to 2015, with a small recovery in 2016. From 1998 to 2010, the number of charter boat anglers were on an upward trend. After 2010, the number of anglers began a downward trend through 2015 and had a slight uptick in 2016.

Table 8.2 Annual Number of Vessels, Vessel Trips, and Anglers for Charter Boats in Statistical Area 514 (1998-2016)

Year	Vessels	Vessel Trips	Anglers
1998	99	1,212	7,263
1999	103	1,223	8,152
2000	102	1,398	9,159
2001	104	1,724	12,231
2002	129	2,167	13,440
2003	121	1,703	11,978
2004	113	1,871	13,167
2005	122	2,098	13,342
2006	118	2,013	13,008
2007	120	2,199	13,451
2008	111	2,134	13,638
2009	119	2,072	13,342
2010	121	2,490	15,504
2011	129	2,433	15,186
2012	106	2,261	13,448
2013	103	1,943	12,431
2014	95	1,762	11,406
2015	71	1,161	7,466
2016	63	1,261	8,267
Total	2,049	35,125	225,879

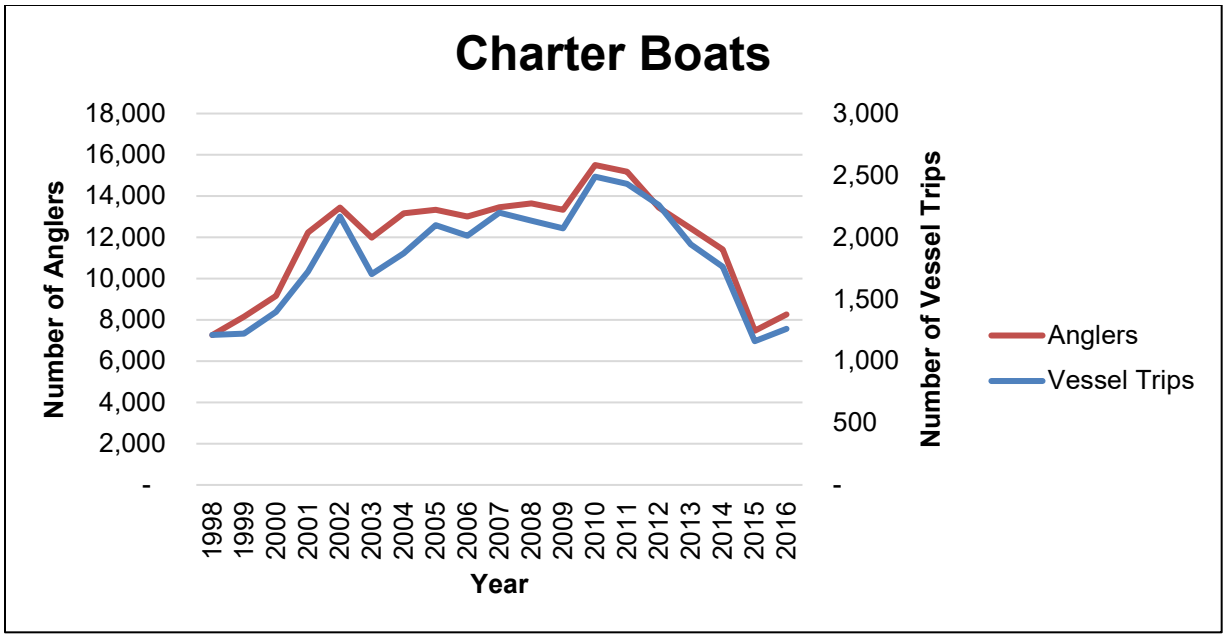

Figure 0.6 Trend in Number of Vessel Trips and Anglers for Charter Boats in Statistical Area 514 (1998-2016)

Party Boat Catch by Species/Species Groups

From 1998 to 2016, cod was the most landed fish by party boats in statistical area 514 with over 653,500 kept, which accounts for 35.0% of the quantity kept by party boats during this time period. This was followed by haddock at 620,000 (33.2%), pollock at 231,000 (12.4%), mackerel at 116,000 (6.2%), and redfish at 97,000 (5.2%). The top five species/species groups accounted for 92% of party boat landings from 1998 to 2016 (Table 8.3).

Table 8.3 Party Boat Landings by Species in Statistical Area 514 1998-2016 Total

Species	Quantity Kept	Percentage of Total Fish Kept
Cod	653,595	32.1%
Haddock	619,944	30.4%
Pollock	230,784	11.3%
Mackerel	116,116	5.7%
Cusk	97,455	4.8%
Scup	71,429	3.5%
Redfish	49,779	2.4%
Bluefish	44,834	2.2%
FLBB	30,074	1.5%
Spiny dogfish	27,893	1.4%

Trends in Top Five Species Groups (Party Boats)

Cod

In total, from 1998 to 2016, cod was the most kept species in statistical area 514 by party boats (Table 8.8). The number of cod kept rose from 1998 to 2001 with its peak at over 100,000 kept in 2001. Since 2001, cod has been on a continual decrease, with low points in 2015 and 2016 with 0 (due to a recreational moratorium for cod fishing) and 3,700 kept, respectively (Figure 8.7 and Table C.6).

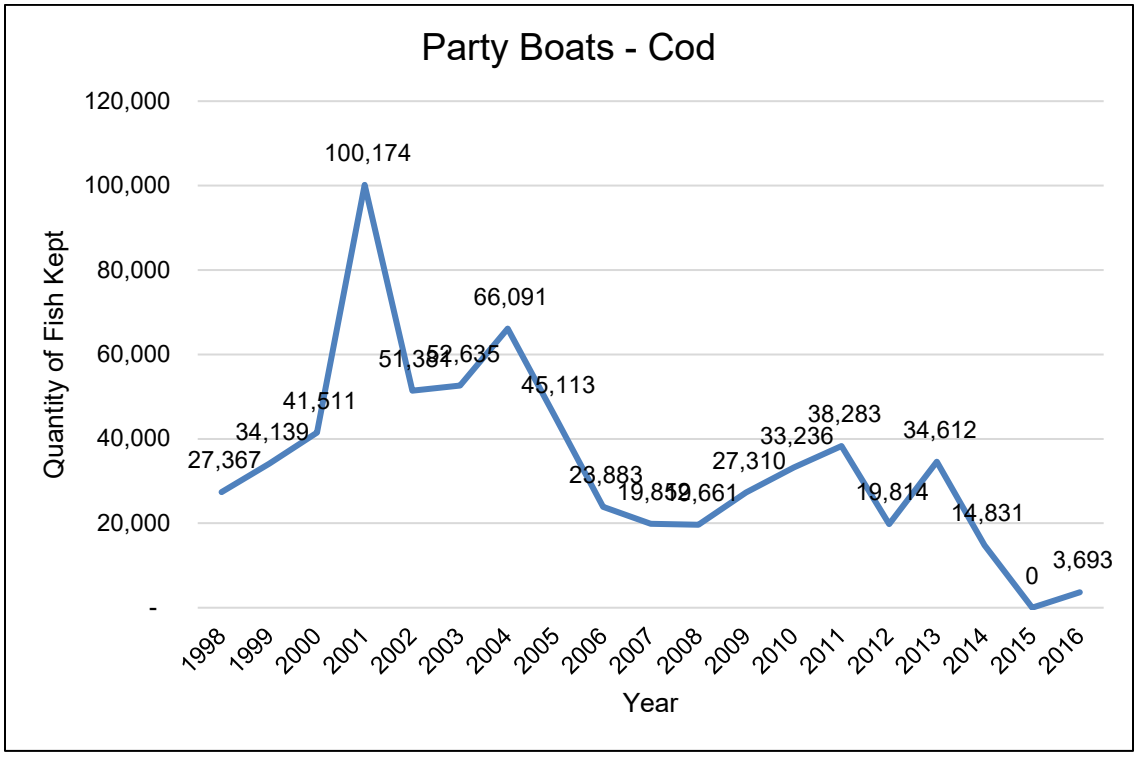

Figure 0.7 Quantity of Cod Kept by Party Boats in Statistical Area 514 (1998-2016)

Haddock

In total, from 1998 to 2016, haddock was the second most kept species in statistical area 514 by party boats (Table 8.8). Haddock kept rose from 1998 to 2005, reaching a high point of around 64,000 kept in 2005. From 2006 to 2016, the quantity of haddock kept was more volatile, but had a general downward trend from 2005 to 2015 before it increased to roughly 54,000 kept in 2016 (Figure 8.8 and Table C.7).

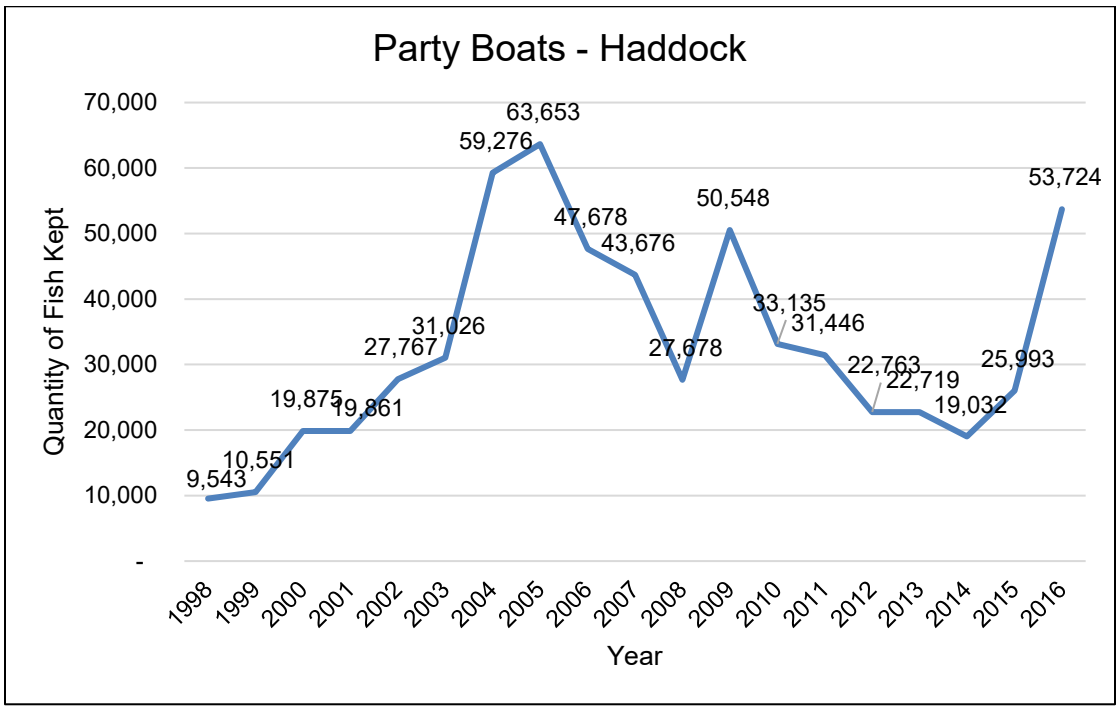

Figure 0.8 Quantity of Haddock Kept by Party Boats in Statistical Area 514 (1998-2016)

Pollock

In total, from 1998 to 2016, pollock was the third most landed species in statistical area 514 by party boats (Table 8.8). Over the study period, there was a general upward trend in the number kept. However, there were a few spikes in pollock kept. These spikes occurred in 2006 (21,000 kept) and 2010 (23,000 kept) (Figure 8.9 and Table C.8).

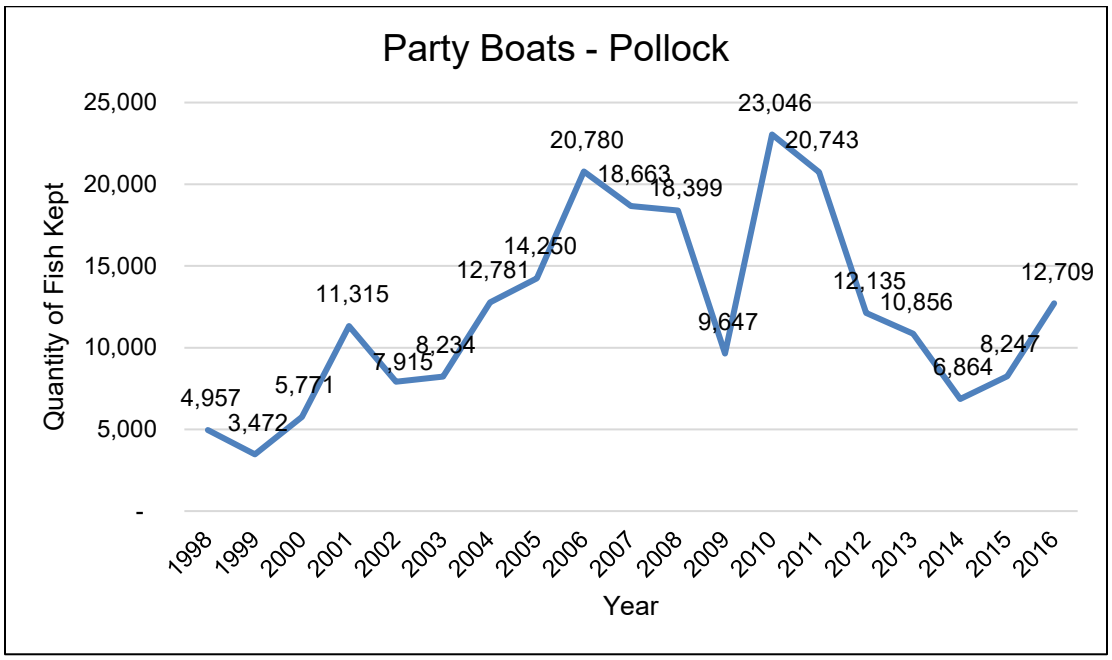

Figure 0.9 Quantity of Pollock Kept by Party Boats in Statistical Area 514 (1998-2016)

Mackerel

In total, from 1998 to 2016, mackerel was the fourth most kept species in statistical area 514 by party boats (Table 8.8). From 1998 to 2003, mackerel kept was volatile, with no clear trend. A low point was reached in 2006 at 316 kept and a high point in 2008 with over 10,000 mackerel kept (Figure 8.10 and Table C.9).

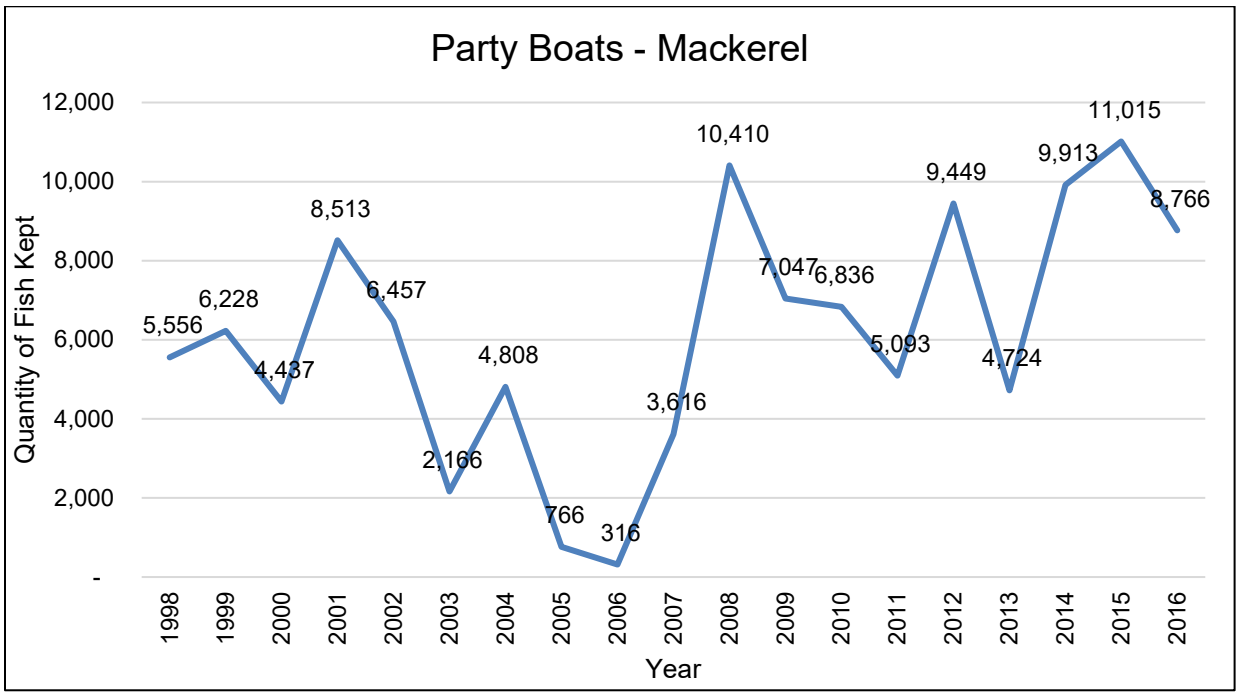

Figure 0.10 Quantity of Mackerel Kept by Party Boats in Statistical Area 514 (1998-2016)

Cusk

In total, from 1998 to 2016, cusk was the fifth most kept species in statistical area 514 by party boats (Table 8.8). From 1998 to 2011, there was an upward trend in the number of cusk kept, peaking in 2011 at 8,500 kept. Then, from 2011 to 2016, there was a downward trend (Figure 8.11 and Table C.10).

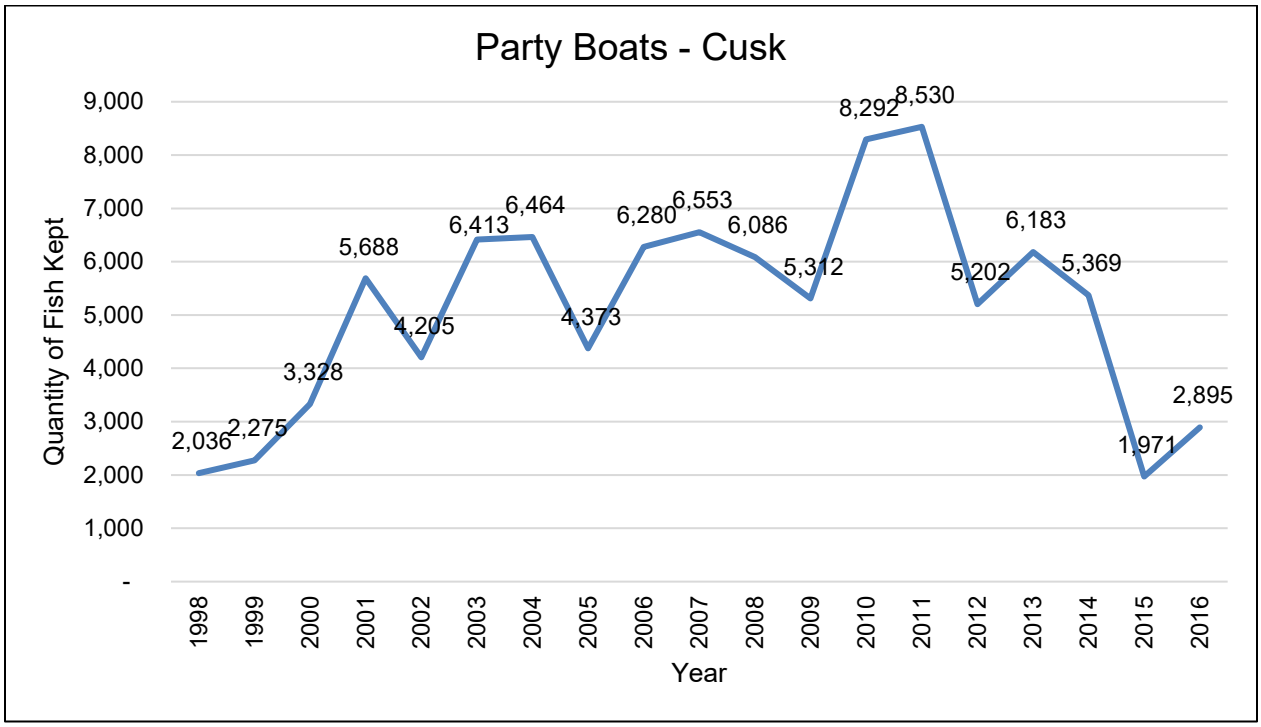

Figure 0.11 Quantity of Cusk Kept by Party Boats in Statistical Area 514 (1998-2016)

Trends in Number of Vessels, Trips, and Anglers (Party Boats)

The number of party boat vessels in statistical area 514 rose from 1998 to 2005 before decreasing from 2006 to 2016. The number of trips and anglers followed a similar trend, showing an upward trajectory from 1998 to 2007 and then decreasing from 2007 to 2015, with an increase in 2016 (Table 8.14 and Figure 8.12).

Table 8.4 Annual Number of Vessels, Vessel Trips, and Anglers for Party Boats in Statistical Area 514 (1998-2016)

Year	Vessels	Vessel Trips	Anglers
1998	40	846	28,180
1999	48	954	32,196
2000	40	1,065	34,432
2001	48	1,446	57,618
2002	41	1,206	43,818
2003	43	1,347	48,513
2004	55	1,662	59,627
2005	56	1,290	47,481
2006	49	1,349	46,512
2007	46	1,537	52,500
2008	44	1,276	41,020
2009	44	1,098	33,981
2010	45	1,317	42,040
2011	40	1,326	41,966
2012	37	1,294	40,604
2013	31	1,045	30,927
2014	32	1,082	32,252
2015	32	759	23,746
2016	30	840	26,993
Total	801	22,739	764,406

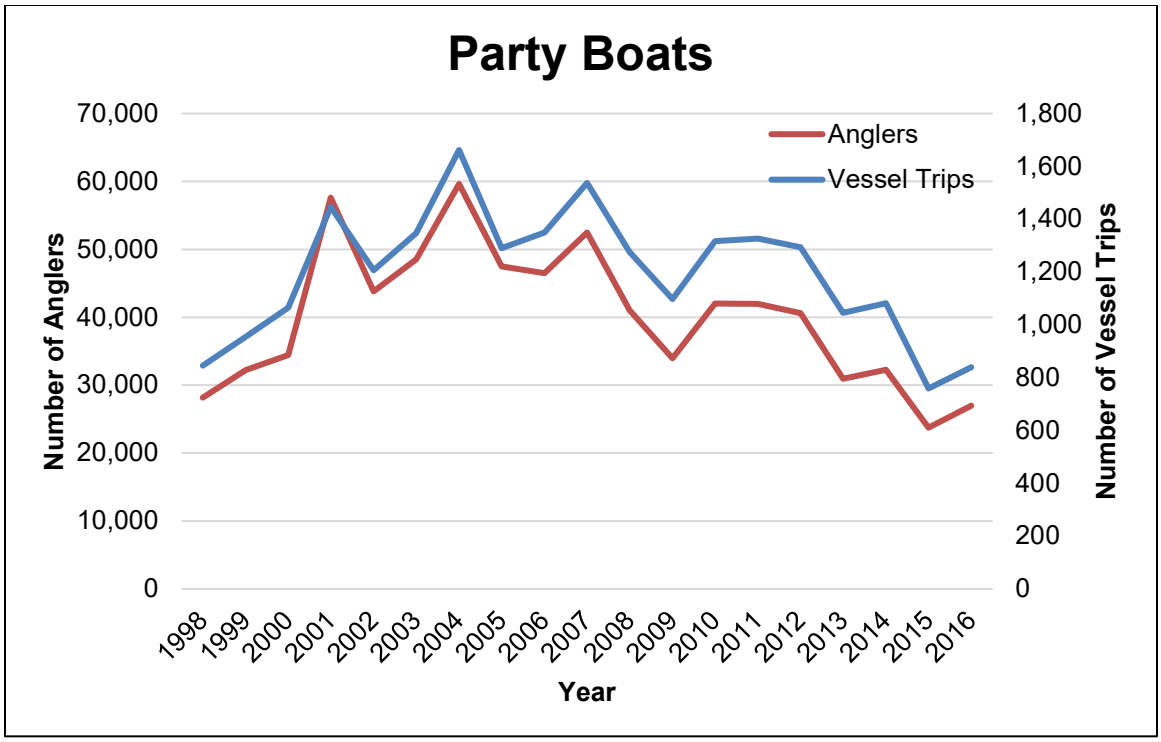

Figure 0.12 Trend in Number of Vessel Trips and Anglers for Party Boats in Statistical Area 514 (1998-2016)

Chapter 9: Economic Contributions of Recreational Fishing in Statistical Area 514

Angler Expenditures

Total for-hire angler expenditures were estimated using the angler expenditure profiles developed by NOAA Fisheries for Massachusetts (Lovell et al., 2013). The most recent year angler expenditure profiles were completed was 2011; those estimates are used here (Table 9.1). Total for-hire angler expenditures are equal to person-days of recreational fishing on for-hire vessels multiplied by expenditures per person-day and were converted to 2018 dollars for all years using the consumer price index (tables 9.2 and 9.3).

Table 9.1 Profiles of For-Hire Angler Trip Expenditures (2011$)

Massachusetts			
	Expenditure Category	**IMPLAN Code**	**All Anglers**
For-Hire Angler Trip Expenditures	Auto fuel	3156	$27.98
	Auto rental	442	$0.53
	Bait	3017	$0.06
	Boat rental	443	$1.30
	Charter fees	414	$188.42
	Crew tips	414	$10.96
	Fish processing	93	$0.00
	Food from grocery stores	Grocery commodity	$13.80
	Food from restaurants	503	$20.65
	Gifts & souvenirs	405	$9.99
	Ice	3107	$0.23
	Lodging	499, 500	$34.97
	Parking and site access	State/local government non-education	$2.80
	Public transportation	412	$7.80
	Tournament fees	496	$0.31
	Trip Total		$319.81

Source: Lovell et al. 2013

The largest expenditure category for charter boat anglers for each year from 2007 to 2016 was charter boat fees. This is followed by lodging and then auto fuel. This pattern of expenditures is also true for party boat passengers (tables 9.2 and 9.3).

Table 9.2 Charter Boat Angler Expenditures Stat Area 514 (2018$)

Expenditure Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auto fuel	$419,199	$425,027	$415,802	$483,181	$473,270	$419,106	$387,411	$355,467	$232,677	$257,640
Auto rental	$7,941	$8,051	$7,876	$9,152	$8,965	$7,939	$7,338	$6,733	$4,407	$4,880
Bait	$899	$911	$892	$1,036	$1,015	$899	$831	$762	$499	$552
Boat rental	$19,477	$19,748	$19,319	$22,449	$21,989	$19,472	$18,000	$16,516	$10,811	$11,970
Charter fees	$2,822,928	$2,862,174	$2,800,053	$3,253,786	$3,187,048	$2,822,299	$2,608,863	$2,393,749	$1,566,871	$1,734,975
Crew tips	$164,204	$166,487	$162,873	$189,266	$185,384	$164,167	$151,752	$139,239	$91,142	$100,920
Fish processing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Food from grocery stores	$206,753	$209,627	$205,078	$238,309	$233,421	$206,707	$191,075	$175,320	$114,759	$127,071
Food from restaurants	$309,380	$313,682	$306,873	$356,601	$349,286	$309,311	$285,920	$262,344	$171,722	$190,146
Gifts & souvenirs	$149,671	$151,752	$148,458	$172,515	$168,977	$149,638	$138,322	$126,916	$83,075	$91,988
Ice	$3,446	$3,494	$3,418	$3,972	$3,890	$3,445	$3,185	$2,922	$1,913	$2,118
Lodging	$523,924	$531,208	$519,679	$603,890	$591,503	$523,807	$484,195	$444,270	$290,805	$322,004
Parking and site access	$41,950	$42,533	$41,610	$48,353	$47,361	$41,941	$38,769	$35,572	$23,284	$25,782
Public transportation	$116,860	$118,485	$115,913	$134,697	$131,934	$116,834	$107,999	$99,094	$64,864	$71,823
Tournament fees	$4,644	$4,709	$4,607	$5,353	$5,244	$4,643	$4,292	$3,938	$2,578	$2,854

Table 9.3 Party Boat Angler Expenditures Stat Area 514 (2018$)

Expenditure Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auto fuel	$1,636,158	$1,278,385	$1,059,015	$1,310,173	$1,307,867	$1,265,420	$963,837	$1,005,131	$740,042	$841,235
Auto rental	$30,992	$24,215	$20,060	$24,817	$24,774	$23,970	$18,257	$19,039	$14,018	$15,935
Bait	$3,509	$2,741	$2,271	$2,810	$2,805	$2,714	$2,067	$2,155	$1,587	$1,804
Boat rental	$76,019	$59,396	$49,204	$60,873	$60,766	$58,794	$44,782	$46,700	$34,384	$39,085
Charter fees	$11,018,046	$8,608,767	$7,131,509	$8,822,831	$8,807,301	$8,521,462	$6,490,573	$6,768,648	$4,983,515	$5,664,955
Crew tips	$640,897	$500,754	$414,825	$513,206	$512,302	$495,676	$377,543	$393,718	$289,881	$329,519
Fish processing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Food from grocery stores	$806,969	$630,512	$522,316	$646,190	$645,052	$624,117	$475,374	$495,740	$364,996	$414,905
Food from restaurants	$1,207,529	$943,483	$781,582	$966,943	$965,241	$933,915	$711,338	$741,814	$546,171	$620,854
Gifts & souvenirs	$584,175	$456,436	$378,112	$467,785	$466,962	$451,807	$344,129	$358,873	$264,225	$300,355
Ice	$13,449	$10,509	$8,705	$10,770	$10,751	$10,402	$7,923	$8,262	$6,083	$6,915
Lodging	$2,044,905	$1,597,753	$1,323,580	$1,637,482	$1,634,600	$1,581,549	$1,204,625	$1,256,234	$924,920	$1,051,393
Parking and site access	$163,733	$127,930	$105,977	$131,111	$130,880	$126,632	$96,453	$100,585	$74,057	$84,184
Public transportation	$456,113	$356,376	$295,222	$365,238	$364,595	$352,762	$268,689	$280,201	$206,302	$234,511
Tournament fees	$18,128	$14,164	$11,733	$14,516	$14,490	$14,020	$10,679	$11,136	$8,199	$9,320

Economic Contributions of Charter Boats

The economic contributions for recreational for-hire fishing were estimated for a 14-county study area identified as SBNMS's local economy. The area includes counties adjacent to and inland from SBNMS, which receive most of the socioeconomic contribution of activities within the sanctuary. Primary counties are those adjacent to the sanctuary. After the primary counties are selected, secondary counties are determined by looking at commuter flow data from the 5-Year American Community Survey. If more than 5,000 people in a given county are commuting to or from primary counties, that county is selected as a secondary county. Socioeconomic contributions to SBNMS's local economy include income, jobs, value-added and economic output. Using IMPLAN's multiregional input output modeling online platform, the economic contributions were estimated.

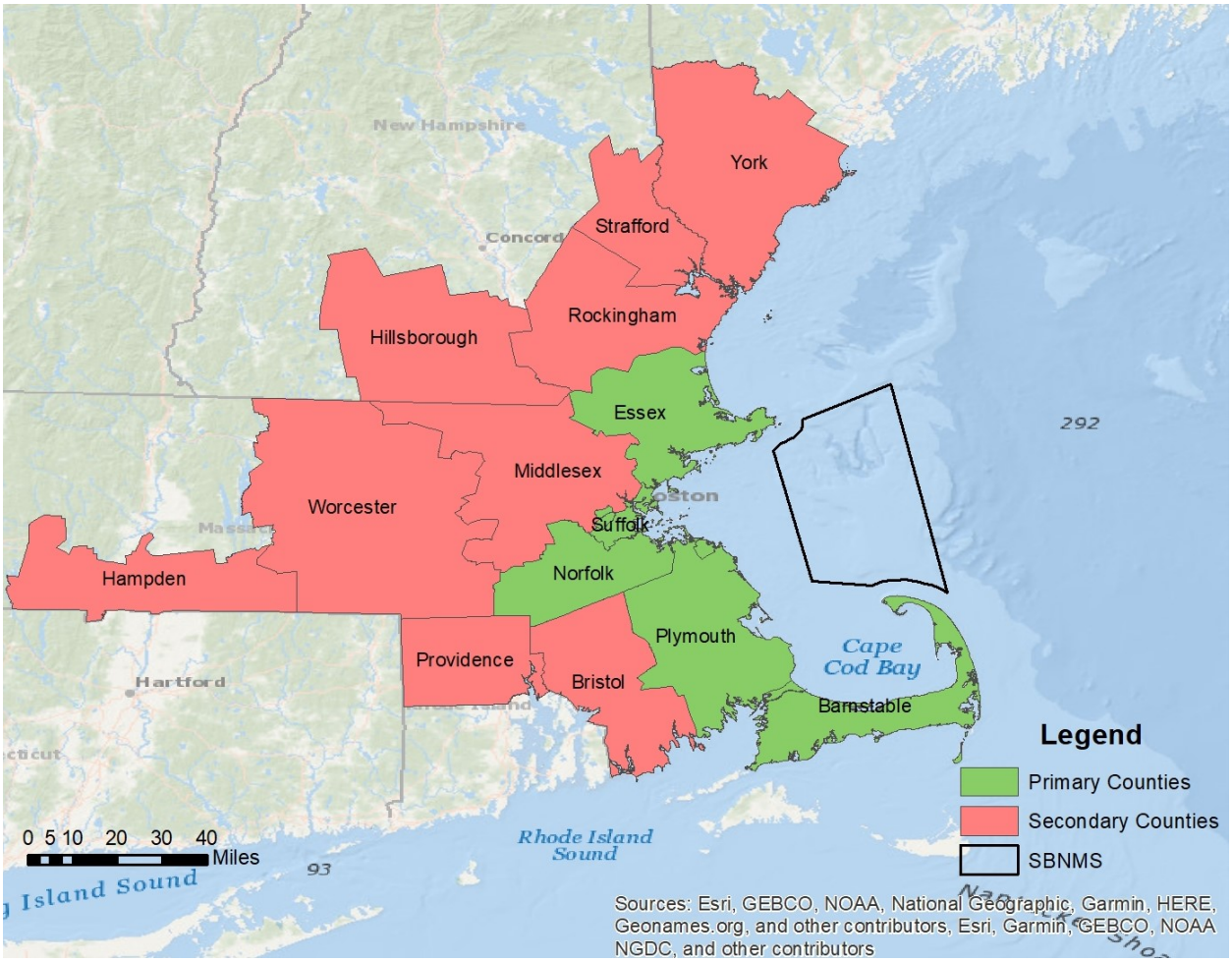

Figure 9.1 Map depicting the 14 coastal counties whose local economy is impacted by SBNMS.
Image: R. Shea/NOAA

Total for-hire angler expenditures were then incorporated into IMPLAN to estimate the total economic contributions generated from for-hire recreational fishing in statistical area 514. Each angler expenditure category corresponds to a certain sector in IMPLAN. For the categories "food from grocery stores" and "parking and site access," institutional spending patterns were used, because money spent in those categories does not flow into one specific sector. The spending patterns provide a more accurate representation of the way money spent at grocery stores or for parking move through the economy. Chapter 3 provides a more detailed explanation of the terminology used in this report, as defined by IMPLAN.

From 2007 to 2016, there were 124,139 charter boat person-days (which may also be referred to as angler-trips angler-days) in statistical area 514. Their spending supported 596 full- and part-time jobs, almost $33.5 million in income, $44.7 million in value added, and $77.8 million in output. In terms of average annual contributions, recreational charter fishing in statistical area 514 supports 60 jobs, $3.3 million in income, $4.5 million in value-added, and $7.8 million in output. Economic contributions rose from 2007 to 2011 before decreasing from 2012 to 2016 (Table 9.6). (Refer to Table 3.1 for a detailed explanation of IMPLAN terminology.) A more detailed breakdown of effects by year can be found in Appendix B.

Table 9.4 Annual Contribution of Charter Boats Stat Area 514: Employment, Income, Value Added, and Output (2018$)

Year	Employment	Income	Value Added	Output
2007	65	$3,637,621	$4,859,886	$8,459,898
2008	66	$3,688,191	$4,927,483	$8,577,811
2009	64	$3,608,117	$4,820,407	$8,391,211
2010	72	$4,099,455	$5,472,855	$9,538,055
2011	73	$4,108,285	$5,488,828	$9,555,086
2012	65	$3,636,811	$4,858,803	$8,458,013
2013	60	$3,361,024	$4,490,244	$7,816,343
2014	55	$3,082,978	$4,118,634	$7,169,044
2015	36	$2,014,638	$2,690,937	$4,683,419
2016	40	$2,231,389	$2,980,668	$5,187,722
Total	596	$33,468,508	$44,708,744	$77,836,604
2007-2016 Average	60	$3,346,851	$4,470,874	$7,783,660

Economic Contributions of Party Boats

From 2007 to 2016, there were 366,029 party boat angler person-days in statistical area 514. Their spending supported nearly 1,776 full- and part-time jobs, $100.1 million in income, $133.7 million in value added, and $232.4 million in output. Economic contributions rose from to 2007 to 2011 before decreasing from 2012 to 2016 (Table 9.7). Party boat fishing in statistical area 514 supported nearly 200 jobs, $10.0 million in income, $13.4 million in value-added, and $23.2 million in output on average each year during the study period.

Table 9.5 Annual Contribution of Party Boats Stat Area 514: Employment, Income, Value Added, and Output (2018$)

Year	Employment	Income	Value Added	Output
2007	254	$14,241,605	$19,033,335	$33,141,534
2008	198	$11,122,843	$14,864,660	$25,882,021
2009	164	$9,211,007	$12,309,324	$21,432,301
2010	203	$11,400,153	$15,235,332	$26,527,613
2011	203	$11,380,086	$15,208,514	$26,480,919
2012	196	$11,009,920	$14,713,735	$25,619,210
2013	149	$8,381,420	$11,200,454	$19,500,949
2014	156	$8,741,296	$11,681,453	$20,338,627
2015	115	$6,432,711	$8,595,721	$14,965,154
2016	138	$8,155,098	$10,872,345	$18,516,869
Total	1,776	$100,076,139	$133,714,872	$232,405,198
2007-2016 Average	178	$10,007,614	$13,371,487	$23,240,520

Chapter 10: Recreational Fisheries' Profiles in Stellwagen Bank National Marine Sanctuary

Charter Boat Catch by Species/Species Groups

In total, from 1998 to 2016, cod was the most landed fish by charter boats in Stellwagen Bank National Marine Sanctuary with roughly 712,000 kept. This was followed by haddock at 279,000 (23.0%), pollock at 119,000 (9.8%), cusk at 23,000 (1.9%), and redfish at 22,000 (1.8%). The top five species/species groups accounted for over 95% of charter boat landings from 1998 to 2016 (Table 10.1). Further, roughly three quarters of the cod kept in statistical area 514 was caught within the sanctuary. Roughly two-thirds of all fish kept on charter boats in statistical area 514 was caught within the sanctuary.

Table 10.1 Charter Boat Landings in Stellwagen Bank National Marine Sanctuary by Species 1998-2016 Total

Species	Stellwagen Bank National Marine Sanctuary Quantity Kept	Statistical Area 514 Quantity Kept	Percentage of Statistical Area 514 Kept from Stellwagen Bank National Marine Sanctuary
Cod	712,381	920,967	77.4%
Haddock	279,311	447,902	62.4%
Pollock	119,051	173,575	68.6%
Cusk	23,410	47,338	49.5%
Redfish	22,366	49,535	45.2%
Mackerel	20,859	81,891	25.5%
Bluefin tuna	19,741	31,085	63.5%
Wolffish	4,167	8,090	51.5%
Bluefish	3,389	30,883	11.0%
Albacore tuna	1,608	1,925	83.5%
Total fish kept	1,216,554	1,866,699	65.2%

Trends in Top Five Species Groups (Charter Boats)

Cod

In total, from 1998 to 2016, cod was the most kept species in Stellwagen Bank National Marine Sanctuary by charter boats (Table 10.1). The number of cod kept rose from 1998 to 2001 with its peak at around 104,000 kept in 2001. The quantity kept then began to fall from 2002 to 2007 but then rose again from 2008 to 2010. Since 2010, the number kept has fallen significantly with its two lowest points in 2015 and 2016 at 0 (due to a recreational moratorium for cod fishing) and 816 kept, respectively (Figure 10.1 and Table C.11).

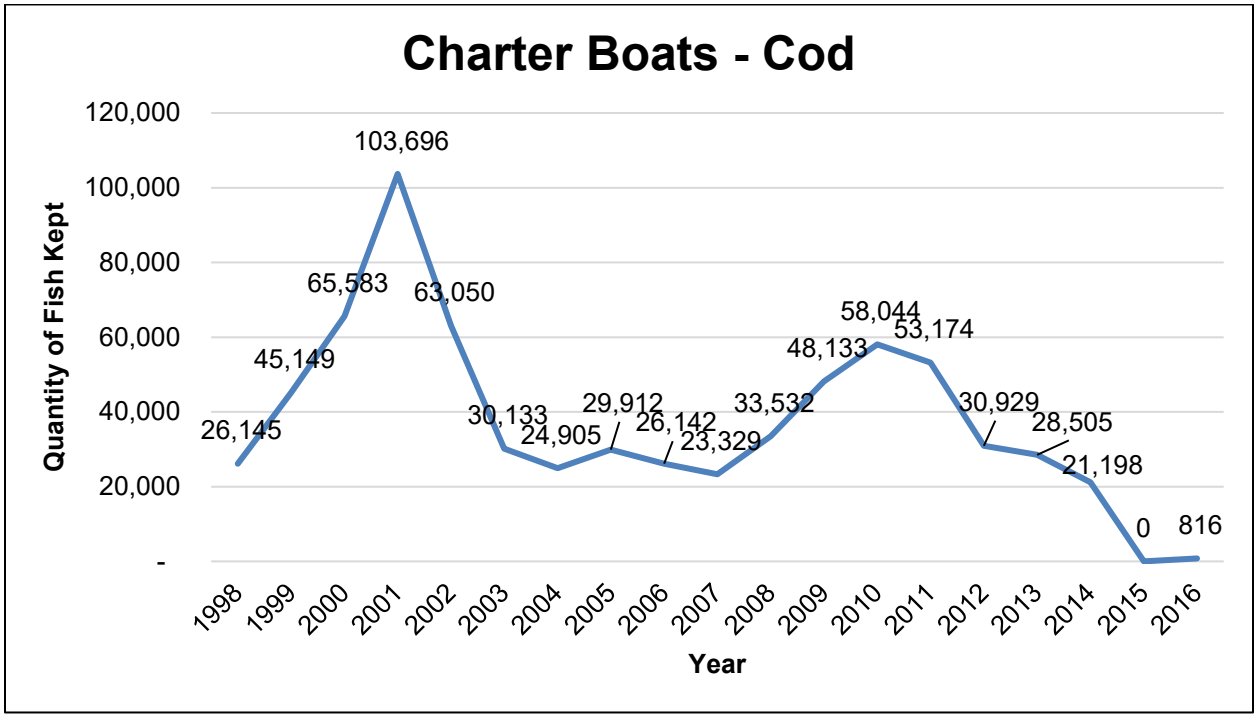

Figure 0.1 Quantity of Cod Kept by Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Haddock

In total, from 1998 to 2016, haddock was the second most kept species in Stellwagen Bank National Marine Sanctuary by charter boats (Table 10.1). From 1998 to 2009, the number of haddock kept was on an upward trend. From 2010 to 2015, the quantity kept dropped, with a low point of around 5,700 kept in 2015. In 2016, haddock kept made a 521% increase from the previous year to reach a high of roughly 35,000 kept (Figure 10.2 and Table C.12).

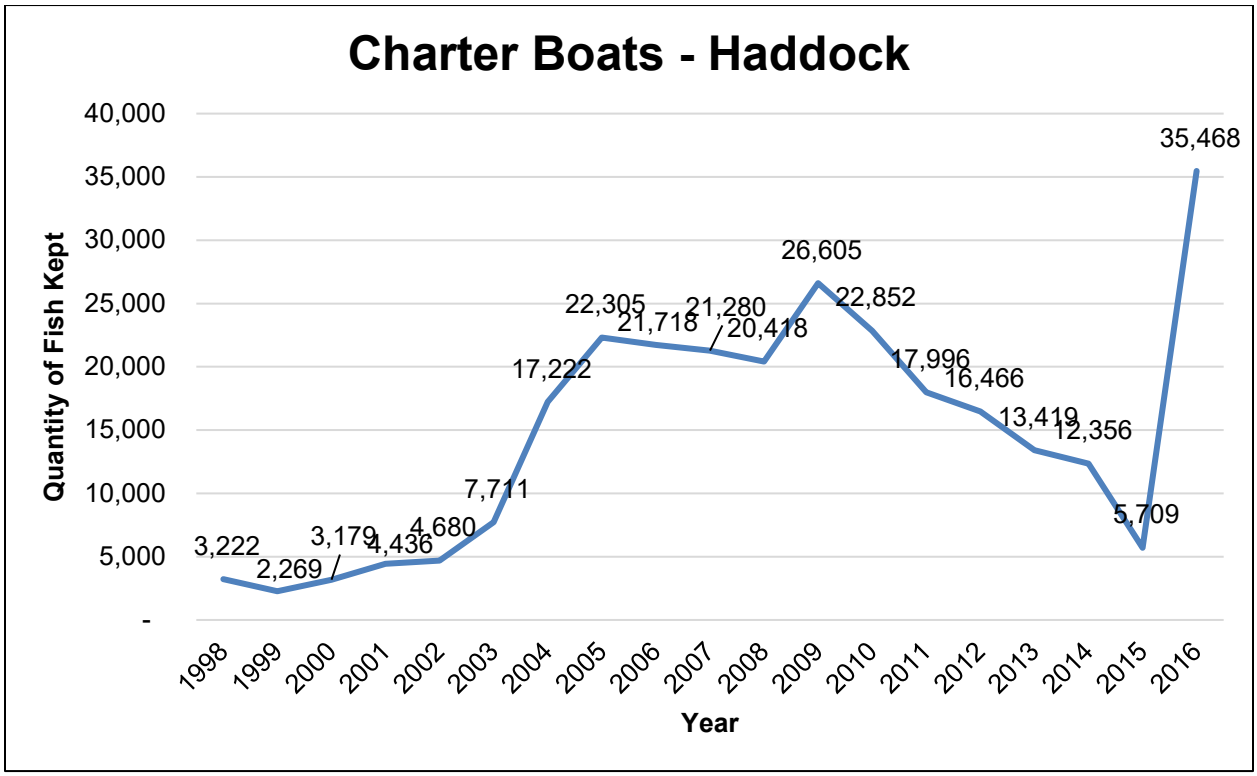

Figure 0.2 Quantity of Haddock Kept by Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Pollock

In total, from 1998 to 2016, pollock was the third most kept species in Stellwagen Bank National Marine Sanctuary by charter boats (Table 10.1). Pollock catch was variable from 1998 to 2009 before a spike in 2010 when it peaked at over 21,000 caught. Landings have since continued to decrease and were at 3,000 kept in 2016 (Figure 10.3 and Table C.13).

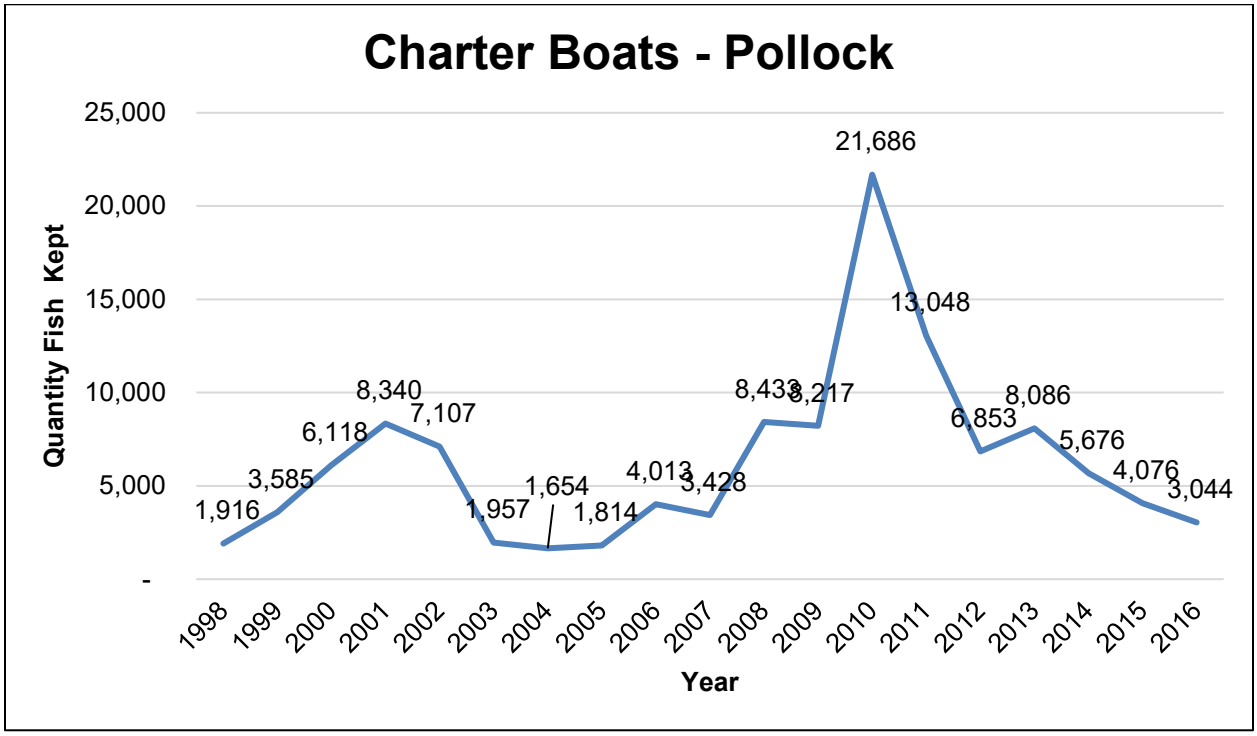

Figure 0.3 Quantity of Pollock Kept by Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Cusk

In total, from 1998 to 2016, cusk was the fourth most kept species in Stellwagen Bank National Marine Sanctuary by charter boats (Table 10.1). The quantity of cusk kept generally rose from 1998 to 2012, although there was some volatility from 2007 to 2012 and a slight lull in 2002. After its peak in 2012, cusk landings have continued to fall with the lowest points occurring in 2015 and 2016 (Figure 10.4 and Table C.14).

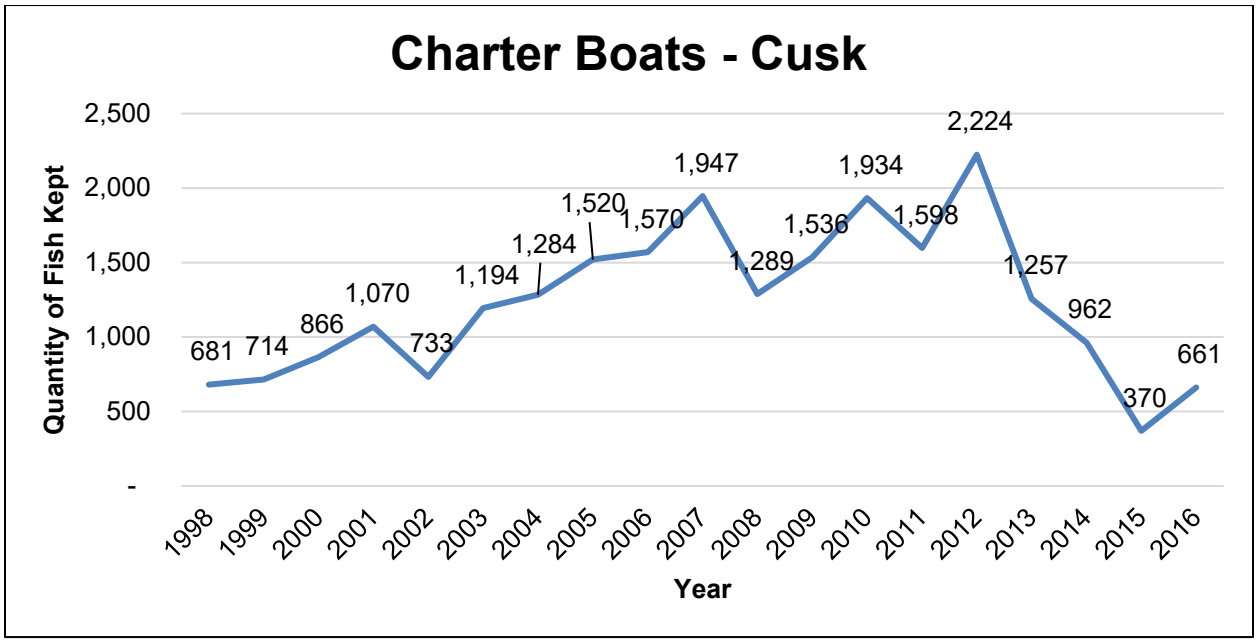

Figure 0.4 Quantity of Cusk Kept by Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Redfish

In total, from 1998 to 2016, redfish was the fifth most landed species in Stellwagen Bank National Marine Sanctuary by charter boats (Table 10.1). Redfish kept was relatively low in Stellwagen Bank National Marine Sanctuary from 1998 to 2004, and then began to increase from 2005 to 2013. There was a large spike in landings in 2013 when almost 6,000 were kept; catch then fell back down to lower levels the following years (Figure 10.5 and Table C.15).

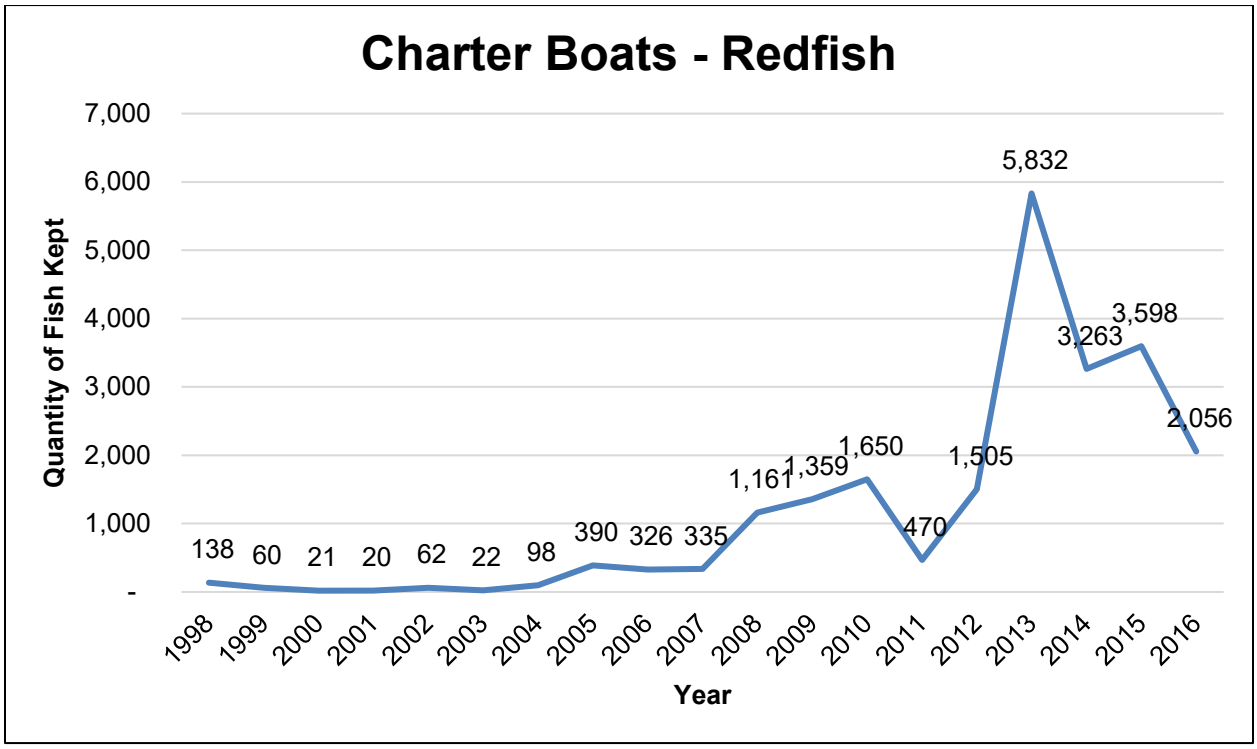

Figure 0.5 Quantity of Redfish Kept by Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Trends in Number of Vessels, Trips, and Anglers (Charter Boats)

The number of charter boat vessels in Stellwagen Bank National Marine Sanctuary generally rose from 1998 to 2010. There was a slight decrease in 2011, sharp decline from 2012 to 2015, and some recovery in 2016. The number of charter boat trips followed a nearly identical trend, rising from 1998 to 2010 to reach a peak before a sharp decline from 2012 to 2015 and a small recovery in 2016. The number of charter boat anglers peaked in 2011 with a general rise in numbers after 1998. From 2012 to 2015, there was a sharp decrease. Numbers began to rise again somewhat in 2016 (Table 10.2 and Figure 10.6).

Table 10.2 Annual Number of Vessels, Vessel Trips, and Anglers for Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Year	Vessels	Vessel Trips	Anglers
1998	44	452	3,678
1999	45	469	3,682
2000	53	751	5,243
2001	58	922	6,686
2002	76	1,044	6,622
2003	63	823	6,378
2004	65	751	5,624
2005	76	944	6,124
2006	74	950	6,400
2007	84	1,068	6,691
2008	80	1,037	6,612
2009	87	1,232	7,904
2010	91	1,420	8,536
2011	88	1,409	8,727
2012	73	1,100	6,605
2013	65	986	5,755
2014	59	943	5,863
2015	41	483	2,909
2016	45	678	4,296
TOTAL	1,267	17,462	114,335

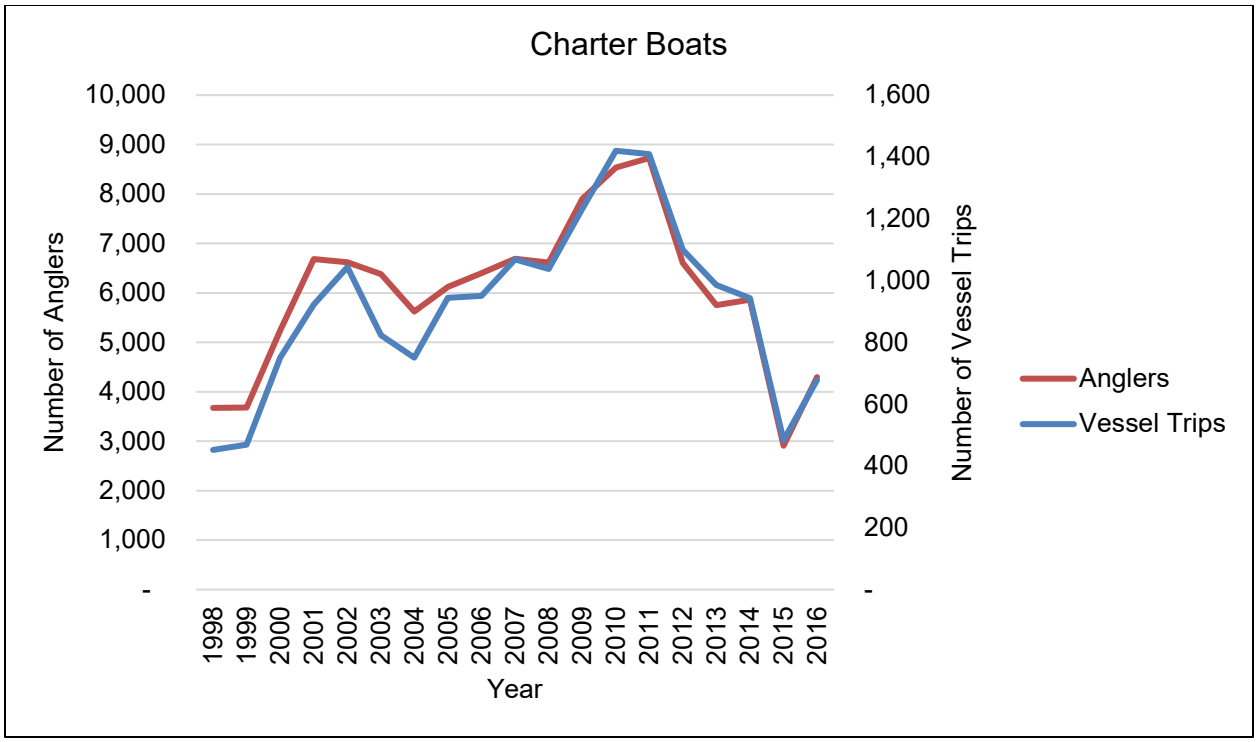

Figure 0.6 Trend in Number of Vessel Trips and Anglers for Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Table 10.3 Percentage of Stellwagen Bank National Marine Sanctuary Charter Boats Operating in Statistical Area 514 (1998-2016)

Year	Stellwagen Bank National Marine Sanctuary Vessels	Statistical Area 514 Vessels	% 514 Vessels in Stellwagen Bank National Marine Sanctuary	Stellwagen Bank National Marine Sanctuary Trips	Statistical Area 514 Trips	% 514 Trips in Stellwagen Bank National Marine Sanctuary	Stellwagen Bank National Marine Sanctuary Anglers	Statistical Area 514 Anglers	% 514 Anglers in Stellwagen Bank National Marine Sanctuary
1998	44	99	44.4%	452	1,212	37.3%	3,678	7,263	50.6%
1999	45	103	43.7%	469	1,223	38.3%	3,682	8,152	45.2%
2000	53	102	52.0%	751	1,398	53.7%	5,243	9,159	57.2%
2001	58	104	55.8%	922	1,724	53.5%	6,686	12,231	54.7%
2002	76	129	58.9%	1,044	2,167	48.2%	6,622	13,440	49.3%
2003	63	121	52.1%	823	1,703	48.3%	6,378	11,978	53.2%
2004	65	113	57.5%	751	1,871	40.1%	5,624	13,167	42.7%
2005	76	122	62.3%	944	2,098	45.0%	6,124	13,342	45.9%
2006	74	118	62.7%	950	2,013	47.2%	6,400	13,008	49.2%
2007	84	120	70.0%	1,068	2,199	48.6%	6,691	13,451	49.7%
2008	80	111	72.1%	1,037	2,134	48.6%	6,612	13,638	48.5%
2009	87	119	73.1%	1,232	2,072	59.5%	7,904	13,342	59.2%
2010	91	121	75.2%	1,420	2,490	57.0%	8,536	15,504	55.1%
2011	88	129	68.2%	1,409	2,433	57.9%	8,727	15,186	57.5%
2012	73	106	68.9%	1,100	2,261	48.7%	6,605	13,448	49.1%
2013	65	103	63.1%	986	1,943	50.7%	5,755	12,431	46.3%
2014	59	95	62.1%	943	1,762	53.5%	5,863	11,406	51.4%
2015	41	71	57.7%	483	1,161	41.6%	2,909	7,466	39.0%
2016	45	63	71.4%	678	1,261	53.8%	4,296	8,267	52.0%

Party Boat Catch by Species/Species Groups

From 1998 to 2016, cod was the most landed fish by party boats in Stellwagen Bank National Marine Sanctuary with 320,000 kept, which accounts for 42.5% of the quantity kept by party boats in Stellwagen Bank National Marine Sanctuary during this time period. This was followed by haddock at 275,000 (36.5%), pollock at 63,000 (8.3%), cusk at 38,000 (5.0%), and redfish at 26,000 (3.4%). The top five species/species groups accounted for over 96% of charter boat landings from 1998 to 2016. Roughly half the cod landed within statistical area 514 were caught in the sanctuary and one-third of all fish kept on party boats within statistical area 514 were caught in the sanctuary (Table 10.9).

Table 10.4 Party Boat Landings by Species in Stellwagen Bank National Marine Sanctuary 1998-2016 Total

Species	Stellwagen Bank National Marine Sanctuary Quantity Kept	Statistical Area 514 Quantity Kept	Percentage of Statistical Area 514 Kept from Stellwagen Bank National Marine Sanctuary
Cod	320,218	653,595	49.0%
Haddock	274,635	619,944	44.3%
Pollock	62,701	230,784	27.2%
Cusk	37,847	97,455	38.8%
Redfish	25,701	49,799	51.6%
Mackerel	10,490	116,116	9.0%
Spiny dogfish	8,748	27,893	31.4%
Wolffish	5,208	13,823	37.7%
Pout	1,558	6,969	22.4%
Bluefish	1,157	44,834	2.6%
Total fish kept	752,869	2,039,137	36.9%

Trends in Top Five Species Groups (Party Boats)

Cod

In total, from 1998 to 2016, *cod* was the most landed species in Stellwagen Bank National Marine Sanctuary by party boats (Table 10.9). *Cod* landings rose from 1998 to 2001 with its peak at around 53,000 kept in 2001. Landings dropped significantly in 2002, rose again until 2004, and steadily decreased from 2005 to 2008. The number kept rose once again from 2009 to 2011 but then declined to its lowest points in 2015 and 2016 with 0 (due to a recreational moratorium for cod fishing) and 2,000 kept, respectively (Figure 10.7 and Table C.16).

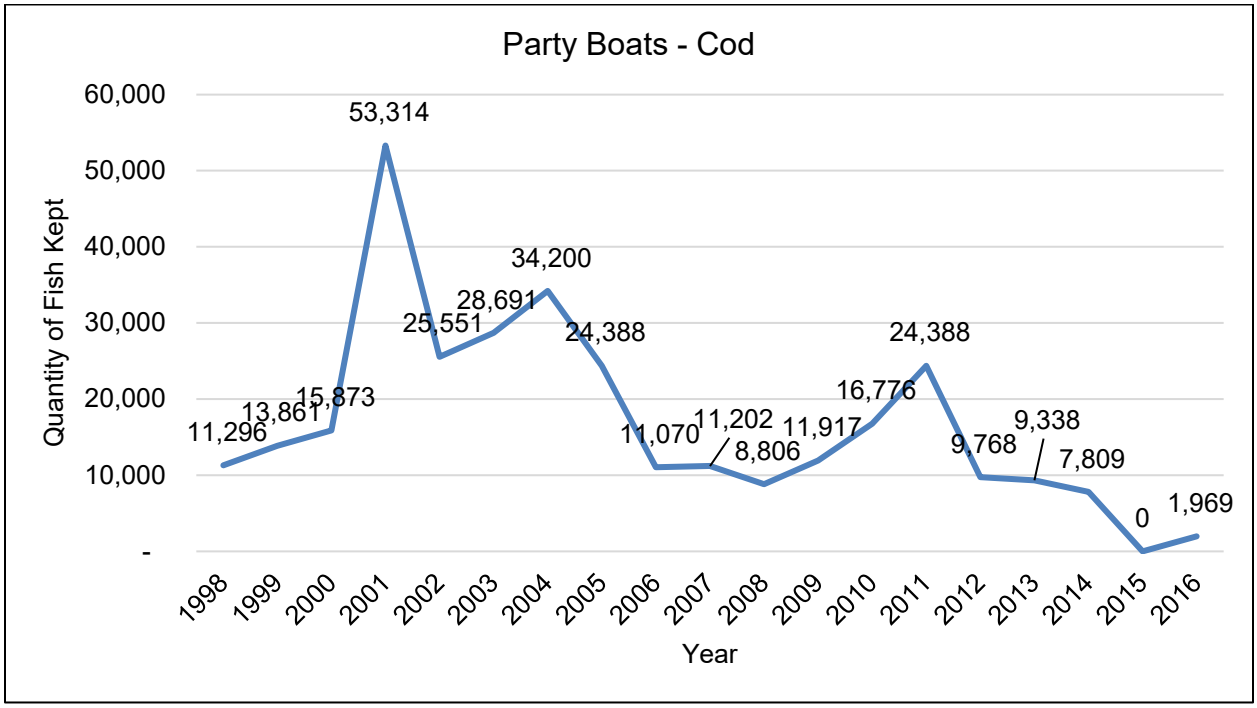

Figure 0.7 Quantity of Cod Kept by Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Haddock

In total, from 1998 to 2016, haddock was the second most kept species in Stellwagen Bank National Marine Sanctuary by party boats (Table 10.9). Haddock landings rose significantly from 1998 to 2005; in 2005, it reached its second highest point at around 30,000 kept. Landings were more volatile from 2006 to 2011 before decreasing to reach a low point with less than 4,000 kept in 2013. The number of haddock landed increased from 2014 to 2016, with an especially large increase in 2016 where it reached its highest point of 33,000 kept (Figure 10.8 and Table C.17).

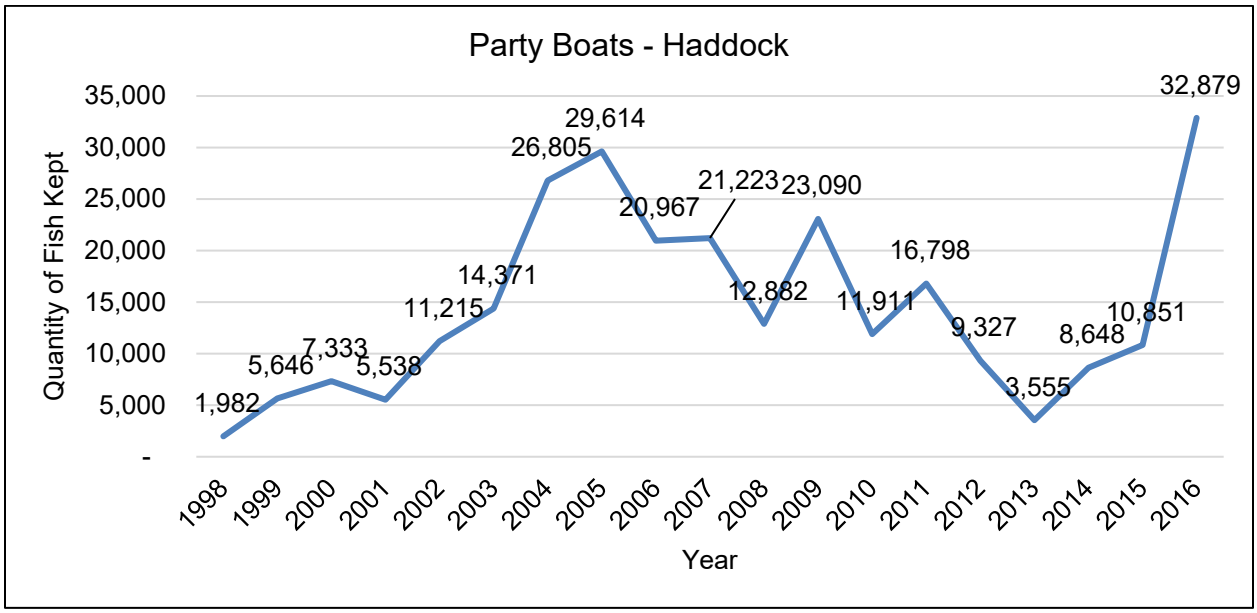

Figure 0.8 Quantity of Haddock Kept by Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Pollock

In total, from 1998 to 2016, pollock was the third most kept species in Stellwagen Bank National Marine Sanctuary by party boats (Table 10.9). From 1998 to 2003, pollock landings were relatively constant despite some minor variations. In 2004, there was a spike upward in the quantity kept, followed by a decline that lasted until 2007. From 2008 to 2010, there was a landings increase, with 2010 being the highest point at over 9,000 kept. After 2010, landings sharply decreased, although there was some slight recovery in 2015 and 2016 (Figure 10.9 and Table C.18).

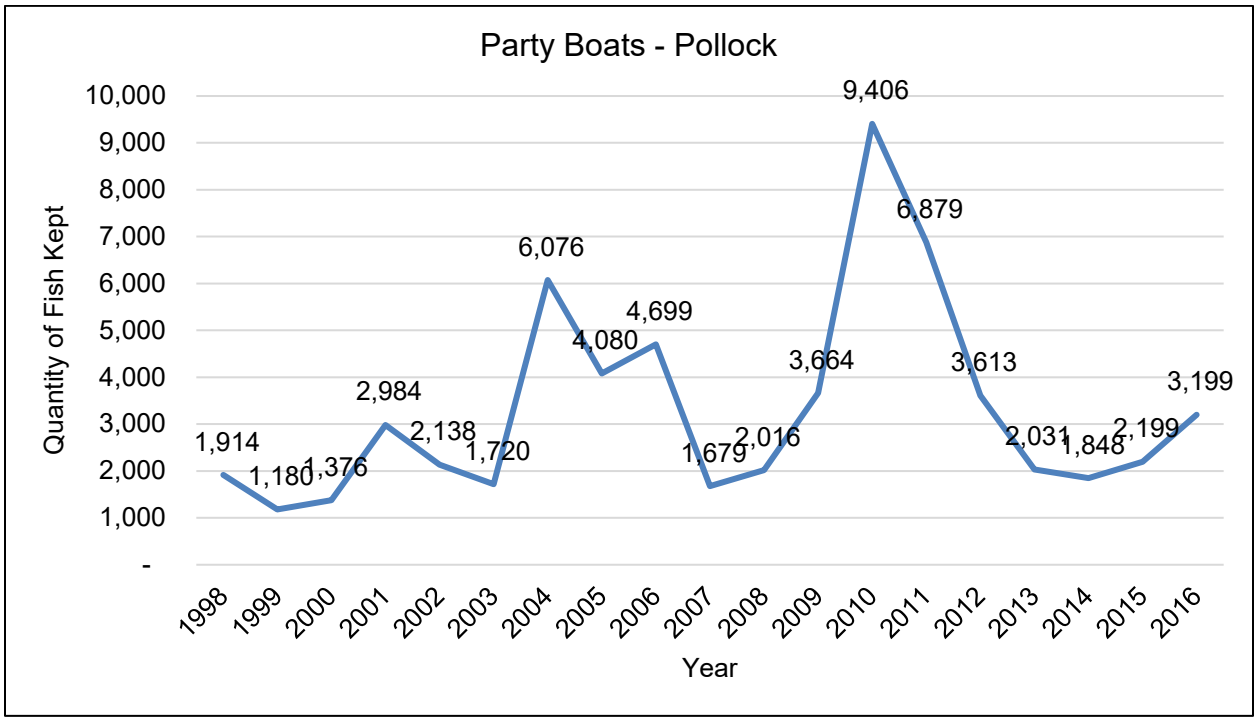

Figure 0.9 Quantity of Pollock Kept by Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Cusk

In total, from 1998 to 2016, cusk was the fourth most kept species in Stellwagen Bank National Marine Sanctuary by party boats (Table 10.9). The number of cusk kept rose from 430 in 1998 to just over 3,000 in 2003. From 2004 to 2011, the quantity kept was fairly stable with no clear trend. From 2012 to 2016, the number kept decreased overall (Figure 10.10 and Table C.19).

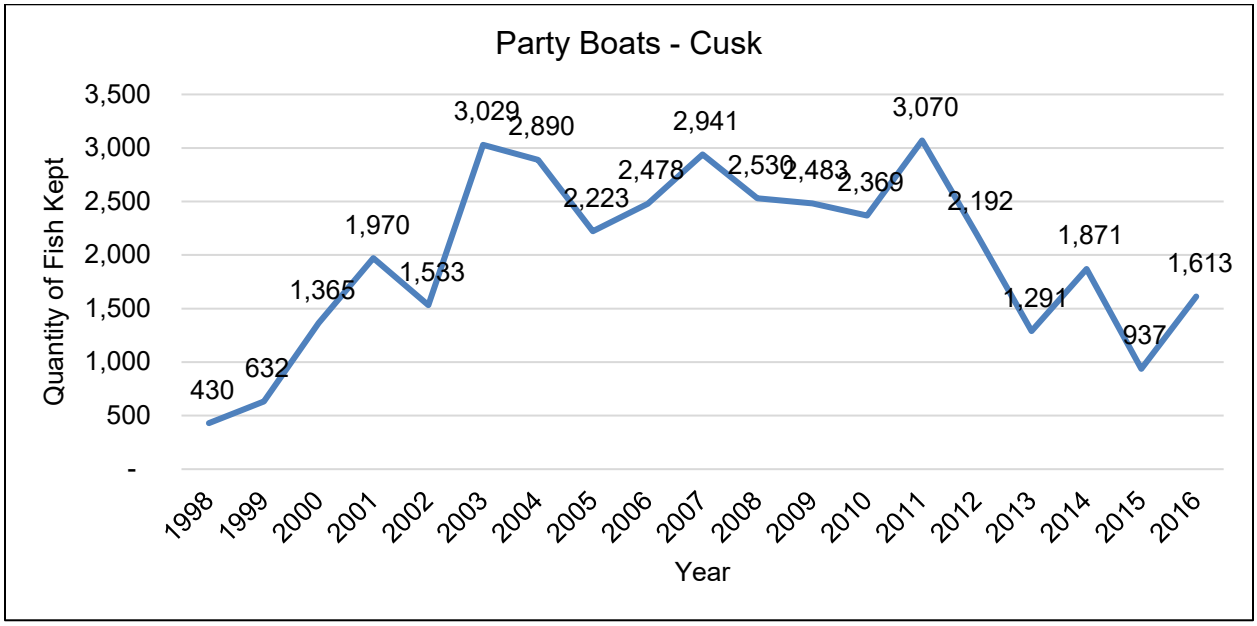

Figure 0.10 Quantity of Cusk Kept by Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Redfish

In total, from 1998 to 2016, redfish was the fifth most kept species in Stellwagen Bank National Marine Sanctuary by party boats (Table 10.9). From 1998 to 2009, there was an upward trend in redfish landings; it reached its third highest point in 2009 despite a noticeable downward spike in 2008. After 2009, landings began to decrease through 2013, then underwent an increase of almost 173% in 2014, where it reached its high point of 4,000 kept. There was a sharp decrease in quantity kept in both 2015 and 2016 (Figure 10.11 and Table C.20).

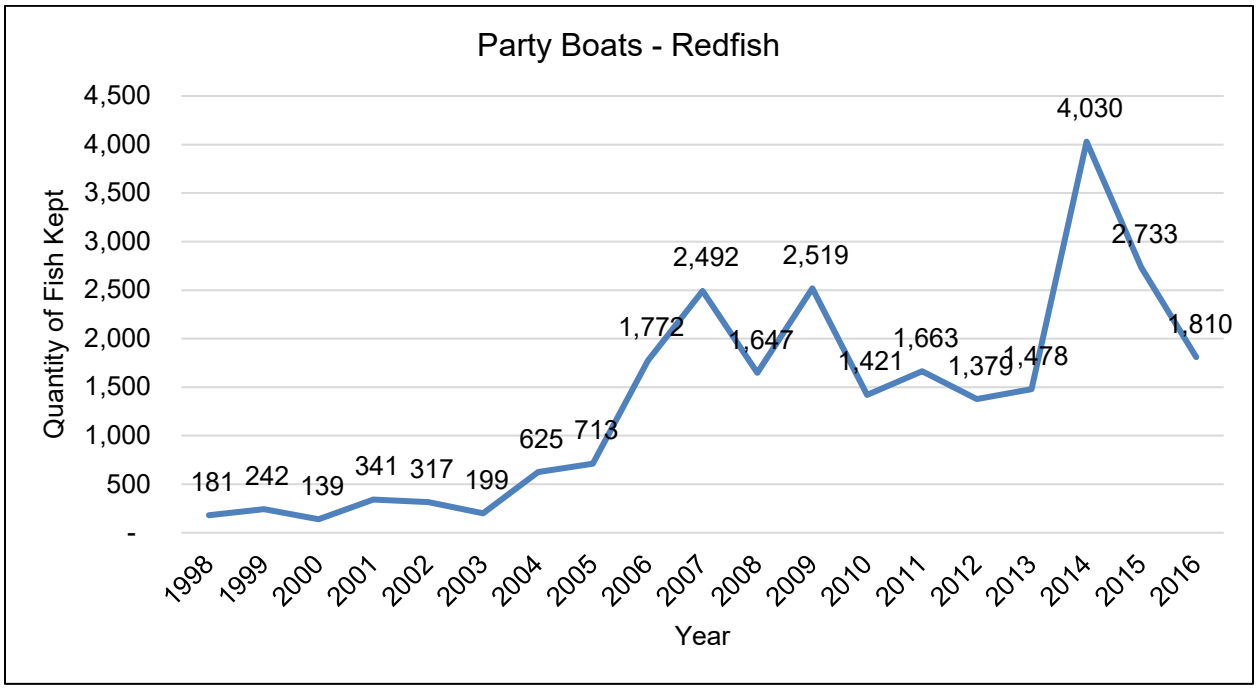

Figure 0.11 Quantity of Redfish Kept by Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Trends in Number of Vessels, Trips, and Anglers (Party Boats)

The number of party boat vessels in Stellwagen Bank National Marine Sanctuary rose from 1998 to 2005 before decreasing from 2006 to 2016. The number of trips and anglers followed a similar trend, rising from 1998 to 2004 with large increase in 2001, and then falling from 2005 to 2016 (Table 10.5 and Figure 10.12).

Table 10.5 Annual Number of Vessels, Vessel Trips, and Anglers for Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Year	Vessels	Vessel Trips	Anglers
1998	19	149	3,820
1999	23	215	6,649
2000	19	222	6,716
2001	31	485	20,459
2002	23	409	16,931
2003	25	526	20,531
2004	34	589	23,328
2005	44	493	19,621
2006	36	474	18,467
2007	31	483	18,482
2008	28	398	13,270
2009	31	417	14,206
2010	30	365	12,767
2011	25	506	17,557
2012	21	351	11,744
2013	19	195	6,512
2014	21	329	10,800
2015	14	209	7,119
2016	17	307	11,329
Total	491	7,122	260,308

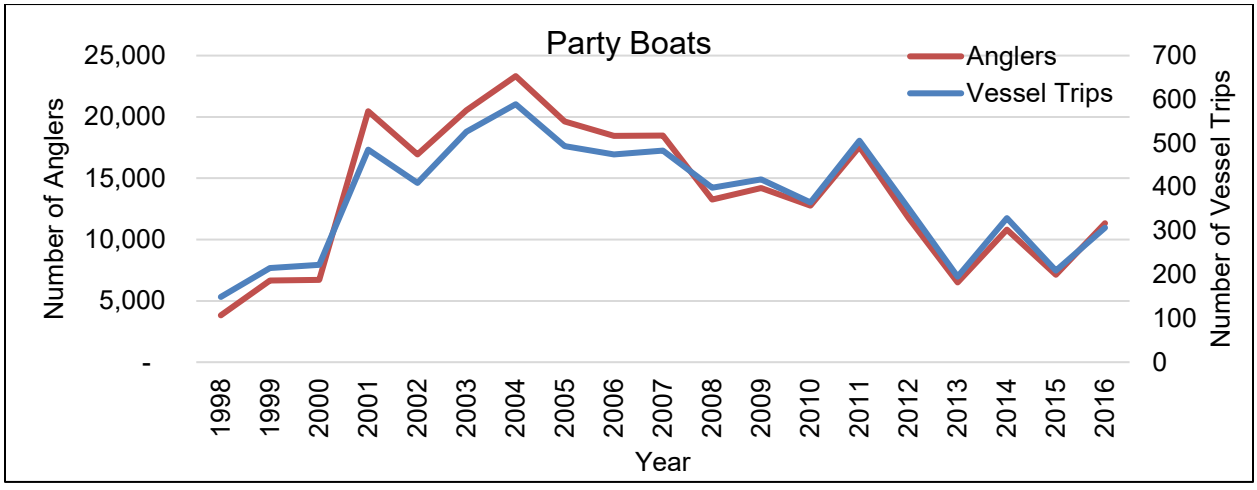

Figure 0.12 Trend in Number of Vessel Trips and Anglers for Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Table 10.6 Percentage of Stellwagen Bank National Marine Sanctuary Party Boats Operating in Statistical Area 514 (1998-2016)

Year	Stellwagen Bank National Marine Sanctuary Vessels	Statistical Area 514 Vessels	% 514 Vessels in Stellwagen Bank National Marine Sanctuary	Stellwagen Bank National Marine Sanctuary Trips	Statistical Area 514 Trips	% 514 Trips in Stellwagen Bank National Marine Sanctuary	Stellwagen Bank National Marine Sanctuary Anglers	Statistical Area 514 Anglers	% 514 Anglers in Stellwagen Bank National Marine Sanctuary
1998	19	40	47.5%	149	846	17.6%	3,820	28,180	13.6%
1999	23	48	47.9%	215	954	22.5%	6,649	32,196	20.7%
2000	19	40	47.5%	222	1,065	20.8%	6,716	34,432	19.5%
2001	31	48	64.6%	485	1,446	33.5%	20,459	57,618	35.5%
2002	23	41	56.1%	409	1,206	33.9%	16,931	43,818	38.6%
2003	25	43	58.1%	526	1,347	39.0%	20,531	48,513	42.3%
2004	34	55	61.8%	589	1,662	35.4%	23,328	59,627	39.1%
2005	44	56	78.6%	493	1,290	38.2%	19,621	47,481	41.3%
2006	36	49	73.5%	474	1,349	35.1%	18,467	46,512	39.7%
2007	31	46	67.4%	483	1,537	31.4%	18,482	52,500	35.2%
2008	28	44	63.6%	398	1,276	31.2%	13,270	41,020	32.4%
2009	31	44	70.5%	417	1,098	38.0%	14,206	33,981	41.8%
2010	30	45	66.7%	365	1,317	27.7%	12,767	42,040	30.4%
2011	25	40	62.5%	506	1,326	38.2%	17,557	41,966	41.8%
2012	21	37	56.8%	351	1,294	27.1%	11,744	40,604	28.9%
2013	19	31	61.3%	195	1,045	18.7%	6,512	30,927	21.1%
2014	21	32	65.6%	329	1,082	30.4%	10,800	32,252	33.5%
2015	14	32	43.8%	209	759	27.5%	7,119	23,746	30.0%
2016	17	30	56.7%	307	840	36.5%	11,329	26,993	42.0%

Chapter 11: Economic Contributions of Recreational Fishing in Stellwagen Bank National Marine Sanctuary

Angler Expenditures

Total for-hire angler expenditures were estimated using the angler expenditure profiles developed by NOAA Fisheries for Massachusetts (Lovell et al. 2013). The latest year angler expenditure profiles were completed was 2011, and those estimates are used here (Table 9.1). Total angler expenditures are equal to person-days multiplied by expenditures per person-day and are converted to 2018 dollars for all years using the consumer price index (tables 11.2 and 11.3).

The largest expenditure category for charter boat users for each year from 2007 to 2016 was the charter boat fees. This is followed by lodging and then auto fuel. This pattern of expenditures is also true for party boat passengers. One notable difference is that charter boat users spend less on ice and bait relative to party boat passengers (tables 11.2 and 11.3).

Table 11.1 Charter Boat Angler Expenditures in Stellwagen Bank National Marine Sanctuary (2018$)

Expenditure Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auto fuel	$208,524	$206,062	$246,328	$266,024	$271,976	$205,844	$179,354	$182,720	$90,659	$133,884
Auto rental	$3,950	$3,903	$4,666	$5,039	$5,152	$3,899	$3,397	$3,461	$1,717	$2,536
Bait	$447	$442	$528	$570	$583	$441	$385	$392	$194	$287
Boat rental	$9,688	$9,574	$11,445	$12,360	$12,636	$9,564	$8,333	$8,489	$4,212	$6,221
Charter fees	$1,404,224	$1,387,644	$1,658,793	$1,791,429	$1,831,514	$1,386,175	$1,207,788	$1,230,453	$610,505	$901,591
Crew tips	$81,681	$80,716	$96,489	$104,204	$106,535	$80,631	$70,255	$71,573	$35,512	$52,444
Fish processing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Food from grocery stores	$102,846	$101,632	$121,491	$131,205	$134,141	$101,524	$88,459	$90,119	$44,714	$66,033
Food from restaurants	$153,897	$152,080	$181,796	$196,333	$200,726	$151,919	$132,368	$134,852	$66,909	$98,810
Gifts & souvenirs	$74,452	$73,573	$87,949	$94,981	$97,107	$73,495	$64,037	$65,238	$32,369	$47,802
Ice	$1,714	$1,694	$2,025	$2,187	$2,236	$1,692	$1,474	$1,502	$745	$1,101
Lodging	$260,618	$257,541	$307,865	$332,482	$339,922	$257,269	$224,161	$228,367	$113,307	$167,332
Parking and site access	$20,867	$20,621	$24,650	$26,621	$27,217	$20,599	$17,948	$18,285	$9,072	$13,398
Public transportation	$58,130	$57,444	$68,669	$74,160	$75,819	$57,383	$49,999	$50,937	$25,273	$37,323
Tournament fees	$2,310	$2,283	$2,729	$2,947	$3,013	$2,281	$1,987	$2,024	$1,004	$1,483
Total	$2,383,348	$2,355,209	$2,815,423	$3,040,542	$3,108,577	$2,352,716	$2,049,945	$2,088,412	$1,036,192	$1,530,245

Table 11.2 Party Boat Angler Expenditures in Stellwagen Bank National Marine Sanctuary (2018$)

Expenditure Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auto fuel	$575,990	$413,558	$442,729	$397,883	$547,162	$366,001	$202,946	$336,581	$221,863	$353,067
Auto rental	$10,910	$7,834	$8,386	$7,537	$10,364	$6,933	$3,844	$6,376	$4,203	$6,688
Bait	$1,235	$887	$949	$853	$1,173	$785	$435	$722	$476	$757
Boat rental	$26,762	$19,215	$20,570	$18,486	$25,422	$17,005	$9,429	$15,638	$10,308	$16,404
Charter fees	$3,878,772	$2,784,942	$2,981,378	$2,679,379	$3,684,644	$2,464,684	$1,366,657	$2,266,569	$1,494,047	$2,377,589
Crew tips	$225,620	$161,994	$173,421	$155,854	$214,328	$143,366	$79,496	$131,842	$86,906	$138,299
Fish processing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Food from grocery stores	$284,084	$203,971	$218,358	$196,239	$269,866	$180,515	$100,095	$166,005	$109,425	$174,136
Food from restaurants	$425,096	$305,217	$326,746	$293,648	$403,821	$270,119	$149,780	$248,406	$163,741	$260,573
Gifts & souvenirs	$205,652	$147,657	$158,072	$142,060	$195,359	$130,677	$72,460	$120,173	$79,214	$126,059
Ice	$4,735	$3,400	$3,639	$3,271	$4,498	$3,009	$1,668	$2,767	$1,824	$2,902
Lodging	$719,885	$516,874	$553,332	$497,282	$683,855	$457,436	$253,646	$420,666	$277,289	$441,271
Parking and site access	$57,640	$41,385	$44,305	$39,817	$54,755	$36,626	$20,309	$33,682	$22,202	$35,332
Public transportation	$160,569	$115,288	$123,420	$110,918	$152,533	$102,030	$56,575	$93,829	$61,849	$98,425
Tournament fees	$6,382	$4,582	$4,905	$4,408	$6,062	$4,055	$2,249	$3,729	$2,458	$3,912
Total	$6,583,332	$4,726,804	$5,060,210	$4,547,635	$6,253,842	$4,183,241	$2,319,589	$3,846,985	$2,535,805	$4,035,414

Economic Contributions of Charter Boats

Using the angler trip estimates from Chapter 10 and the angler expenditure profiles, IMPLAN is used to estimate market benefits associated with recreational fishing in Stellwagen Bank National Marine Sanctuary. Refer to Chapter 8 for a more detailed explanation of IMPLAN.

From 2007 to 2016, there were 63,898 charter boat anglers in Stellwagen Bank National Marine Sanctuary. Their spending generated 298 full- and part-time jobs, over $16.7 million in income, $22.3 million in value added, and $38.8 million in output. The average number of annual jobs supported by charter boat fishing in the sanctuary is 30. Additionally, $1.7 million in income, $2.2 million in value-added, and $3.9 million in output is supported annually on average. Economic contributions rose from 2007 to 2011 before decreasing from 2012 to 2016 (Table 11.4). A more detailed breakdown of effects by year can be found in Appendix B.

Table 11.3 Annual Contributions of Charter Boats in Stellwagen Bank National Marine Sanctuary: Employment, Income, Value Added, and Output (2018$)

Year	Employment	Income	Value Added	Output
2007	32	$1,799,831	$2,402,239	$4,181,662
2008	32	$1,778,581	$2,373,878	$4,132,291
2009	38	$2,126,974	$2,839,027	$4,942,297
2010	32	$1,809,128	$2,415,705	$4,204,465
2011	42	$2,349,205	$3,135,844	$5,459,313
2012	32	$1,776,698	$2,371,365	$4,127,917
2013	28	$1,547,429	$2,065,246	$3,594,860
2014	28	$1,576,646	$2,104,194	$3,662,698
2015	14	$780,387	$1,041,223	$1,812,198
2016	21	$1,157,278	$1,545,354	$2,689,098
Total	298	$16,702,158	$22,294,074	$38,806,799
2007-2016 Average	30	$1,670,216	$2,229,407	$3,880,680

Table 11.5 shows how much of the economic contributions to the local sanctuary economy in statistical area 514 are derived from Stellwagen Bank National Marine Sanctuary. From 2007 to 2016, 50% of the economic contributions (employment, income, value-added, and output) in statistical area 514 came from within the sanctuary. The lowest year for contributions from the sanctuary was in 2015 with 38.7% and the highest year was 2009 with 59.0%.

Table 11.4 Percentage of Charter Boat Economic Contributions in Statistical Area 514 from Stellwagen Bank National Marine Sanctuary

Year	Employment in Stellwagen Bank National Marine Sanctuary	Income in Stellwagen Bank National Marine Sanctuary	Value Added in Stellwagen Bank National Marine Sanctuary	Output in Stellwagen Bank National Marine Sanctuary	Employment in Statistical Area 514	Income in Statistical Area 514	Value Added in Statistical Area 514	Output in Statistical Area 514	% Statistical Area 514 Contributions in Stellwagen Bank National Marine Sanctuary
2007	32.1	$1,799,831	$2,402,239	$4,181,662	64.9	$3,637,621	$4,859,886	$8,459,898	49.5%
2008	31.7	$1,778,581	$2,373,878	$4,132,291	65.8	$3,688,191	$4,927,483	$8,577,811	48.2%
2009	38.0	$2,126,974	$2,839,027	$4,942,297	64.3	$3,608,117	$4,820,407	$8,391,211	59.0%
2010	32.3	$1,809,128	$2,415,705	$4,204,465	71.8	$4,099,455	$5,472,855	$9,538,055	45.0%
2011	41.9	$2,349,205	$3,135,844	$5,459,313	73.3	$4,108,285	$5,488,828	$9,555,086	57.2%
2012	31.7	$1,776,698	$2,371,365	$4,127,917	64.9	$3,636,811	$4,858,803	$8,458,013	48.9%
2013	27.6	$1,547,429	$2,065,246	$3,594,860	59.9	$3,361,024	$4,490,244	$7,816,343	46.1%
2014	28.1	$1,576,646	$2,104,194	$3,662,698	55.0	$3,082,978	$4,118,634	$7,169,044	51.2%
2015	13.9	$780,387	$1,041,223	$1,812,198	36.0	$2,014,638	$2,690,937	$4,683,419	38.7%
2016	20.7	$1,157,278	$1,545,354	$2,689,098	39.8	$2,231,389	$2,980,668	$5,187,722	51.9%
Total	298	$16,702,158	$22,294,074	$38,806,799	595.6	$33,468,508	$44,708,744	$77,836,604	50.0%

Economic Contributions of Party Boats

From 2007 to 2016, there were 123,786 party boat anglers in Stellwagen Bank National Marine Sanctuary. Their spending supported 597 full- and part-time jobs, $33.5 million in income, $44.7 million in value added, and $77.8 million in output. Economic contributions rose from 2008 to 2011 before decreasing from 2012 to 2015 (Table 11.5). The average annual contributions from party boats in Stellwagen Bank National Marine Sanctuary are also shown in the table below.

Table 11.5 Annual Contributions of Party Boats in Stellwagen Bank National Marine Sanctuary: Employment, Income, Value Added, and Output (2018$)

Year	Employment	Income	Value Added	Output
2007	89	$5,003,580	$6,685,348	$11,638,723
2008	64	$3,588,646	$4,794,394	$8,345,929
2009	69	$3,842,717	$5,133,952	$8,937,144
2010	62	$3,451,971	$4,611,791	$8,027,923
2011	85	$4,752,534	$6,349,812	$11,054,472
2012	57	$3,174,795	$4,241,326	$7,382,779
2013	31	$1,756,608	$2,346,198	$4,083,183
2014	52	$2,918,427	$3,898,876	$6,786,564
2015	34	$1,920,739	$2,565,453	$4,464,980
2016	55	$3,061,982	$4,090,609	$7,120,307
Total	597	$33,471,998	$44,717,760	$77,842,004
2007-2016 Average	60	$3,347,200	$4,471,776	$7,784,200

Table 11.6 below shows the economic contributions from Stellwagen Bank National Marine Sanctuary within statistical area 514. The contributions from party boats within the sanctuary are less than those of charter boat passengers. From 2007 to 2016 roughly one-third of party boat economic contributions within statistical area 514 came from the sanctuary. The highest year for contributions from the sanctuary was 2011 at 41.8% and the lowest year was 2013 at 21.0%.

Table 11.6 Percentage of Party Boat Economic Contributions in Statistical Area 514 from Stellwagen Bank National Marine Sanctuary

Year	Employment in Stellwagen Bank National Marine Sanctuary	Income in Stellwagen Bank National Marine Sanctuary	Value Added in Stellwagen Bank National Marine Sanctuary	Output in Stellwagen Bank National Marine Sanctuary	Employment in Statistical Area 514	Income in Statistical Area 514	Value Added in Statistical Area 514	Output in Statistical Area 514	% Statistical Area 514 Contributions from Stellwagen Bank National Marine Sanctuary
2007	89.2	$5,003,580	$6,685,348	$11,638,723	253.8	$14,241,605	$19,033,335	$33,141,534	35.1%
2008	64.0	$3,588,646	$4,794,394	$8,345,929	198.3	$11,122,843	$14,864,660	$25,882,021	32.3%
2009	68.5	$3,842,717	$5,133,952	$8,937,144	164.2	$9,211,007	$12,309,324	$21,432,301	41.7%
2010	61.6	$3,451,971	$4,611,791	$8,027,923	2032	$11,400,153	$15,235,332	$26,527,613	30.3%
2011	84.7	$4,752,534	$6,349,812	$11,054,472	202.8	$11,380,086	$15,208,514	$26,480,919	41.8%
2012	56.6	$3,174,795	$4,241,326	$7,382,779	196.2	$11,009,920	$14,713,735	$25,619,210	28.9%
2013	31.4	$1,756,608	$2,346,198	$4,083,183	149.4	$8,381,420	$11,200,454	$19,500,949	21.0%
2014	52.0	$2,918,427	$3,898,876	$6,786,564	155.8	$8,741,296	$11,681,453	$20,338,627	33.4%
2015	34.3	$1,920,739	$2,565,453	$4,464,980	114.7	$6,432,711	$8,595,721	$14,965,154	29.9%
2016	54.6	$3,061,982	$4,090,609	$7,120,307	137.5	$8,155,098	$10,872,345	$18,516,869	39.7%
Total	597	$33,471,998	$44,717,760	$77,842,004	1,776	$100,076,139	$133,714,872	$232,405,198	33.6%

Chapter 12: Special Analysis: Recreational Fisheries Profiles in the Sliver

Charter Boat Catch by Species/Species Groups

In total, from 1998 to 2016, cod was the most landed fish by charter boats in the sliver with 234,000 kept, which is about 52.4% of the quantity kept by charter boats in the sliver during this time period. This was followed by haddock at 137,000 (30.6%), pollock at 43,000 (9.7%), cusk at 13,000 (2.8%), and redfish at 9,000 (2.1%). These top five species/species groups accounted for almost 98% of charter boat landings from 1998 to 2016. Roughly 24% of all fish landed within statistical area 514 were caught in the sliver, and roughly one-third of all fish landed in Stellwagen Bank National Marine Sanctuary were caught within the sliver over the study period (Table 12.1).

Table 12.1 Charter Boat Landings by Species in the Sliver 1998-2016 Total

Species	Sliver Quantity Kept	Stellwagen Bank National Marine Sanctuary Quantity Kept	Statistical Area 514 Quantity Kept	Percentage of Stellwagen Bank National Marine Sanctuary Kept from Sliver	Percentage of Statistical Area 514 Kept from Sliver
Cod	234,283	712,381	920,967	32.9%	25.4%
Haddock	136,707	279,311	447,902	48.9%	30.5%
Pollock	43,499	119,051	173,575	36.5%	25.1%
Cusk	12,513	23,410	47,338	53.5%	26.4%
Redfish	9,198	22,366	49,535	41.1%	18.6%
Mackerel	5,402	20,859	81,891	25.9%	6.6%
Wolffish	1,639	4,167	8,090	39.3%	20.3%
Bluefin tuna	1,218	19,741	31,085	6.2%	3.9%
Spiny dogfish	460	1,374	2,906	33.5%	15.8%
Bluefish	426	3,389	30,883	12.6%	1.4%
Total Fish Kept	446,702	1,216,554	1,866,699	36.7%	23.9%

Additionally, a CPUA analysis for charter boats was completed. For charter boats, all of the top five ranked species in Stellwagen Bank National Marine Sanctuary had a higher CPUA in the sliver than in the sanctuary. The average CPUA for the top five species in the sanctuary was 363 fish per nautical mile in the sanctuary and 611 fish per nautical mile in the sliver. (At a 90% confidence level, these two average CUPA values are not statistically different: ρ=.112.)

Table 12.2 Charter Boat Catch Per Square Nautical Mile for Stellwagen Bank National Marine Sanctuary and the Sliver

Sanctuary Rank	Sliver Rank	Species	Total Fish Landed 2007-2016 in the Sanctuary	Total Fish Landed 2007-2016 in the Sliver	CPUA Stellwagen Bank National Marine Sanctuary	CPUA Sliver
1	1	Cod	712,381	234,283	1,117	1,669
2	2	Haddock	279,311	136,707	438	974
3	3	Pollock	119,051	43,499	187	310
4	4	Cusk	23,410	5,402	37	38
5	5	Redfish	22,366	9,198	35	66

Trends in Top Five Species Groups (Charter Boats)

Cod

In total, from 1998 to 2016, cod was the most landed species in the sliver by charter boats (Table 12.1). Landings increased drastically from 1998 to 2001, when it peaked at over 29,000 kept. Landings dropped in 2002 and fluctuated until 2013 before a drop-off from 2014 to 2016. The two lowest points occurred in 2015 (due to a recreational moratorium for cod fishing) and 2016 (Figure 12.1 and Table C.21).

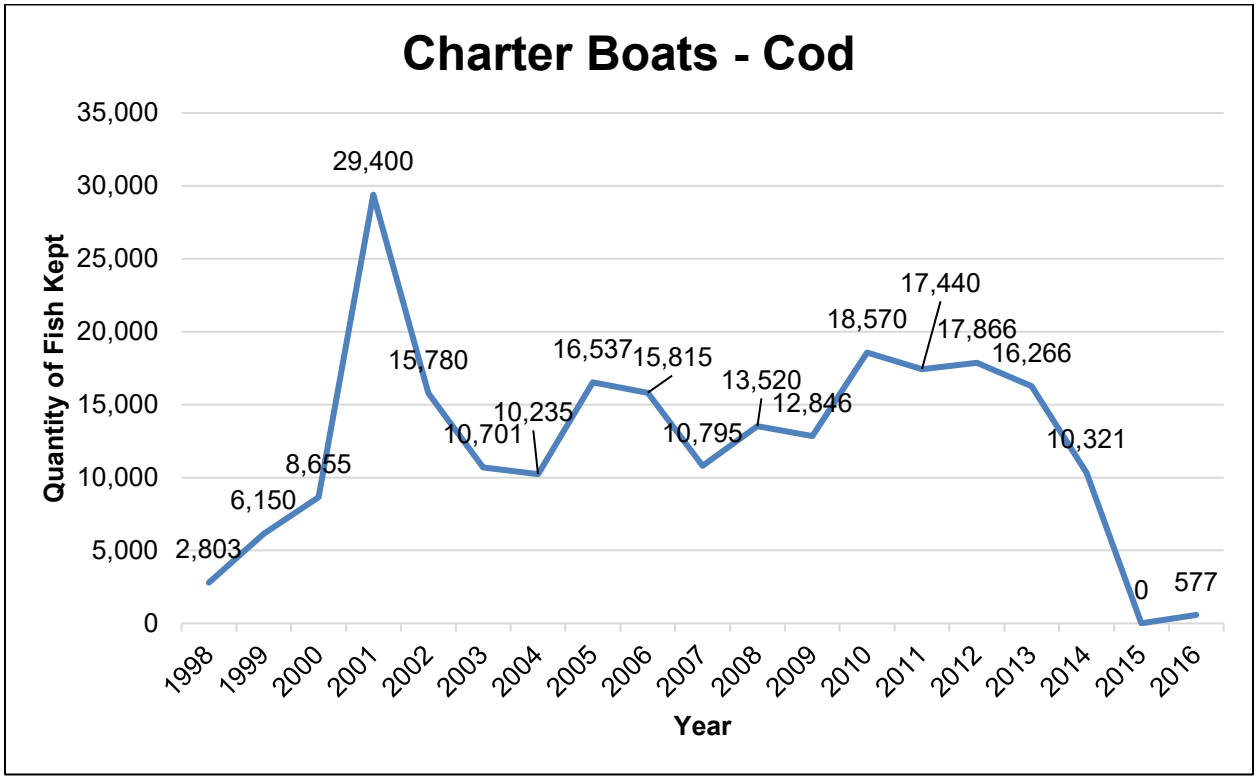

Figure 0.1 Quantity of Cod Kept by Charter Boats in the Sliver (1998-2016)

Haddock

In total, from 1998 to 2016, haddock was the second most kept species in the sliver by charter boats (Table 12.1). Haddock landings rose from 1998 to 2005, then remained relatively constant until 2010 but with a slight decrease in 2008. After 2010, landings fell a low point in 2015 at nearly 2,000 kept. However, in 2016 there was a large increase and landings reached a high point of over 18,000 kept (Figure 12.2 and Table C.22).

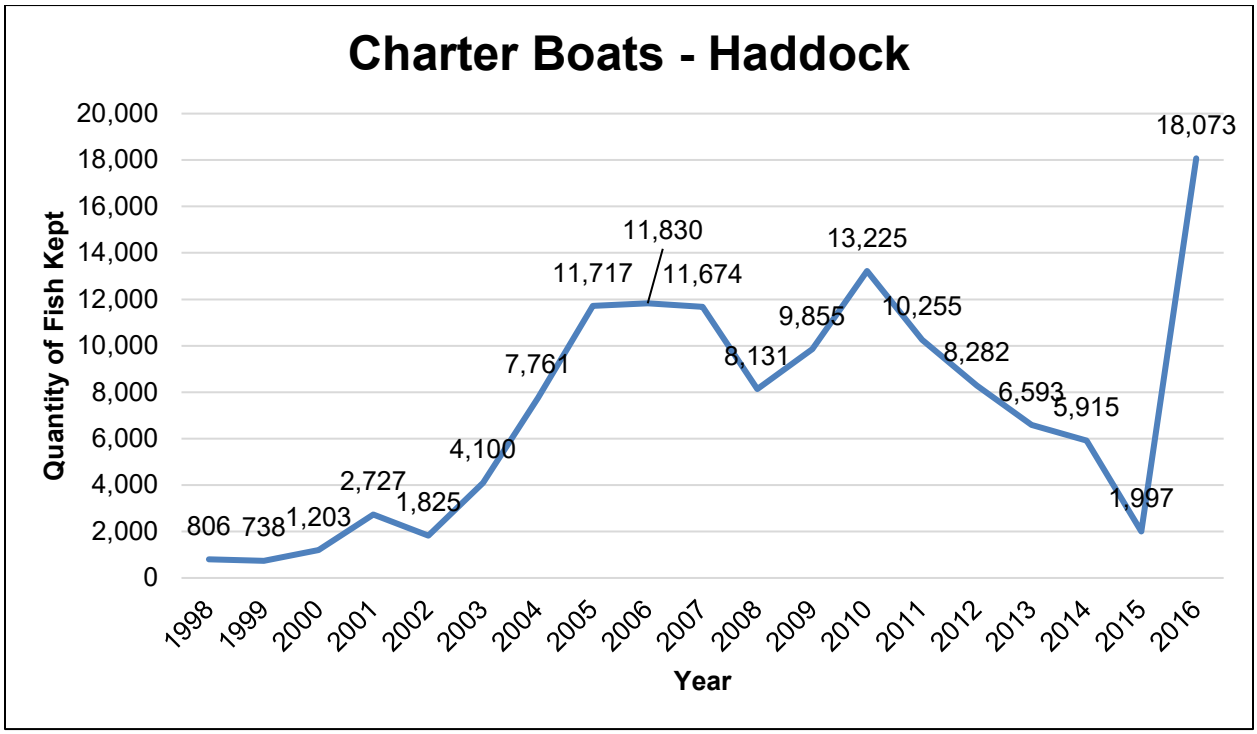

Figure 0.2 Quantity of Haddock Kept by Charter Boats in the Sliver (1998-2016)

Pollock

In total, from 1998 to 2016, pollock was the third most kept species in the sliver by charter boats (Table 12.1). Pollock landings slightly increased from 1998 to 2007, with a spike in 2001. The number of fish kept rose sharply after 2007 until it reached a peak in 2010 with 7,000 kept. Landings dropped sharply in 2011 but have since remained steady until the most recent data year, 2016 (Figure 12.3 and Table C.23).

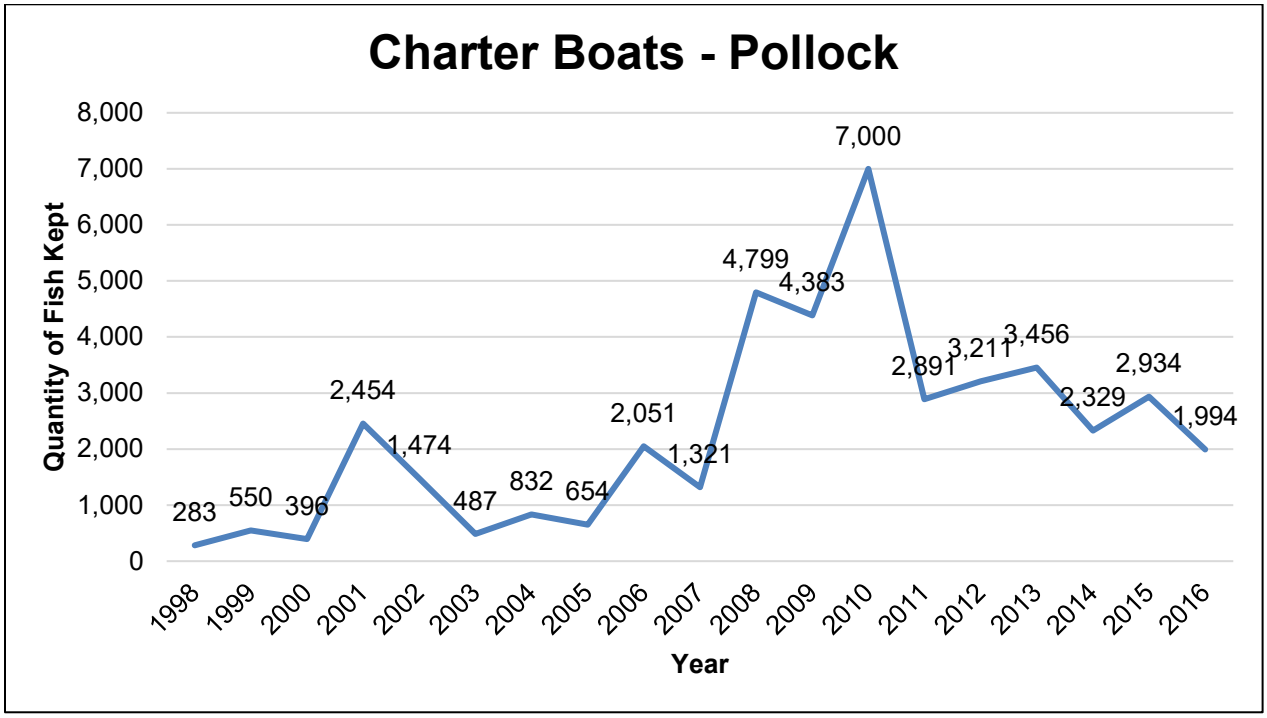

Figure 0.3 Quantity of Pollock Kept by Charter Boats in the Sliver (1998-2016)

Cusk

In total, from 1998 to 2016, cusk was the fourth most landed species in the sliver by charter boats (Table 12.1). Cusk landings rose from 1998 to 2007, then underwent a volatile period between 2007 and 2012 before decreasing to a low point in 2015, with some slight recovery in 2016 (Figure 12.4 and Table C.24).

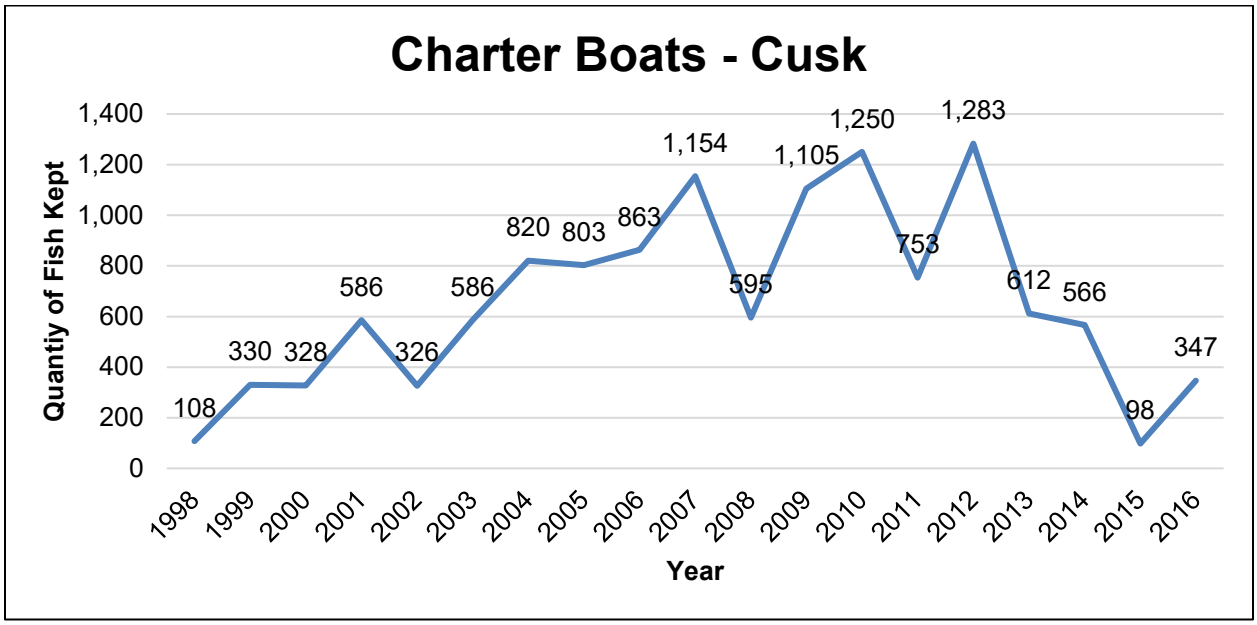

Figure 0.4 Quantity of Cusk Kept by Charter Boats in the Sliver (1998-2016)

Redfish

In total, from 1998 to 2016, redfish was the fifth most kept species in the sliver by charter boats (Table 12.1). Redfish landings were relatively low from 1998 to 2007, then rose sharply until 2010. Landings have been volatile since then and have remained that way until the most recent data year in 2016 (Figure 12.5 and Table C.25).

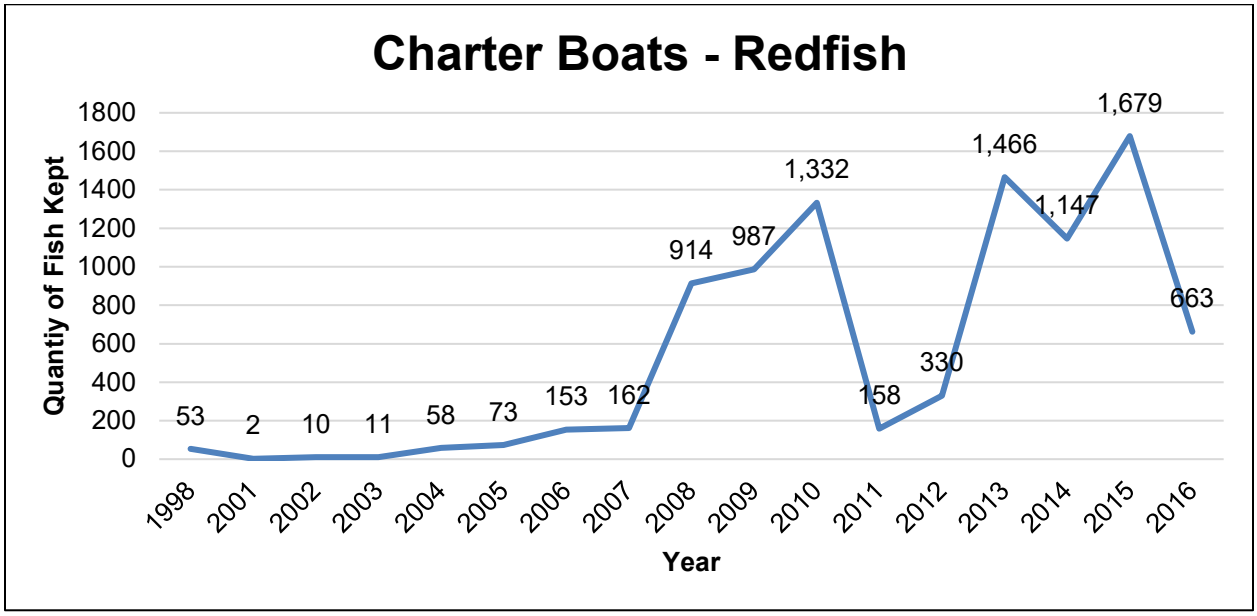

Figure 0.5 Quantity of Redfish Kept by Charter Boats in the Sliver (1998-2016)

Trends in Number of Vessels, Trips and Anglers (Charter Boats)

The number of charter boat vessels in the sliver rose from 1998 to 2007, remained relatively constant despite some volatility between 2007 and 2014, and declined in 2015 and 2016. The number of trips and anglers rose from 1998 until a peak in 2005, remained relatively constant from 2006 to 2014 despite some variability, declined in 2015, and had some recovery in 2016 (Table 12.2 and Figure 12.6).

Table 12.3 Annual Number of Vessels, Vessel Trips and Anglers for Charter Boats in the Sliver (1998-2016)

Year	Vessels	Vessel Trips	Anglers
1998	15	58	478
1999	20	59	635
2000	20	129	1,240
2001	27	247	2,194
2002	34	296	2,009
2003	32	296	2,454
2004	40	315	2,526
2005	51	488	3,250
2006	46	472	3,137
2007	55	433	2,799
2008	41	350	2,115
2009	45	379	2,424
2010	50	485	2,920
2011	43	432	2,473
2012	44	505	2,930
2013	44	475	2,795
2014	48	434	2,878
2015	22	183	1,026
2016	21	283	1,884
Total	698	6,319	42,167

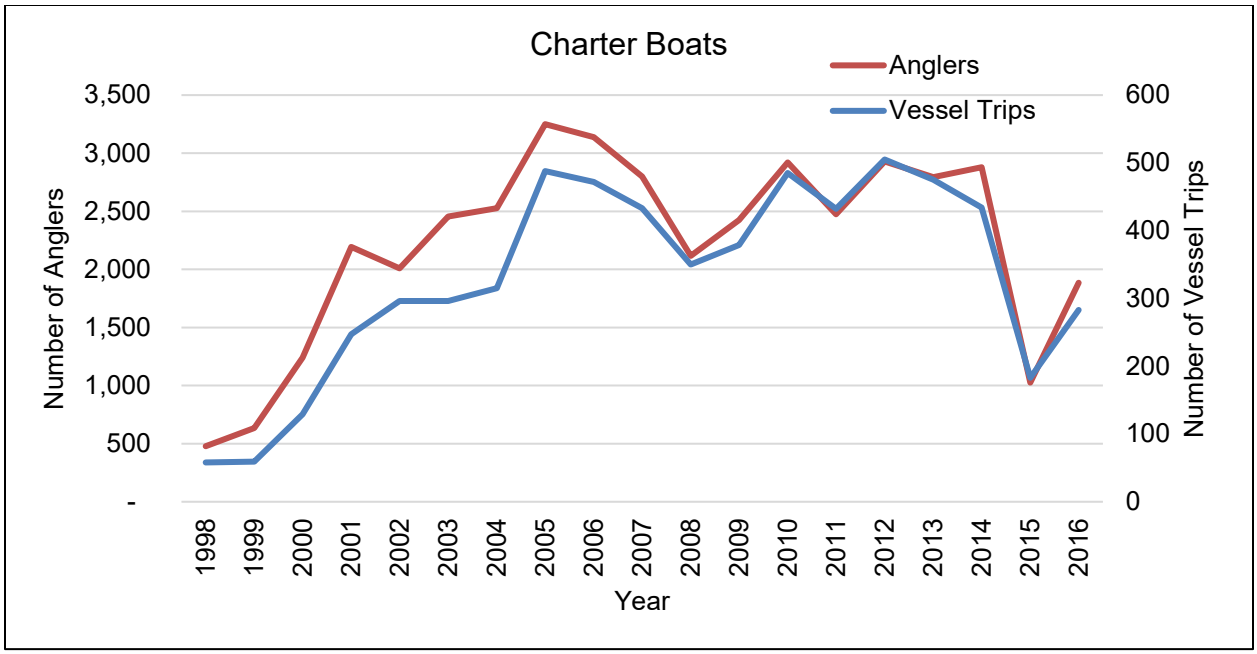

Figure 0.6 Trend in Number of Vessel Trips and Anglers for Charter Boats in the Sliver (1998-2016)

Table 12.4 Percentage of Sliver Charter Boats Operating in Stellwagen Bank National Marine Sanctuary and Statistical Area 514 (1998-2016)

Year	Sliver Vessels	Stellwagen Bank National Marine Sanctuary Vessels	Statistical Area 514 Vessels	% Stellwagen Bank National Marine Sanctuary Vessels In Sliver	% 514 Vessels in Sliver	Sliver Trips	Stellwagen Bank National Marine Sanctuary Trips	Statistical Area 514 Trips	% Stellwagen Bank National Marine Sanctuary Trips in Sliver	% 514 Trips in Stellwagen Bank National Marine Sanctuary	Sliver Anglers	Stellwagen Bank National Marine Sanctuary Anglers	Statistical Area 514 Anglers	% Sliver Anglers Stellwagen Bank National Marine Sanctuary	% Stellwagen Bank National Marine Sanctuary Anglers in 514
1998	15	44	99	34.1%	15.2%	58	452	1,212	12.8%	4.8%	478	3,678	7,263	13.0%	6.6%
1999	20	45	103	44.4%	19.4%	59	469	1,223	12.6%	4.8%	635	3,682	8,152	17.2%	7.8%
2000	20	53	102	37.7%	19.6%	129	751	1,398	17.2%	9.2%	1,240	5,243	9,159	23.7%	13.5%
2001	27	58	104	46.6%	26.0%	247	922	1,724	26.8%	14.3%	2,194	6,686	12,231	32.8%	17.9%
2002	34	76	129	44.7%	26.4%	296	1,044	2,167	28.4%	13.7%	2,009	6,622	13,440	30.3%	14.9%
2003	32	63	121	50.8%	26.4%	296	823	1,703	36.0%	17.4%	2,454	6,378	11,978	38.5%	20.5%
2004	40	65	113	61.5%	35.4%	315	751	1,871	41.9%	16.8%	2,526	5,624	13,167	44.9%	19.2%
2005	51	76	122	67.1%	41.8%	488	944	2,098	51.7%	23.3%	3,250	6,124	13,342	53.1%	24.4%
2006	46	74	118	62.2%	39.0%	472	950	2,013	49.7%	23.4%	3,137	6,400	13,008	49.0%	24.1%
2007	55	84	120	65.5%	45.8%	433	1,068	2,199	40.5%	19.7%	2,799	6,691	13,451	41.8%	20.8%
2008	41	80	111	51.3%	36.9%	350	1,037	2,134	33.8%	16.4%	2,115	6,612	13,638	32.0%	15.5%
2009	45	87	119	51.7%	37.8%	379	1,232	2,072	30.8%	18.3%	2,424	7,904	13,342	30.7%	18.2%
2010	50	91	121	54.9%	41.3%	485	1,420	2,490	34.2%	19.5%	2,920	8,536	15,504	34.2%	18.8%
2011	43	88	129	48.9%	33.3%	432	1,409	2,433	30.7%	17.8%	2,473	8,727	15,186	28.3%	16.3%
2012	44	73	106	60.3%	41.5%	505	1,100	2,261	45.9%	22.3%	2,930	6,605	13,448	44.4%	21.8%
2013	44	65	103	67.7%	42.7%	475	986	1,943	48.2%	24.4%	2,795	5,755	12,431	48.6%	22.5%
2014	48	59	95	81.4%	50.5%	434	943	1,762	46.0%	24.6%	2,878	5,863	11,406	49.1%	25.2%
2015	22	41	71	53.7%	31.0%	183	483	1,161	37.9%	15.8%	1,026	2,909	7,466	35.3%	13.7%
2016	21	45	63	46.7%	33.3%	283	678	1,261	41.7%	22.4%	1,884	4,296	8,267	43.9%	22.8%

Party Boat Catch by Species/Species Groups

In total, from 1998 to 2016, haddock was the number one most landed fish by party boats in the sliver with more than 140,000 kept, which is about 39.6% of the quantity kept by party boats in the sliver during this time period. This was followed by cod at roughly 135,000 (38.2%), pollock at over 36,000 (10.2%), cusk at nearly 27,000 (6.9%), and redfish at over 6,000 (1.8%). Roughly half of the total fish landed in Stellwagen Bank National Marine Sanctuary were caught within the sliver and roughly one-third of all fight landed in statistical area 514 were caught in the sliver. The top five species/species groups accounted for almost 97% of party boat catch from 1998 to 2016 (Table 12.9).

Table 12.5 Party Boat Landings by Species in the Sliver 1998-2016 Total

Species	Sliver Quantity Kept	Stellwagen Bank National Marine Sanctuary Quantity Kept	Statistical Area 514 Quantity Kept	Percentage of Sliver Kept in Stellwagen Bank National Marine Sanctuary	Percentage of Sliver Kept in Statistical Area 514
Haddock	140,157	274,635	619,944	51.0%	22.6%
Cod	135,017	320,218	653,595	42.2%	20.7%
Pollock	36,042	62,701	230,784	57.5%	15.6%
Cusk	24,699	37,847	97,455	65.3%	25.3%
Redfish	6,203	25,701	49,799	24.1%	12.5%
Spiny dogfish	5,751	8,748	27,893	65.7%	20.6%
Wolffish	3,343	5,208	13,823	64.2%	24.2%
Pout	672	1,558	6,969	43.1%	9.6%
White hake	540	1,100	5,007	49.1%	10.8%
Mackerel	446	10,490	116,116	4.3%	0.4%
Total	353,773	752,869	2,039,137	47.0%	17.3%

Analyzing the catch per unit area revealed that for party boats, all of the top five ranked species in Stellwagen Bank National Marine Sanctuary had a higher CPUA in the sliver than in the sanctuary. The average CPUA for the top five species in the sanctuary was 226 fish per nautical mile in the sanctuary and 487 fish per nautical mile in the sliver. (At a 90% confidence level, these two average CPUA values are statistically different: ρ=.072.)

Table 12.6 Party Boat Catch Per Square Nautical Mile for Stellwagen Bank National Marine Sanctuary and the Sliver

Sanctuary Rank	Sliver Rank	Species	Total Fish Landed 2007-2016 in the Sanctuary	Total Fish Landed 2007-2016 in the Sliver	CPUA Stellwagen Bank National Marine Sanctuary	CPUA Sliver
1	2	Cod	320,218	135,017	502	962
2	1	Haddock	274,635	140,157	430	999
3	3	Pollock	62,701	36,042	98	257
4	4	Cusk	37,847	24,699	59	176
5	5	Redfish	25,701	6,203	40	44

Trends in Top Five Species Groups (Party Boats)

Haddock

In total, from 1998 to 2016, haddock was the most kept species in the sliver by party boats (Table 12.9). Haddock landings rose from 1998 to 2004, then fell from 2005 to 2015, before undergoing an increase of over 320% to reach a high point of almost 20,000 kept in 2016. Almost half of the haddock kept within statistical area 514 were from within the sliver across the study period. Roughly 44% of the haddock that were kept within the sanctuary were caught within the sliver (Figure 12.7 and Table C.26)

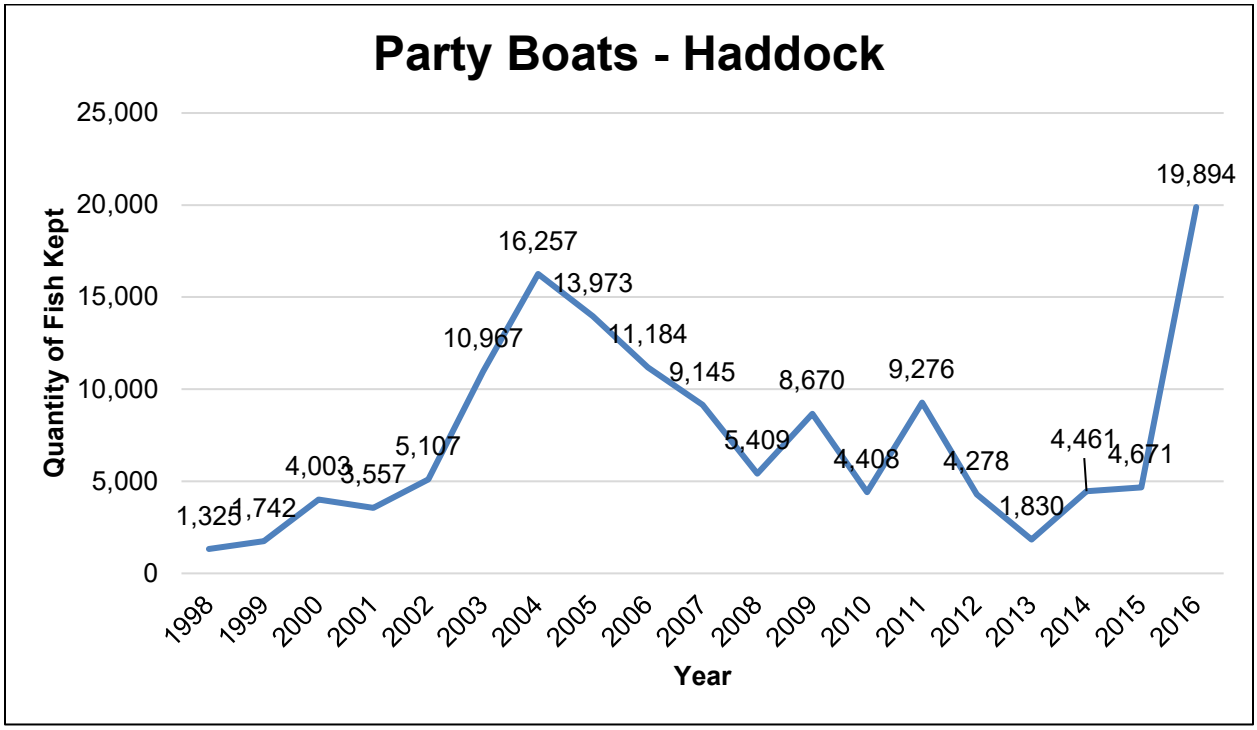

Figure 0.7 Quantity of Haddock Kept by Party Boats in the Sliver (1998-2016)

Cod

In total, from 1998 to 2016, cod was the second most kept species in the sliver by party boats (Table 12.9). Cod landings rose sharply from 1998 to 2001. Landings peaked at over 22,000 kept in 2001 before falling sharply in 2002. Since 2001, the trend in cod landings has been decreasing (Figure 12.8 and Table C.27).

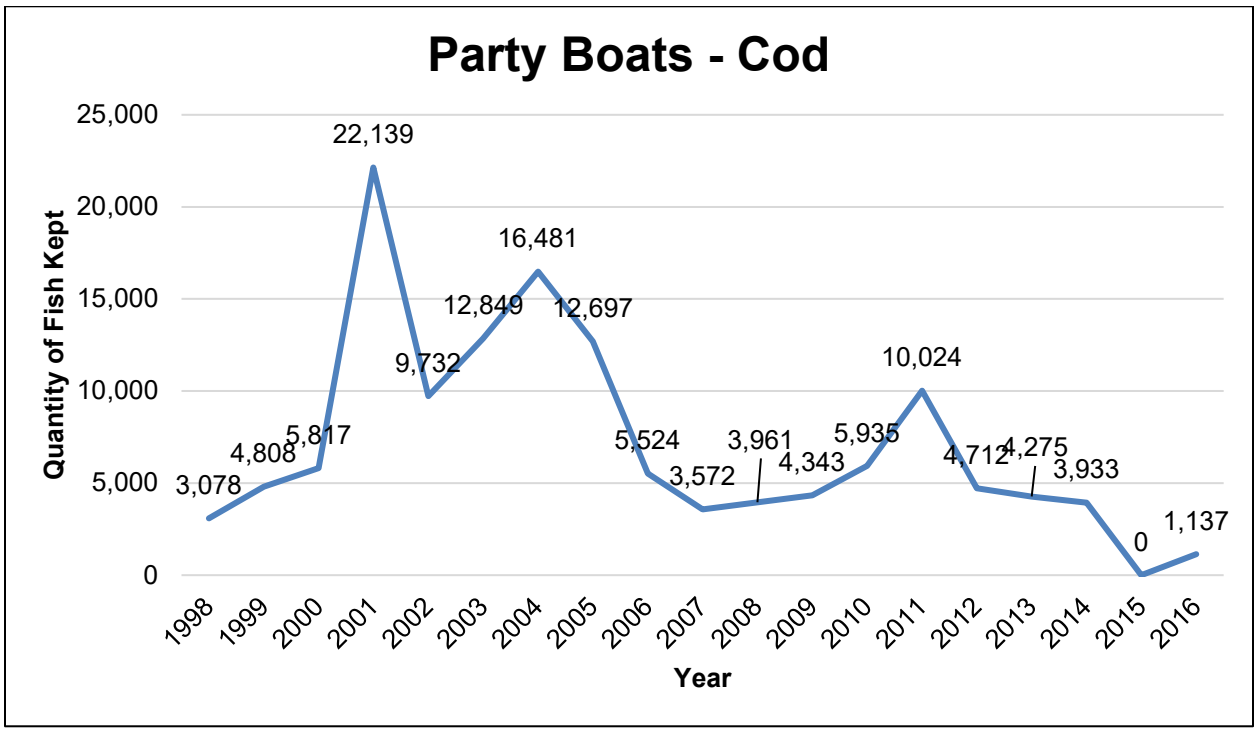

Figure 0.8 Quantity of Cod Kept by Party Boats in the Sliver (1998-2016)

Pollock

In total, from 1998 to 2016, pollock was the third most landed species in the sliver by party boats (Table 12.9). The number of pollock kept has been volatile over the 1998-2016 time period, ranging from a low of 315 kept in 1999 to a high of over 4,000 kept in 2004. Landings have decreased since 2010 but saw some increase in 2015 and 2016 (Figure 12.9 and Table C.28).

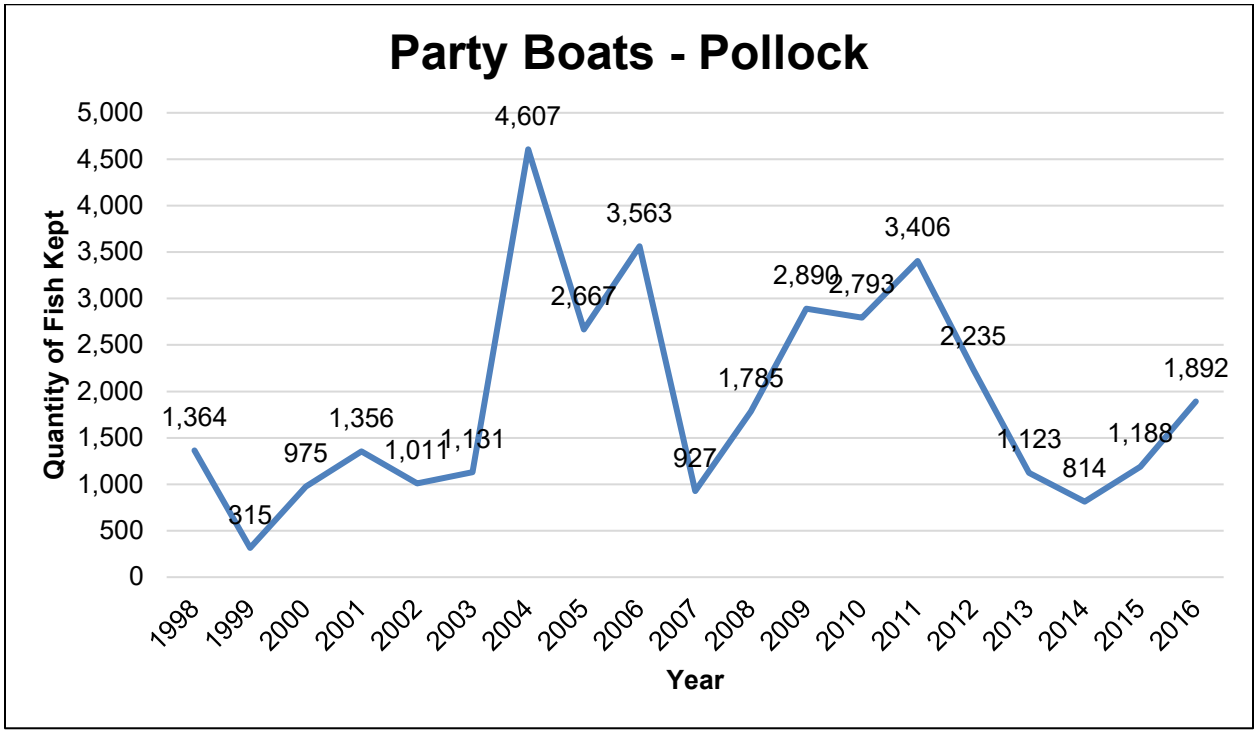

Figure 0.9 Quantity of Pollock Kept by Party Boats in the Sliver (1998-2016)

Cusk

In total, from 1998 to 2016, cusk was the fourth most kept species in the sliver by party boats (Table 12.9). Landings rose substantially from 1998 to 2003, with 2003 being the high point at over 2,000 kept. Since then, quantity of cusk kept has been volatile, although it generally decreased from 2002 to 2016 (Figure 12.10 and Table C.29).

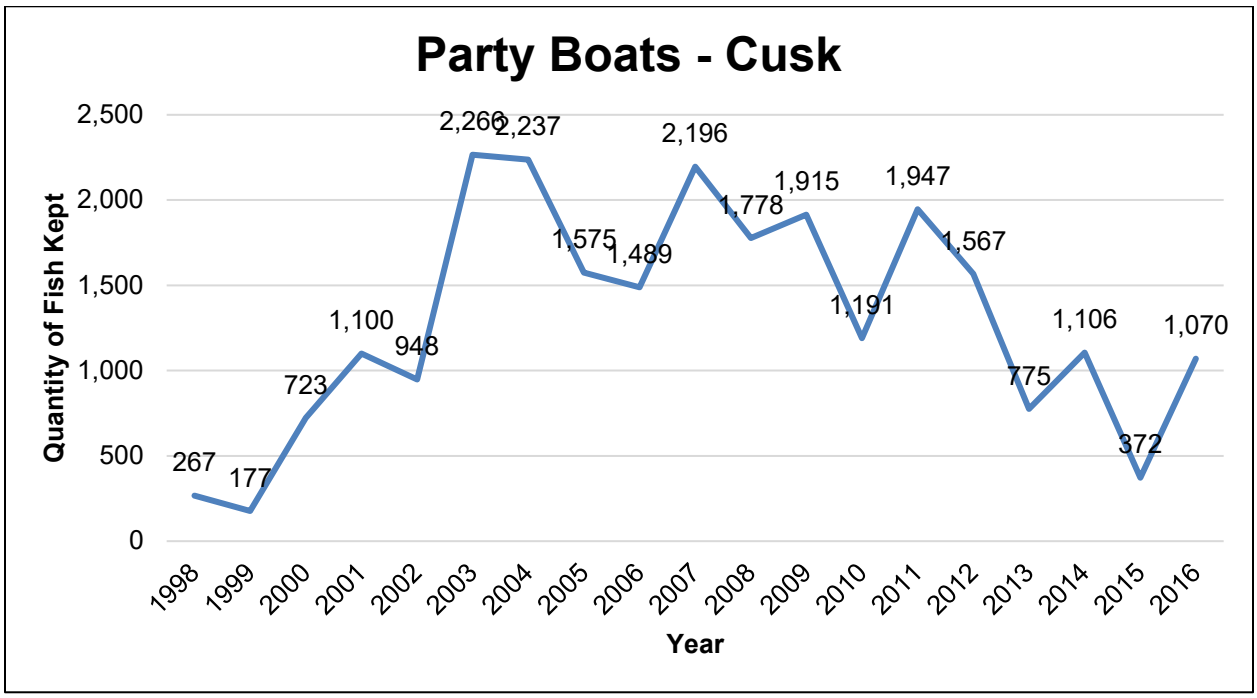

Figure 0.10 Quantity of Cusk Kept by Party Boats in the Sliver (1998-2016)

Redfish

In total, from 1998 to 2016, redfish was the fifth most landed species in the sliver by party boats (Table 12.9). Redfish catch rose from1998 to 2005 and was then volatile from 2006 to 2013. There was an increase in the number kept in 2013 and 2014 (Figure 2.11 and Table C.30).

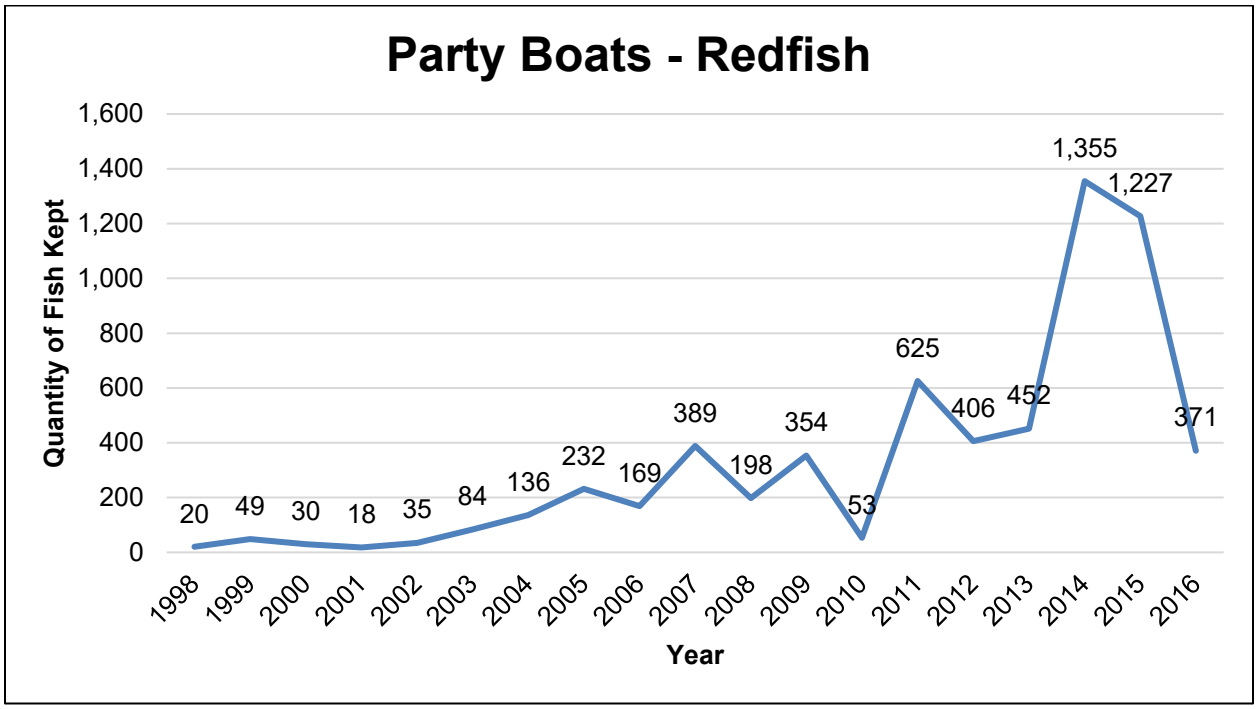

Figure 0.11 Quantity of Redfish Kept by Party Boats in the Sliver (1998-2016)

Trends in Number of Vessels, Vessel Trips, and Anglers (Party Boats)

The number of party boat vessels in the sliver rose from 1998 to 2005, with 2005 having the most vessels at 29. Since then, the number of vessels has decreased with only 12 vessels present in 2016. The number of trips and anglers in the sliver increased sharply from 1998 to 2004, and then began to decrease until 2010. Since 2010, the number of trips and anglers has been volatile. In 2016, there were 135 trips and over 4,500 anglers (Table 12.5 and Figure 12.12).

Table 12.7 Annual Number of Vessels, Vessel Trips, and Anglers for Party Boats in the Sliver (1998-2016)

Year	Vessels	Vessel Trips	Anglers
1998	6	55	1,430
1999	11	68	2,173
2000	11	76	2,627
2001	13	173	6,886
2002	15	144	5,587
2003	16	212	8,143
2004	25	274	10,778
2005	29	236	9,424
2006	22	222	8,727
2007	18	216	8,331
2008	21	151	5,041
2009	19	147	4,627
2010	19	104	3,582
2011	17	182	6,257
2012	14	129	4,288
2013	13	76	2,570
2014	12	145	4,749
2015	8	69	2,518
2016	12	135	4,672
Total	301	2,814	102,410

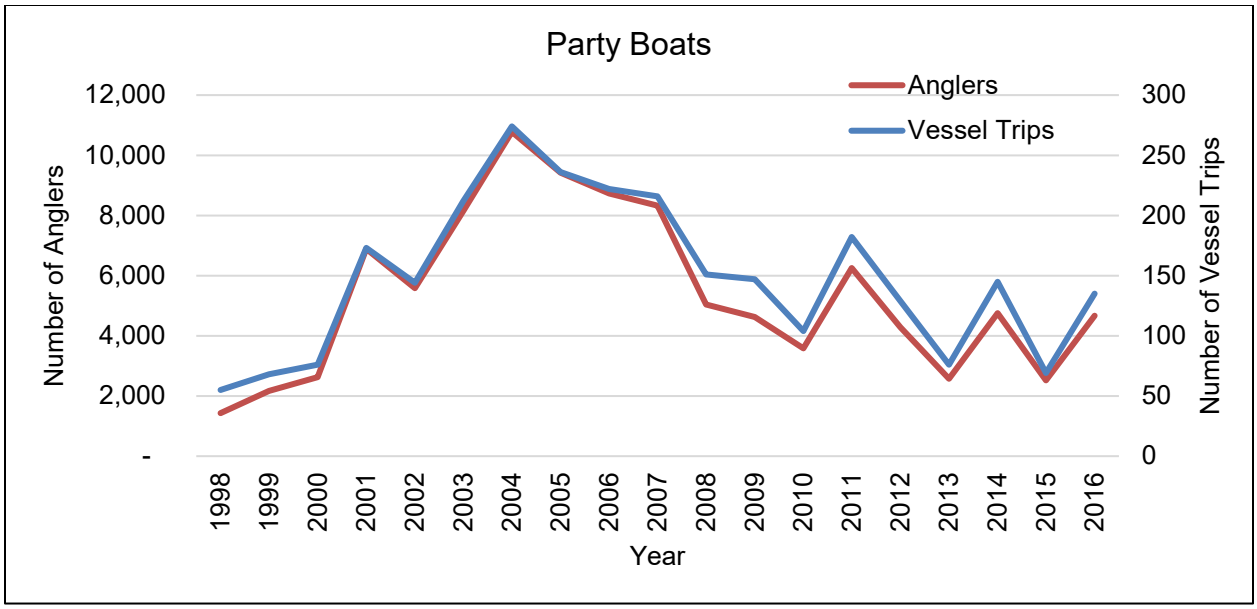

Figure 0.12 Trend in Number of Vessel Trips and Anglers for Party Boats in the Sliver (1998-2016)

Table 12.8 Percentage of Sliver Party Boats Operating in Stellwagen Bank National Marine Sanctuary and Statistical Area 514 (1998-2016)

Year	Sliver Vessels	Stellwagen Bank National Marine Sanctuary Vessels	Statistical Area 514 Vessels	% Stellwagen Bank National Marine Sanctuary Vessels in Sliver	% 514 Vessels in Sliver	Sliver Trips	Stellwagen Bank National Marine Sanctuary Trips	Statistical Area 514 Trips	% Stellwagen Bank National Marine Sanctuary Trips in Sliver	% 514 Trips in Stellwagen Bank National Marine Sanctuary	Sliver Anglers	Stellwagen Bank National Marine Sanctuary Anglers	Statistical Area 514 Anglers	% Stellwagen Bank National Marine Sanctuary Anglers in Sliver	% Stellwagen Bank National Marine Sanctuary Anglers in 514
1998	6	19	40	31.6%	15.0%	55	149	846	36.9%	6.5%	55	3,820	28,180	1.4%	0.2%
1999	11	23	48	47.8%	22.9%	68	215	954	31.6%	7.1%	68	6,649	32,196	1.0%	0.2%
2000	11	19	40	57.9%	27.5%	76	222	1,065	34.2%	7.1%	76	6,716	34,432	1.1%	0.2%
2001	13	31	48	41.9%	27.1%	173	485	1,446	35.7%	12.0%	173	20,459	57,618	0.8%	0.3%
2002	15	23	41	65.2%	36.6%	144	409	1,206	35.2%	11.9%	144	16,931	43,818	0.9%	0.3%
2003	16	25	43	64.0%	37.2%	212	526	1,347	40.3%	15.7%	212	20,531	48,513	1.0%	0.4%
2004	25	34	55	73.5%	45.5%	274	589	1,662	46.5%	16.5%	274	23,328	59,627	1.2%	0.5%
2005	29	44	56	65.9%	51.8%	236	493	1,290	47.9%	18.3%	236	19,621	47,481	1.2%	0.5%
2006	22	36	49	61.1%	44.9%	222	474	1,349	46.8%	16.5%	222	18,467	46,512	1.2%	0.5%
2007	18	31	46	58.1%	39.1%	216	483	1,537	44.7%	14.1%	216	18,482	52,500	1.2%	0.4%
2008	21	28	44	75.0%	47.7%	151	398	1,276	37.9%	11.8%	151	13,270	41,020	1.1%	0.4%
2009	19	31	44	61.3%	43.2%	147	417	1,098	35.3%	13.4%	147	14,206	33,981	1.0%	0.4%
2010	19	30	45	63.3%	42.2%	104	365	1,317	28.5%	7.9%	104	12,767	42,040	0.8%	0.2%
2011	17	25	40	68.0%	42.5%	182	506	1,326	36.0%	13.7%	182	17,557	41,966	1.0%	0.4%
2012	14	21	37	66.7%	37.8%	129	351	1,294	36.8%	10.0%	129	11,744	40,604	1.1%	0.3%
2013	13	19	31	68.4%	41.9%	76	195	1,045	39.0%	7.3%	76	6,512	30,927	1.2%	0.2%
2014	12	21	32	57.1%	37.5%	145	329	1,082	44.1%	13.4%	145	10,800	32,252	1.3%	0.4%
2015	8	14	32	57.1%	25.0%	69	209	759	33.0%	9.1%	69	7,119	23,746	1.0%	0.3%
2016	12	17	30	70.6%	40.0%	135	307	840	44.0%	16.1%	135	11,329	26,993	1.2%	0.5%

Chapter 13: Special Analysis: Economic Contributions to Recreational Fishing from the Sliver

Angler Expenditures

Total for-hire angler expenditures were estimated using the angler expenditure profiles developed by NOAA Fisheries for Massachusetts (Lovell et al. 2013). The latest year angler expenditure profiles were completed was 2011, and those estimates are used here. Total expenditures are equal to person-days multiplied by expenditures per person-day and are converted to 2018 dollars for all years using the consumer price index. The results for the sliver are presented in tables 13.2 and 13.3.

Table 13.1 Charter Boat Angler Expenditures in the Sliver (2018$)

Expenditure Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auto fuel	$87,231	$65,914	$75,544	$91,002	$77,071	$91,313	$87,106	$89,693	$31,975	$58,715
Auto rental	$1,652	$1,249	$1,431	$1,724	$1,460	$1,730	$1,650	$1,699	$606	$1,112
Bait	$187	$141	$162	$195	$165	$196	$187	$192	$69	$126
Boat rental	$4,053	$3,062	$3,510	$4,228	$3,581	$4,243	$4,047	$4,167	$1,486	$2,728
Charter fees	$587,419	$443,870	$508,719	$612,813	$519,002	$614,912	$586,580	$603,999	$215,324	$395,390
Crew tips	$34,169	$25,819	$29,591	$35,646	$30,189	$35,768	$34,120	$35,133	$12,525	$22,999
Fish processing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Food from grocery stores	$43,023	$32,509	$37,259	$44,883	$38,012	$45,037	$42,961	$44,237	$15,770	$28,959
Food from restaurants	$64,379	$48,646	$55,753	$67,162	$56,880	$67,392	$64,287	$66,196	$23,599	$43,333
Gifts & souvenirs	$31,145	$23,534	$26,972	$32,491	$27,517	$32,603	$31,100	$32,024	$11,416	$20,964
Ice	$717	$542	$621	$748	$634	$751	$716	$737	$263	$483
Lodging	$109,023	$82,380	$94,416	$113,736	$96,325	$114,125	$108,867	$112,100	$39,963	$73,383
Parking and site access	$8,729	$6,596	$7,560	$9,107	$7,713	$9,138	$8,717	$8,976	$3,200	$5,876
Public transportation	$24,317	$18,375	$21,059	$25,369	$21,485	$25,455	$24,283	$25,004	$8,914	$16,368
Tournament fees	$966	$730	$837	$1,008	$854	$1,012	$965	$994	$354	$651

Table 13.2 Party Boat Angler Expenditures in the Sliver (2018$)

Expenditure Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auto fuel	$259,635	$157,102	$144,200	$111,633	$194,999	$133,635	$80,094	$148,002	$78,473	$145,602
Auto rental	$4,918	$2,976	$2,731	$2,115	$3,694	$2,531	$1,517	$2,803	$1,486	$2,758
Bait	$557	$337	$309	$239	$418	$287	$172	$317	$168	$312
Boat rental	$12,063	$7,299	$6,700	$5,187	$9,060	$6,209	$3,721	$6,876	$3,646	$6,765
Charter fees	$1,748,406	$1,057,942	$971,057	$751,746	$1,313,141	$899,912	$539,360	$996,661	$528,446	$980,501
Crew tips	$101,701	$61,538	$56,484	$43,727	$76,383	$52,346	$31,373	$57,974	$30,739	$57,034
Fish processing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Food from grocery stores	$128,054	$77,484	$71,121	$55,058	$96,175	$65,910	$39,503	$72,996	$38,704	$71,813
Food from restaurants	$191,618	$115,946	$106,424	$82,388	$143,914	$98,626	$59,111	$109,230	$57,915	$107,459
Gifts & souvenirs	$92,700	$56,092	$51,485	$39,857	$69,623	$47,713	$28,597	$52,843	$28,018	$51,986
Ice	$2,134	$1,291	$1,185	$918	$1,603	$1,099	$658	$1,217	$645	$1,197
Lodging	$324,497	$196,350	$180,224	$139,521	$243,714	$167,020	$100,103	$184,976	$98,078	$181,977
Parking and site access	$25,982	$15,721	$14,430	$11,171	$19,514	$13,373	$8,015	$14,811	$7,853	$14,571
Public transportation	$72,379	$43,796	$40,199	$31,120	$54,360	$37,254	$22,328	$41,259	$21,876	$40,590
Tournament fees	$2,877	$1,741	$1,598	$1,237	$2,160	$1,481	$887	$1,640	$869	$1,613

Economic Contribution of Charter Boats in the Sliver

Using the person-day estimates from Chapter 12 and the angler expenditure profiles, data were inputted to IMPLAN to estimate market benefits associated with recreational fishing in the sliver. Refer to Chapter 9 for a more detailed explanation of IMPLAN.

From 2007 to 2016, there were 24,244 charter boat anglers in the sliver. Their spending supported 116 full- and part-time jobs, almost $6.5 million in income, $8.9 million in value added, and $15.1 million in output. In 2012, economic contributions peaked, and have declined since then (Table 13.4). The average annual contributions from charter boats in the sliver are also shown in the table below.

Table 13.3 Annual Contribution of Charter Boats in the Sliver: Employment, Income, Value Added, and Output (2018$)

Year	Employment	Income	Value Added	Output
2007	13	$752,753	$1,005,026	$1,748,852
2008	10	$568,313	$758,665	$1,319,956
2009	12	$651,738	$870,088	$1,514,005
2010	14	$785,435	$1,048,685	$1,824,812
2011	12	$664,912	$887,675	$1,544,609
2012	14	$788,126	$1,052,277	$1,831,063
2013	13	$751,620	$1,003,481	$1,746,207
2014	14	$768,214	$1,025,008	$1,784,371
2015	5	$274,810	$366,663	$638,063
2016	9	$505,894	$675,320	$1,175,016
Total	116	$6,511,817	$8,692,887	$15,126,954
2007-2016 average	12	$651,182	$869,289	$1,512,695

Table 13.5 shows the percentage of economic contributions from charter boats in statistical area 514 that occur within the sliver. From 2007 to 2016, roughly 19.5% of the economic contributions to the local economy from statistical area 514 came from the sliver. The highest level of contributions occurred in 2014 at 24.9% and the lowest occurred in 2015 at 13.7%. Table 13.6 shows the percentage of economic contributions of Stellwagen Bank National Marine Sanctuary that occur within the sliver. Depending on the year, between 28.3% (2011) and 48.6% (2013 and 2014) of the contributions in the sanctuary occurred within the sliver.

Table 13.4 Percentage of Charter Boat Economic Contributions in Statistical Area 514 from the Sliver

Year	Employment in Sliver	Income in Sliver	Value Added in Sliver	Output in Sliver	Employment in Statistical Area 514	Income in Statistical Area 514	Value Added in Statistical Area 514	Output in Statistical Area 514	% Statistical Area 514 Contributions in Sliver
2007	13.4	$752,753	$1,005,026	$1,748,852	64.9	$3,637,621	$4,859,886	$8,459,898	20.7%
2008	10.1	$568,313	$758,665	$1,319,956	65.8	$3,688,191	$4,927,483	$8,577,811	15.4%
2009	11.6	$651,738	$870,088	$1,514,005	64.3	$3,608,117	$4,820,407	$8,391,211	18.1%
2010	14.0	$785,435	$1,048,685	$1,824,812	71.8	$4,099,455	$5,472,855	$9,538,055	19.5%
2011	11.9	$664,912	$887,675	$1,544,609	73.3	$4,108,285	$5,488,828	$9,555,086	16.2%
2012	14.1	$788,126	$1,052,277	$1,831,063	64.9	$3,636,811	$4,858,803	$8,458,013	21.7%
2013	13.4	$751,620	$1,003,481	$1,746,207	59.9	$3,361,024	$4,490,244	$7,816,343	22.4%
2014	13.7	$768,214	$1,025,008	$1,784,371	55.0	$3,082,978	$4,118,634	$7,169,044	24.9%
2015	4.9	$274,810	$366,663	$638,063	36.0	$2,014,638	$2,690,937	$4,683,419	13.7%
2016	9.0	$505,894	$675,320	$1,175,016	39.8	$2,231,389	$2,980,668	$5,187,722	22.7%
Total	116.3	$6,511,817	$8,692,887	$15,126,954	595.6	$33,468,508	$44,708,744	$77,836,604	19.5%

Table 13.5 Percentage of Charter Boat Economic Contributions in Stellwagen Bank National Marine Sanctuary from the Sliver

Year	Employment in Sliver	Income in Sliver	Value Added in Sliver	Output in Sliver	Employment in Stellwagen Bank National Marine Sanctuary	Income in Stellwagen Bank National Marine Sanctuary	Value Added in Stellwagen Bank National Marine Sanctuary	Output in Stellwagen Bank National Marine Sanctuary	% Stellwagen Bank National Marine Sanctuary Contributions in Sliver
2007	13.4	$752,753	$1,005,026	$1,748,852	32.1	$1,799,831	$2,402,239	$4,181,662	41.9%
2008	10.2	$568,313	$758,665	$1,319,956	31.7	$1,778,581	$2,373,878	$4,132,291	32.0%
2009	11.6	$651,738	$870,088	$1,514,005	38.0	$2,126,974	$2,839,027	$4,942,297	30.7%
2010	14.0	$785,435	$1,048,685	$1,824,812	32.3	$1,809,128	$2,415,705	$4,204,465	43.4%
2011	11.9	$664,912	$887,675	$1,544,609	41.9	$2,349,205	$3,135,844	$5,459,313	28.3%
2012	14.1	$788,126	$1,052,277	$1,831,063	31.7	$1,776,698	$2,371,365	$4,127,917	44.4%
2013	13.4	$751,620	$1,003,481	$1,746,207	27.6	$1,547,429	$2,065,246	$3,594,860	48.6%
2014	13.7	$768,214	$1,025,008	$1,784,371	28.1	$1,576,646	$2,104,194	$3,662,698	48.6%
2015	4.9	$274,810	$366,663	$638,063	13.9	$780,387	$1,041,223	$1,812,198	35.2%
2016	9.0	$505,894	$675,320	$1,175,016	20.7	$1,157,278	$1,545,354	$2,689,098	43.8%
Total	116.3	$6,511,817	$8,692,887	$15,126,954	298.0	$16,702,158	$22,294,074	$38,806,799	39.0%

Economic Contribution of Party Boats in the Sliver

From 2007 to 2016, there were 46,635 party boat anglers in the sliver. Their spending supported 224.3 full- and part-time jobs, roughly $12.6 million in income, $16.8 million in value added, and $29.2 million in output (Table 13.7). Party boats in the sliver support 22 jobs, $1.3 million in income, $1.7 million in value-added, and $2.9 million in output on average each year.

Table 13.6 Annual Contribution of Party Boats in the Sliver: Employment, Income, Value Added, and Output (2018$)

Year	Employment	Income	Value Added	Output
2007	40	$2,248,775	$3,003,942	$5,228,341
2008	24	$1,358,740	$1,814,528	$3,157,605
2009	22	$1,246,615	$1,664,721	$2,896,801
2010	17	$964,287	$1,287,650	$2,240,737
2011	30	$1,687,623	$2,253,927	$3,922,521
2012	21	$1,155,334	$1,542,767	$2,684,572
2013	12	$691,020	$922,538	$1,605,340
2014	23	$1,279,553	$1,708,734	$2,973,495
2015	12	$677,011	$903,827	$1,572,715
2016	22	$1,258,741	$1,680,914	$2,924,978
Total	224	$12,567,699	$16,783,548	$29,207,105
2007-2016 average	22	$1,256,770	$1,678,355	$2,920,711

Table 13.8 shows the percentage of economic contributions to the local economy from party boat users in statistical area 514 that occur within the sliver. The contributions from the sliver range from 8.3% (in 2013) to 16.3% (in 2016). From 2007 to 2016, 37.6% of economic contributions from the sanctuary occurred within the sliver (Table 13.9).

Table 13.7 Percentage of Party Boat Economic Contributions in Statistical Area 514 from the Sliver

Year	Employment in Sliver	Income in Sliver	Value Added in Sliver	Output in Sliver	Employment in Statistical Area 514	Income in Statistical Area 514	Value Added in Statistical Area 514	Output in Stat Area 514	% Statistical Area 514 Contributions in Sliver
2007	40.11	$2,248,775	$3,003,942	$5,228,341	253.8	$14,241,605	$19,033,335	$33,141,534	15.8%
2008	24.3	$1,358,740	$1,814,528	$3,157,605	198.3	$11,122,843	$14,864,660	$25,882,021	12.2%
2009	22.3	$1,246,615	$1,664,721	$2,896,801	164.2	$9,211,007	$12,309,324	$21,432,301	13.6%
2010	17.2	$964,287	$1,287,650	$2,240,737	203.2	$11,400,153	$15,235,332	$26,527,613	8.5%
2011	30.1	$1,687,623	$2,253,927	$3,922,521	202.8	$11,380,086	$15,208,514	$26,480,919	14.8%
2012	20.6	$1,155,334	$1,542,767	$2,684,572	196.2	$11,009,920	$14,713,735	$25,619,210	10.5%
2013	12.3	$691,020	$922,538	$1,605,340	149.4	$8,381,420	$11,200,454	$19,500,949	8.3%
2014	22.8	$1,279,553	$1,708,734	$2,973,495	155.8	$8,741,296	$11,681,453	$20,338,627	14.7%
2015	12.1	$677,011	$903,827	$1,572,715	1147	$6,432,711	$8,595,721	$14,965,154	10.5%
2016	22.5	$1,258,741	$1,680,914	$2,924,978	137.5	$8,155,098	$10,872,345	$18,516,869	16.3%
Total	224.3	$12,567,699	$16,783,548	$29,207,105	1,776.0	$100,076,139	$133,714,872	$232,405,198	12.6%

Table 13.8 Percentage of Party Boat Economic Contributions in Stellwagen Bank National Marine Sanctuary from the Sliver

Year	Employment in Sliver	Income in Sliver	Value Added in Sliver	Output in Sliver	Employment in Stellwagen Bank National Marine Sanctuary	Income in Stellwagen Bank National Marine Sanctuary	Value Added in Stellwagen Bank National Marine Sanctuary	Output in Stellwagen Bank National Marine Sanctuary	% Stellwagen Bank National Marine Sanctuary Contributions in Sliver
2007	40.1	$2,248,775	$3,003,942	$5,228,341	89.2	$5,003,580	$6,685,348	$11,638,723	45.0%
2008	24.3	$1,358,740	$1,814,528	$3,157,605	64.0	$3,588,646	$4,794,394	$8,345,929	37.9%
2009	22.3	$1,246,615	$1,664,721	$2,896,801	68.5	$3,842,717	$5,133,952	$8,937,144	32.5%
2010	17.2	$964,287	$1,287,650	$2,240,737	61.6	$3,451,971	$4,611,791	$8,027,923	28.0%
2011	30.1	$1,687,623	$2,253,927	$3,922,521	84.7	$4,752,534	$6,349,812	$11,054,472	35.5%
2012	20.6	$1,155,334	$1,542,767	$2,684,572	56.6	$3,174,795	$4,241,326	$7,382,779	36.4%
2013	12.3	$691,020	$922,538	$1,605,340	31.4	$1,756,608	$2,346,198	$4,083,183	39.4%
2014	22.8	$1,279,553	$1,708,734	$2,973,495	52.1	$2,918,427	$3,898,876	$6,786,564	43.9%
2015	12.1	$677,011	$903,827	$1,572,715	34.3	$1,920,739	$2,565,453	$4,464,980	35.3%
2016	22.5	$1,258,741	$1,680,914	$2,924,978	54.6	$3,061,982	$4,090,609	$7,120,307	41.1%
Total	224.3	$12,567,699	$16,783,548	$29,207,105	596.9	$33,471,998	$44,717,760	$77,842,004	37.6%

Chapter 14: Private Boaters

In the most recent study available, a snapshot of the private-boating activity within Stellwagen Bank National Marine Sanctuary was estimated for 2009 (Hellin et al. 2011; Starbuck and Lipsky 2013). It was found that 92% of boats that visit the sanctuary are 26 feet or greater in length and that there was a total of 117,120 person-days of private boat fishing in the sanctuary. This activity supported roughly $7.1 million in spending, $5.4 million in value-added, and $2.9 million in income, and supported nearly 60 jobs in the local economy from trip-related expenditures (Table 14.1).

Table 14.1 Economic Contribution of Private Boat Recreation in 2009 (2018$)

Economic Contribution	Value
Person-days	117,120
Spending	$7,056,045
Output	$11,872,461
Value-added	$5,371,563
Income	$2,873,612
Employment	57

Source: Hellin et al. 2011 and Starbuck and Lipsky 2013

Although this is a snapshot of activity, the number of boat registrations over 26 feet can be analyzed for how it has changed. From 2009 to 2015, the number of Massachusetts boat registrations remained stable; however, in 2016, there was an increase in over 2,000 boat registrations from 2015. It is unknown if this is an outlier, data error, or indication of a future trend (Figure H.23; NMMA 2016 and U.S. Coast Guard 2017). Given the relative stability of boat registrations from 2009 to 2015, it can be expected that the contribution of private boat fishing to the local economy has also remained relatively stable.

Table 14.2 Boat Registrations by Size in Massachusetts, 2005-2016

Year	Boat Registrations 26 Feet and Over	Total Boat Registrations	Percentage 26 Feet and Over
2005	6,892	150,026	4.59%
2006	6,907	148,640	4.65%
2007	6,789	145,496	4.67%
2008	6,826	145,113	4.70%
2009	6,694	142,625	4.69%
2010	6,763	141,959	4.76%
2011	6,657	139,991	4.76%
2012	6,682	139,123	4.80%
2013	6,680	137,668	4.85%
2014	6,628	135,750	4.88%
2015	6,530	134,678	4.85%
2016	8,977	140,008	6.41%

Source: NMMA 2016 and U.S. Coast Guard 2017

Chapter 15: Conclusion

Summary

Data were obtained for the commercial and recreational fisheries for Stellwagen Bank National Marine Sanctuary and the larger region around the sanctuary to assess the significance of the fisheries resources in the larger region. For commercial fisheries, the Gulf of Maine was used for the comparisons of catch and effort. For recreational fisheries, the statistical area 514 was used for comparisons of catch and effort. For the economic contribution on local and regional economies, the New England region was used (as defined in Chapter 1). For both commercial and recreational fishing, data from 2007 to 2016 were examined.

Not all components of recreational fishing data were available. Specifically, data for fishing from private boats were not available for 2007 to 2016. Instead, what was available was a snapshot of one year (2009) from a study sponsored by the state of Massachusetts under its marine spatial planning initiative. Trends of boat registrations for boats in the size class observed in Stellwagen Bank National Marine Sanctuary suggested that the number of private boats using the sanctuary was stable or not changing over the 2007 to 2016 period.

For the economic contributions on the local and regional economies, five-year averages (2012-2016) in 2018$ are summarized here. For commercial fishing in Stellwagen Bank National Marine Sanctuary the five-year average was $18.7 million in harvest revenue, $60.6 million in total output, $21.2 million in total income, and 657 jobs. For for-hire recreational fishing, the five-year average was $11.2 million in total spending by for-hire anglers, $19.3 million in total output, $6.4 million in total income, and 127 jobs. The average total economic contributions for both commercial and for-hire recreational fisheries combined in the sanctuary are $79.9 million in output, $27.6 million in income, and 784 jobs. The five-year average in the sanctuary accounted for 21.8% of the commercial fishing vessels, active in, and 4.6% of the commercial fisheries harvest revenue from the Gulf of Maine, and 4.4% of the output generated in New England. Further, 35.1% of spending and 32.1% of the output generated from recreational fishing from statistical area 514 was derived within the sanctuary on average from 2012 to 2016. Therefore, Stellwagen Bank National Marine Sanctuary is a substantial component of the regional fisheries and the livelihoods of those who depend on the fisheries.

Table 15.1 Summary Table of Commercial Harvest in Gulf of Maine (2018$)

Commercial	Harvest Revenue	Output	Income	Jobs	Vessels
2012	$513,002,965	$1,943,560,595	$685,396,427	15,478	1,141
2013	$497,111,141	$1,642,072,601	$575,304,572	12,841	1,077
2014	$340,143,695	$1,119,160,590	$395,021,270	8,874	$970
2015	$346,818,156	$1,130,036,792	$399,026,244	8,797	$969
2016	$331,769,060	$1,076,198,986	$380,931,910	8,563	$921
Five-year Average	$405,769,004	$1,382,205,913	$487,136,085	10,911	1,016
Stellwagen Bank National Marine Sanctuary % of Gulf of Maine	4.6%	4.4%	4.4%	6.0%	21.8%

Table 15.2 Summary Table Statistical Area 514 (Party and Charter Boats Only) (2018$)

Charter Boats	Spending	Output	Income	Jobs	Anglers
2012	$4,790,209	$8,650,627	$3,581,171	65.0	13,448
2013	$4,427,951	$7,996,426	$3,310,347	60.1	12,431
2014	$4,062,844	$7,337,077	$3,037,390	55.1	11,406
2015	$2,659,406	$4,802,272	$1,988,053	36.1	7,466
2016	$2,944,725	$5,317,868	$2,201,482	40.0	8,267
Five-year Average	$3,777,027	$6,820,854	$2,823,689	51	10,604
Party Boats	**Spending**	**Output**	**Income**	**Jobs**	**Anglers**
2012	$14,463,239	$26,119,136	$10,812,754	196.3	40,604
2013	$11,016,269	$19,894,254	$8,235,788	149.5	30,927
2014	$11,488,237	$20,746,580	$8,588,633	155.9	32,252
2015	$8,458,380	$15,275,030	$6,323,530	114.8	23,746
2016	$9,615,269	$17,363,650	$7,188,173	130.5	26,993
Five-year Average	$11,008,279	$19,879,730	$8,229,776	149	30,904
Total Recreation	$14,785,306	$26,700,584	$11,053,464	201	41,508
Sanctuary % of 514	35.1%	32.1%	32.2%	32.3%	35.1%

Table 15.3a Summary Table of Stellwagen Bank National Marine Sanctuary (2018$)

Commercial	Harvest Revenue	Output	Income	Jobs	Vessels
2012	$23,439,282	$79,688,040	$27,796,208	937	264
2013	$16,426,307	$53,504,452	$18,766,454	571	220
2014	$15,578,375	$49,739,232	$17,609,001	576	199
2015	$14,220,443	$44,528,071	$15,511,015	454	181
2016	$23,630,032	$75,521,606	$26,342,897	747	242
Five-year average	$18,658,888	$60,596,280	$21,205,115	657	221

Table 15.4b Summary Table of Stellwagen Bank National Marine Sanctuary (2018$)

Recreational					
Charter boats	**Spending**	**Output**	**Income**	**Jobs**	**Anglers**
2012	$2,352,716	$4,127,917	$1,776,698	32	6,605
2013	$2,049,944	$3,594,860	$1,547,429	28	5,755
2014	$2,088,414	$3,662,698	$1,576,646	28	5,863
2015	$1,036,193	$1,812,198	$780,387	14	2,909
2016	$1,530,245	$2,689,098	$1,157,278	21	4,296
Five-year average	$1,811,502	$3,177,354	$1,367,688	24	5,086
Party boats	**Spending**	**Output**	**Income**	**Jobs**	**Anglers**
2012	4,183,240	$7,382,779	$3,174,795	57	11,744
2013	2,319,589	$4,083,183	$1,756,608	31	6,512
2014	3,846,985	$6,786,564	$2,918,427	52	10,800
2015	2,535,804	$4,464,980	$1,920,739	34	7,119
2016	4,035,416	$7,120,307	$3,061,982	55	11,329
Five-year average	$3,384,207	$5,967,562	$2,566,510	46	9,501
Charter & party	$5,195,709	$9,144,917	$3,934,198	70	14,586
Private boats	$7,056,045	$11,872,461	$2,873,612	57	
Total recreation	$11,224,146	$19,288,331	$6,389,311	127	
Total all fisheries		$79,884,611	$27,594,426	784	

Sliver. Charter and party boat fishing estimates were produced in this report, and there is no estimate of the amount of private boat fishing in the sliver. The five-year average for all charter and party boat fishing was 6,062 anglers who spent $2.12 million, which generated $3.9 million in output and $1.6 million in income and supported 29 jobs. The sliver accounted for 41.6% of all charter and party boat anglers in the sanctuary, 41.6% of all of their spending, 42.6% of all output, 41.0% of all income, and 41.8% of all jobs generated from the spending. The sliver represents a large proportion of all charter and party boat recreational fishing in Stellwagen Bank National Marine Sanctuary.

Table 15.5 Summary Table Sliver (2018$)

Charter Boats	Spending	Output	Income	Jobs	Anglers
2012	$1,043,673	$1,884,771	$780,254	14	2,930
2013	$995,585	$1,797,924	$744,302	14	2,795
2014	$1,025,150	$1,851,317	$766,405	14	2,878
2015	$365,464	$659,992	$273,223	5	1,026
2016	$671,085	$1,211,772	$501,627	9	1,884
Five-year Average	$820,191	$1,481,155	$613,162	11	2,303
Party Boats	**Spending**	**Output**	**Income**	**Jobs**	**Anglers**
2012	1,527,396	$2,758,320	$1,141,885	21	4,288
2013	915,440	$1,653,187	$684,383	12	2,570
2014	1,691,605	$3,054,865	$1,264,648	23	4,749
2015	896,917	$1,619,738	$670,536	12	2,518
2016	1,664,177	$3,005,337	$1,244,144	23	4,672
Five-year Average	$1,339,107	$2,418,289	$1,001,119	18	3,759
	Spending	**Output**	**Income**	**Jobs**	**Anglers**
Charter & Party	$2,159,298	$3,899,445	$1,614,281	29	6,062
	Spending	**Output**	**Income**	**Jobs**	**Anglers**
% of Stellwagen Bank National Marine Sanctuary in Sliver	41.6%	42.6%	41.0%	41.8%	41.6%

Edge. The edge consists of a two-mile buffer on the southern and western boundary of the sliver. There is no commercial fishing inside the sliver, which is a protected area. Over one-third of all vessels that fished in Stellwagen Bank National Marine Sanctuary fished in the edge and they accounted for 13.7% of the harvest revenue, 14.4% of the output, 13.8% of the income, and 15.2% of the jobs generated from commercial fishing in the sanctuary. The analysis provided in this document supports that there is some level of an edge effect (given the edge is 12.2% of the sanctuary) and this warrants further exploration in future research.

Table 15.6 Summary Table Edge (2018$)

Commercial	Harvest Revenue	Output	Income	Jobs	Vessels
2012	$3,335,453	$11,904,726	$3,915,896	134	109
2013	$1,397,515	$4,992,362	$1,621,176	53	63
2014	$1,881,076	$6,498,759	$2,174,295	88	66
2015	$2,302,297	$7,527,050	$2,579,635	99	56
2016	$3,830,242	$12,787,382	$4,292,983	126	78
Five-year Average	$2,549,317	$8,742,056	$2,916,797	100	74
% of Stellwagen Bank National Marine Sanctuary	13.7%	14.4%	13.8%	15.2%	33.6%

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Glossary of Acronyms

BEA – Bureau of Economic Analysis

BLS – Bureau of Labor Statistics

CPUA – Catch per unit area

DMIS – Data Matching and Imputation System

FEMA – Federal Emergency Management Agency

IBT – Indirect business taxes

NEFSC – NOAA Northeast Fisheries Science Center

NEPA – National Environmental Policy Act

NMFS (NOAA Fisheries) – NOAA National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

ONMS – NOAA Office of National Marine Sanctuaries

OPTI – Other property type income

USFS – United States Forest Service

WGOM – Western Gulf of Maine

Appendix A: Trends in Top Five Commercial Species by Landings and Value

Top Five Species in Gulf of Maine

Table A.1 Trends in Sea Scallops Landed in the Gulf of Maine 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	22,550,332	$177,658,402	$7.88
2008	14,552,320	$119,560,081	$8.22
2009	15,151,446	$115,662,063	$7.63
2010	13,410,400	$141,605,954	$10.56
2011	18,655,207	$205,189,388	$11.00
2012	30,906,547	$327,600,224	$10.60
2013	27,075,652	$324,782,809	$12.00
2014	12,028,350	$167,627,623	$13.94
2015	11,593,638	$149,578,007	$12.90
2016	9,824,805	$135,830,293	$13.83

Table A.2 Trends in Lobster Landed in the Gulf of Maine 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	9,818,403	$56,982,282	$5.80
2008	10,906,318	$52,308,137	$4.80
2009	12,675,475	$50,613,524	$3.99
2010	14,682,420	$63,012,811	$4.29
2011	14,078,115	$59,067,741	$4.20
2012	15,288,073	$58,331,937	$3.82
2013	14,674,050	$59,830,536	$4.08
2014	14,786,482	$67,881,877	$4.59
2015	16,131,134	$79,705,919	$4.94
2016	17,296,416	$83,951,460	$4.85

Table A.3 Trends in Cod Landed in the Gulf of Maine 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	14,150,425	$30,783,048	$2.18
2008	16,008,198	$35,417,938	$2.21
2009	16,613,277	$28,324,653	$1.70
2010	14,511,219	$30,450,800	$2.10
2011	14,018,590	$33,236,888	$2.37
2012	8,564,973	$22,609,114	$2.64
2013	3,901,508	$10,061,042	$2.58
2014	4,157,778	$9,192,974	$2.21
2015	2,653,950	$6,150,063	$2.32
2016	2,195,787	$5,035,192	$2.29

Table A.4 Trends in Atlantic Herring Landed in the Gulf of Maine 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	101,413,113	$12,778,455	$0.13
2008	125,262,158	$18,033,864	$0.14
2009	153,748,734	$18,084,862	$0.12
2010	102,363,379	$15,925,465	$0.16
2011	143,631,518	$20,846,879	$0.15
2012	146,885,154	$23,202,589	$0.16
2013	148,347,365	$23,223,136	$0.16
2014	156,508,085	$23,627,437	$0.15
2015	142,827,000	$21,773,067	$0.15
2016	109,134,114	$25,908,927	$0.24

Table A.5 Trends in Haddock Landed in the Gulf of Maine 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	7,120,248	$14,551,349	$2.04
2008	12,260,501	$19,154,834	$1.56
2009	11,427,696	$15,796,783	$1.38
2010	18,737,247	$24,236,012	$1.29
2011	10,806,608	$17,435,630	$1.61
2012	3,945,358	$8,334,852	$2.11
2013	3,631,354	$6,323,314	$1.74
2014	8,782,460	$11,905,167	$1.36
2015	10,321,112	$13,165,918	$1.28
2016	9,570,017	$13,695,804	$1.43

Top Five Species in Stellwagen Bank National Marine Sanctuary

Table A.6 Trends in Cod Landed in Stellwagen Bank National Marine Sanctuary 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	3,807,835	$8,791,719	$2.31
2008	5,692,680	$11,902,315	$2.09
2009	6,488,976	$10,762,325	$1.66
2010	6,151,323	$12,771,238	$2.08
2011	3,859,727	$9,429,909	$2.44
2012	2,345,045	$6,152,365	$2.62
2013	611,918	$1,780,956	$2.91
2014	567,620	$1,265,426	$2.23
2015	67,321	$192,418	$2.86
2016	175,157	$521,493	$2.98

Table A.7 Trends in Lobsters Landed in Stellwagen Bank National Marine Sanctuary 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	408,979	$2,384,029	$5.83
2008	385,869	$1,755,388	$4.55
2009	579,687	$2,332,640	$4.02
2010	653,866	$2,826,500	$4.32
2011	706,587	$2,748,252	$3.89
2012	973,405	$3,429,462	$3.52
2013	1,143,387	$4,362,372	$3.82
2014	972,157	$4,332,615	$4.46
2015	1,211,329	$5,696,860	$4.70
2016	1,284,332	$5,582,613	$4.35

Table A.8 Trends in Sea Scallops Landed in Stellwagen Bank National Marine Sanctuary 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	72,275	$570,937	$7.90
2008	20,701	$174,003	$8.41
2009	24,312	$194,638	$8.01
2010	97,810	$895,820	$9.16
2011	138,354	$1,607,474	$11.62
2012	440,601	$4,921,332	$11.17
2013	465,427	$5,742,715	$12.34
2014	279,397	$4,105,667	$14.69
2015	277,465	$3,745,778	$13.50
2016	809,953	$11,292,402	$13.94

Table A.9 Trends in Yellowtail Flounder Landed in Stellwagen Bank National Marine Sanctuary 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	473,229	$999,510	$2.11
2008	640,977	$1,390,016	$2.17
2009	619,691	$1,018,783	$1.64
2010	755,968	$1,360,972	$1.80
2011	739,795	$1,026,267	$1.39
2012	1,229,579	$1,720,313	$1.40
2013	788,364	$1,195,183	$1.52
2014	550,313	$661,861	$1.20
2015	292,259	$396,948	$1.36
2016	413,516	$744,700	$1.80

Table A.10 Trends in Haddock Landed in Stellwagen Bank National Marine Sanctuary 2007 to 2016 (2017$)

Year	Pounds	Value	Value per Pound
2007	692,458	$1,825,299	$2.64
2008	364,138	$849,381	$2.33
2009	438,446	$943,242	$2.15
2010	424,833	$945,989	$2.23
2011	452,529	$1,066,840	$2.36
2012	506,597	$1,229,853	$2.43
2013	92,137	$273,911	$2.97
2014	45,568	$116,093	$2.55
2015	17,075	$31,798	$1.86
2016	187,263	$296,678	$1.58

Top Five Species in the Edge

Table A.11 Trends in Cod Landed in the Edge 2007 to 2016 (2017$)

Year	Value	Pounds	Value per Pound
2007	$1,271,995	545,125	$2.33
2008	$1,343,613	623,597	$2.15
2009	$1,123,772	678,384	$1.66
2010	$942,028	428,944	$2.20
2011	$1,255,127	502,219	$2.50
2012	$810,409	294,840	$2.75
2013	$195,340	64,334	$3.04
2014	$146,044	53,417	$2.73
2015	$52,724	18,356	$2.87
2016	$95,469	33,310	$2.87

Table A.12 Trends in Sea Scallops Landed in the Edge 2007 to 2016 (2017$)

Year	Value	Pounds	Value per Pound
2007	$34,129	4,738	$7.20
2008	$5,184	634	$8.18
2009	$9,526	1,132	$8.42
2010	$43,578	4,818	$9.04
2011	$34,523	2,869	$12.03
2012	$305,666	27,966	$10.93
2013	$69,869	5,259	$13.29
2014	$526,689	37,120	$14.19
2015	$1,004,783	78,116	$12.86
2016	$2,223,662	147,216	$15.10

Table A.13 Trends in Monkfish Landed in the Edge 2007 to 2016 (2017$)

Year	Value	Pounds	Value per Pound
2007	$606,751	264,801	$2.29
2008	$469,146	155,733	$3.01
2009	$489,572	146,887	$3.33
2010	$327,171	84,480	$3.87
2011	$241,076	71,070	$3.39
2012	$187,897	60,082	$3.13
2013	$249,408	99,807	$2.50
2014	$234,947	94,534	$2.49
2015	$390,295	161,701	$2.41
2016	$433,123	138,871	$3.12

Table A.14 Trends in Haddock Landed in the Edge 2007 to 2016 (2017$)

Year	Value	Pounds	Value per Pound
2007	$334,739	127,471	$2.63
2008	$179,565	73,446	$2.44
2009	$277,360	125,863	$2.20
2010	$357,164	161,518	$2.21
2011	$503,987	226,838	$2.22
2012	$527,282	224,889	$2.34
2013	$79,914	27,218	$2.94
2014	$24,539	9,916	$2.47
2015	$5,087	3,054	$1.67
2016	$141,239	108,291	$1.30

Table A.15 Trends in Pollock Landed in the Edge 2007 to 2016 (2017$)

Year	Value	Pounds	Value per Pound
2007	$158,542	305,625	$0.52
2008	$461,271	861,145	$0.54
2009	$469,192	644,104	$0.73
2010	$270,456	267,803	$1.01
2011	$359,380	428,152	$0.84
2012	$291,780	238,232	$1.22
2013	$67,037	46,040	$1.46
2014	$99,037	81,902	$1.21
2015	$131,395	134,376	$0.98
2016	$59,141	40,658	$1.45

Appendix B: Annual Harvest Revenue

Gulf of Maine Harvest Revenue 2008-2015

Table B.1 Harvest Revenue Distribution in the Gulf of Maine 2008 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1,215	100.0%	100.0%
Greater than $1,000,000	58	4.8%	23.8%
Greater than $300,000	360	29.6%	75.1%
Greater than $200,000	491	40.41	85.1%
Greater than $100,000	720	59.3%	95.1%
Greater than $50,000	865	71.2%	98.4%
Greater than $30,000	929	76.5%	99.2%
Greater than $10,000	1,034	85.1%	99.8%
Less than $10,000	182	15.0%	0.2%
Less than $5,000	134	11.0%	0.1%
Less than $1,000	65	5.4%	0.01%
Less than $100	17	1.4%	0.0%

Table B.2 Harvest Revenue Distribution in the Gulf of Maine 2009 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1,172	100.0%	100.0%
Greater than $1,000,000	42	3.6%	19.1%
Greater than $300,000	328	28.0%	72.9%
Greater than $200,000	462	39.4%	83.7%
Greater than $100,000	702	59.9%	95.3%
Greater than $50,000	828	70.7%	98.5%
Greater than $30,000	884	75.4%	99.2%
Greater than $10,000	983	83.9%	99.8%
Less than $10,000	189	16.1%	0.2%
Less than $5,000	144	12.3%	0.1%
Less than $1,000	61	5.2%	0.01%
Less than $100	11	0.9%	0.0%

Table B.3 Harvest Revenue Distribution in the Gulf of Maine 2010 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1,258	100.0%	100.0%
Greater than $1,000,000	76	6.0%	30.7%
Greater than $300,000	341	27.1%	72.8%
Greater than $200,000	547	43.5%	86.4%
Greater than $100,000	781	62.1%	96.4%
Greater than $50,000	885	70.4%	98.6%
Greater than $30,000	945	75.1%	99.3%
Greater than $10,000	1,052	83.6%	99.8%
Less than $10,000	206	16.4%	0.2%
Less than $5,000	156	12.4%	0.1%
Less than $1,000	73	5.8%	0.01%
Less than $100	15	1.2%	0.0%

Table B.4 Harvest Revenue Distribution in the Gulf of Maine 2011 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1,143	100.0%	100.0%
Greater than $1,000,000	113	9.9%	40.3%
Greater than $300,000	460	40.2%	85.3%
Greater than $200,000	556	48.6%	90.90%
Greater than $100,000	731	64.0%	97.1%
Greater than $50,000	837	73.2%	99.0%
Greater than $30,000	891	78.0%	99.5%
Greater than $10,000	980	85.7%	99.9%
Less than $10,000	163	14.3%	0.1%
Less than $5,000	113	9.9%	0.04%
Less than $1,000	58	5.1%	0.00%
Less than $100	14	1.2%	0.00%

Table B.5 Harvest Revenue Distribution in the Gulf of Maine 2012 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1,141	100.0%	100.0%
Greater than $1,000,000	190	16.7%	56.8%
Greater than $300,000	485	42.5%	89.5%
Greater than $200,000	565	49.5%	93.3%
Greater than $100,000	726	63.6%	97.7%
Greater than $50,000	832	72.9%	99.2%
Greater than $30,000	889	77.9%	99.6%
Greater than $10,000	976	85.5%	99.9%
Less than $10,000	165	14.5%	0.1%
Less than $5,000	124	10.9%	0.04%
Less than $1,000	58	5.1%	0.00%
Less than $100	14	1.2%	0.00%

Table B.6 Harvest Revenue Distribution in the Gulf of Maine 2013 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	1,077	100.0%	100.0%
Greater than $1,000,000	194	18.0%	61.5%
Greater than $300,000	431	40.0%	88.9%
Greater than $200,000	499	46.3%	92.1%
Greater than $100,000	684	63.5%	97.6%
Greater than $50,000	789	73.3%	99.3%
Greater than $30,000	838	77.8%	99.6%
Greater than $10,000	931	86.4%	99.9%
Less than $10,000	146	13.6%	0.2%
Less than $5,000	107	9.9%	0.04%
Less than $1,000	49	4.6%	0.00%
Less than $100	13	1.2%	0.00%

Table B.7 Harvest Revenue Distribution in the Gulf of Maine 2014 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	970	100.0%	100.0%
Greater than $1,000,000	106	10.9%	44.6%
Greater than $300,000	353	36.4%	82.2%
Greater than $200,000	448	46.2%	88.7%
Greater than $100,000	646	66.6%	97.2%
Greater than $50,000	733	75.6%	99.0%
Greater than $30,000	781	80.5%	99.6%
Greater than $10,000	847	87.3%	99.9%
Less than $10,000	123	12.7%	0.1%
Less than $5,000	93	9.6%	0.04%
Less than $1,000	45	4.6%	0.00%
Less than $100	7	0.7%	0.00%

Table B.8 Harvest Revenue Distribution in the Gulf of Maine 2015 (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	969	100.0%	100.0%
Greater than $1,000,000	75	7.8%	31.7%
Greater than $300,000	362	37.4%	83.0%
Greater than $200,000	464	47.9%	90.1%
Greater than $100,000	623	64.4%	97.1%
Greater than $50,000	715	73.9%	99.0%
Greater than $30,000	760	78.5%	99.5%
Greater than $10,000	820	84.7%	99.9%
Less than $10,000	149	15.4%	0.1%
Less than $5,000	110	11.4%	0.1%
Less than $1,000	48	5.0%	0.01%
Less than $100	9	0.9%	0.00%

Stellwagen Bank National Marine Sanctuary Harvest Revenue 2008-2015

Table B.9 Harvest Revenue Distribution 2008 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	275	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	12	4.4%	21.0%
Greater than $200,000	40	14.6%	51.5%
Greater than $100,000	84	30.6%	79.9%
Greater than $50,000	115	41.8%	89.8%
Greater than $30,000	143	52.0%	94.7%
Greater than $10,000	188	68.4%	98.6%
Less than $10,000	87	31.6%	1.4%
Less than $5,000	63	22.9%	0.5%
Less than $1,000	22	8.0%	0.04%
Less than $100	5	1.8%	0.00%

Table B.10 Harvest Revenue Distribution 2009 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	287	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	5	1.7%	8.7%
Greater than $200,000	26	9.2%	34.9%
Greater than $100,000	77	26.8%	73.9%
Greater than $50,000	118	41.1%	88.2%
Greater than $30,000	143	49.8%	93.4%
Greater than $10,000	196	68.3%	98.7%
Less than $10,000	91	31.7%	1.3%
Less than $5,000	73	25.4%	0.6%
Less than $1,000	26	9.1%	0.1%
Less than $100	7	2.4%	0.00%

Table B.11 Harvest Revenue Distribution 2010 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	320	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	13	4.1%	22.8%
Greater than $200,000	31	9.7%	41.4%
Greater than $100,000	85	26.6%	74.6%
Greater than $50,000	131	40.9%	88.4%
Greater than $30,000	163	50.9%	93.9%
Greater than $10,000	222	69.4%	98.7%
Less than $10,000	98	30.6%	1.3%
Less than $5,000	69	21.6%	0.4%
Less than $1,000	33	10.3%	0.1%
Less than $100	6	1.9%	0.00%

Table B.12 Harvest Revenue Distribution 2011 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	251	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	11	4.4%	26.6%
Greater than $200,000	32	12.8%	51.6%
Greater than $100,000	67	26.7%	77.5%
Greater than $50,000	105	41.8%	90.7%
Greater than $30,000	128	51.0%	95.1%
Greater than $10,000	167	66.5%	98.7%
Less than $10,000	84	33.5%	1.3%
Less than $5,000	63	25.1%	0.6%
Less than $1,000	22	8.8%	0.04%
Less than $100	8	3.2%	0.00%

Table B.13 Harvest Revenue Distribution 2012 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	264	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	20	7.6%	39.7%
Greater than $200,000	31	11.7%	51.7%
Greater than $100,000	77	29.2%	79.9%
Greater than $50,000	107	40.5%	90.6%
Greater than $30,000	130	49.2%	94.9%
Greater than $10,000	172	65.2%	98.6%
Less than $10,000	92	34.9%	1.4%
Less than $5,000	63	23.9%	0.5%
Less than $1,000	26	9.9%	0.1%
Less than $100	3	1.1%	0.00%

Table B.14 Harvest Revenue Distribution 2013 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	220	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	10	4.6%	30.8%
Greater than $200,000	25	11.4%	53.8%
Greater than $100,000	47	21.4%	73.8%
Greater than $50,000	79	35.9%	88.0%
Greater than $30,000	105	47.7%	94.4%
Greater than $10,000	140	63.6%	98.5%
Less than $10,000	80	36.4%	1.5%
Less than $5,000	59	26.8%	0.6%
Less than $1,000	26	11.8%	0.1%
Less than $100	6	2.7%	0.00%

Table B.15 Harvest Revenue Distribution 2014 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	199	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	9	4.5%	29.4%
Greater than $200,000	22	11.1%	49.3%
Greater than $100,000	49	24.6%	74.7%
Greater than $50,000	73	36.7%	86.8%
Greater than $30,000	101	50.8%	94.3%
Greater than $10,000	135	67.8%	98.6%
Less than $10,000	64	32.2%	1.4%
Less than $5,000	49	24.6%	0.1%
Less than $1,000	16	8.0%	0.04%
Less than $100	5	2.5%	0.00%

Table B.16 Harvest Revenue Distribution 2015 (Stellwagen Bank National Marine Sanctuary) (2017$)

Distribution Range	Number of Vessels	Percentage of Vessels	Percentage of Harvest Revenue
Greater than $0	180	100.0%	100.0%
Greater than $1,000,000	0	0.00%	0.00%
Greater than $300,000	9	5.0%	30.2%
Greater than $200,000	21	11.7%	50.4%
Greater than $100,000	47	26.1%	75.7%
Greater than $50,000	75	41.7%	89.9%
Greater than $30,000	90	50.0%	94.0%
Greater than $10,000	120	66.7%	98.5%
Less than $10,000	61	33.9%	1.5%
Less than $5,000	45	25.0%	0.7%
Less than $1,000	14	7.8%	0.03%
Less than $100	5	2.8%	0.00%

Appendix C: Trends in Top Five Recreational Charter and Party Boat Species

Statistical Area 514

Charter Boats

Table C.1 Top Five Species Kept by Charter Boats in Statistical Area 514 (1998-2016)

Year	Cod	Haddock	Pollock	Mackerel	Redfish
1998	38,091	6,583	3,336	3,543	191
1999	64,549	4,706	6,272	1,891	101
2000	76,469	7,166	6,874	3,838	68
2001	121,672	7,308	10,862	2,468	96
2002	78,788	12,713	8,376	2,278	72
2003	38,534	12,618	2,613	1,809	69
2004	40,120	31,316	3,071	1,605	226
2005	45,214	38,693	3,912	1,623	630
2006	32,377	38,972	5,661	1,619	655
2007	30,739	34,966	4,623	992	920
2008	44,459	32,201	12,571	3,584	3,156
2009	56,855	37,475	11,532	1,817	2,075
2010	73,481	34,428	27,493	2,331	7,852
2011	67,100	26,798	18,082	7,001	1,613
2012	39,967	24,340	13,113	8,539	4,148
2013	44,129	20,872	14,102	6,483	10,788
2014	26,958	18,297	8,562	10,058	5,574
2015	0	10,452	7,241	8,775	8,582
2016	1,458	47,998	5,279	11,637	2,719

Party Boats

Table C.2 Top Five Species Kept by Party Boats in Statistical Area 514 (1998-2016)

Year	Cod	Haddock	Pollock	Mackerel	Cusk
1998	27,367	9,543	4,957	5,556	2,036
1999	34,139	10,551	3,472	6,228	2,275
2000	41,511	19,875	5,771	4,437	3,328
2001	100,174	19,861	11,315	8,513	5,688
2002	51,381	27,767	7,915	6,457	4,205
2003	52,635	31,026	8,234	2,166	6,413
2004	66,091	59,276	12,781	4,808	6,464
2005	45,113	63,653	14,250	766	4,373
2006	23,883	47,678	20,780	316	6,280
2007	19,852	43,676	18,663	3,616	6,553
2008	19,661	27,678	18,399	10,410	6,086
2009	27,310	50,548	9,647	7,047	5,312
2010	33,236	33,135	23,046	6,836	8,292
2011	38,283	31,446	20,743	5,093	8,530
2012	19,814	22,763	12,135	9,449	5,202
2013	34,612	22,719	10,856	4,724	6,183
2014	14,831	19,032	6,864	9,913	5,369
2015	0	25,993	8,247	11,015	1,971
2016	3,693	53,724	12,709	8,766	2,895

Stellwagen Bank National Marine Sanctuary

Charter Boats

Table C.2 Top Five Species Kept by Charter Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Year	Cod	Haddock	Pollock	Cusk	Redfish
1998	26,145	3,222	1,916	681	138
1999	45,149	2,269	3,585	714	60
2000	65,583	3,179	6,118	866	21
2001	103,696	4,436	8,340	1,070	20
2002	63,050	4,680	7,107	733	62
2003	30,133	7,711	1,957	1,194	22
2004	24,905	17,222	1,654	1,284	98
2005	29,912	22,305	1,814	1,520	390
2006	26,142	21,718	4,013	1,570	326
2007	23,329	21,280	3,428	1,947	335
2008	33,532	20,418	8,433	1,289	1,161
2009	48,133	26,605	8,217	1,536	1,359
2010	58,044	22,852	21,686	1,934	1,650
2011	53,174	17,996	13,048	1,598	470
2012	30,929	16,466	6,853	2,224	1,505
2013	28,505	13,419	8,086	1,257	5,832
2014	21,198	12,356	5,676	962	3,263
2015	0	5,709	4,076	370	3,598
2016	816	35,468	3,044	661	2,056

Party Boats

Table C.4 Top Five Species Kept by Party Boats in Stellwagen Bank National Marine Sanctuary (1998-2016)

Year	Cod	Haddock	Pollock	Cusk	Redfish
1998	11,296	1,982	1,914	430	181
1999	13,861	5,646	1,180	632	242
2000	15,873	7,333	1,376	1,365	139
2001	53,314	5,538	2,984	1,970	341
2002	25,551	11,215	2,138	1,533	317
2003	28,691	14,371	1,720	3,029	199
2004	34,200	26,805	6,076	2,890	625
2005	24,388	29,614	4,080	2,223	713
2006	11,070	20,967	4,699	2,478	1,772
2007	11,202	21,223	1,679	2,941	2,492
2008	8,806	12,882	2,016	2,530	1,647
2009	11,917	23,090	3,664	2,483	2,519
2010	16,776	11,911	9,406	2,369	1,421
2011	24,388	16,798	6,879	3,070	1,663
2012	9,768	9,327	3,613	2,192	1,379
2013	9,338	3,555	2,031	1,291	1,478
2014	7,809	8,648	1,848	1,871	4,030
2015	0	10,851	2,199	937	2,733
2016	1,969	32,879	3,199	1,613	1,810

Sliver

Charter Boats

Table C.5 Number of Cod Kept by Charter Boats in the Sliver (1998-2016)

Year	Cod	Haddock	Pollock	Cusk	Redfish
1998	2,803	806	283	108	53
1999	6,150	738	550	330	--
2000	8,655	1,203	396	328	--
2001	29,400	2,727	2,454	586	2
2002	15,780	1,825	1,474	326	10
2003	10,701	4,100	487	586	11
2004	10,235	7,761	832	820	58
2005	16,537	11,717	654	803	73
2006	15,815	11,830	2,051	863	153
2007	10,795	11,674	1,321	1,154	162
2008	13,520	8,131	4,799	595	914
2009	12,846	9,855	4,383	1,105	987
2010	18,570	13,225	7,000	1,250	1,332
2011	17,440	10,255	2,891	753	158
2012	17,866	8,282	3,211	1,283	330
2013	16,266	6,593	3,456	612	1,466
2014	10,321	5,915	2,329	566	1,147
2015	0	1,997	2,934	98	1,679
2016	577	18,073	1,994	347	663

Party Boats

Table C.3 Number of Haddock Kept by Party Boats in the Sliver (1998-2016)

Year	Haddock	Cod	Pollock	Cusk	Redfish
1998	1,325	3,078	1,364	267	20
1999	1,742	4,808	315	177	49
2000	4,003	5,817	975	723	30
2001	3,557	22,139	1,356	1,100	18
2002	5,107	9,732	1,011	948	35
2003	10,967	12,849	1,131	2,266	84
2004	16,257	16,481	4,607	2,237	136
2005	13,973	12,697	2,667	1,575	232
2006	11,184	5,524	3,563	1,489	169
2007	9,145	3,572	927	2,196	389
2008	5,409	3,961	1,785	1,778	198
2009	8,670	4,343	2,890	1,915	354
2010	4,408	5,935	2,793	1,191	53
2011	9,276	10,024	3,406	1,947	625
2012	4,278	4,712	2,235	1,567	406
2013	1,830	4,275	1,123	775	452
2014	4,461	3,933	814	1,106	1,355
2015	4,671	0	1,188	372	1,227
2016	19,894	1,137	1,892	1,070	371

Appendix D: Recreational Charter And Party Boat Fishing Economic Contributions

This appendix details the annual economic contributions of spending from party and charter boats by study area (statistical area 514, Stellwagen Bank National Marine Sanctuary, and the sliver).

Statistical Area 514

Charter Boats

Table D.1 2007 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	40.4	$2,036,747	$2,482,398	$4,641,523
Indirect effect	13.6	$914,173	$1,263,683	$2,080,710
Induced effect	10.9	$686,701	$1,113,804	$1,737,665
Total effect	64.9	$3,637,621	$4,859,886	$8,459,898

Table D.2 2008 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	41.0	$2,064,889	$2,516,689	$4,705,751
Indirect effect	13.8	$927,060	$1,281,514	$2,110,243
Induced effect	11.1	$696,242	$1,129,281	$1,761,817
Total effect	65.8	$3,688,191	$4,927,483	$8,577,811

Table D.3 2009 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	40.1	$2,020,242	$2,462,282	$4,603,910
Indirect effect	13.5	$906,743	$1,253,354	$2,063,730
Induced effect	10.8	$681,131	$1,104,771	$1,723,571
Total effect	64.3	$3,608,117	$4,820,407	$8,391,211

Table D.4 2010 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	44.1	$2,293,302	$2,791,024	$5,227,842
Indirect effect	15.4	$1,032,814	$1,427,489	$2,353,208
Induced effect	12.3	$773,339	$1,254,342	$1,957,006
Total effect	71.8	$4,099,455	$5,472,855	$9,538,055

Table D.5 2011 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	45.6	$2,299,484	$2,802,626	$5,240,260
Indirect effect	15.3	$1,033,264	$1,428,298	$2,352,313
Induced effect	12.3	$775,537	$1,257,904	$1,962,513
Total effect	73.3	$4,108,285	$5,488,828	$9,555,086

Table D.6 2012 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	40.4	$2,036,294	$2,481,846	$4,640,489
Indirect effect	13.6	$913,970	$1,263,401	$2,080,246
Induced effect	10.9	$686,548	$1,113,556	$1,737,278
Total effect	64.9	$3,636,811	$4,858,803	$8,458,013

Table D.7 2013 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	37.4	$1,882,300	$2,294,157	$4,289,553
Indirect effect	12.5	$844,232	$1,166,969	$1,921,264
Induced effect	10.1	$634,492	$1,029,118	$1,605,526
Total effect	59.9	$3,361,024	$4,490,244	$7,816,343

Table D.8 2014 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	34.3	$1,727,094	$2,104,991	$3,935,856
Indirect effect	11.5	$773,872	$1,069,651	$1,760,490
Induced effect	9.2	$582,012	$943,992	$1,472,698
Total effect	55.0	$3,082,978	$4,118,634	$7,169,044

Table D.9 2015 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	22.4	$1,130,501	$1,377,861	$2,576,287
Indirect effect	7.5	$503,776	$696,171	$1,144,788
Induced effect	6.0	$380,361	$616,905	$962,344
Total effect	36.0	$2,014,638	$2,690,937	$4,683,419

Table D.10 2016 Economic Contributions of Charter Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	24.8	$1,251,786	$1,525,684	$2,852,684
Indirect effect	8.3	$558,323	$771,713	$1,269,157
Induced effect	6.7	$421,279	$683,272	$1,065,881
Total effect	39.8	$2,231,389	$2,980,668	$5,187,722

Party Boats

Table D.11 2007 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	157.8	$7,949,541	$9,688,943	$18,116,129
Indirect effect	53.4	$3,603,960	$4,984,115	$8,221,875
Induced effect	42.7	$2,688,104	$4,360,277	$6,803,530
Total effect	253.8	$14,241,605	$19,033,335	$33,141,534

Table D.12 2008 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	123.3	$6,211,241	$7,570,293	$14,154,735
Indirect effect	41.7	$2,812,130	$3,888,911	$6,413,696
Induced effect	33.3	$2,099,472	$3,405,455	$5,313,591
Total effect	198.3	$11,122,843	$14,864,660	$25,882,021

Table D.13 2009 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	102.1	$5,145,397	$6,271,237	$11,725,793
Indirect effect	34.5	$2,326,979	$3,217,953	$5,306,268
Induced effect	27.6	$1,738,631	$2,820,134	$4,400,240
Total effect	164.2	$9,211,007	$12,309,324	$21,432,301

Table D.14 2010 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	126.3	$6,365,689	$7,758,536	$14,506,704
Indirect effect	42.7	$2,882,657	$3,986,446	$6,574,835
Induced effect	34.2	$2,151,808	$3,490,351	$5,446,073
Total effect	203.2	$11,400,153	$15,235,332	$26,527,613

Table D.15 2011 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	126.1	$6,354,484	$7,744,879	$14,481,170
Indirect effect	42.6	$2,877,583	$3,979,429	$6,563,262
Induced effect	34.1	$2,148,020	$3,484,207	$5,436,487
Total effect	202.8	$11,380,086	$15,208,514	$26,480,919

Table D.16 2012 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	122.0	$6,148,251	$7,493,521	$14,011,188
Indirect effect	41.3	$2,783,510	$3,849,330	$6,348,378
Induced effect	33.0	$2,078,159	$3,370,883	$5,259,644
Total effect	196.2	$11,009,920	$14,713,735	$25,619,210

Table D.17 2013 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	92.9	$4,682,960	$5,707,617	$10,671,951
Indirect effect	31.4	$2,116,403	$2,926,682	$4,825,071
Induced effect	25.1	$1,582,056	$2,566,155	$4,003,927
Total effect	149.4	$8,381,420	$11,200,454	$19,500,949

Table D.18 2014 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	96.9	$4,883,591	$5,952,147	$11,129,167
Indirect effect	32.7	$2,207,726	$3,052,975	$5,033,614
Induced effect	26.2	$1,649,979	$2,676,331	$4,175,846
Total effect	155.8	$8,741,296	$11,681,453	$20,338,627

Table D.19 2015 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	71.4	$3,595,615	$4,382,354	$8,194,011
Indirect effect	24.1	$1,622,855	$2,243,835	$3,698,174
Induced effect	19.3	$1,214,242	$1,969,531	$3,072,969
Total effect	114.7	$6,432,711	$8,595,721	$14,965,154

Table D.20 2016 Economic Contributions of Party Boat Passengers – Statistical Area 514 (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	84.8	$4,692,530	$5,700,117	$10,226,318
Indirect effect	28.1	$1,913,415	$2,659,229	$4,370,567
Induced effect	24.6	$1,549,153	$2,513,000	$3,919,984
Total effect	137.5	$8,155,098	$10,872,345	$18,516,869

Stellwagen Bank National Marine Sanctuary

Charter Boats

Table D.21 2007 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	20.1	$1,013,149	$1,234,831	$2,308,856
Indirect effect	6.7	$450,779	$622,801	$1,023,953
Induced effect	5.3	$335,903	$544,607	$848,854
Total effect	32.1	$1,799,831	$2,402,239	$4,181,662

Table D.22 2008 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	19.9	$1,001,188	$1,220,253	$2,281,596
Indirect effect	6.6	$445,457	$615,448	$1,011,863
Induced effect	5.3	$331,937	$538,178	$838,832
Total effect	31.7	$1,778,581	$2,373,878	$4,132,291

Table D.23 2009 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	23.8	$1,196,821	$1,458,692	$2,727,425
Indirect effect	7.9	$533,230	$736,791	$1,211,795
Induced effect	6.3	$396,922	$643,544	$1,003,077
Total effect	38.0	$2,126,974	$2,839,027	$4,942,297

Table D.24 2010 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	20.3	$1,018,900	$1,242,392	$2,322,502
Indirect effect	6.7	$452,573	$625,866	$1,028,684
Induced effect	5.3	$337,655	$547,447	$853,280
Total effect	32.3	$1,809,128	$2,415,705	$4,204,465

Table D.25 2011 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	26.2	$1,321,439	$1,610,577	$3,011,415
Indirect effect	8.8	$589,415	$814,552	$1,340,112
Induced effect	6.9	$438,350	$710,715	$1,107,786
Total effect	41.9	$2,349,205	$3,135,844	$5,459,313

Table D.26 2012 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	19.9	$1,000,127	$1,218,961	$2,279,181
Indirect effect	6.6	$444,985	$614,796	$1,010,792
Induced effect	5.2	$331,586	$537,608	$837,944
Total effect	31.7	$1,776,698	$2,371,365	$4,127,917

Table D.27 2013 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	17.3	$871,421	$1,062,093	$1,985,873
Indirect effect	5.8	$387,189	$534,887	$879,136
Induced effect	4.6	$288,819	$468,266	$729,851
Total effect	27.6	$1,547,429	$2,065,246	$3,594,860

Table D.28 2014 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	17.6	$887,774	$1,082,023	$2,023,139
Indirect effect	5.9	$394,611	$545,080	$895,952
Induced effect	4.7	$294,261	$477,090	$743,607
Total effect	28.1	$1,576,646	$2,104,194	$3,662,698

Table D.29 2015 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	8.7	$440,480	$536,859	$1,003,805
Indirect effect	2.9	$194,176	$268,095	$440,171
Induced effect	2.3	$145,732	$236,269	$368,222
Total effect	13.9	$780,387	$1,041,223	$1,812,198

Table D.30 2016 Economic Contributions of Charter Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	12.9	$650,499	$792,832	$1,482,417
Indirect effect	4.3	$288,265	$398,129	$653,892
Induced effect	3.5	$218,513	$354,393	$552,790
Total effect	20.7	$1,157,278	$1,545,354	$2,689,098

Party Boats

Table D.31 2007 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	55.5	$2,798,541	$3,410,876	$6,377,567
Indirect effect	18.7	$1,260,529	$1,742,474	$2,870,927
Induced effect	15.0	$944,510	$1,531,998	$2,390,230
Total effect	89.2	$5,003,580	$6,685,348	$11,638,723

Table D.32 2008 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	39.9	$2,009,340	$2,448,995	$4,579,066
Indirect effect	13.4	$901,850	$1,246,590	$2,052,593
Induced effect	10.8	$677,456	$1,098,809	$1,714,270
Total effect	64.0	$3,588,646	$4,794,394	$8,345,929

Table D.33 2009 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	42.7	$2,151,070	$2,621,736	$4,902,052
Indirect effect	14.3	$966,238	$1,335,622	$2,199,443
Induced effect	11.5	$725,409	$1,176,595	$1,835,649
Total effect	68.5	$3,842,717	$5,133,952	$8,937,144

Table D.34 2010 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	38.4	$1,933,177	$2,356,166	$4,405,498
Indirect effect	12.9	$867,133	$1,198,659	$1,973,452
Induced effect	10.3	$651,661	$1,056,966	$1,648,973
Total effect	61.6	$3,451,971	$4,611,791	$8,027,923

Table D.35 2011 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	52.8	$2,658,489	$3,240,180	$6,058,397
Indirect effect	17.8	$1,196,921	$1,654,497	$2,725,781
Induced effect	14.2	$897,124	$1,455,134	$2,270,294
Total effect	84.7	$4,752,534	$6,349,812	$11,054,472

Table D.36 2012 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	35.3	$1,778,275	$2,167,371	$4,052,493
Indirect effect	11.8	$797,179	$1,101,853	$1,813,724
Induced effect	9.5	$599,341	$972,102	$1,516,563
Total effect	56.6	$3,174,795	$4,241,326	$7,382,779

Table D.37 2013 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	19.6	$986,046	$1,201,798	$2,247,089
Indirect effect	6.5	$438,911	$606,501	$997,010
Induced effect	5.3	$331,651	$537,899	$839,084
Total effect	31.4	$1,756,608	$2,346,198	$4,083,183

Table D.38 2014 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	32.5	$1,635,334	$1,993,154	$3,726,746
Indirect effect	10.9	$732,139	$1,012,108	$1,665,727
Induced effect	8.7	$550,955	$893,614	$1,394,090
Total effect	52.1	$2,918,427	$3,898,876	$6,786,564

Table D.39 2015 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	21.4	$1,077,958	$1,313,822	$2,456,549
Indirect effect	7.1	$480,145	$663,477	$1,090,944
Induced effect	5.8	$362,635	$588,154	$917,488
Total effect	34.3	$1,920,739	$2,565,453	$4,464,980

Table D.40 2016 Economic Contributions of Party Boat Passengers – Stellwagen Bank National Marine Sanctuary (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	34.04	$1,715,435	$2,090,781	$3,909,287
Indirect effect	11.40	$768,498	$1,062,263	$1,748,354
Induced effect	9.17	$578,050	$937,564	$1,462,665
Total effect	54.61	$3,061,982	$4,090,609	$7,120,307

Sliver

Charter Boats

Table D.41 2007 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	8.4	$423,824	$516,558	$965,847
Indirect effect	2.8	$186,786	$257,942	$423,452
Induced effect	2.3	$142,144	$230,526	$359,553
Total effect	13.4	$752,753	$1,005,026	$1,748,852

Table D.42 2008 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	6.4	$320,252	$390,325	$729,821
Indirect effect	2.1	$140,740	$194,292	$318,683
Induced effect	1.7	$107,320	$174,048	$271,452
Total effect	10.2	$568,313	$758,665	$1,319,956

Table D.43 2009 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	7.3	$367,041	$447,352	$836,447
Indirect effect	2.4	$161,626	$223,143	$366,255
Induced effect	2.0	$123,070	$199,593	$311,303
Total effect	11.6	$651,738	$870,088	$1,514,005

Table D.44 2010 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	8.8	$442,147	$538,891	$1,007,603
Indirect effect	2.9	$194,975	$269,260	$442,044
Induced effect	2.4	$148,313	$240,533	$375,165
Total effect	14.0	$785,435	$1,048,685	$1,824,812

Table D.45 2011 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	7.4	$374,461	$456,395	$853,355
Indirect effect	2.5	$164,894	$227,653	$373,659
Induced effect	2.0	$125,558	$203,627	$317,596
Total effect	11.9	$664,912	$887,675	$1,544,609

Table D.46 2012 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	8.8	$443,661	$540,737	$1,011,055
Indirect effect	2.9	$195,643	$270,183	$443,558
Induced effect	2.4	$148,822	$241,357	$376,450
Total effect	14.1	$788,126	$1,052,277	$1,831,063

Table D.47 2013 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	8.4	$423,219	$515,821	$964,468
Indirect effect	2.8	$186,471	$257,480	$422,727
Induced effect	2.3	$141,930	$230,180	$359,012
Total effect	13.4	$751,620	$1,003,481	$1,746,207

Table D.48 2014 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	8.5	$432,354	$526,648	$985,241
Indirect effect	2.8	$190,783	$263,073	$432,150
Induced effect	2.3	$145,078	$235,287	$366,980
Total effect	13.7	$768,214	$1,025,008	$1,784,371

Table D.49 2015 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	3.1	$155,347	$189,338	$354,025
Indirect effect	1.0	$67,559	$93,155	$152,785
Induced effect	0.8	$51,904	$84,170	$131,253
Total effect	4.9	$274,810	$366,663	$638,063

Table D.50 2016 Economic Contributions of Charter Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	5.7	$285,275	$347,695	$650,110
Indirect effect	1.9	$125,082	$172,691	$283,272
Induced effect	1.5	$95,536	$154,934	$241,633
Total effect	9.0	$505,894	$675,320	$1,175,016

Party Boats

Table D.51 2007 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	25.0	$1,261,479	$1,537,498	$2,874,772
Indirect effect	8.4	$562,736	$777,849	$1,279,381
Induced effect	6.7	$424,560	$688,595	$1,074,188
Total effect	40.1	$2,248,775	$3,003,942	$5,228,341

Table D.52 2008 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	15.2	$763,307	$930,323	$1,739,493
Indirect effect	5.0	$338,888	$468,128	$769,088
Induced effect	4.1	$256,544	$416,077	$649,023
Total effect	24.3	$1,358,740	$1,814,528	$3,157,605

Table D.53 2009 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	13.9	$700,619	$853,918	$1,596,634
Indirect effect	4.6	$310,616	$429,054	$704,705
Induced effect	3.7	$235,381	$381,749	$595,462
Total effect	22.3	$1,246,615	$1,664,721	$2,896,801

Table D.54 2010 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	10.8	$542,386	$661,062	$1,236,037
Indirect effect	3.6	$239,823	$331,290	$544,099
Induced effect	2.9	$182,079	$295,298	$460,601
Total effect	17.2	$964,287	$1,287,650	$2,240,737

Table D.55 2011 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	18.8	$947,434	$1,154,737	$2,159,097
Indirect effect	6.3	$421,561	$582,413	$957,293
Induced effect	5.1	$318,629	$516,777	$806,130
Total effect	30.1	$1,687,623	$2,253,927	$3,922,521

Table D.56 2012 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	12.9	$649,410	$791,513	$1,479,929
Indirect effect	4.3	$287,777	$397,455	$652,779
Induced effect	3.5	$218,147	$353,799	$551,864
Total effect	20.6	$1,155,334	$1,542,767	$2,684,572

Table D.57 2013 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	7.7	$389,148	$474,296	$886,825
Indirect effect	2.6	$171,385	$236,621	$388,449
Induced effect	2.1	$130,488	$211,622	$330,066
Total effect	12.3	$691,020	$922,538	$1,605,340

Table D.58 2014 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	14.3	$719,093	$876,434	$1,638,733
Indirect effect	4.7	$318,862	$440,466	$723,565
Induced effect	3.8	$241,599	$391,835	$611,196
Total effect	22.8	$1,279,553	$1,708,734	$2,973,495

Table D.59 2015 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	7.6	$381,274	$464,699	$868,882
Indirect effect	2.5	$167,894	$231,796	$380,458
Induced effect	2.0	$127,842	$207,332	$323,374
Total effect	12.1	$677,011	$903,827	$1,572,715

Table D.60 2016 Economic Contributions of Party Boat Passengers – Sliver (2018$)

Contribution Type	Employment	Labor Income	Value Added	Output
Direct effect	14.0	$707,434	$862,224	$1,612,164
Indirect effect	4.7	$313,637	$433,227	$711,560
Induced effect	3.8	$237,670	$385,462	$601,254
Total effect	22.5	$1,258,741	$1,680,914	$2,924,978

AMERICA'S UNDERWATER TREASURES