FINAL REPORT

Characterization of Community-Specific Spatial and Socio-Economic Linkages to Massachusetts Waters

July 2009

Prepared by:
Industrial Economics, Incorporated,
Massachusetts Division of Marine Fisheries *and*
The Massachusetts Ocean Partnership

Table of Contents

Introduction

On May 28, 2008, Governor Deval Patrick signed legislation mandating the formulation of an integrated ocean management plan for Massachusetts' state waters. In the development of this plan, the "Oceans Act" requires a balancing among uses – including offshore renewable energy development, fishing, maritime shipping, recreation, conservation and others – through consideration of stakeholder needs and scientific principles.

An important consideration in the development and evolution of the plan is gaining an understanding of the areas of the state's waters that are of particular importance to specific communities. This is critical to understanding and characterizing the ecosystem services relied upon by each community, the economic values associated with these services, and the potential socio-economic impacts of ocean management decisions in different areas. It may also help shape efforts to eliminate or minimize any adverse effects.

This report examines the extent to which available information supports characterization of community-specific ecosystem service values for Massachusetts' ocean waters, and suggests ways to address key data gaps. The report focuses on three activities of particular interest to the Massachusetts Ocean Partnership and the state's Executive Office of Energy and Environmental Affairs (EOEEA): commercial fishing; vessel navigation; and recreational activities. For each of these activities, the report presents the data available to characterize potential linkages between communities and the location of activity in Massachusetts' state waters. When practicable, we provide maps and tables to demonstrate these linkages. For commercial fishing and recreational activity, we present and discuss the available data on associated economic values. We also offer recommendations to improve the state's understanding of important ecosystem services, particularly with respect to recreational activities.

Commercial Fishing

The Massachusetts Division of Marine Fisheries (DMF) collects data on commercial fishing effort conducted in the state's waters. We use this information to characterize the value of commercial fishing associated with specific communities. Below, we describe DMF's data sources and our approach to linking this information to specific communities. We also present an overview of our findings.

Community Linkages to Commerical Fisheries (non-shellfish)

Data Sources and Methodology

DMF provided IEc with its 2007 dataset on commercial fishing activity within state waters.[1] This dataset relies on two sources of information: annual catch reports that commercial fishermen are required to file with DMF; and Vessel Trip Reports (VTRs) collected from Federal fishing permit holders by the National Marine Fisheries Service (NMFS). DMF's dataset includes information on the following state fisheries: coastal lobster; seasonal lobster; gillnet; groundfish; sea urchin; striped bass; fluke; scup (pot fishery); and black sea bass (pot fishery).[2] It also captures the activity of vessels that hold a Federal commercial fishing permit, are not required to file a Massachusetts catch report, and report fishing in state waters.[3]

The DMF dataset provides information on commercial fishing activity (both number of vessels and associated trips) by home port and the location in which the vessels fished, as defined by state reporting requirements. These requirements divide the state's waters into 14 Statistical Reporting Areas (SRAs). This information allows us to link fishing activity in an SRA to ports of origin. In addition to providing information on the location of fishing activity, DMF's dataset includes information on annual landings by species. Based on this information, we determine the distribution of catch by species, port, and SRA for 2007.

The dataset described above does not provide information on the ex-vessel value of commercial landings. To estimate this value, we employ the table of 2007 landings-weighted state-wide average prices (dollars per pound) presented in the final report of the Fisheries Workgroup formed to support development of the state's ocean management plan.[4] This information allows us to estimate the ex-vessel value of commercial landings by SRA and vessel port of origin.

[1] DMF also provided IEc with data from 2003 through 2006; however, several fisheries did not file catch reports with the state during these years. Given this limitation, our analysis focused on data from 2007.

[2] The gillnet catch report includes fields for bluefish, cod, flounder (four specific species, plus a fifth subcategory for "other"), pollock, wolfish, red hake, skate, dogfish, Atlantic mackerel, monkfish, haddock, and two "other" species. The groundfish catch report incorporates fields for cod, haddock, pollock, redfish, white hake, yellowtail flounder, winter flounder, windowpane, dab (American plaice), grey sole (witch flounder), monkfish, skate, and dogfish. The gillnet catch report is designed to capture data on any catch made using gillnets. The groundfish catch report documents the catch of groundfish with other gear (trawl, longline, or rod and reel); it specifically excludes fish caught with gillnets.

[3] The combined DMF/Federal dataset provides the best available information on commercial catch and effort by area, but is not completely comprehensive. In particular, it excludes activity that currently goes unreported, such as commercial fishing for scup, black sea bass, and bluefish with hook and line. It also excludes data on commercial shellfish harvests, which DMF chose to characterize using other data sources (see below). Nonetheless, the dataset captures the vast majority of commercial fishing activity.

[4] Fisheries Workgroup Final Report. 2008. p. 35. The report does not provide the 2007 average price per pound for sea urchins. For this exercise, we employ the 2008 average price of $1.27 per pound, as provided by DMF. This assumption likely has little impact on the overall results, since sea urchins represent less than one percent of the total catch (by weight) in state waters. The workgroup's report is available at: http://www.mass.gov/Eoeea/docs/eea/oceans/112608_ocean_mgt_fish_wkgp.pdf.

Overview of Findings

Exhibits 1 through 4 present an overview of commercial fishing effort and catch within Massachusetts state waters during 2007. Exhibit 1 summarizes overall 2007 fishing activity by home port. Exhibit 2 maps the distribution of catch by home port, while Exhibit 3 maps the distribution of ex-vessel revenues. Each of these maps indicates, in parentheses, the number of individuals or vessels that reported activity associated with each home port. Exhibit 4 summarizes the distribution of the catch and ex-vessel revenues by species.

Exhibit 1: Summary of Commercial Fishing Activity in Massachusetts State Waters by Home Port (2007)

TOWN	Catch (Pounds)	Ex-Vessel Revenue	Total Individuals or Vessels	Total Trips
BARNSTABLE	160,300	$312,000	46	700
BEVERLY	491,900	$2,182,100	76	5300
BOSTON	622,300	$2,016,800	76	2700
BOURNE	12,100	$25,600	8	100
CAMBRIDGE	Less than 3 Individuals or Vessels			
CHATHAM	548,200	$1,369,700	150	2500
CHILMARK	138,000	$356,900	55	1300
COHASSET	253,500	$1,258,100	45	2300
DANVERS	54,500	$262,900	16	600
DARTMOUTH	65,600	$177,100	64	700
DENNIS	142,000	$469,100	60	1600
DUXBURY	27,800	$115,900	27	400
EASTHAM	6,400	$24,600	16	200
EDGARTOWN	48,800	$88,500	43	700
ESSEX	1,000	$3,300	7	100
FAIRHAVEN	301,800	$817,000	124	1700
FALL RIVER	71,200	$111,400	20	300
FALMOUTH	85,600	$180,200	77	600
GLOUCESTER	1,652,900	$4,957,100	347	18000
GOSNOLD	6,100	$27,700	10	100
HARWICH	67,400	$122,600	36	400
HINGHAM	181,600	$910,000	20	1400
HULL	432,700	$1,494,200	22	3300
IPSWICH	21,000	$93,900	29	800
KINGSTON	26,700	$114,200	7	400
LYNN	3,200	$10,600	17	200
MANCHESTER	165,000	$812,400	41	3000
MARBLEHEAD	880,300	$1,824,900	58	8200
MARION	85,800	$180,900	21	600
MARSHFIELD	698,200	$2,446,200	113	4900
MATTAPOISETT	135,700	$417,300	26	700
NAHANT	209,400	$1,052,800	28	1800
NANTUCKET	52,200	$173,100	26	500

TOWN	Catch (Pounds)	Ex-Vessel Revenue	Total Individuals or Vessels	Total Trips
NEW BEDFORD	1,648,100	$817,400	103	1300
NEWBURYPORT	68,200	$239,000	31	700
OAK BLUFFS	14,200	$31,800	18	100
ORLEANS	246,000	$1,222,800	40	1800
PLYMOUTH	901,000	$3,547,300	189	8200
PROVINCETOWN	685,200	$1,873,700	150	4600
QUINCY	27,300	$126,100	23	400
ROCKPORT	565,500	$2,549,600	87	8000
ROWLEY	2,200	$11,100	4	100
SALEM	46,300	$220,800	27	700
SALISBURY	29,500	$137,700	17	600
SANDWICH	701,900	$1,921,600	107	4800
SAUGUS	170,000	$854,700	34	1700
SCITUATE	800,100	$1,828,100	63	6300
SWAMPSCOTT	470,400	$921,800	34	4900
SWANSEA	2,700	$6,700	7	0
TAUNTON	Less than 3 Individuals or Vessels			
TISBURY	27,900	$83,300	26	300
TRURO	79,700	$323,900	38	1100
WAREHAM	61,400	$178,000	39	500
WELLFLEET	80,800	$395,500	36	400
WESTPORT	162,200	$400,300	94	900
WEYMOUTH	45,000	$208,100	12	600
WINTHROP	65,600	$310,900	21	900
YARMOUTH	66,500	$188,800	32	700
TOWN NOT IDENTIFIED	579,800	$1,433,400	918	5700
OUT OF STATE	167,900	$371,700	121	700
Total[1]	**15,366,300**	**$44,617,200**	**4,000**	**122,100**

Notes:
[1] Totals may not sum due to rounding.

Exhibit 2: Distribution of Catch from State Waters by Home Port

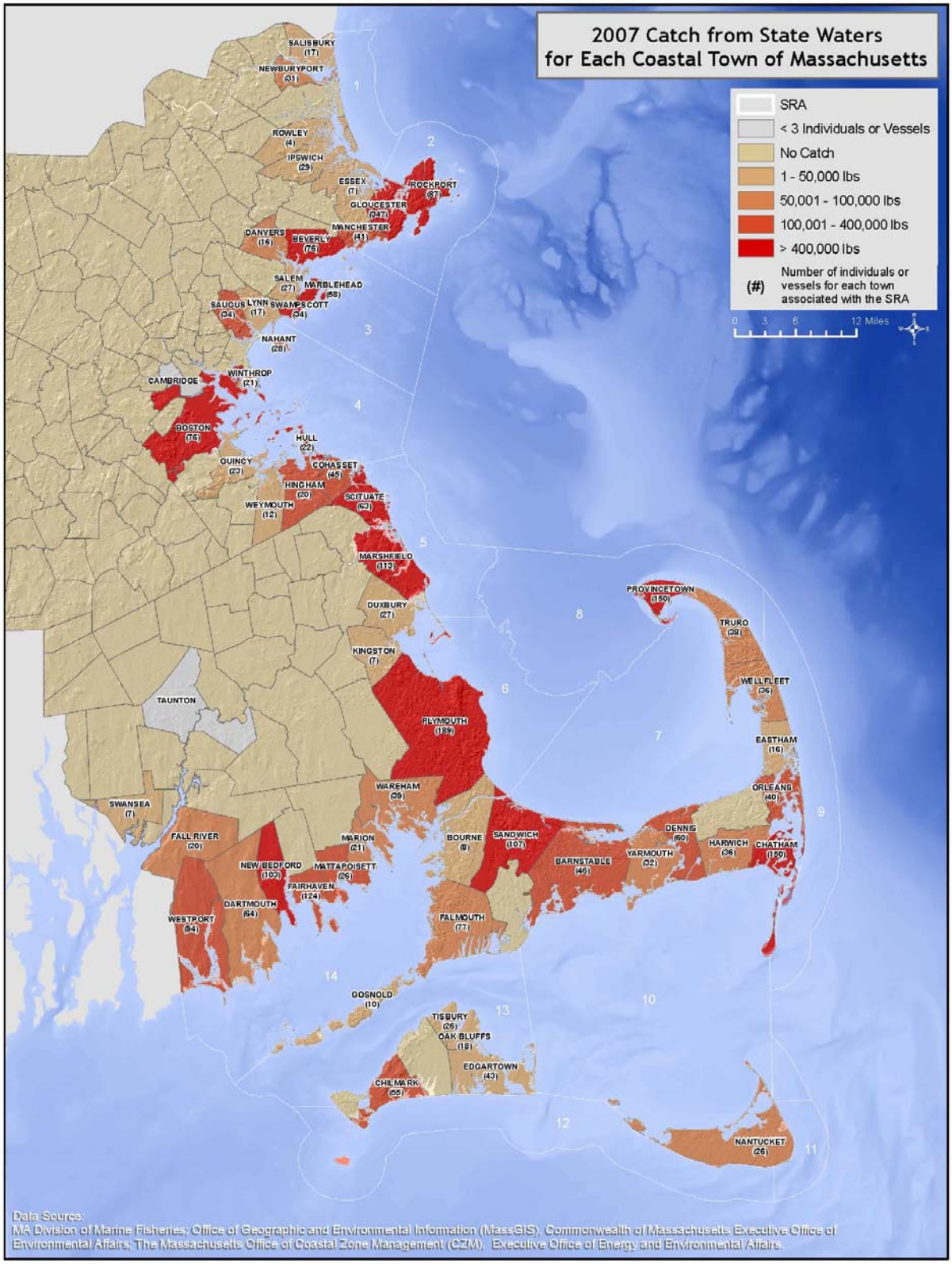


Exhibit 3: Distribution of Ex-Vessel Revenue from State Waters by Home Port

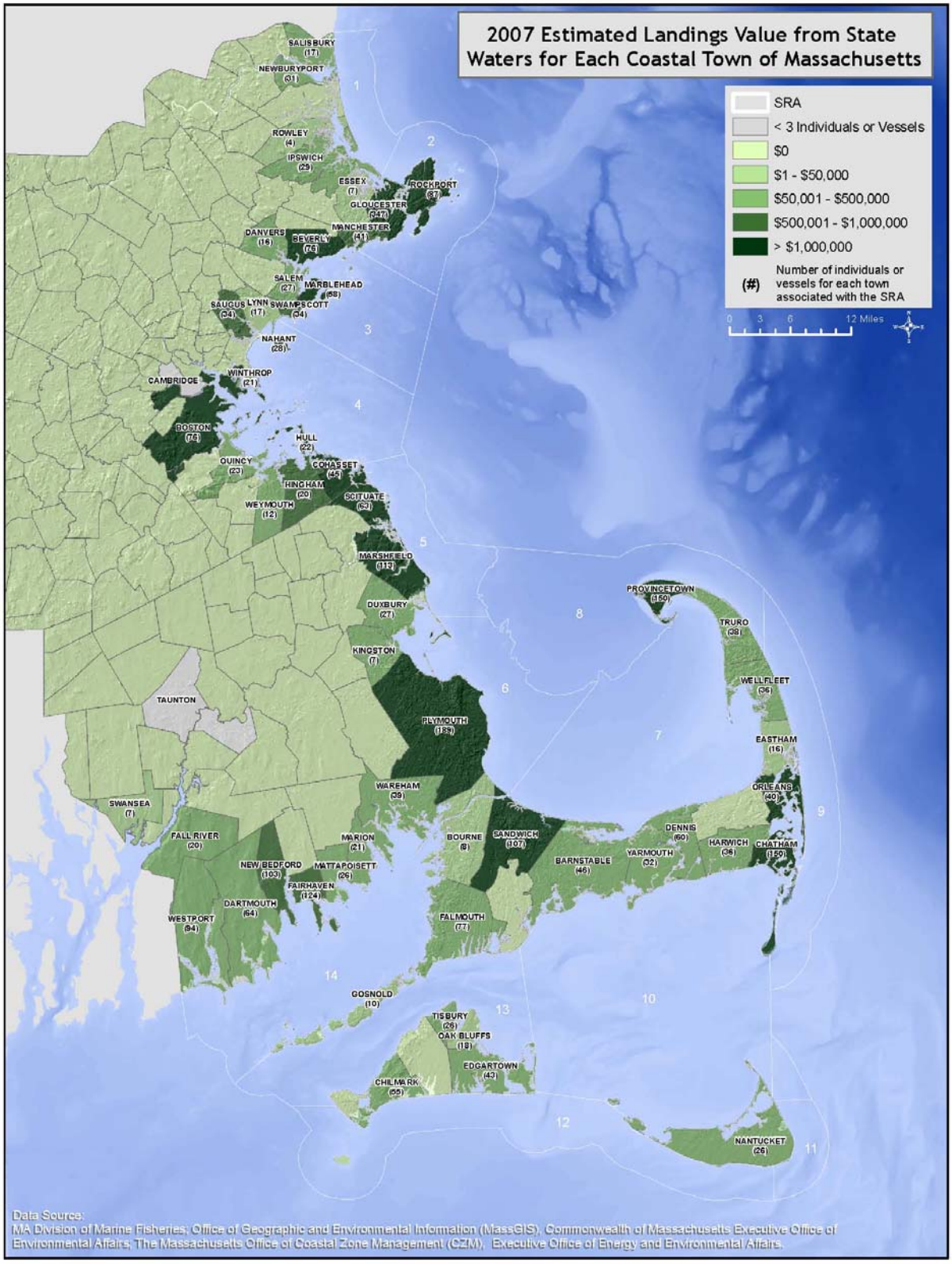


Exhibit 4: Distribution of Catch and Ex-Vessel Revenue from State Waters by Species (2007)

Fishery[1]	Catch (Pounds)	Ex- Vessel Revenue
Lobster	7,196,399	$34,636,757
Striped Bass	1,003,739	$2,649,870
Gillnet[2]	2,409,301	$2,426,733
Fluke	485,463	$1,169,965
Black Sea Bass Pot	382,744	$924,428
Groundfish[2]	630,202	$716,882
Flounder	325,687	$667,201
Squid	446,892	$387,018
Scup Pot	313,147	$291,226
Cod	147,738	$273,315
Skate	1,437,081	$116,742
Dogfish	342,992	$78,799
Haddock	32,893	$57,563
Urchin	43,740	$55,550
Hake	93,564	$46,964
Tuna	5,400	$45,630
Monkfish	11,060	$27,593
Crab	13,231	$16,528
Bluefish	21,485	$11,172
Tautog	3,510	$7,617
Pollock	9,505	$4,753
Wolffish	2,449	$1,935
Butterfish	1,643	$1,035
Weakfish	495	$931
Herring	5,000	$450
Redfish	266	$146
Cusk	165	$130
Eel	148	$83
Mackerel	173	$17

Notes:
[1] Fisheries reporting a catch of less than 100 pounds are omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Appendix A offers additional detail on the distribution of commercial fishing activity, providing maps and tables that link activity in specific areas of the ocean to particular communities. For each of the 14 SRAs referenced above, the appendix presents maps illustrating the distribution of catch and ex-vessel revenues by home port. The appendix also provides, for each SRA, a table summarizing the distribution of catch, ex-vessel revenues, and effort (both vessels and trips) by home port. To preserve confidentiality, these tables exclude cases in which fewer than three individuals/vessels from a particular community reported activity in a specific SRA.

Overall, the commercial catch within Massachusetts state waters totaled nearly 15.4 million pounds in 2007, with an estimated ex-vessel value of $44.6 million. Vessels from Gloucester, Plymouth, and Rockport accounted for the greatest share of estimated revenues, with values of $5.0 million, $3.5 million, and $2.5 million, respectively. The lobster, striped bass, and gillnet fisheries (as designated by DMF) were the highest value fisheries in state waters, with ex-vessel revenues estimated at $34.6 million, $2.6 million, and $2.4 million, respectively.

Assessment of Data Needs

The information currently available provides an initial overview of the socio-economic linkages between commercial fishing communities and activity within each of the state's 14 SRAs. Assessments of the impact of offshore development, however, may require additional information on commercial fishing activity and related industries. In particular:

- The findings reported above do not include catch or value information for commercial fishing in Federal waters. A significant share of the effort undertaken by vessels based in Massachusetts occurs outside state waters.[5] As a result, the data presented herein reflect only a subset of commercial fishing activity out of Massachusetts ports. An understanding of activity in Federal waters on a port-by-port basis would provide a more complete baseline for future assessments of the impacts of offshore development. This would require expanding the analysis to incorporate data on activity in Federal waters, as reflected in Vessel Trip Reports submitted to NMFS.

- The precision of the data on the location of fishing activity is limited. Better information on the location of fishing activity within an SRA, or on the location of habitat that is critical to the fishery's long-term sustainability, would improve subsequent evaluations of the impacts of offshore development.

- The economic information presented in this report is limited to data on commercial landings and ex-vessel revenue. The report does not address the link between landings in Massachusetts ports and economic activity in related sectors of the economy (e.g., fishing supplies and services, seafood processing and distribution, or retail and food service seafood sales). The general nature of these linkages has been explored, however, most recently in a 2006 report by the University of Massachusetts' Donahue Institute, which employs an input-output model to evaluate the economic impacts of the state's marine economy.[6] This report provides an established framework for assessing the broader economic implications of changes in commercial fishing activity in Massachusetts, and could be applied, in combination with estimates of direct impacts, to characterize the potential effects of offshore development on the commercial seafood industry.

[5] Dean, Micah, DMF. April 2009. Personal Communication.
[6] Donahue Institute, University of Massachusetts. 2006. "Report I: An Assessment of the Coastal and Marine Economies of Massachusetts." RFR ENV 06 CZM 09.

Community Linkages to Shellfish Fisheries

Data Sources and Methodology

Shellfish landings are reported, along with ex-vessel price, to the Atlantic Coastal Cooperative Statistics Program's (ACCSP's) Standard Atlantic Fisheries Information System (SAFIS) when the catch is sold to a seafood dealer. Each report identifies the location of the shellfish harvest, specifying one of the 303 Designated Shellfish Growing Areas (DSGAs) that encompass all of Massachusetts state waters. Landings of both cultured and uncultured shellfish are represented in these data (the dataset does not distinguish between these categories).[7] In addition, the SAFIS data identify the landing port for each transaction.

DMF provided IEc with a summary of the 2007 SAFIS data by port of landing for each DSGA. Using these data, we link commercial activity within each DSGA to ports of landing (i.e., ports in which some or all of the harvest from a DSGA was sold to a seafood dealer). To protect the confidentiality of shellfish harvesters, we consolidate the 303 DSGAs into 12 regions.[8]

Overview of Findings

Exhibits 5 through 7 present an overview of commercial shellfish harvesting effort and catch within Massachusetts state waters during 2007. Exhibit 5 summarizes 2007 activity by port of landing. Exhibit 6 maps the distribution of ex-vessel revenues by port of landing and also indicates, in parentheses, the number of shellfish permits associated with transactions in each port. The map outlines, in white, the boundaries of the 12 consolidated shellfish growing regions. Exhibit 7 summarizes the distribution of the harvest and ex-vessel revenues by species.

Appendix B offers additional detail on the distribution of shellfish harvesting activity, providing tables that link activity in specific waters to particular communities. For each of the 12 shellfish growing regions referenced above, the appendix presents a table summarizing the distribution of the harvest, ex-vessel revenues, and effort (both permits and trips) by port of landing. To preserve confidentiality, these tables exclude cases in which fewer than three permits associated with a particular port of landing are linked to harvests from a specific shellfish growing region. In addition, the appendix provides estimates of total harvest and ex-vessel revenues for each region by species.

[7] Fisheries Workgroup Final Report. 2008. p. 3. Available at: http://www.mass.gov/Eoeea/docs/eea/oceans/112608_ocean_mgt_fish_wkgp.pdf.

[8] Each of the 303 DSGAs is identified by one of 12 region codes (e.g., "BB" represents Buzzards Bay) and a number (i.e., "BB12"). We employ these codes to classify activity by region.

Exhibit 5: Summary of Commercial Shellfishing Activity in Massachusetts State Waters, by Port of Landing (2007)

Landing Port	Catch (Pounds)	Ex-Vessel Revenue	Total Permits	Total Trips
Acushnet	1,900	$3,500	8	8
Amesbury	2,200	$700	4	4
Aquinnah	27,000	$47,900	13	100
Barnstable	2,456,200	$1,078,100	110	2,443
Berkley	Less than 3 Permits Identified by DMF			
Boston	269,400	$220,400	47	1,434
Bourne	211,500	$145,700	32	1,021
Brewster	4,500	$10,300	9	85
Cambridge	1,000	$1,000	8	9
Chatham	3,909,700	$2,708,900	471	13,346
Chilmark	190,300	$222,400	49	773
Danvers	Less than 3 Permits Identified by DMF			
Dartmouth	126,800	$52,200	11	311
Dennis	67,800	$151,400	45	570
Duxbury	1,515,300	$2,382,400	36	2,380
Eastham	682,500	$185,100	36	339
Edgartown	974,000	$1,157,400	48	1,470
Essex	1,408,000	$1,813,700	126	6,647
Fairhaven	361,800	$154,700	39	662
Fall River	92,600	$76,500	34	370
Falmouth	1,295,600	$1,085,000	192	4,364
Gloucester	1,197,500	$1,059,400	128	5,192
Gosnold	23,800	$43,500	3	51
Harwich	1,128,700	$398,700	12	384
Hingham	Less than 3 Permits Identified by DMF			
Hull				
Ipswich	1,682,200	$2,228,600	190	10,145
Kingston	Less than 3 Permits Identified by DMF			
Marblehead	5,800	$3,600	14	80
Marion	74,800	$74,400	15	572
Marshfield	46,400	$29,500	4	28
Mashpee	103,400	$67,800	9	342
Nahant	Less than 3 Permits Identified by DMF			
Nantucket	225,000	$161,900	16	282
New Bedford	880,700	$689,700	89	1,143
Newbury	434,300	$583,300	98	2,647
Newburyport	28,400	$31,900	25	235
Oak Bluffs	208,800	$203,400	21	313
Orleans	695,400	$591,600	140	2,274
Peabody	800	$1,100	4	4
Plymouth	125,300	$29,900	7	32
Provincetown	77,600	$170,600	18	384

Landing Port	Catch (Pounds)	Ex-Vessel Revenue	Total Permits	Total Trips
Quincy	220,000	$314,500	4	397
Revere	59,900	$47,000	22	160
Rockport	Less than 3 Permits Identified by DMF			
Rowley	144,700	$196,900	22	1,063
Salem	1,300	$2,000	7	7
Salisbury	Less than 3 Permits Identified by DMF			
Sandwich	309,400	$306,600	33	340
Scituate	Less than 3 Permits Identified by DMF			
Tisbury	85,100	$100,300	22	272
Wareham	255,200	$243,000	29	1,015
Wellfleet	4,072,700	$3,401,000	174	5,061
West Tisbury	16,200	$10,200	5	39
Westport	38,200	$29,400	10	88
Weymouth	Less than 3 Permits Identified by DMF			
Yarmouth	138,500	$94,200	20	540
Total[1]	**26,104,900**	**$22,817,700**	**2,500**	**69,600**

[1] Totals may not sum due to rounding.

Exhibit 6: Distribution of Ex-Vessel Revenue for Shellfish from Massachusetts State Waters, by Port of Landing

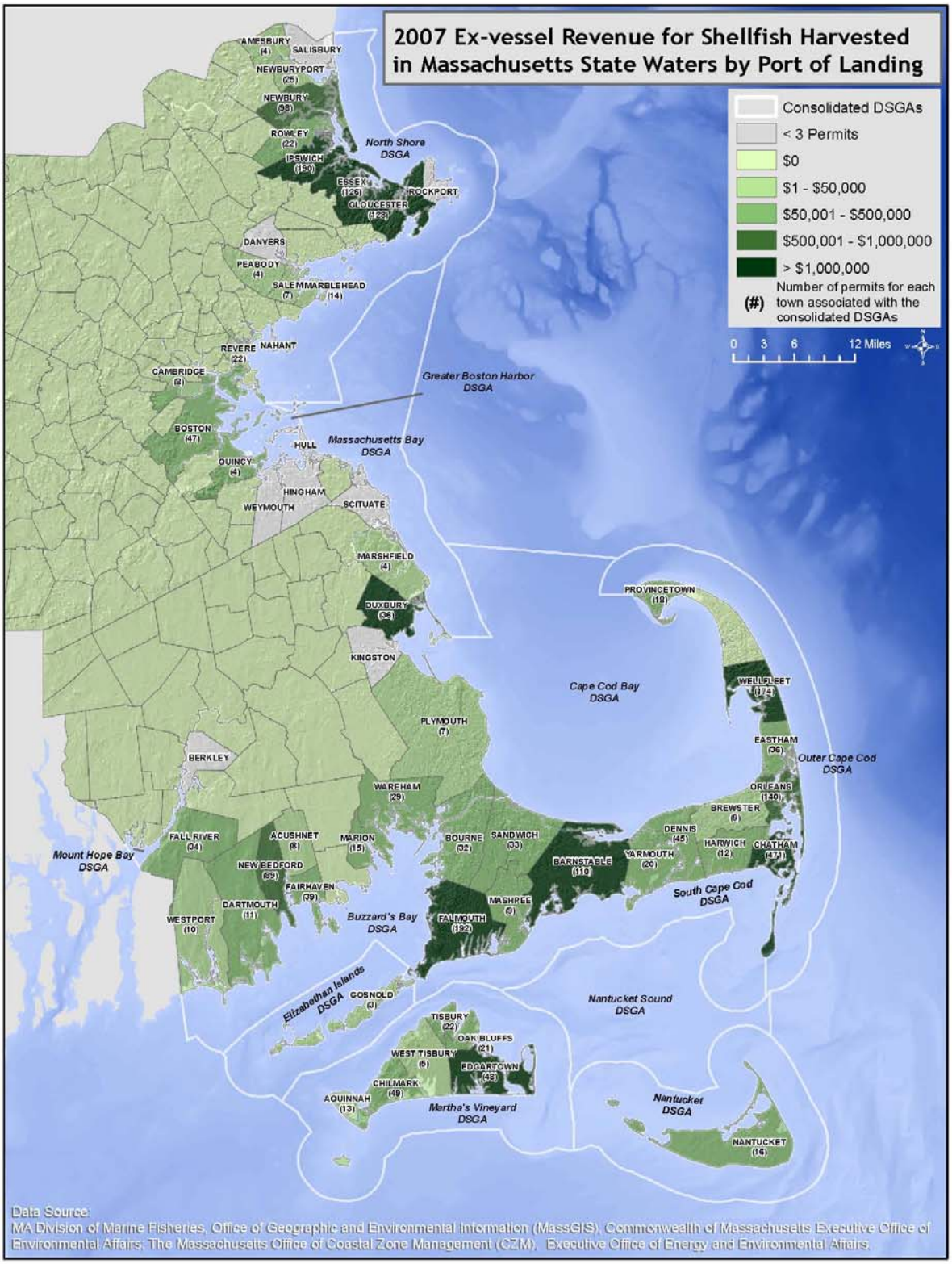


Exhibit 7: Distribution of Harvest and Ex-Vessel Revenue from State Waters by Shellfish Species (2007)

Species	Catch (Pounds)	Ex-Vessel Revenue
CLAM, SOFT	6,229,700	$8,188,100
CLAM, NORTHERN QUAHOG	8,306,900	$5,293,900
OYSTER, EASTERN	1,760,900	$4,179,200
WHELK, CHANNELED	1,745,900	$1,689,200
SCALLOP, SEA	1,520,300	$1,346,400
CLAM, SURF	4,100,300	$741,800
SCALLOP, BAY	803,700	$605,700
CLAM, RAZOR, ATLANTIC	201,200	$310,600
MUSSEL, BLUE	1,063,000	$205,300
WHELK, KNOBBED	179,400	$176,400
SNAILS (CONCHS)	49,200	$51,300
CLAM, UNC	67,500	$14,400
CLAM, OCEAN QUAHOG	74,700	$13,800
MOLLUSKS, UNC	2,100	$1,500

Overall, the commercial shellfish harvest within Massachusetts state waters totaled approximately 26.1 million pounds in 2007, with an estimated ex-vessel value of $22.8 million. Landings in Wellfleet, Chatham, and Duxbury accounted for the greatest share of estimated revenues, with values of $3.4 million, $2.7 million, and $2.4 million, respectively. By species, the harvest of soft clams ($8.2 million), northern quahogs ($5.3 million), and eastern oysters ($4.2 million) represented the highest total value.

Assessment of Data Needs

The information currently available demonstrates the connection between shellfish growing regions and specific ports of landing, providing an initial overview of the spatial and socio-economic linkages in this sector of the marine economy. Assessments of the impact of offshore development, however, may require additional information on shellfish harvesting. In particular:

- The findings reported above do not include catch or value information for shellfish harvested from Federal waters. As a result, the data represent only a subset of shellfish landings in Massachusetts ports. The SAFIS data provided by DMF for 2007 indicate that approximately 145.2 million pounds of shellfish, with an ex-vessel value of $117.0 million, were harvested in Federal waters and landed in Massachusetts. Sea scallops accounted for over 99 percent of the landings from Federal waters. Expanding the analysis to incorporate these harvests would provide a more complete baseline for future assessments of the impacts of offshore development.

- The SAFIS data include a large number of shellfish transactions that do not indicate a specific DSGA (or offshore area). The data show that landings of nearly 127.2 million pounds of shellfish, valued at approximately $102.1 million, were not attributed to a specific area. Sea scallops accounted for nearly 98 percent of the unattributed landings. We assume that most of this total was harvested from Federal waters. Discussions with DMF corroborate this assumption, as the Massachusetts sea scallop fishery is known to be large and predominantly prosecuted in Federal waters.[9] Nonetheless, a better understanding of the source of these landings would improve future assessments of the impact of offshore development. We suggest that MOP and/or EOEEA begin by working with DMF, ACCSP, and/or NMFS to understand the reasons the data are not currently available. Once these reasons are identified, it should be possible to identify and propose changes in reporting standards that would address this data gap.

- Because the shellfish data only provide community linkages by port of landing (as opposed to home port), these results cannot be directly added to or compared with the remainder of the commercial fisheries information developed in this report. To overcome this limitation, MOP or EOEEA could work with ACCSP, DMF, and NMFS to expand the SAFIS data, gathering information on each harvester's home port as well as the port of landing. This relatively minor change in reporting standards would facilitate analysis of the linkage between home ports, ports of landing, and shellfish growing regions.

- As with other forms of commercial fishing, the findings presented in this report are limited to the direct economic impacts of shellfish harvesting. The analysis could be expanded to take into account the link between landings of shellfish in Massachusetts ports and economic activity in related sectors of the economy (e.g., fishing supplies and services, seafood processing and distribution, or retail and food service seafood sales). The input-output framework developed by the Donahue Institute captures these relationships. Given an estimate of the effect of offshore development on shellfish harvests, MOP and EOEEA could apply this framework to assess the broader implications for the state's economy.

Vessel Navigation

Using data provided by the MOP and EOEEA, IEc developed maps demonstrating the linkage between ocean areas important for navigation and the coastal communities to which or from which vessels travel. Our effort did not attempt to place economic values on these activities, as this would require resources beyond the scope of this report.

[9] Dean, Micah, DMF. April 2009. Personal Communication.

Data Sources and Methodology

The vessel navigation maps draw on two data sources:

- **Vessel Monitoring System (VMS) data** – NMFS collects VMS data to track fishing vessel activity for law enforcement and safety purposes, as well as scientific study.[10] The system consists of vessel-mounted GPS/transmitter packages and on-shore base stations that receive transmitter signals and record vessel locations. The requirements for operating with a VMS are limited to vessels holding Federal permits for the Atlantic sea scallop, Northeast multispecies, monkfish, Atlantic herring, and Atlantic surf clam/ocean quahog fisheries.[11]

- **Automatic Identification System (AIS) data** – The International Maritime Organization (IMO) requires all vessels of 300 gross tons or more that are engaged on international voyages, cargo ships of 500 gross tons or more not engaged on international voyages, and all passenger ships irrespective of size to carry an AIS transponder.[12] The system records a ship's position and course information using GPS, and transmits this information, along with other details about the vessel, to base stations and other ships.[13]

Applied Science Associates (ASA) processed each dataset to map ship travel through the state's 250-meter Ocean Management Planning Grid. For both datasets, vessels were counted as they passed through grid cells covering the coastal region. Each vessel was counted once as it entered a grid cell and was not counted again unless it had been at least half an hour (AIS) or an hour (VMS) since it was last observed in a particular grid cell. This allows ships that repeatedly follow the same course over a month to be counted properly, while only counting a vessel once even though it may be recorded several times as it passes through a particular cell. This approach highlights high traffic areas, as well as areas where vessels stop to fish.[14, 15] ASA produced maps for each dataset. On each map, the ship density scale moves from blue (low density) to red (high density). Note that the maximum ship density scale differs between the VMS and AIS datasets.

[10] The VMS data evaluated in this report reflect activity in the Massachusetts coastal region from September 1, 2007 to September 1, 2008.
[11] The Northeast multispecies Fishery Management Plan governs commercial fishing in New England and Mid-Atlantic waters for fifteen species of demersal fish: American plaice; Atlantic cod; Atlantic halibut; haddock; ocean pout; offshore hake; pollock; red hake (ling); redfish; silver hake (whiting); white hake; windowpane flounder; winter flounder; witch flounder; and yellowtail flounder.
[12] IMO. 2009. "AIS Transponders." Available at: http://www.imo.org/Safety/mainframe.asp?topic_id=754#regulations.
[13] The AIS data for the Massachusetts coastal region were recorded by the US Coast Guard. These data represent AIS records for 2008.
[14] This discussion is adapted from ASA's metadata describing the VMS and AIS datasets.
[15] ASA's metadata indicates that ship density estimates may be affected by base station location and the ranges of VMS/AIS receivers. In addition, ASA removed bad data points from the VMS records. ASA was unable to determine the impact these removals had on the results.

To visually highlight the coastal towns that are most likely ports for vessel traffic, IEc first identified all grid cells within one kilometer of each community. From this subset of grid cells, we identified the maximum ship density within one kilometer of each coastal town, as tracked by VMS and AIS. We then modified ASA's maps to highlight, in dark green, communities located within one kilometer of a high density grid cell. This helps to identify ports that serve high levels of ship traffic. The maps also identify areas currently used for dredging and the disposal of dredged material, as these activities are required for safe vessel navigation.[16]

Overview of Findings

Exhibit 8 illustrates navigation patterns for vessels operating with a VMS. This map shows a high concentration of vessel traffic between fishing ports such as Gloucester, Chatham, and New Bedford and fishing grounds located in the Federal waters to the east and south of Massachusetts. Other communities within one kilometer of high traffic areas include Barnstable, Provincetown, and Yarmouth. Exhibit 9 presents a similar map illustrating navigation patterns for vessels operating with an AIS. This map clearly shows major shipping lanes from Boston Harbor to points northeast, east, and south through the Cape Cod Canal. It also shows vessel traffic to and from dredging and dredged material disposal sites, such as two disposal sites located in Cape Cod Bay. As expected, communities located near high traffic areas include many towns surrounding Boston Harbor, such as Boston, Chelsea, and Quincy.

Caveats

- Vessel Monitoring Systems are required for only a subset of federally regulated fisheries. As a result, the VMS data offer only a limited picture of commercial fishing traffic in state waters.

- Only large commercial vessels are required to operate with an AIS. The AIS data do not cover small ship traffic, and therefore provide a limited view of commercial shipping traffic in state waters.

- AIS data were acquired from receivers located in Gloucester, Scituate, and Provincetown. Ship traffic south of Cape Cod may be underreported due to the distance from that area to the receivers.

- Towns linked to waters with a high density of vessel traffic are not necessarily the destination of that traffic. For example, Exhibit 8 indicates a high concentration of commercial fishing traffic near Fairhaven. Some of this traffic is undoubtedly destined for Fairhaven, but a significant share may be destined for nearby New Bedford. Similarly, Exhibit 9 shows a high concentration of shipping traffic near Bourne and Sandwich; this reflects the flow of traffic through the Cape Cod Canal, rather than shipping directly to or from either of these communities.

[16] The location of dredging and dredged material disposal sites was provided by Dan Sampson, EOEEA.

Exhibit 8: Vessel Navigation in State Waters: Fishing Vessels Operating with a VMS

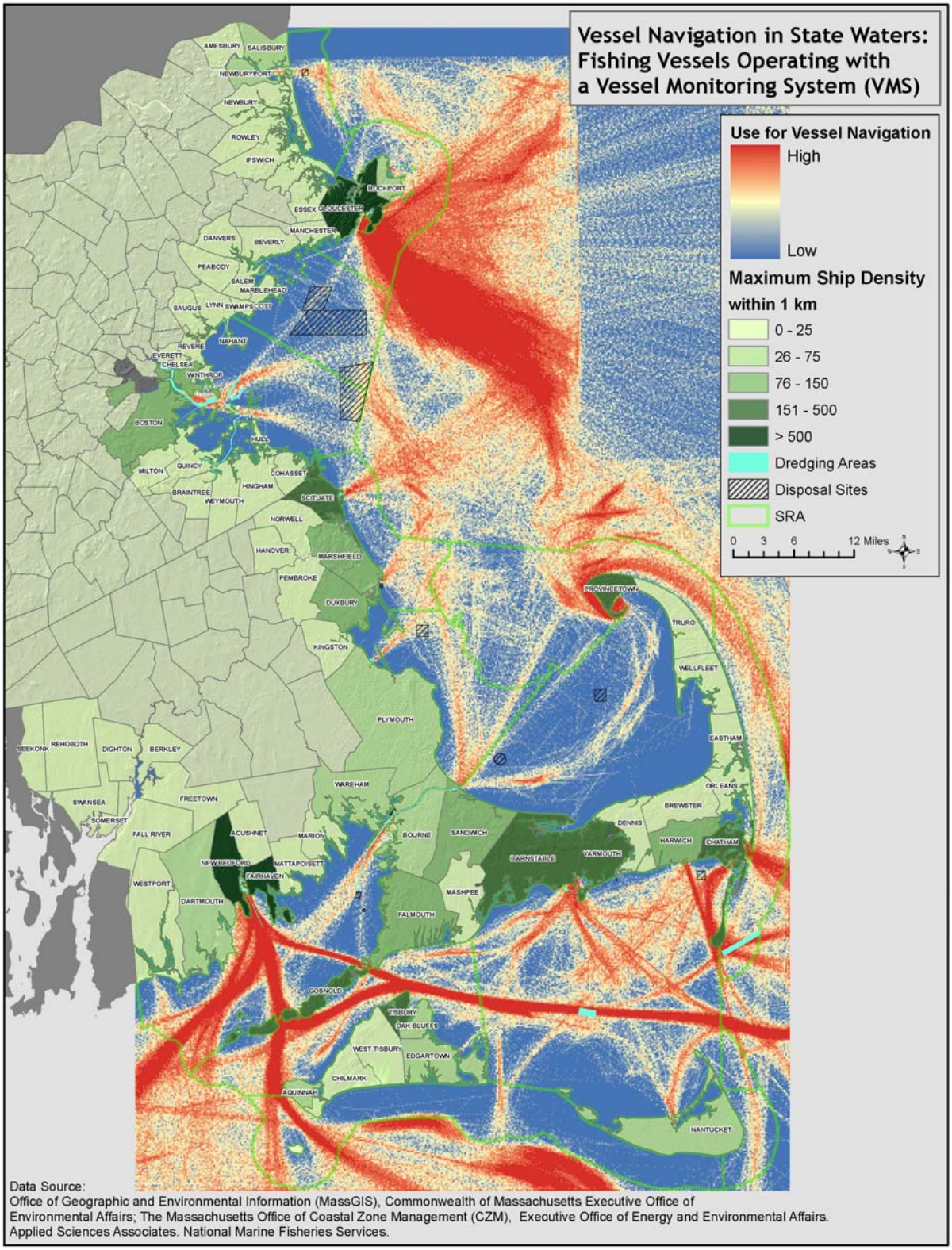
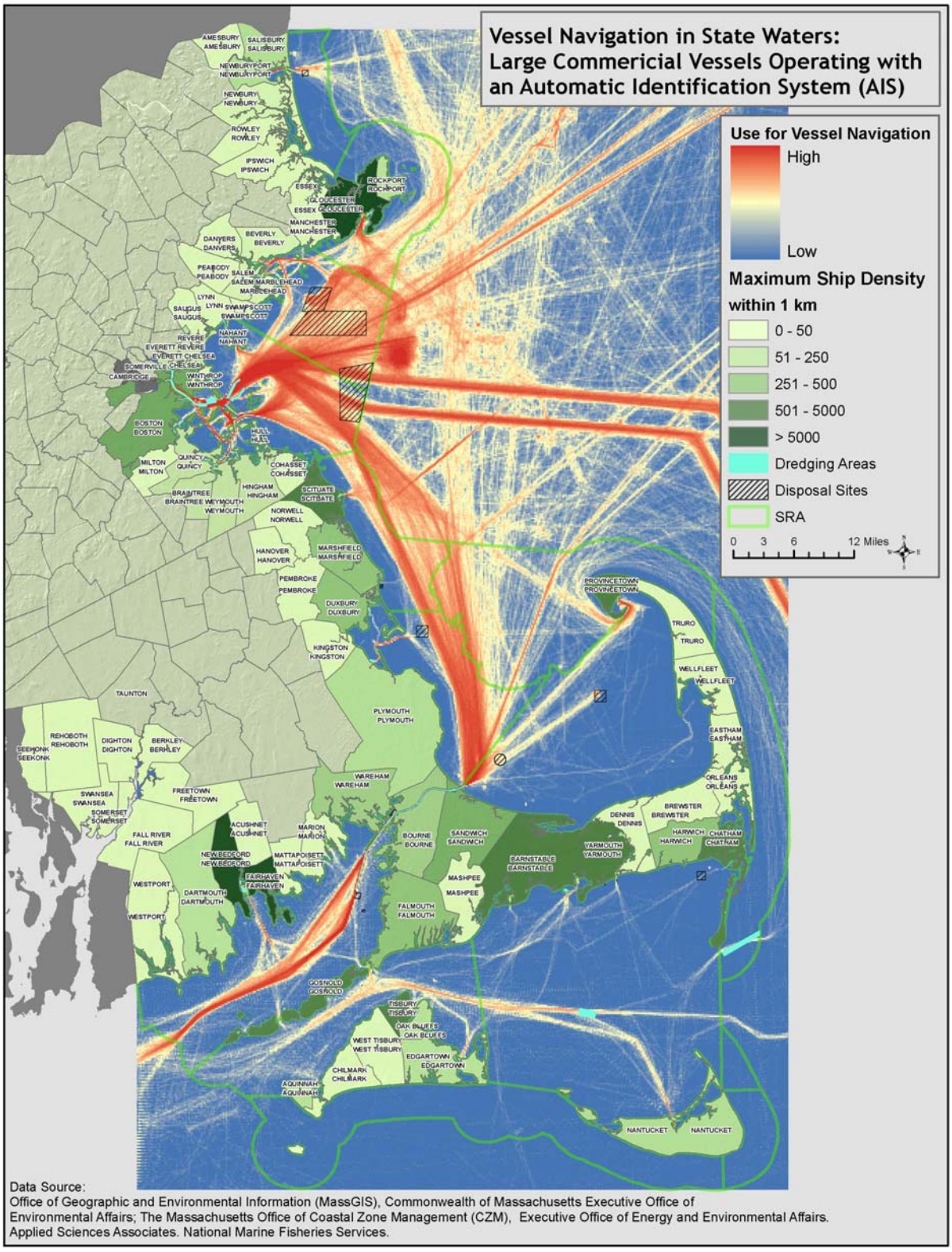


Exhibit 9: Vessel Navigation in State Waters: Vessels Operating with an AIS



Recreational Activity

IEc evaluated the availability of spatially explicit data to determine the extent to which recreational activities in the states' ocean waters, and the economic value of these activities, can be linked to specific communities. The discussion below highlights our evaluation of the existing information and our recommendations for improving data for future efforts.

Evaluation of Existing Data on Recreational Activities

Data Sources and Methodology
IEc investigated a number of datasets provided by the MOP and EOEEA to determine the extent to which spatial linkages can be made between coastal communities and the use of ocean areas for recreation. These data include:

- **DMF's Recreational Fishing Effort Survey.** MOP provided IEc with digitized data derived from DMF's recently conducted recreational fishing survey. This survey solicited information from a limited number of knowledgeable individuals, asking them to identify areas of high recreational fishing activity. The survey focused solely on identifying areas in which activity is high; it was not designed to gather quantitative information on the level of effort at different locations, nor did it attempt to link areas of high activity to particular communities.

- **Massachusetts Marine Trades Association (MMTA) Recreational Boating Survey.** In addition to the DMF survey, MOP provided us with digitized versions of MMTA's recreational boating survey. The survey notes areas in which MMTA members have indicated that recreational boating and fishing occur. The MMTA dataset does not provide information on the frequency or intensity of recreational boating and fishing in the areas identified.

- **NMFS' Marine Recreational Information Program (MRIP) Survey.** MRIP regularly gathers information on recreational fishing in marine waters through telephone surveys of fishing effort and access-site intercept surveys of angler catch. Appendix C provides a brief summary of NMFS' survey methods. We have reviewed the questionnaires associated with these surveys. They do not gather detailed information on the location of fishing activity.

- **Massachusetts Boat Registration Dataset.** These data identify a storage town and vessel size class for all registered boats in the state for 2006. There are four size categories: Class I – less than 16 feet; Class II – 16 to 26 feet; Class III – 27 to 40 feet; and Class IV – more than 40 feet. Appendix D summarizes the available data for boats registered in coastal towns, indicating the number and distribution of vessels by size.

- **Ocean Use GIS Layers.** The Office of Geographic Information (MassGIS) and EOEEA provided a suite of ocean use data collected through a variety of sources. The data included information on the location of marinas, boat access sites, mooring fields, dive sites, and ferry routes.

Limitations of the Available Data

The data sources noted above lack sufficient detail to characterize the socioeconomic links between specific communities and the state waters in which recreational activity occurs. Proximity of a community to an area of high activity is likely the best available indicator of the strength of a potential link. Exhibit 10 draws on the sources listed above to summarize the available data on recreational activity, noting the distribution of boat registrations by community; the location of marinas, boating access sites, and dive sites; and waters that the DMF and/or MMTA surveys identified as areas of high activity.[17] As the map suggests, recreational activity appears to be widely spread throughout state waters.[18]

In the absence of better data, we are exploring the feasibility of relying on expert judgment to characterize, by vessel size class, the distribution of boating activity at various distances from the community in which a boat is registered. We have developed a map that illustrates this concept and raised the idea with MOP and EOEEA for consideration. Appendix E provides additional information on this approach.

Caveats

- Exhibit 10 presents data on boat registrations in coastal communities. This information serves as a general indicator of potential recreational activity in ocean waters near these communities, rather than a precise measure. Vessels registered in coastal communities are not necessarily used in ocean waters; they may be used exclusively in inland waters, or in both ocean and inland waters. Similarly, vessels registered in inland communities may be used in ocean waters. While data on boat registrations can serve as a general indicator of boating activity, data on actual activity would clearly be preferable.

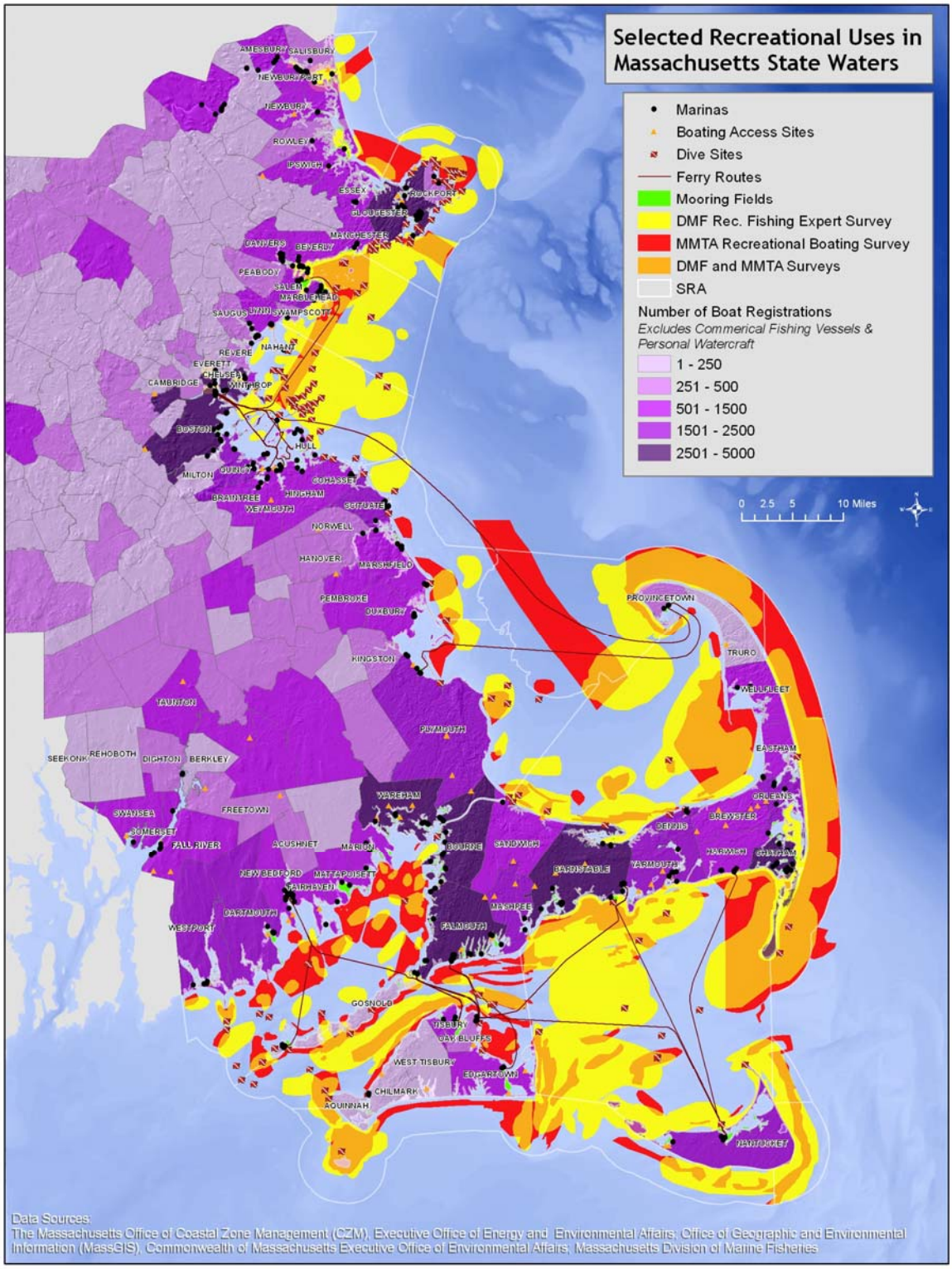
- The boating registration data represents active registrations in 2006. To the extent that the number of registrations has changed since 2006, these data may over- or underestimate the number of boats stored in each community.

- The registration data presented in Exhibit 10 exclude commercial fishing vessels, which presumably are not used for recreational purposes. In addition, the exhibit excludes personal watercraft (e.g. jet skis), which we assume would not venture far from shore unless used in conjunction with a larger vessel.

[17] Each boat registration includes the registrant's home address as well as a designated storage town for the boat. Exhibit 10 and the exhibits in Appendix D indicate the distribution of registrations by designated storage town.

[18] Note that the map uses the color orange to denote areas of activity identified in both the DMF and MMTA surveys. While the overlap indicates areas of agreement between these surveys, it does not necessarily imply a higher level of recreational activity in these areas.

Exhibit 10: Selected Recreational Uses in Massachusetts State Waters



Valuation of Recreational Fishing Activity

The lack of spatially-explicit data on recreational fishing activity does not preclude valuation of that activity at the state level. A number of studies have explored the economic impact of marine recreational fishing in Massachusetts, and others have examined consumer surplus values (i.e., participants' willingness to pay for the activity in excess of their actual expenditures). The most relevant of these studies are described below.

Economic Impacts

The most recent assessment of the economic impact of marine recreational fishing in Massachusetts is provided in a 2008 report prepared for NMFS by Gentner and Steinback.[19] This report draws on a 2006 NMFS survey to present detailed estimates of expenditures on marine recreational fishing in all coastal states, including estimates of trip-related expenditures (e.g., expenditures on transportation, food, lodging, boat fuel, bait, ice, etc.) and expenditures on equipment or other durable goods (e.g., fishing gear, boats, etc.). Exhibit 11 summarizes the results of the survey for Massachusetts. As the exhibit indicates, mean expenditures per angler vary by mode and resident status. Mean annual equipment expenditures in Massachusetts are slightly higher for residents than for non-residents. Non-residents, however, report higher average expenditures per trip, including – as one would expect – higher spending on transportation, food, and lodging.

Exhibit 11: Mean Expenditures on Marine Recreational Fishing in Massachusetts (2006)

Type of Expenditure	Fishing Mode	Resident	Non-Resident
Trip Expenditures ($/trip)	Party/Charter Boat	$98.48	$188.75
	Private/Rental Boat	$28.54	$36.26
	Shore	$26.75	$209.27
Equipment Expenditures ($/year)	Not Applicable	$413.67	$400.49
Source: Gentner and Steinback (2008). Table 43, p. 102.			

Gentner and Steinback (2008) employ the results of the survey on fishing expenditures, combined with NMFS survey data on fishing participation rates, to estimate total spending on marine recreational fishing in Massachusetts. As Exhibit 12 shows, spending in Massachusetts is estimated to have exceeded $771 million in 2006. This figure includes approximately $257 million in trip expenditures and $514 million in equipment expenditures. Massachusetts residents accounted for approximately 56 percent of all spending, including 62 percent of equipment expenditures. In contrast, non-residents accounted for approximately 57 percent of trip expenditures.

[19] Gentner, Brad, and Scott Steinback. 2008. *The Economic Contribution of Marine Angler Expenditures in the United States, 2006*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-94.

Exhibit 12: Total Expenditures on Marine Recreational Fishing in Massachusetts in 2006 (Thousands of Dollars)

Type of Expenditure	Fishing Mode	Resident	Non-Resident	Total
Trip Expenditures	Party/Charter Boat	$12,935	$21,594	$34,529
	Private/Rental Boat	$57,183	$15,751	$72,934
	Shore	$40,722	$109,111	$149,833
	Subtotal	$110,840	$146,456	$257,296
Equipment Expenditures		$320,111	$193,952	$514,063
Total Expenditures		$430,951	$340,408	$771,359
Source: Gentner and Steinback (2008). Table 44, p. 103.				

In addition to providing data on direct expenditures associated with marine recreational fishing, Gentner and Steinback (2008) employ an input-output model to determine the statewide economic impact of these expenditures. The analysis shows that marine recreational fishing accounted for more than $800 million in total sales in 2006, supporting more than 6,000 jobs statewide.

Consumer Surplus Values

We have reviewed a number of online bibliographic databases for information on surplus values for marine recreational fishing, including the National Ocean Economics Program's Non-Market Valuation Database, IEc's Sportfishing Valuation Database, and the Environmental Valuation Reference Inventory, which Environment Canada maintains in collaboration with the U.S. Environmental Protection Agency and environmental management agencies in Australia, France, and the United Kingdom. To date, we have not identified a study that focuses specifically on marine recreational fishing in Massachusetts; however, a number of studies provide general estimates. For example, "The Contribution of Recreation to National Economic Development," a 1997 meta-analysis published by the President's Commission on American Outdoors, estimates a net economic value of $40.81 per person-day (1980 dollars) for saltwater fishing. This figure, adjusted to 2008 dollars ($106.63 per person-day), offers a basis for a simple benefit transfer that provides a rough estimate of the surplus values (i.e., the net economic benefit) associated with marine recreational fishing in Massachusetts. Exhibit 13 illustrates the application of this value to MRIP estimates of recreational fishing activity in Massachusetts ocean waters during 2008. As the exhibit shows, the surplus value in 2008 is estimated to exceed $87 million.

Exhibit 13: Estimated Surplus Values for Marine Recreational Fishing in Massachusetts (State Territorial Sea) in 2008

Fishing Mode	Person-Trips in 2008	Surplus Value per Trip	Annual Surplus Value
Party/Charter Boat	76,849	$106.63	$8,194,409
Private/Rental Boat	441,084	$106.63	$47,032,787
Shore	303,442	$106.63	$32,356,020
Total	821,375	$106.63	$87,583,216

Assessment of Data Needs

The data on marine recreational fishing in Massachusetts supports estimation of participation rates and economic values at the state level. The data are inadequate, however, for characterizing the link between specific communities and the state waters in which recreational fishing occurs. The information currently available is also insufficient to estimate the value of different waters to recreational anglers. Better information on these parameters would be helpful in evaluating the impact of developing offshore energy facilities in particular areas.

A logical starting point for addressing these data gaps would be to expand the MRIP survey to gather information on the location of fishing activity. This approach would take advantage of the existing MRIP survey platform and produce information that would be consistent with MRIP's participation data.[20] This approach would require cooperation and assistance from NMFS, which administers the MRIP survey. Alternatively, the state and MOP could consider developing an independent survey. In either case, the survey would seek to link recreational fishing activity (person-days) to ports of origin (for party/charter boat or private/rental boat activity) and waters fished. This would provide the spatial data needed to establish the link between specific communities and the state waters in which recreational fishing occurs.[21]

[20] Data for the study by Gentner and Steinback (2008) were gathered in a similar manner, expanding the MRIP survey to include questions on expenditures related to recreational fishing activity.

[21] As noted above, fishing from shore accounts for a significant share of marine recreational activity in Massachusetts. It is unlikely, however, that offshore development would have a direct effect on this activity. For this reason, characterizing the location of shore-based activity may be less important than identifying the areas fished by users of party/charter boats or private/rental boats.

The Gentner and Steinback study offers an excellent framework for characterizing the economic impact of marine recreational activity, provided NMFS periodically updates the analysis to track changes in activity and spending over time. Additional research on surplus values, however, may be warranted. In particular, the state and MOP may wish to consider developing and applying a random utility-style model to estimate the welfare losses associated with designating a particular area for offshore energy development. These models predict angler responses to changes in fishery attributes, such as access and catch rates, and are commonly used in natural resource damage assessment to estimate the welfare losses associated with events that impair recreational fishing opportunities (e.g., contamination of a river, lake, or harbor). While typically estimated using data on actual angler behavior, they can also be designed in a stated-preference or survey-based context that would allow for prospective consideration of multiple planning scenarios.

Valuation of Recreational Boating Activity

Economic Impacts

Studies on the economic value of recreational boating activity are less numerous than those on the value of recreational fishing. We have identified one analysis, the Donahue Institute's 2006 assessment of the coastal and marine economies of Massachusetts, that evaluates the economic impact of recreational boating in Massachusetts. This analysis is based upon a study of expenditures on recreational boating in New York.[22] To develop an estimate for Massachusetts, the Donahue Institute applies values from the New York study (mean annual trip-related expenditures per boat) to U.S. Coast Guard data on the number of registered motorboats in Massachusetts.[23] Exhibit 14 summarizes the results of the analysis. As shown, the analysis estimates direct in-state expenditures on recreational boating of approximately $140 million per year, with an overall economic impact of $241 million.

[22] Connelly, Nancy A., Tommy L. Brown and David L. Kay. 2004. "Recreational Boating Expenditures in 2003 in New York State and Their Economic Impacts." Prepared for New York Sea Grant. Cornell University Department of Natural Resources. NYSGI-S-04-001.

[23] U.S. Department of Homeland Security, U.S. Coast Guard. 2005. *Boating Statistics 2004.* Commandant Publication P16754.18.

Exhibit 14: Economic Impact of Recreational Boating Expenditures in Massachusetts (2004)

Item	Value
Mean Annual Trip-Related Expenditures Per Boat	$1,208
Registered Boats	150,683
Total Annual Expenditures	$181,723,698
In-State Expenditures	$140,377,869
Overall Impact (Total Output)	$241,177,491
Total Employment Impact (Jobs)	3,134
Source: Donahue Institute (2006). Figure 50, p. 145.	

Consumer Surplus Values

Our search of the resource economics literature has failed to identify a study that estimates surplus values specifically for marine recreational boating; however, a small number of studies provide general estimates of boating surplus values that may be applicable. For example, a 2001 review of the literature published by the U.S. Forest Service provides an estimate of surplus values for "motorized boating" and "non-motorized boating" per person-day.[24] Application of these values, however, would also require development of corresponding estimates of recreational boating activity. To our knowledge, such estimates are not currently available.

Assessment of Data Needs

In general, data on recreational boating in Massachusetts coastal waters is lacking. The data are insufficient to establish clear links between specific communities and the state waters in which boating occurs. Moreover, basic data on boating activity (i.e., annual person-trips or vessel-trips) are not available. As a result, efforts to date to value boating activity have been limited.

To improve its estimate of the economic impact of marine recreational boating, the Donahue Institute recommends a survey of Massachusetts boaters designed to gather data on both participation and trip-related expenditures. We echo this recommendation, with the following suggestions:

- The survey should attempt to gather data on the communities in which boaters reside, the ports (or other points of access, such as a public boat ramp) from which they operate, and the waters they use for boating and related recreation. This information is necessary to link recreational activity in a specific area of the ocean to boaters from particular communities or ports.

[24] Rosenberger, Randall S. and John B. Loomis. 2001. Benefit transfer of outdoor recreation use values: A technical document supporting the Forest Service Strategic Plan (2000 revision). General Technical Report RMRS-GTR-72. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

- The survey should gather sufficient information to differentiate activity by vessel size (e.g., the four size categories specified in the Massachusetts boat registration database), and perhaps also by primary mode of operation (e.g., power or sail). This information will support more detailed analysis of the relationship between these factors and recreation in particular areas or at a given distance from shore, following the concepts outlined in Appendix E.

- Research on spatial relationships should be accompanied with research on the surplus values associated with recreational boating, either through the application of random utility models or stated preference techniques.

- Until such information is gathered, it will be difficult to assess the socio-economic impact of marine development with respect to boating activity.

Appendices

Table of Contents

Appendix A: Commercial Fishing Activity by SRA

Exhibit A-1: 2007 Catch for SRA 1 by Coastal Town

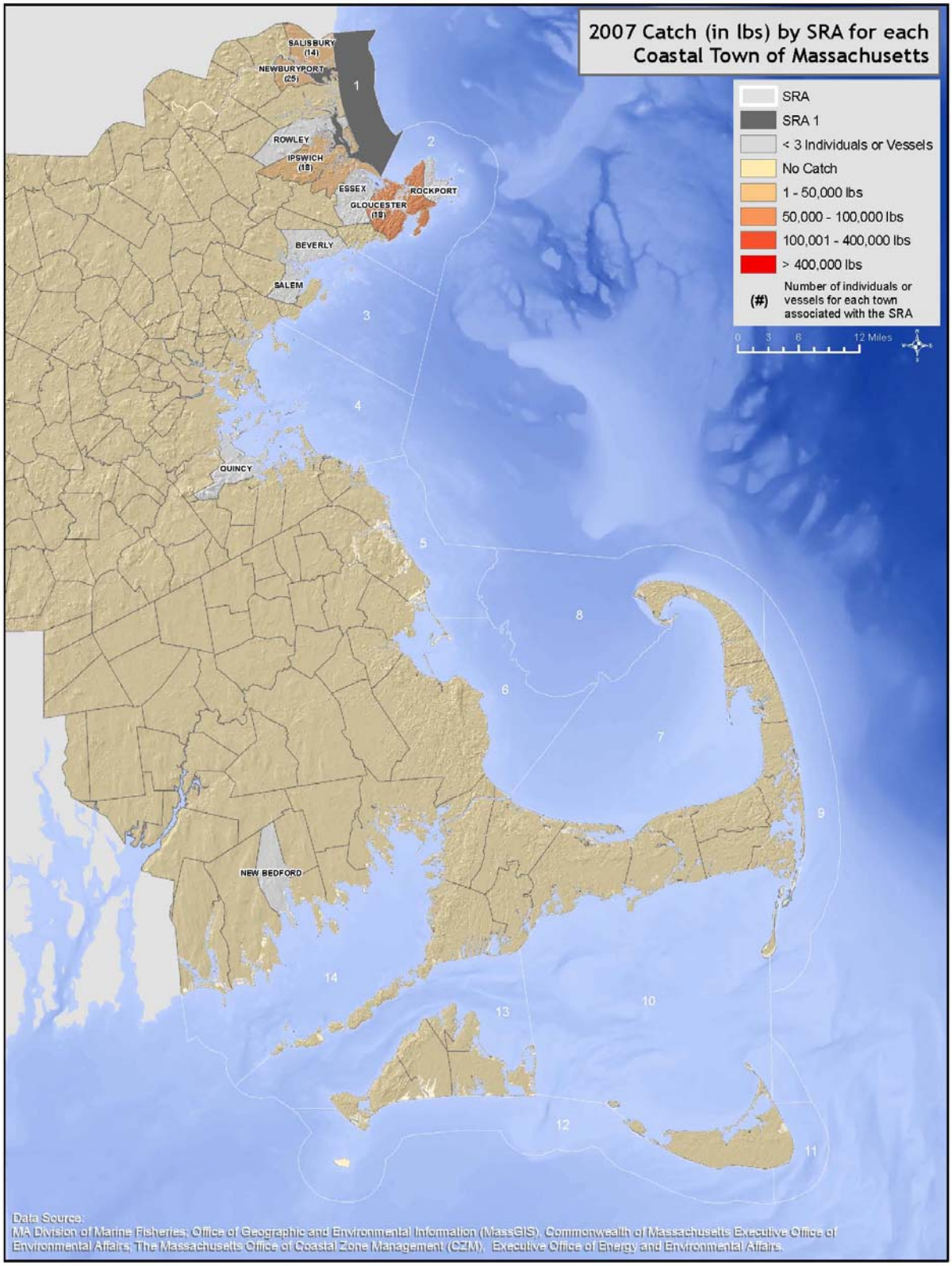


Exhibit A-2: 2007 Estimated Value for SRA 1 by Coastal Town

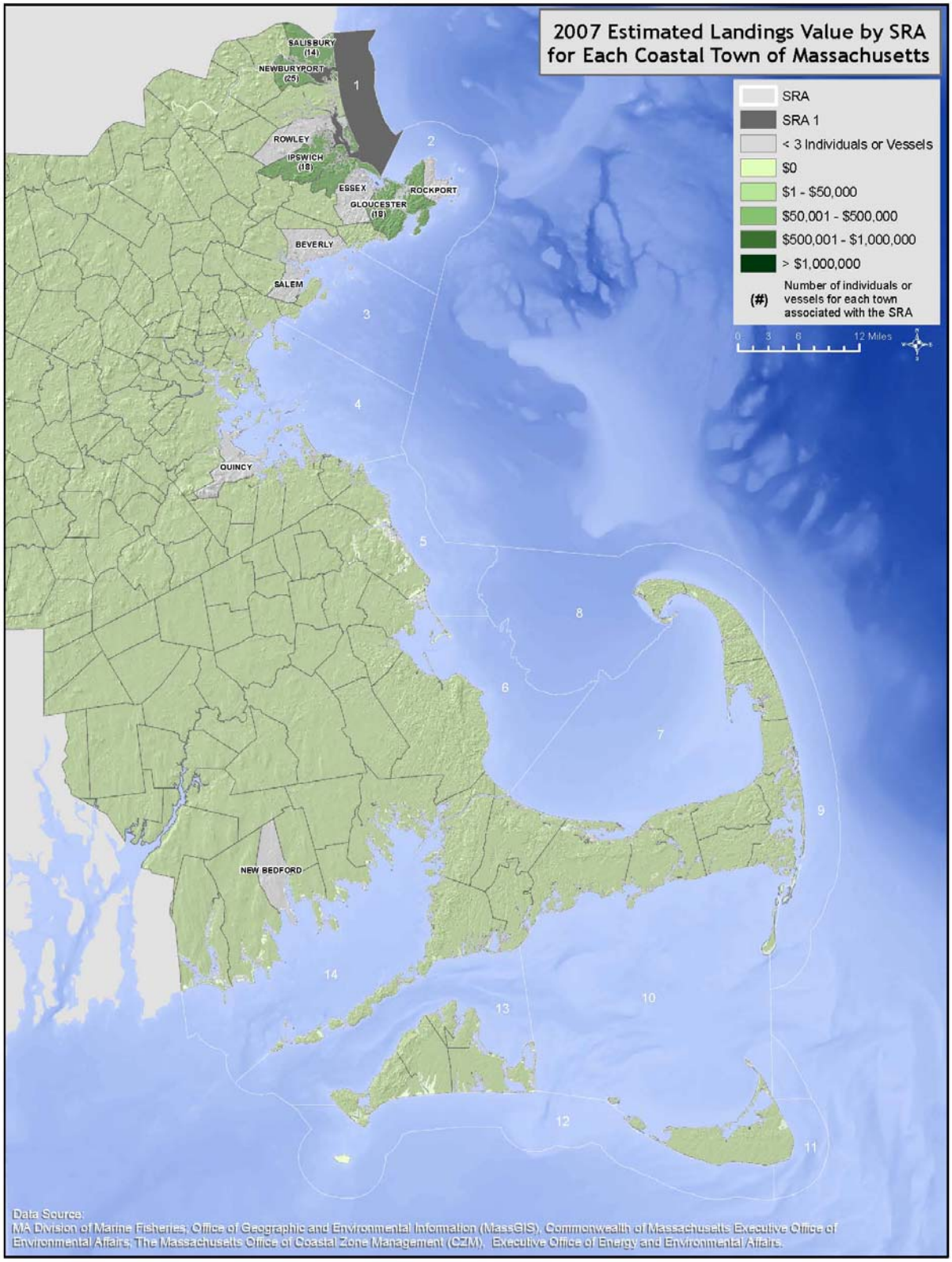


Exhibit A-3: Fishing Effort by Home Port for SRA 1

Town	Catch	Value	Individuals or Vessels	Trips
BEVERLY	Less than 3 Individuals or Vessels			
ESSEX				
GLOUCESTER	56,400	$212,700	18	542
IPSWICH	15,000	$71,900	18	623
NEW BEDFORD	Less than 3 Individuals or Vessels			
NEWBURYPORT	44,500	$208,400	25	706
QUINCY	Less than 3 Individuals or Vessels			
ROCKPORT				
ROWLEY				
SALEM				
SALISBURY	27,000	$133,000	14	592

Exhibit A-4: Total Catch and Value - SRA 1

Fishery[1]	Pounds	Value
Lobster	129,152	$642,608
Gillnet[2]	11,381	$11,397
Striped Bass	5,224	$13,790
Cod	3,476	$6,431
Groundfish[2]	1,936	$457
Flounder	1,852	$4,052
Dogfish	560	$129
Bluefish	142	$74
Wolffish	105	$83

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-5: 2007 Catch For SRA 2 by Coastal Town

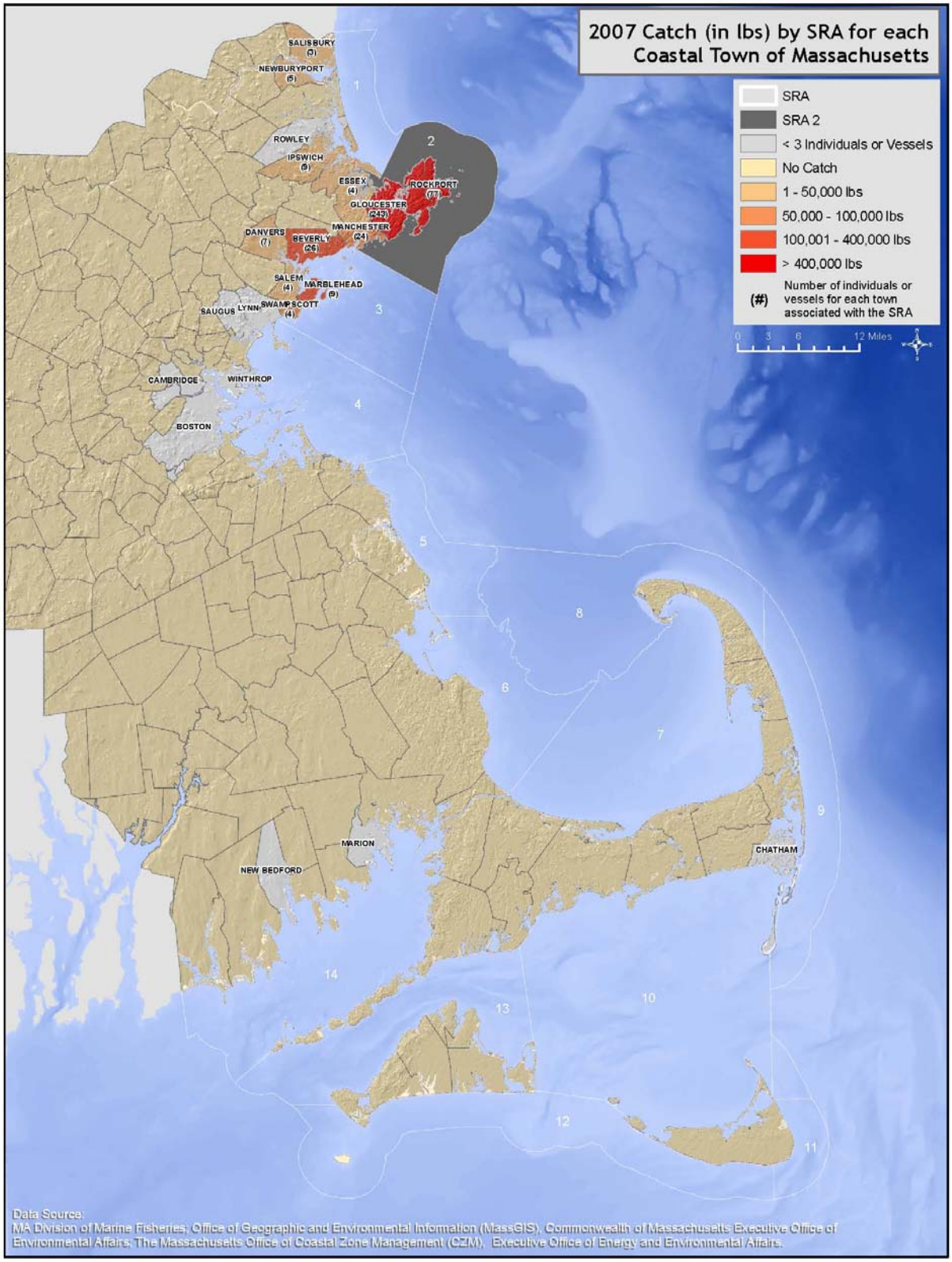


Exhibit A-6: 2007 Estimated Value for SRA 2 by Coastal Town

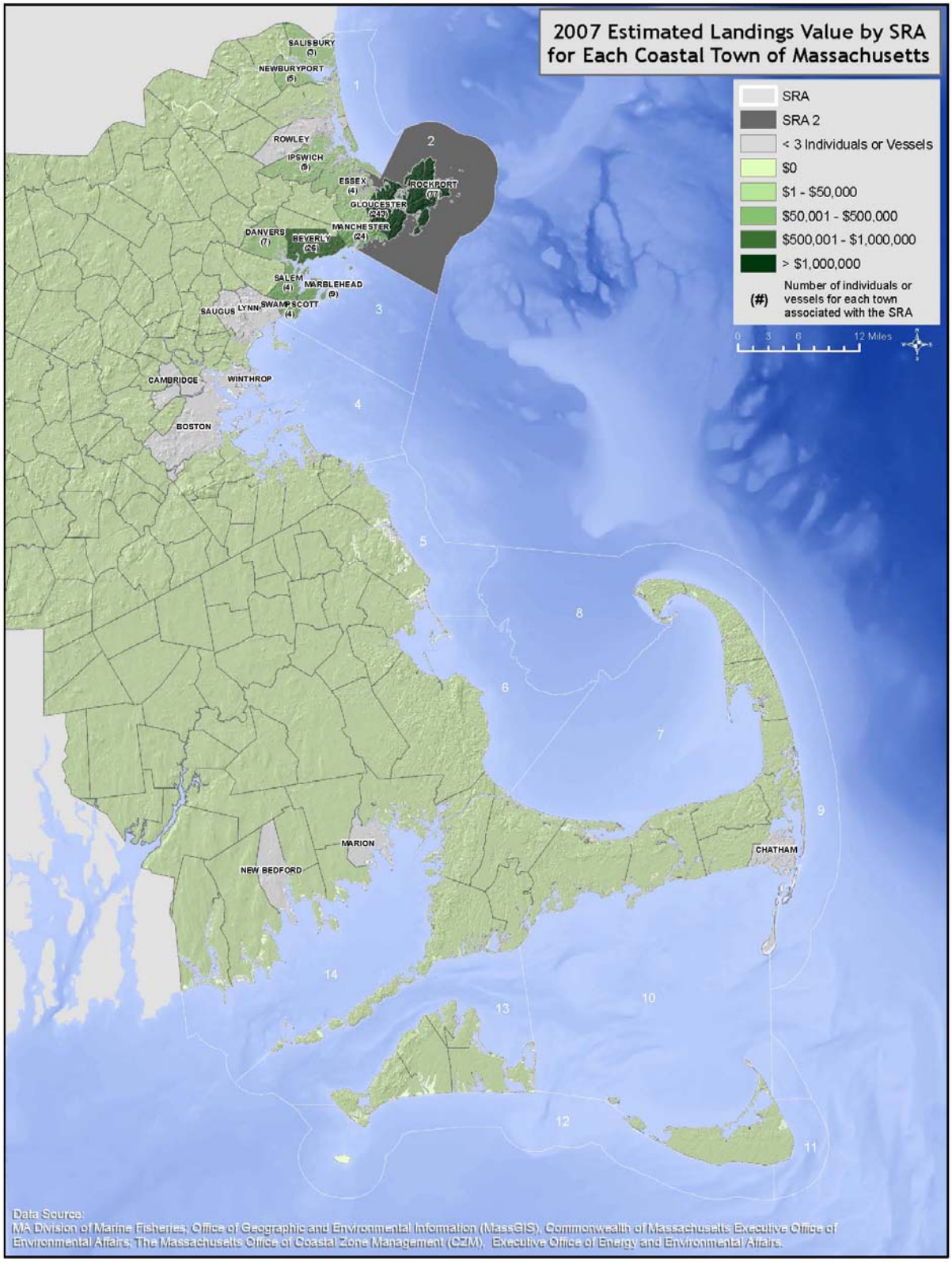


Exhibit A-7: Fishing Effort by Home Port for SRA 2

Town	Catch	Value	Individuals or Vessels	Trips
BEVERLY	130,700	$529,200	26	1,490
BOSTON	Less than 3 Individuals or Vessels			
CAMBRIDGE				
CHATHAM				
DANVERS	10,300	$44,400	7	121
ESSEX	700	$2,600	4	46
GLOUCESTER	1,202,600	$3,732,000	243	14,769
IPSWICH	5,600	$21,000	9	190
LYNN	Less than 3 Individuals or Vessels			
MANCHESTER	88,100	$436,100	24	1,572
MARBLEHEAD	227,700	$258,400	9	1,843
MARION	Less than 3 Individuals or Vessels			
NEW BEDFORD				
NEWBURYPORT	5,700	$14,500	5	12
ROCKPORT	514,300	$2,485,600	77	7,950
ROWLEY	Less than 3 Individuals or Vessels			
SALEM	14,200	$68,500	4	219
SALISBURY	2,500	$4,700	3	12
SAUGUS	Less than 3 Individuals or Vessels			
SWAMPSCOTT	63,500	$84,600	4	503
WINTHROP	Less than 3 Individuals or Vessels			

Exhibit A-8: Total Catch and Value - SRA 2

Fishery[1]	Pounds	Value
Lobster	1,377,830	$6,806,536
Gillnet[2]	672,354	$591,893
Striped Bass	73,567	$194,217
Hake	42,577	$20,760
Groundfish[2]	39,483	$37,106
Dogfish	27,408	$6,304
Cod	25,638	$47,430
Urchin	17,480	$22,200
Flounder	14,432	$30,601
Herring	5,000	$450
Haddock	2,873	$5,028
Pollock	1,872	$936
Monkfish	1,726	$4,453
Wolffish	1,237	$977
Fluke	1,174	$2,829
Bluefish	475	$247
Skate	190	$15

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-9: 2007 Catch for SRA 3 by Coastal Town

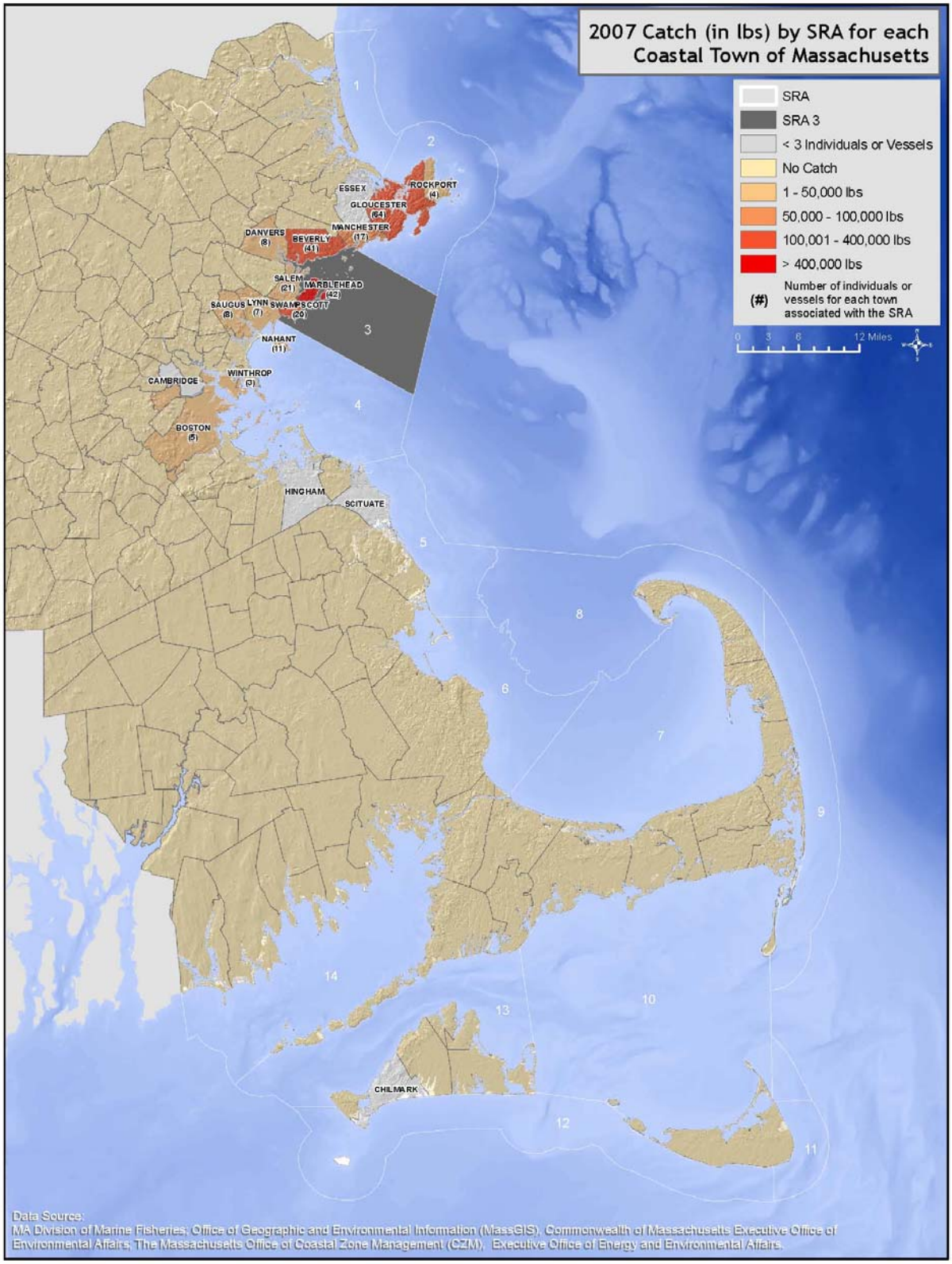


Exhibit A-10: 2007 Estimated Value for SRA 3 by Coastal Town

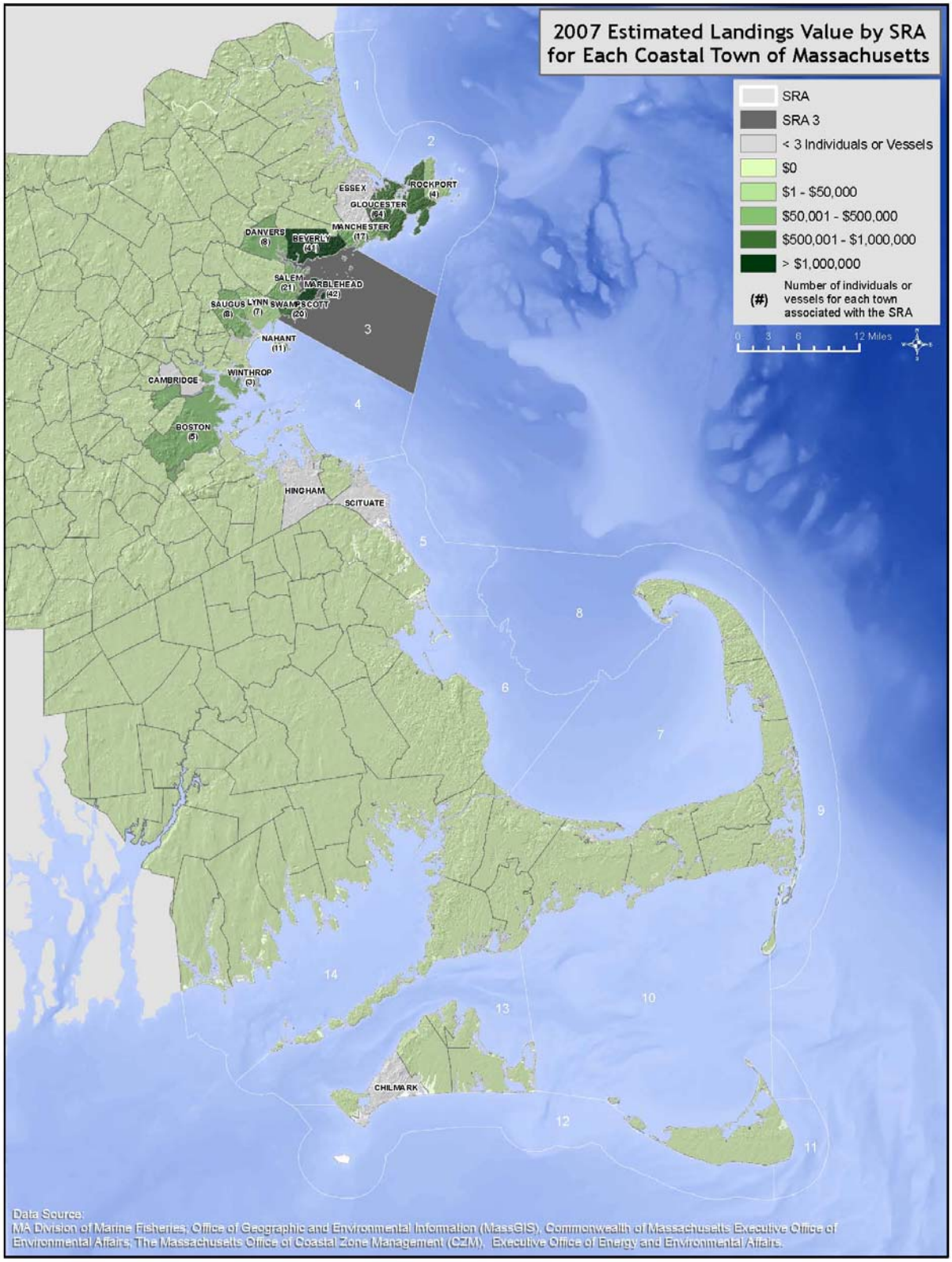


Exhibit A-11: Fishing Effort by Home Port for SRA 3

Town	Catch	Value	Individuals or Vessels	Trips
BEVERLY	305,000	$1,394,000	41	3,415
BOSTON	24,200	$67,100	5	53
CAMBRIDGE	Less than 3 Individuals or Vessels			
CHILMARK				
DANVERS	39,200	$192,900	8	423
ESSEX	Less than 3 Individuals or Vessels			
GLOUCESTER	311,400	$889,800	64	2,304
HINGHAM	Less than 3 Individuals or Vessels			
LYNN	700	$1,700	7	64
MANCHESTER	76,900	$376,300	17	1,400
MARBLEHEAD	570,500	$1,444,300	42	5,513
NAHANT	78,300	$393,700	11	602
ROCKPORT	10,100	$16,400	4	46
SALEM	26,100	$123,100	21	471
SAUGUS	31,000	$155,700	8	295
SCITUATE	Less than 3 Individuals or Vessels			
SWAMPSCOTT	196,200	$510,400	20	2,694
WINTHROP	25,400	$119,000	3	182

Exhibit A-12: Total Catch and Value - SRA 3

Fishery[1]	Pounds	Value
Lobster	1,016,687	$5,044,889
Gillnet[2]	525,299	$528,986
Groundfish[2]	90,505	$84,130
Cod	33,029	$61,104
Urchin	25,260	$32,080
Flounder	24,869	$48,423
Haddock	23,114	$40,450
Striped Bass	18,680	$49,314
Dogfish	1,638	$377
Wolffish	455	$359
Skate	421	$123
Monkfish	245	$624
Hake	111	$76

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-13: 2007 Catch For SRA 4 by Coastal Town

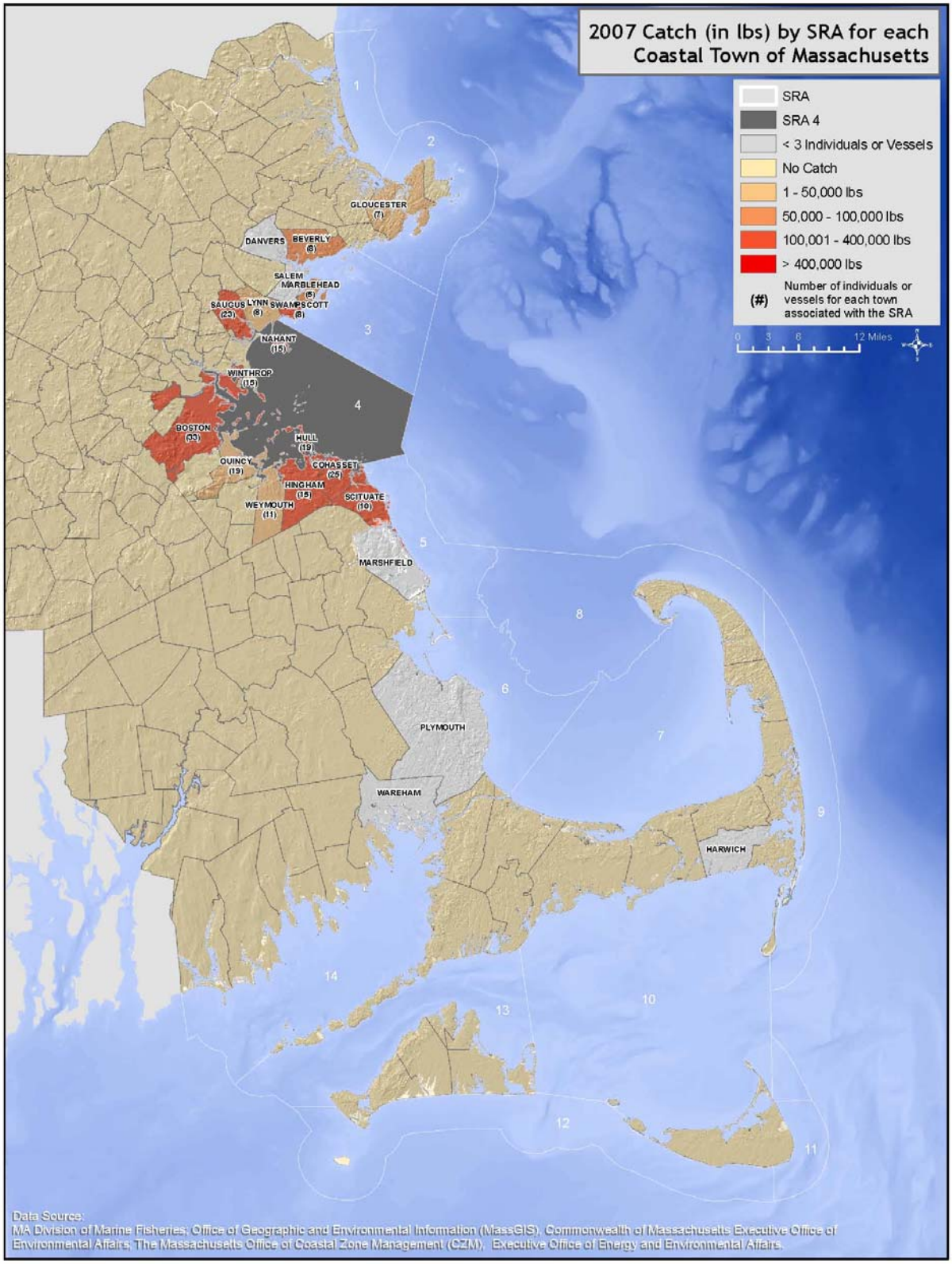


Exhibit A-14: 2007 Estimated Value for SRA 4 by Coastal Town

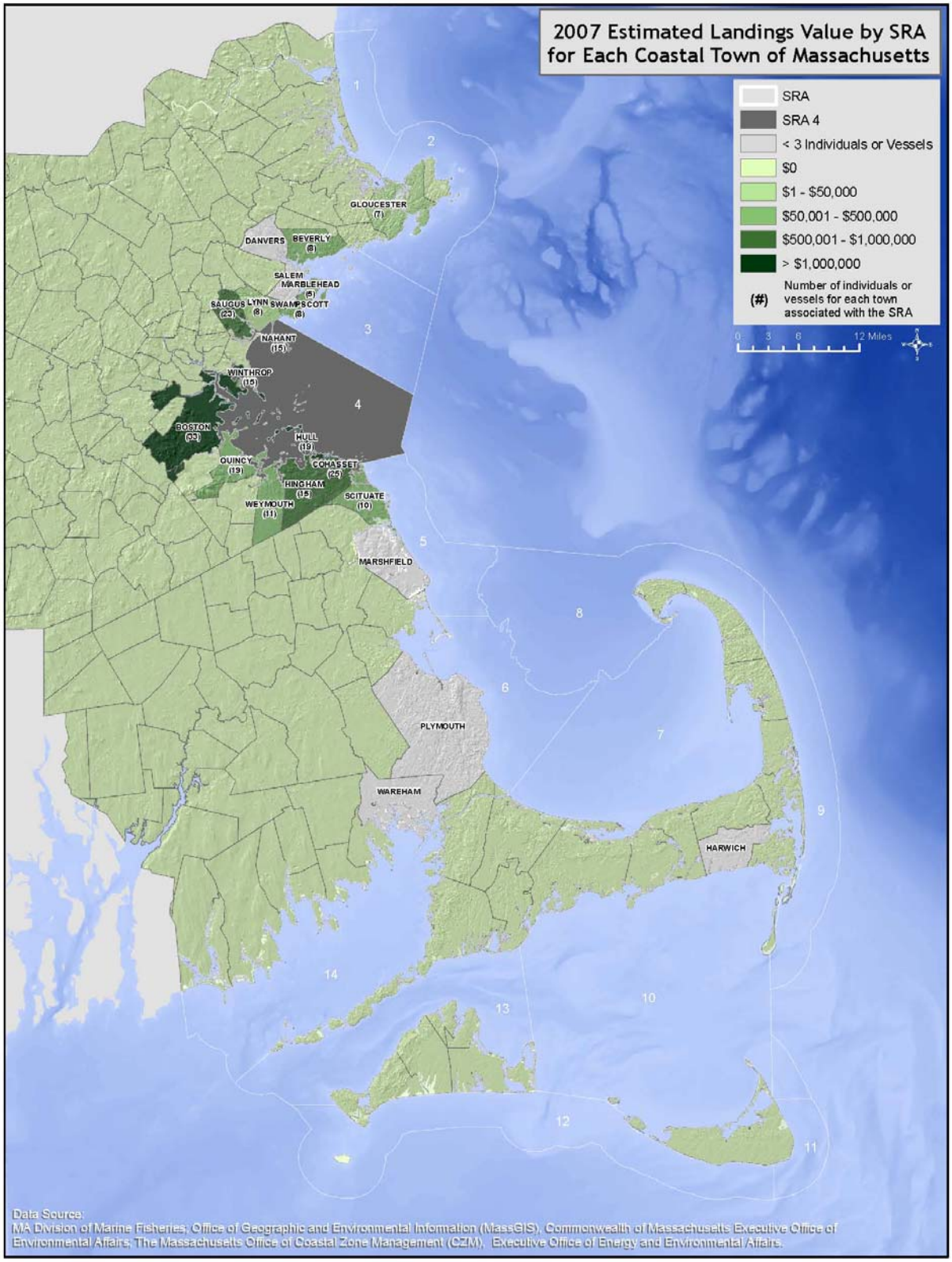


Exhibit A-15: Fishing Effort by Home Port for SRA 4

Town	Catch	Value	Individuals or Vessels	Trips
BEVERLY	56,100	$258,500	8	427
BOSTON	333,700	$1,660,900	33	2,421
COHASSET	146,600	$734,100	25	1,341
DANVERS	Less than 3 Individuals or Vessels			
GLOUCESTER	38,500	$42,900	7	179
HARWICH	Less than 3 Individuals or Vessels			
HINGHAM	168,100	$842,200	15	1,299
HULL	217,300	$1,091,600	19	1,913
LYNN	2,400	$8,700	8	94
MARBLEHEAD	73,800	$110,400	5	741
MARSHFIELD	Less than 3 Individuals or Vessels			
NAHANT	114,000	$573,000	15	1,135
PLYMOUTH	Less than 3 Individuals or Vessels			
QUINCY	25,700	$121,800	19	428
SALEM	Less than 3 Individuals or Vessels			
SAUGUS	136,700	$687,800	23	1,341
SCITUATE	228,300	$364,700	10	1,887
SWAMPSCOTT	150,200	$258,000	8	1,336
WAREHAM	Less than 3 Individuals or Vessels			
WEYMOUTH	43,700	$204,900	11	619
WINTHROP	38,700	$184,100	15	736

Exhibit A-16: Total Catch and Value - SRA 4

Fishery[1]	Pounds	Value
Lobster	1,361,195	$6,825,424
Gillnet[2]	378,661	$316,790
Groundfish[2]	35,037	$60,295
Striped Bass	15,656	$41,333
Pollock	6,000	$3,000
Flounder	1,435	$3,070
Tuna	1,350	$11,408
Haddock	1,300	$2,275
Cod	745	$1,378
Monkfish	650	$1,493
Hake	300	$456
Redfish	205	$113

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-17: 2007 Catch for SRA 5 by Coastal Town

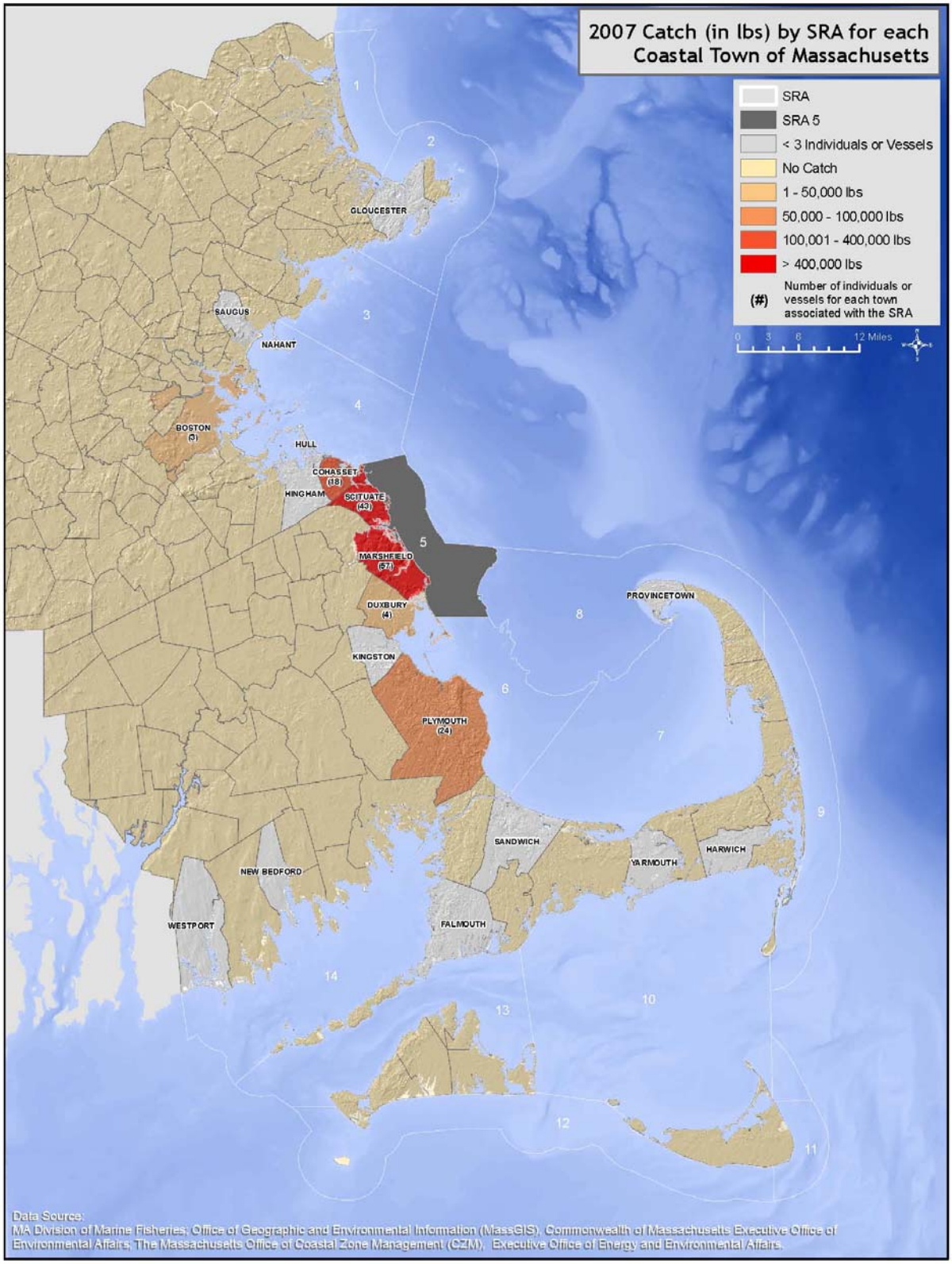


Exhibit A-18: 2007 Estimated Value for SRA 5 by Coastal Town

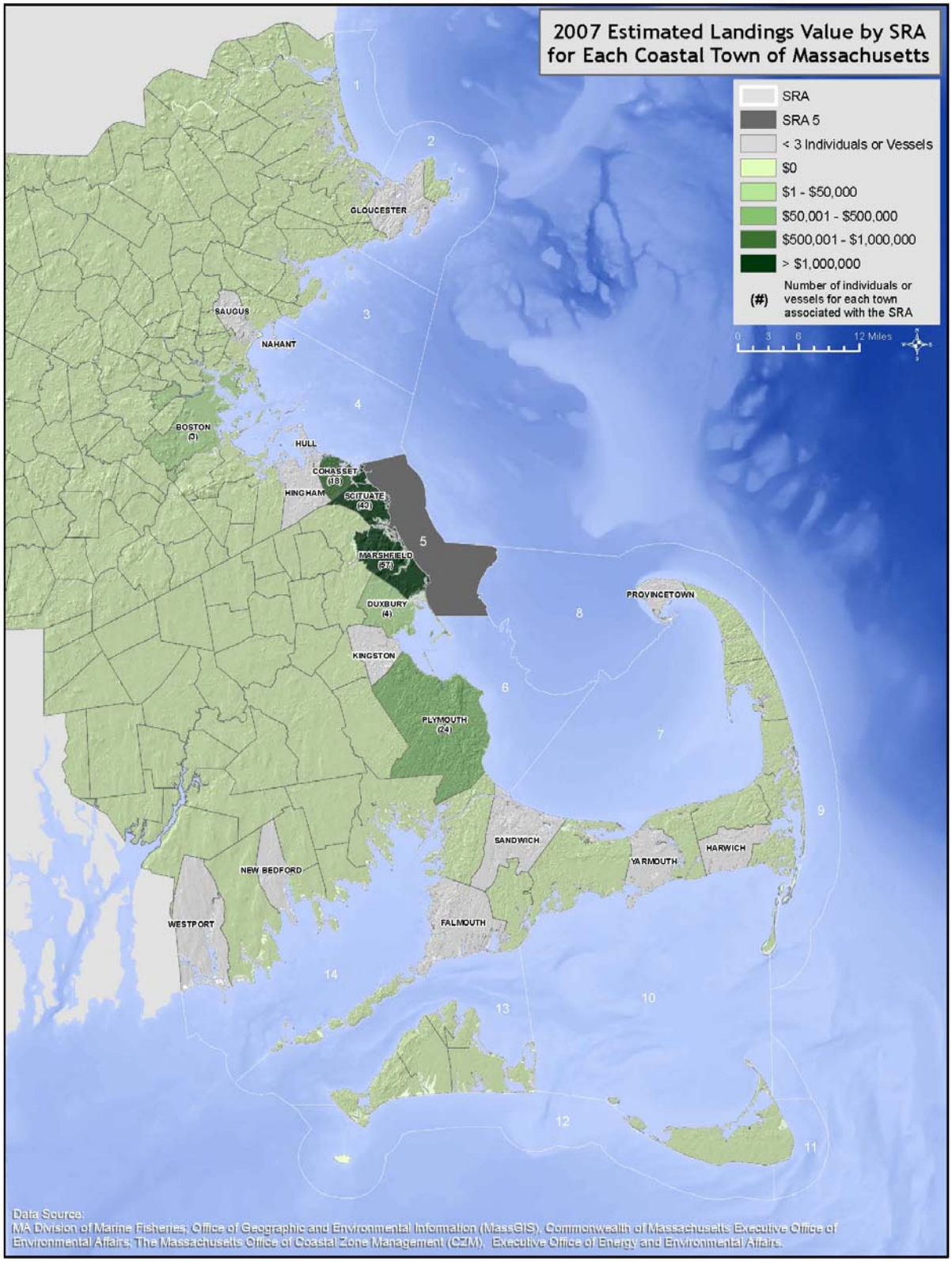


Exhibit A-19: Fishing Effort by Home Port for SRA 5

	Catch	Value	Individuals or Vessels	Trips
BOSTON	18,200	$4,600	3	10
COHASSET	106,600	$522,600	18	937
DUXBURY	10,600	$46,200	4	88
FALMOUTH	Less than 3 Individuals or Vessels			
GLOUCESTER				
HARWICH				
HINGHAM				
HULL				
KINGSTON				
MARSHFIELD	403,900	$1,500,300	57	3,641
NAHANT	Less than 3 Individuals or Vessels			
NEW BEDFORD				
PLYMOUTH	90,500	$342,700	24	946
PROVINCETOWN	Less than 3 Individuals or Vessels			
SANDWICH				
SAUGUS				
SCITUATE	493,900	$1,320,100	43	3,973
WESTPORT	Less than 3 Individuals or Vessels			
YARMOUTH				

Exhibit A-20: Total Catch and Value - SRA 5

Fishery[1]	Pounds	Value
Lobster	707,887	$3,503,158
Gillnet[2]	280,455	$258,250
Groundfish[2]	85,304	$53,011
Dogfish	47,652	$10,960
Cod	27,700	$51,245
Flounder	18,438	$37,018
Striped Bass	464	$1,224
Fluke	294	$709
Pollock	175	$88
Haddock	146	$256

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-21: 2007 Catch for SRA 6 by Coastal Town

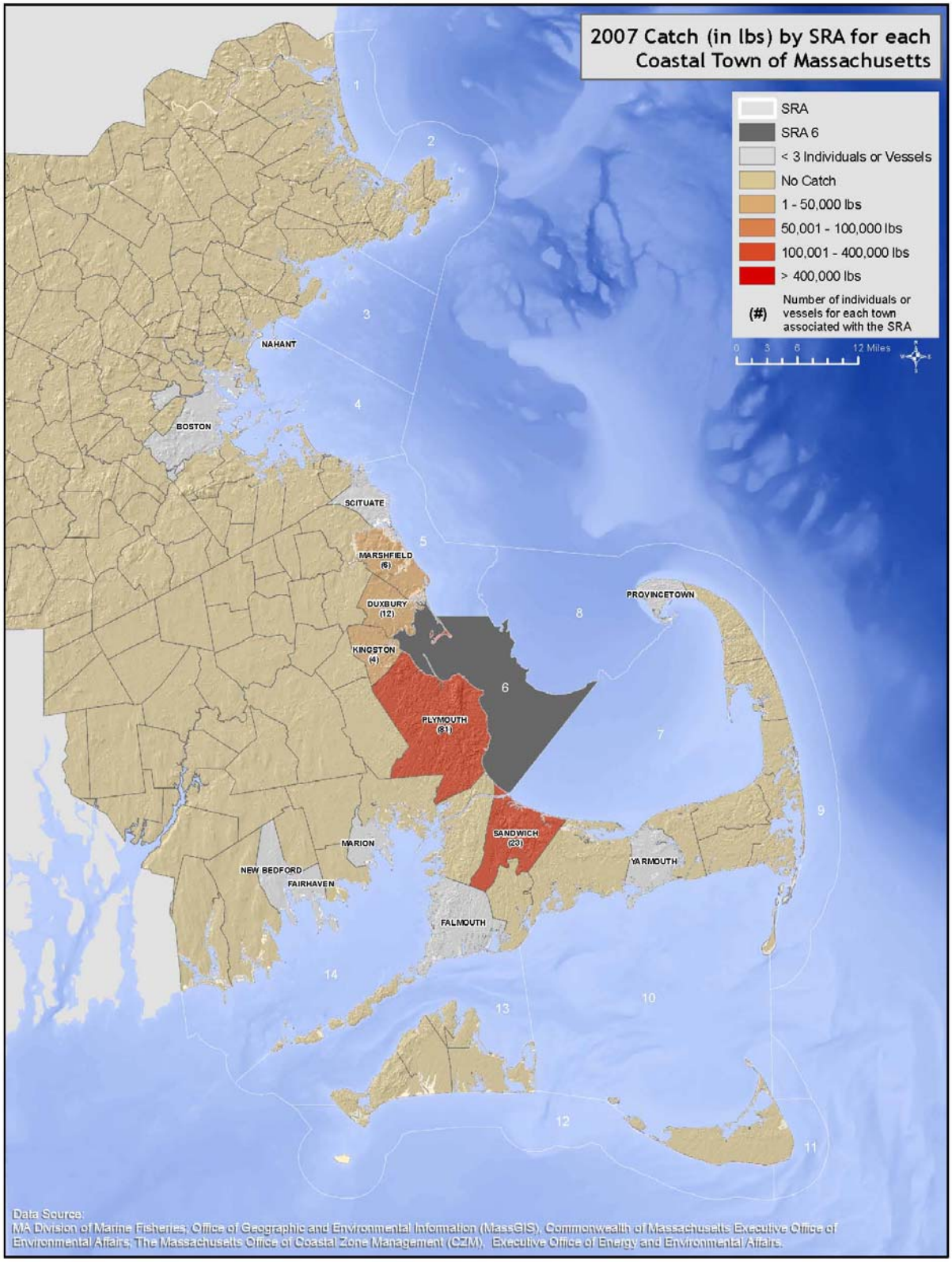


Exhibit A-22: 2007 Estimated Value for SRA 6 by Coastal Town

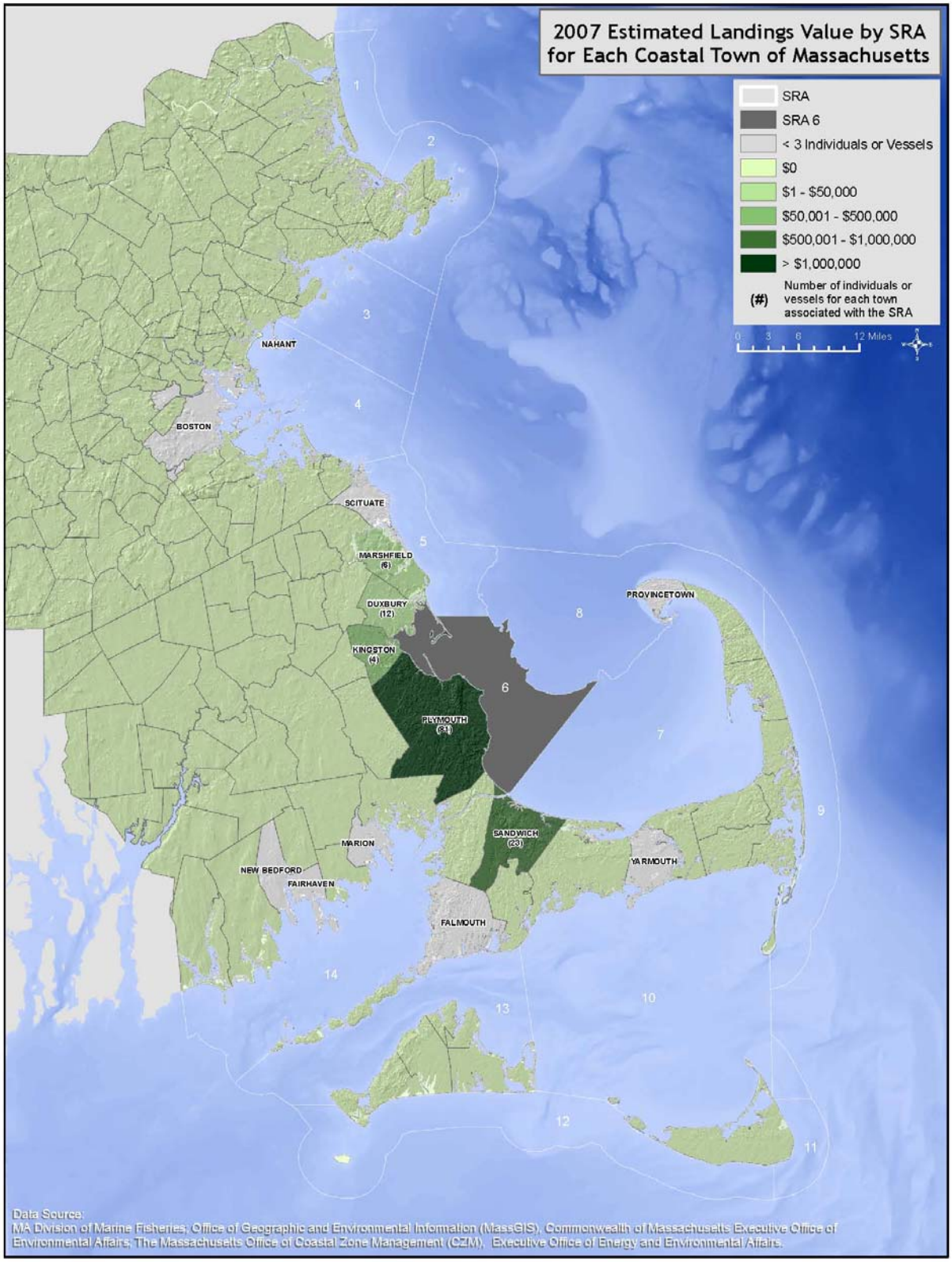


Exhibit A-23: Fishing Effort by Home Port for SRA 6

Town	Catch	Value	Individuals or Vessels	Trips
BOSTON	Less than 3 Individuals or Vessels			
DUXBURY	12,100	$47,500	12	253
FAIRHAVEN	Less than 3 Individuals or Vessels			
FALMOUTH				
KINGSTON	19,500	$94,300	4	406
MARION	Less than 3 Individuals or Vessels			
MARSHFIELD	8,400	$35,900	6	131
NAHANT	Less than 3 Individuals or Vessels			
NEW BEDFORD				
PLYMOUTH	388,800	$1,774,300	81	5,210
PROVINCETOWN	Less than 3 Individuals or Vessels			
SANDWICH	338,000	$801,000	23	2,104
SCITUATE	Less than 3 Individuals or Vessels			
YARMOUTH				

Exhibit A-24: Total Catch and Value - SRA 6

Fishery[1]	Pounds	Value
Lobster	595,902	$2,629,801
Flounder	75,232	$158,756
Groundfish[2]	56,952	$83,946
Skate	47,150	$4,244
Dogfish	41,150	$9,465
Striped Bass	11,960	$31,573
Cod	6,431	$11,897
Monkfish	1,462	$3,659
Fluke	955	$2,302
Tuna	472	$3,988
Hake	130	$198
Haddock	100	$175

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-25: 2007 Catch for SRA 7 by Coastal Town

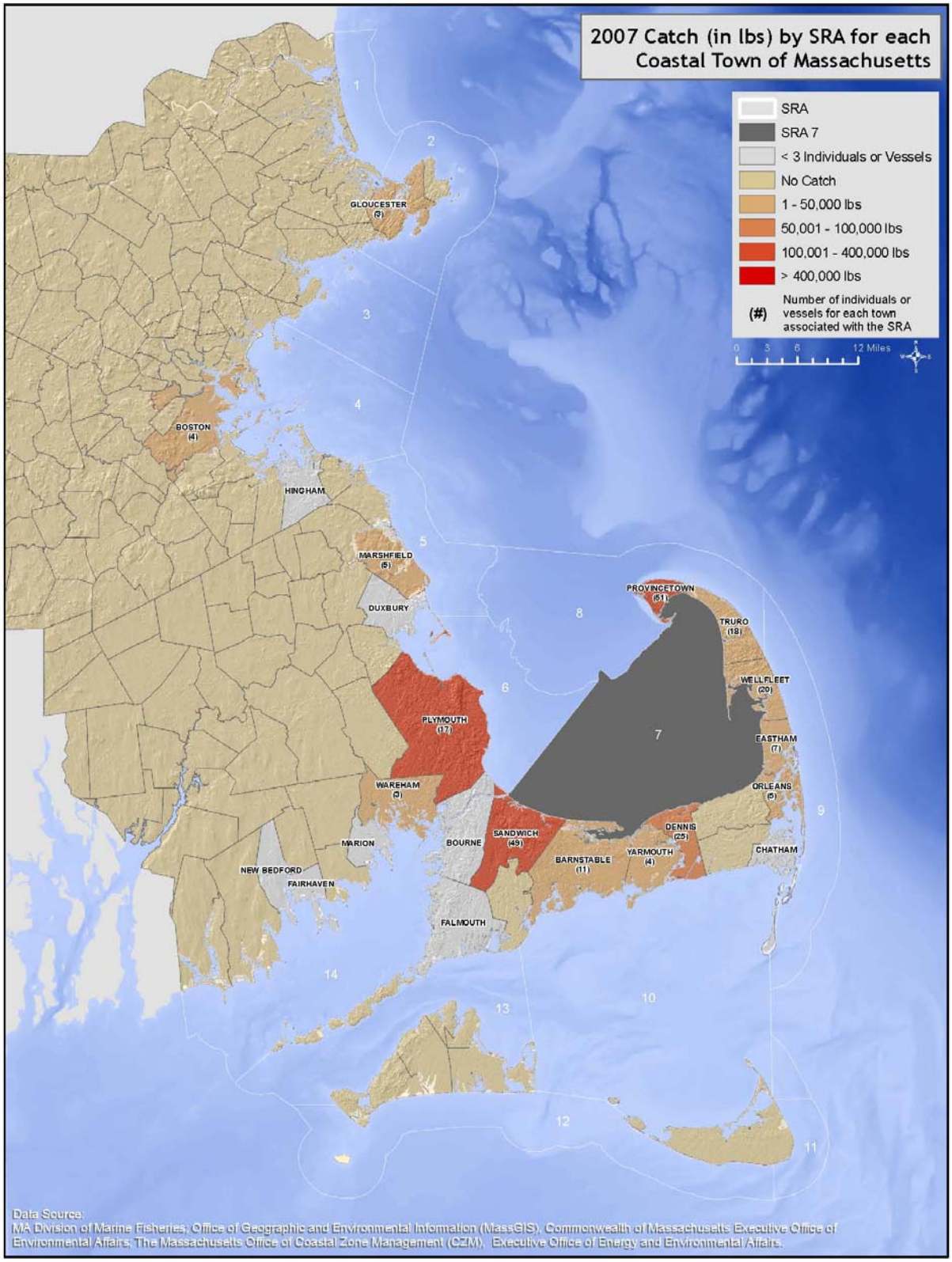


Exhibit A-26: 2007 Estimated Value for SRA 7 by Coastal Town

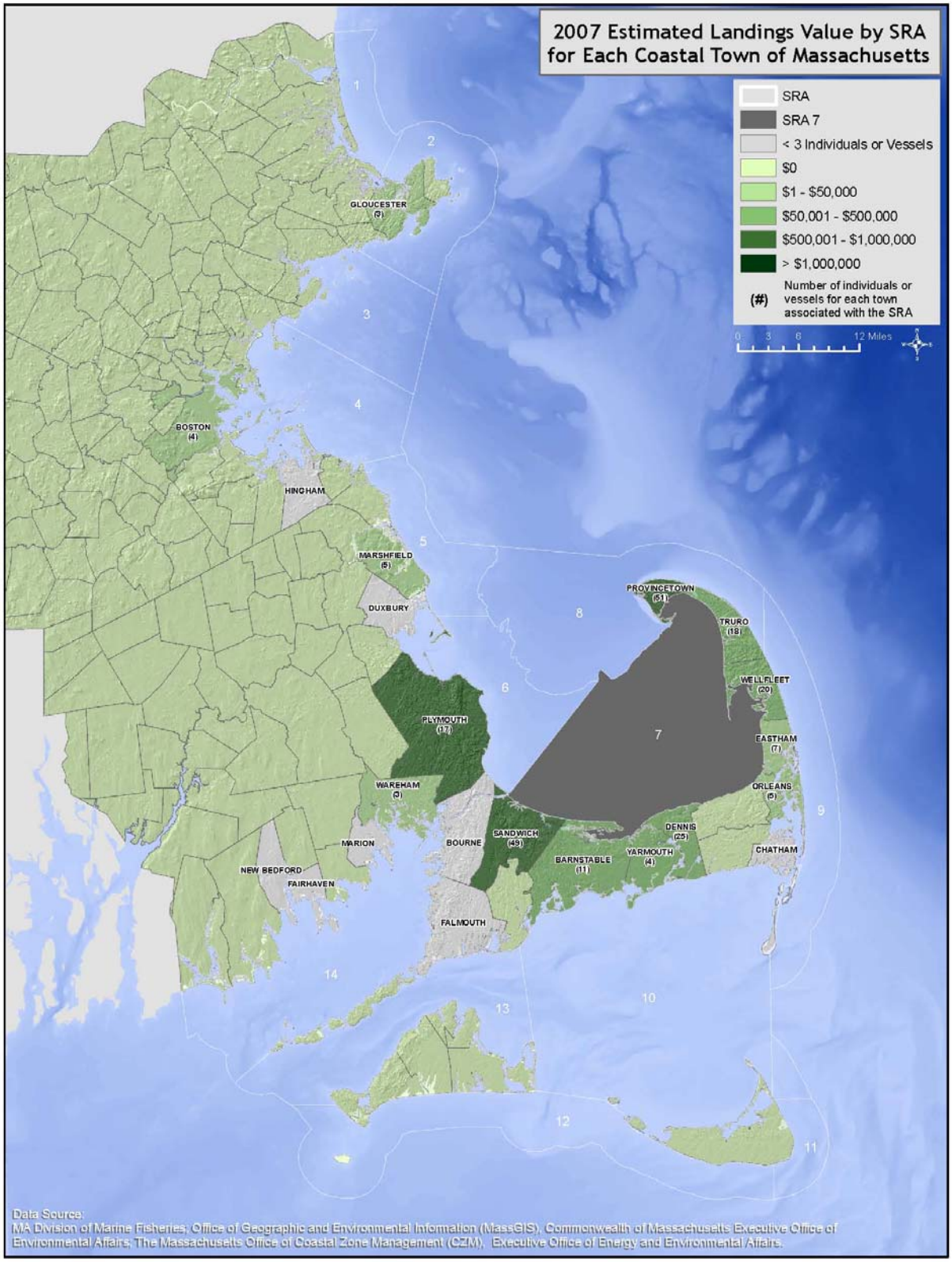


Exhibit A-27: Fishing Effort by Home Port for SRA 7

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	21,400	$79,000	11	190
BOSTON	4,100	$16,200	4	4
BOURNE	Less than 3 Individuals or Vessels			
CHATHAM				
DENNIS	63,900	$271,900	25	1,181
DUXBURY	Less than 3 Individuals or Vessels			
EASTHAM	3,000	$11,400	7	51
FAIRHAVEN	Less than 3 Individuals or Vessels			
FALMOUTH				
GLOUCESTER	3,600	$7,500	3	4
HINGHAM	Less than 3 Individuals or Vessels			
MARION				
MARSHFIELD	8,200	$34,600	5	36
NEW BEDFORD	Less than 3 Individuals or Vessels			
ORLEANS	800	$2,000	5	25
PLYMOUTH	146,400	$576,300	17	780
PROVINCETOWN	205,700	$535,100	51	1,828
SANDWICH	213,100	$759,500	49	2,008
TRURO	39,100	$171,500	18	673
WAREHAM	900	$2,300	3	29
WELLFLEET	21,100	$102,600	20	184
YARMOUTH	15,400	$67,600	4	390

Exhibit A-28: Total Catch and Value - SRA 7

Fishery[1]	Pounds	Value
Lobster	573,075	$2,424,555
Groundfish[2]	99,727	$82,545
Striped Bass	72,154	$190,486
Dogfish	15,500	$3,565
Flounder	11,415	$23,806
Hake	8,529	$4,381
Black Sea Bass Pot	2,929	$7,144
Fluke	2,844	$6,854
Skate	2,030	$182
Tuna	1,214	$10,258
Tautog	581	$1,261
Squid	240	$206
Cod	188	$348
Monkfish	134	$311

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-29: 2007 Catch for SRA 8 by Coastal Town

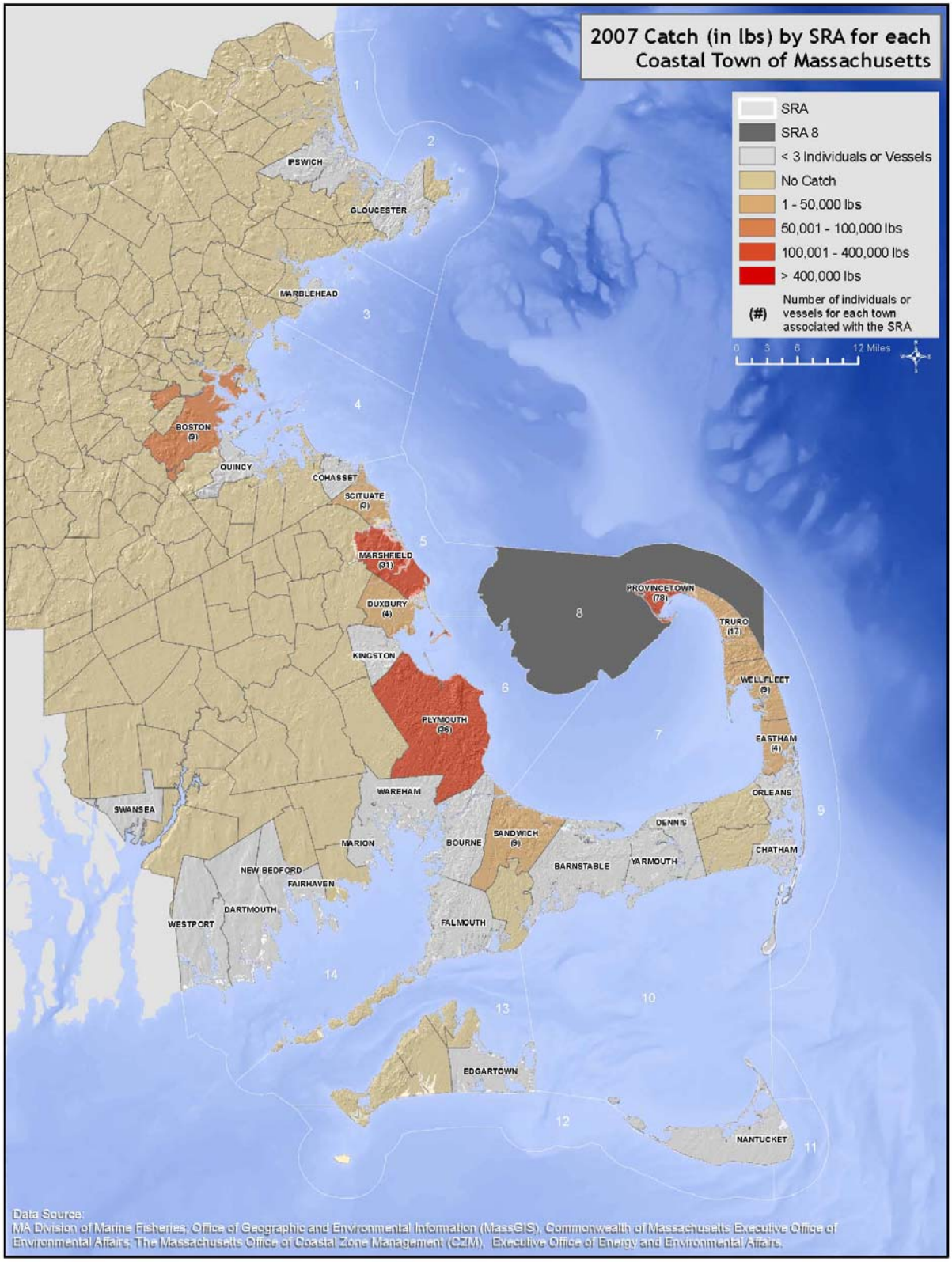


Exhibit A-30: 2007 Estimated Value for SRA 8 by Coastal Town

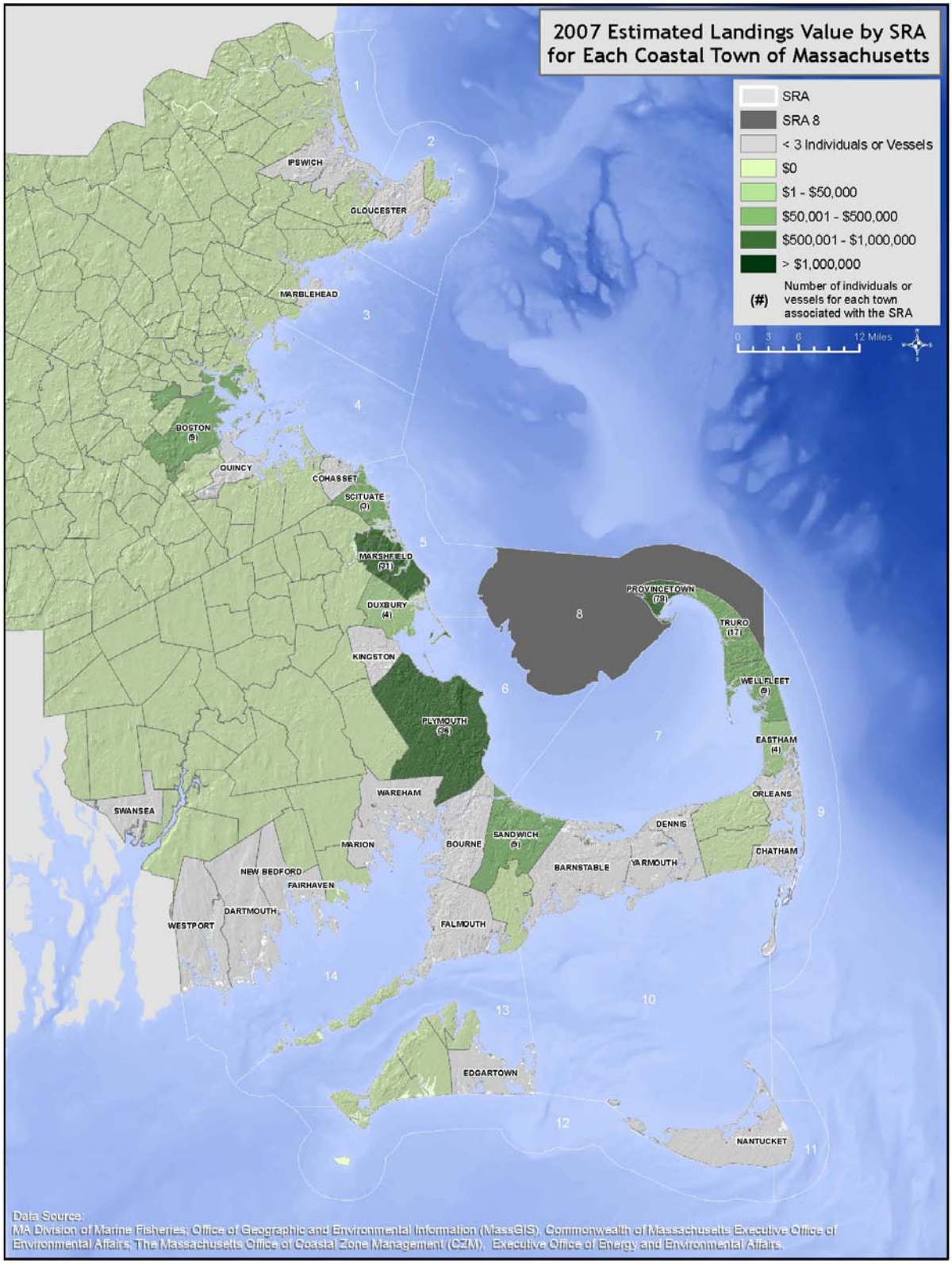


Exhibit A-31: Fishing Effort by Home Port for SRA 8

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	Less than 3 Individuals or Vessels			
BOSTON	99,100	$107,000	9	67
BOURNE	Less than 3 Individuals or Vessels			
CHATHAM				
COHASSET				
DARTMOUTH				
DENNIS				
DUXBURY	3,600	$17,900	4	35
EASTHAM	1,000	$2,600	4	24
EDGARTOWN	Less than 3 Individuals or Vessels			
FAIRHAVEN				
FALMOUTH				
GLOUCESTER				
IPSWICH				
KINGSTON				
MARBLEHEAD				
MARION				
MARSHFIELD	209,400	$755,300	31	931
NANTUCKET	Less than 3 Individuals or Vessels			
NEW BEDFORD				
ORLEANS				
PLYMOUTH	202,600	$702,300	36	986
PROVINCETOWN	373,100	$951,400	78	2,369
QUINCY	Less than 3 Individuals or Vessels			
SANDWICH	36,400	$119,100	9	240
SCITUATE	30,700	$52,300	3	245
SWANSEA	Less than 3 Individuals or Vessels			
TRURO	35,200	$134,500	17	392
WAREHAM	Less than 3 Individuals or Vessels			
WELLFLEET	31,800	$158,200	9	142
WESTPORT	Less than 3 Individuals or Vessels			
YARMOUTH				

Exhibit A-32: Total Catch and Value - SRA 8

Fishery[1]	Pounds	Value
Lobster	501,748	$2,313,743
Flounder	139,423	$282,862
Groundfish[2]	120,720	$175,865
Dogfish	107,045	$24,580
Striped Bass	50,245	$132,647
Hake	41,386	$20,291
Skate	36,733	$4,059
Cod	36,463	$67,457
Gillnet[2]	29,102	$49,388
Monkfish	2,629	$7,276
Tuna	2,364	$19,976
Haddock	1,321	$2,312
Urchin	1,000	$1,270
Squid	831	$715
Wolffish	559	$442
Bluefish	531	$276
Pollock	515	$258
Weakfish	495	$931
Butterfish	152	$96
Mackerel	150	$15
Fluke	138	$333

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-33: 2007 Catch for SRA 9 by Coastal Town

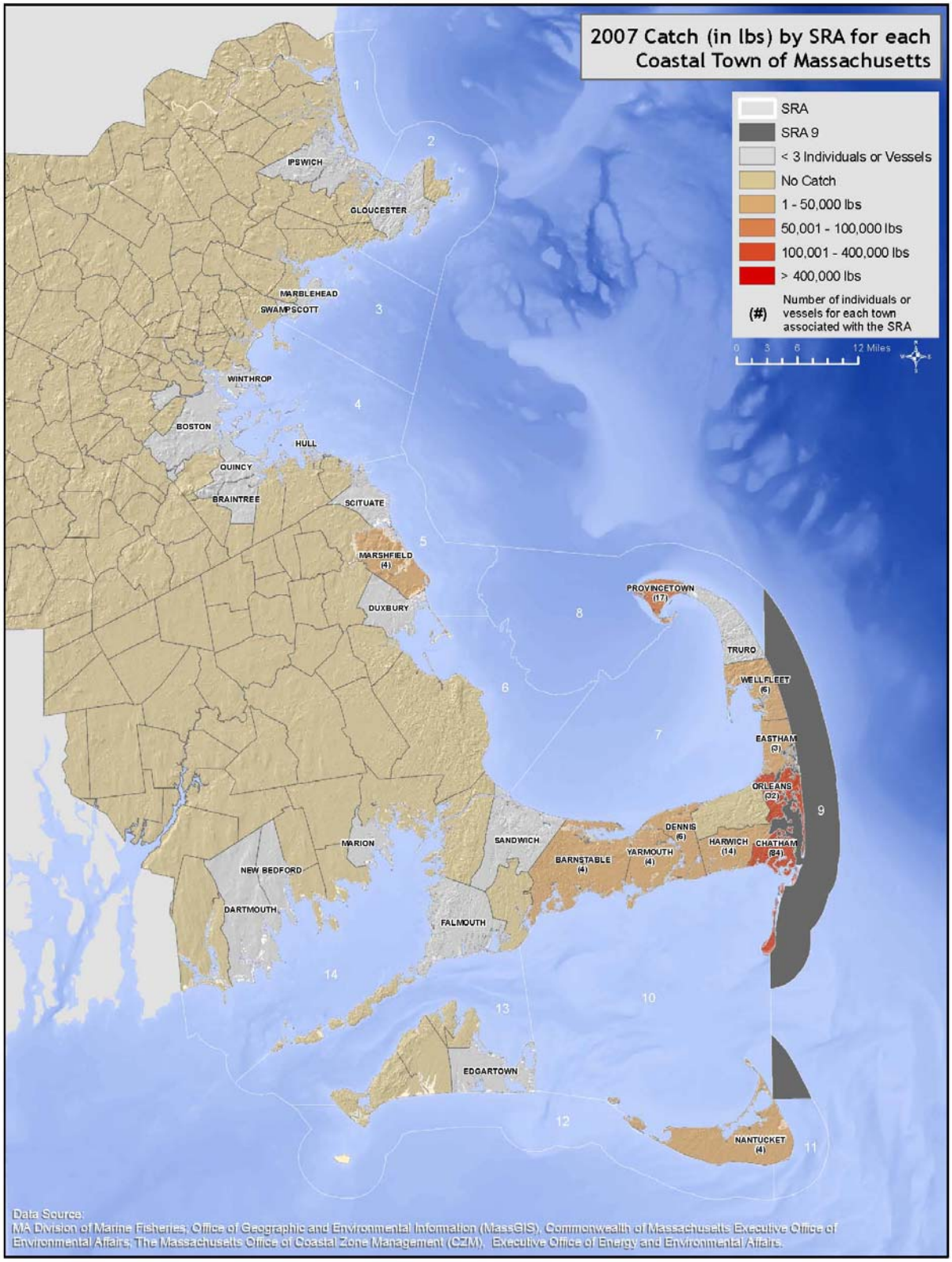


Exhibit A-34: 2007 Estimated Value for SRA 9 by Coastal Town

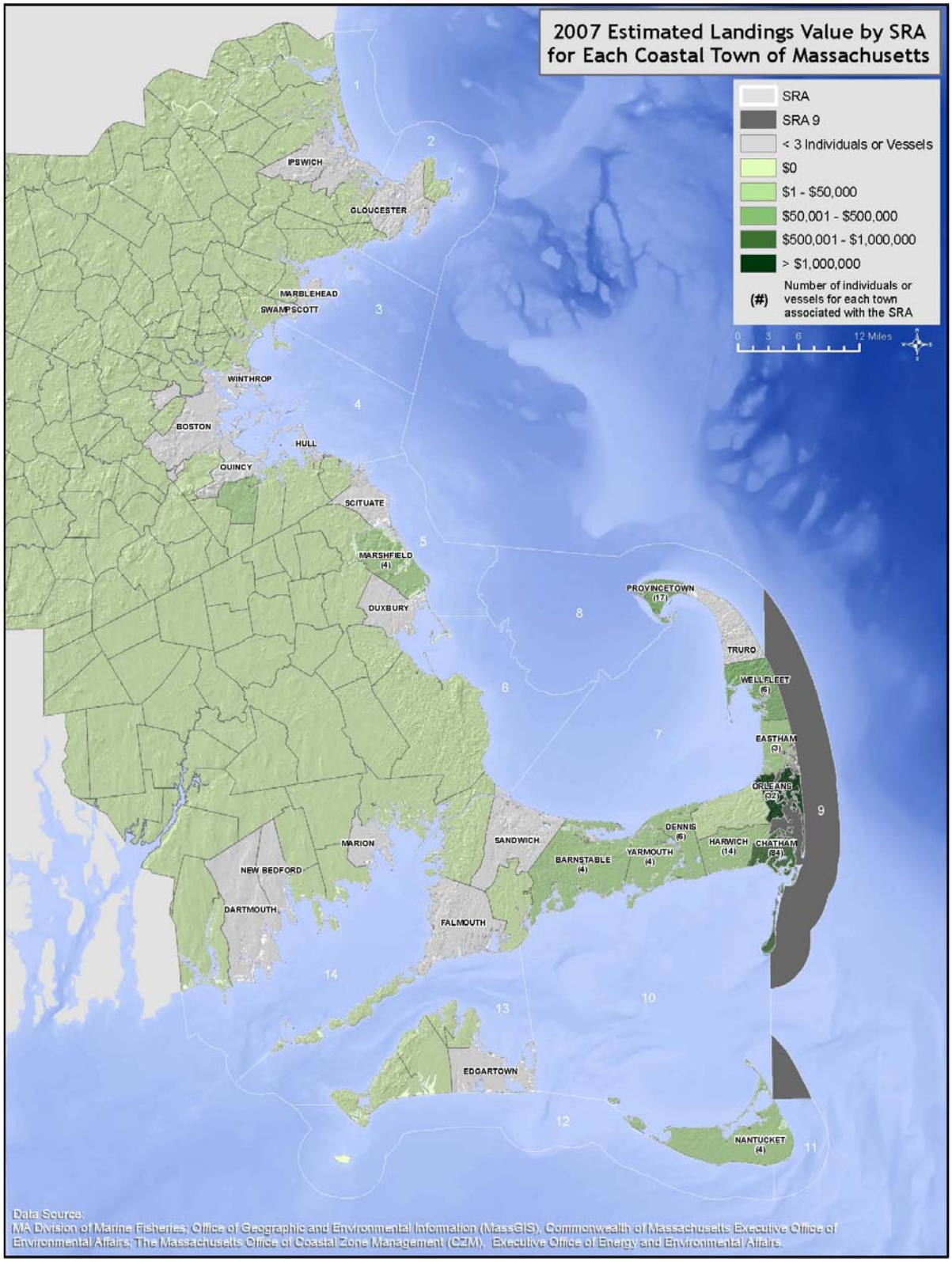


Exhibit A-35: Fishing Effort by Home Port for SRA 9

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	4,400	$3,200	4	49
BOSTON	Less than 3 Individuals or Vessels			
BRAINTREE				
CHATHAM	296,900	$966,600	84	1,472
DARTMOUTH	Less than 3 Individuals or Vessels			
DENNIS	2,100	$5,400	6	20
DUXBURY	Less than 3 Individuals or Vessels			
EASTHAM	1,900	$9,200	3	110
EDGARTOWN	Less than 3 Individuals or Vessels			
FALMOUTH				
GLOUCESTER				
HARWICH	30,700	$32,900	14	90
HULL	Less than 3 Individuals or Vessels			
IPSWICH				
MARBLEHEAD				
MARION				
MARSHFIELD	1,900	$3,300	4	7
NANTUCKET	3,900	$9,200	4	59
NEW BEDFORD	Less than 3 Individuals or Vessels			
ORLEANS	244,500	$1,218,900	32	1,712
PROVINCETOWN	80,600	$362,800	17	371
QUINCY	Less than 3 Individuals or Vessels			
SANDWICH				
SCITUATE				
SWAMPSCOTT				
TRURO				
WELLFLEET	26,100	$130,100	6	108
WINTHROP	Less than 3 Individuals or Vessels			
YARMOUTH	1,200	$3,200	4	6

Exhibit A-36: Total Catch and Value - SRA 9

Fishery[1]	Pounds	Value
Lobster	523,735	$2,630,034
Gillnet[2]	311,587	$401,983
Striped Bass	90,135	$237,956
Dogfish	79,443	$18,272
Groundfish[2]	41,122	$44,470
Cod	10,226	$18,918
Flounder	3,796	$7,546
Bluefish	3,155	$1,641
Skate	2,880	$270
Black Sea Bass Pot	1,816	$4,703
Pollock	840	$420
Crab	400	$500
Monkfish	182	$418
Hake	100	$152

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-37: 2007 Catch for SRA 10 by Coastal Town

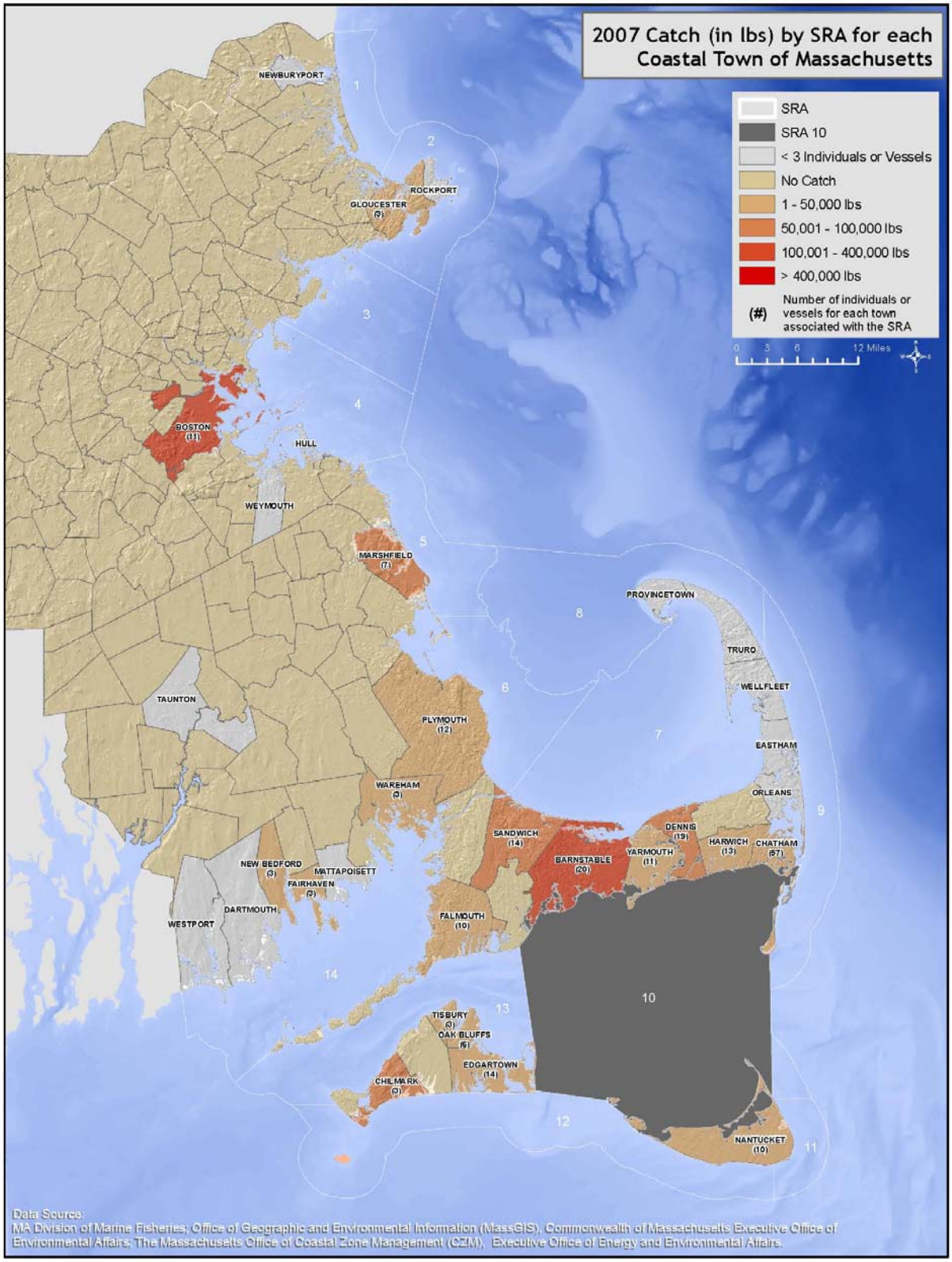


Exhibit A-38: 2007 Estimated Value for SRA 10 by Coastal Town

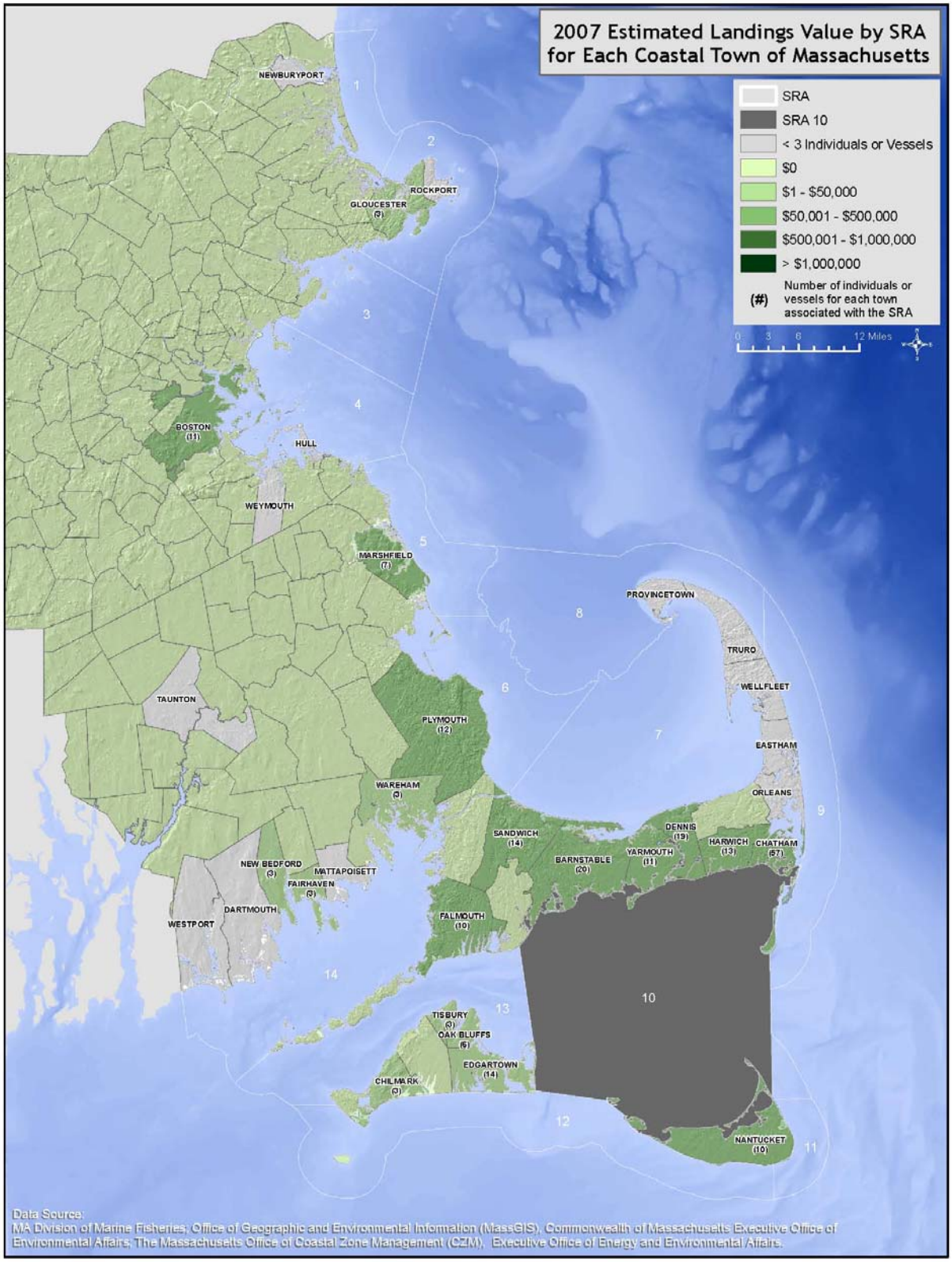


Exhibit A-39: Fishing Effort by Home Port for SRA 10

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	114,800	$180,400	20	369
BOSTON	136,600	$141,800	11	102
CHATHAM	46,500	$123,600	57	358
CHILMARK	52,300	$45,500	3	3
DARTMOUTH	Less than 3 Individuals or Vessels			
DENNIS	64,500	$161,400	19	381
EASTHAM	Less than 3 Individuals or Vessels			
EDGARTOWN	11,000	$25,800	14	75
FAIRHAVEN	14,200	$33,800	3	65
FALMOUTH	24,700	$50,500	10	86
GLOUCESTER	30,300	$29,200	3	20
HARWICH	30,300	$69,200	13	194
HULL	Less than 3 Individuals or Vessels			
MARSHFIELD	60,200	$111,500	7	141
MATTAPOISETT	Less than 3 Individuals or Vessels			
NANTUCKET	14,500	$61,000	10	194
NEW BEDFORD	49,100	$44,700	3	6
NEWBURYPORT	Less than 3 Individuals or Vessels			
OAK BLUFFS	6,600	$15,300	6	31
ORLEANS	Less than 3 Individuals or Vessels			
PLYMOUTH	41,500	$77,000	12	113
PROVINCETOWN	Less than 3 Individuals or Vessels			
ROCKPORT				
SANDWICH	80,800	$164,500	14	275
TAUNTON	Less than 3 Individuals or Vessels			
TISBURY	500	$1,200	3	5
TRURO	Less than 3 Individuals or Vessels			
WAREHAM	2,500	$6,600	3	16
WELLFLEET	Less than 3 Individuals or Vessels			
WESTPORT				
WEYMOUTH				
YARMOUTH	34,600	$80,100	11	170

Exhibit A-40: Total Catch and Value - SRA 10

Fishery[1]	Pounds	Value
Squid	422,207	$365,495
Striped Bass	171,731	$453,369
Black Sea Bass Pot	166,560	$411,593
Fluke	165,447	$398,728
Scup Pot	75,276	$70,007
Lobster	18,037	$90,724
Bluefish	15,113	$7,859
Crab	12,640	$15,800
Haddock	3,954	$6,920
Cod	3,842	$7,108
Dogfish	2,000	$460
Butterfish	1,346	$848
Tautog	1,311	$2,845
Groundfish[2]	240	$512
Hake	233	$354
Monkfish	184	$423

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-41: 2007 Catch for SRA 11 and 12 by Coastal Town

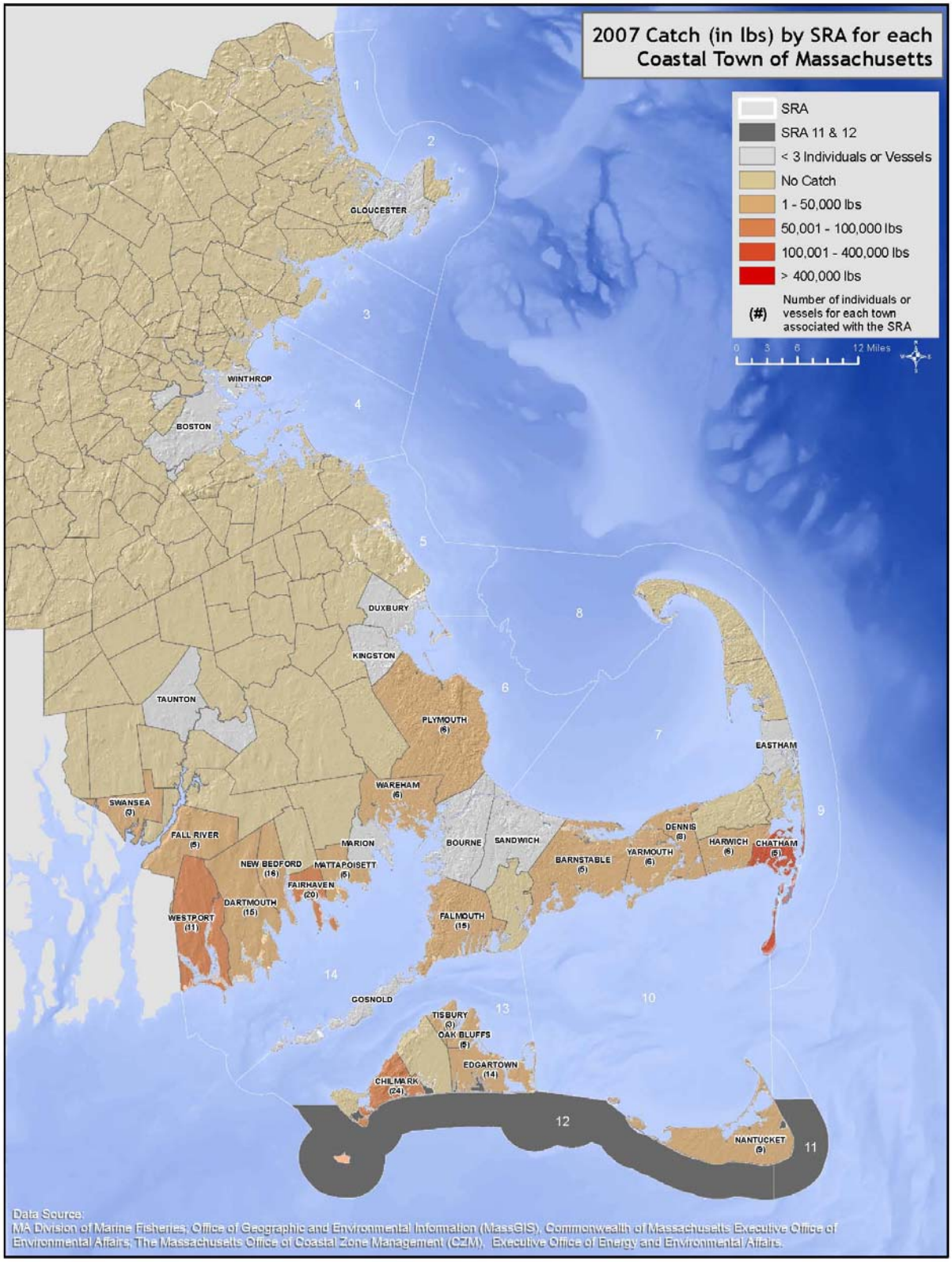


Exhibit A-42: 2007 Estimated Value for SRA 11 and 12 by Coastal Town

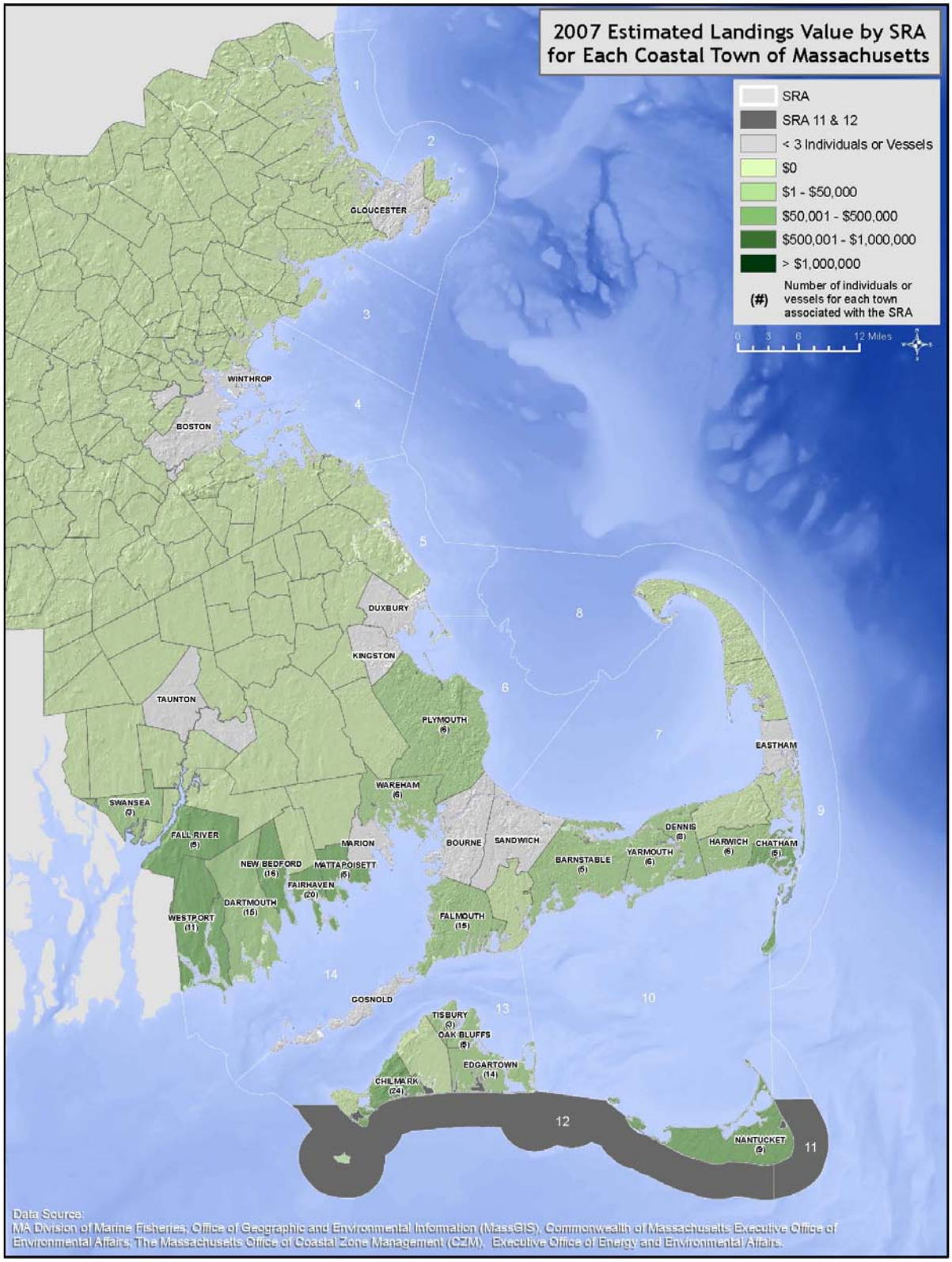


Exhibit A-43: Fishing Effort by Home Port for SRA 11 and 12

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	6,700	$16,200	5	22
BOSTON	Less than 3 Individuals or Vessels			
BOURNE				
CHATHAM	203,200	$275,200	5	685
CHILMARK	54,300	$202,800	24	790
DARTMOUTH	12,000	$31,400	15	54
DENNIS	11,200	$29,600	8	47
DUXBURY	Less than 3 Individuals or Vessels			
EASTHAM				
EDGARTOWN	7,600	$20,000	14	48
FAIRHAVEN	95,400	$271,800	20	359
FALL RIVER	47,200	$57,000	5	80
FALMOUTH	12,500	$25,900	15	58
GLOUCESTER	Less than 3 Individuals or Vessels			
GOSNOLD				
HARWICH	4,700	$12,300	6	44
KINGSTON	Less than 3 Individuals or Vessels			
MARION				
MATTAPOISETT	19,500	$96,500	5	76
NANTUCKET	19,200	$87,300	9	242
NEW BEDFORD	28,700	$67,500	16	196
OAK BLUFFS	600	$1,500	5	13
PLYMOUTH	6,500	$17,100	6	20
SANDWICH	Less than 3 Individuals or Vessels			
SWANSEA	700	$1,600	3	7
TAUNTON	Less than 3 Individuals or Vessels			
TISBURY	3,900	$15,200	3	71
WAREHAM	5,200	$13,900	6	26
WESTPORT	58,100	$93,900	11	163
WINTHROP	Less than 3 Individuals or Vessels			
YARMOUTH	6,900	$18,200	6	32

Exhibit A-44: Total Catch and Value - SRA 11 and 12

Fishery[1]	Pounds	Value
Striped Bass	238,455	$629,521
Gillnet[2]	200,462	$268,047
Lobster	131,568	$610,233
Scup Pot	117,111	$108,914
Groundfish[2]	36,161	$53,047
Fluke	11,471	$27,646
Black Sea Bass Pot	8,770	$22,706
Skate	6,500	$540
Flounder	5,295	$9,940
Dogfish	2,170	$499
Bluefish	867	$451
Monkfish	745	$1,711

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-45: 2007 Catch for SRA 13 by Coastal Town

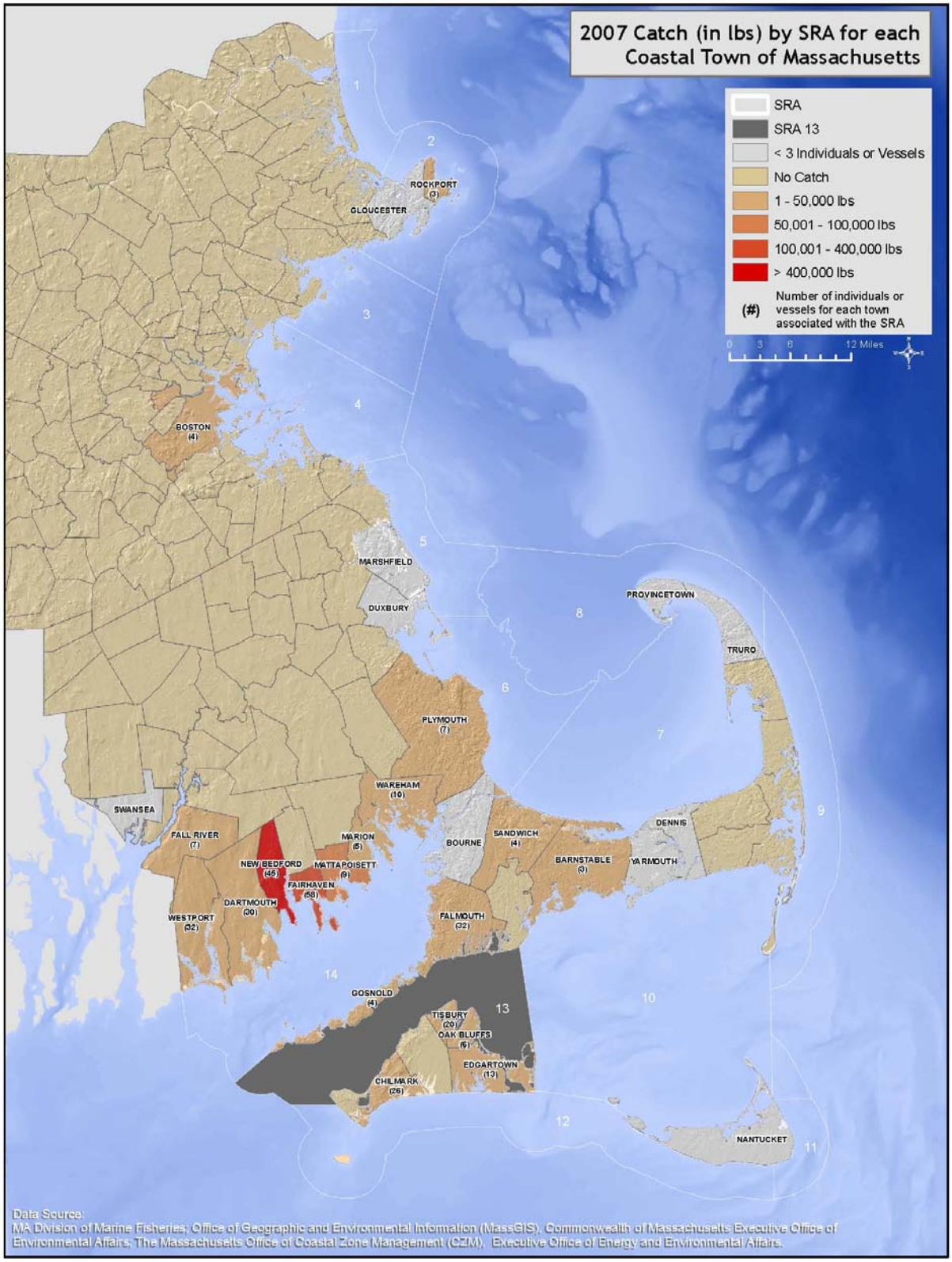


Exhibit A-46: 2007 Estimated Value for SRA 13 by Coastal Town

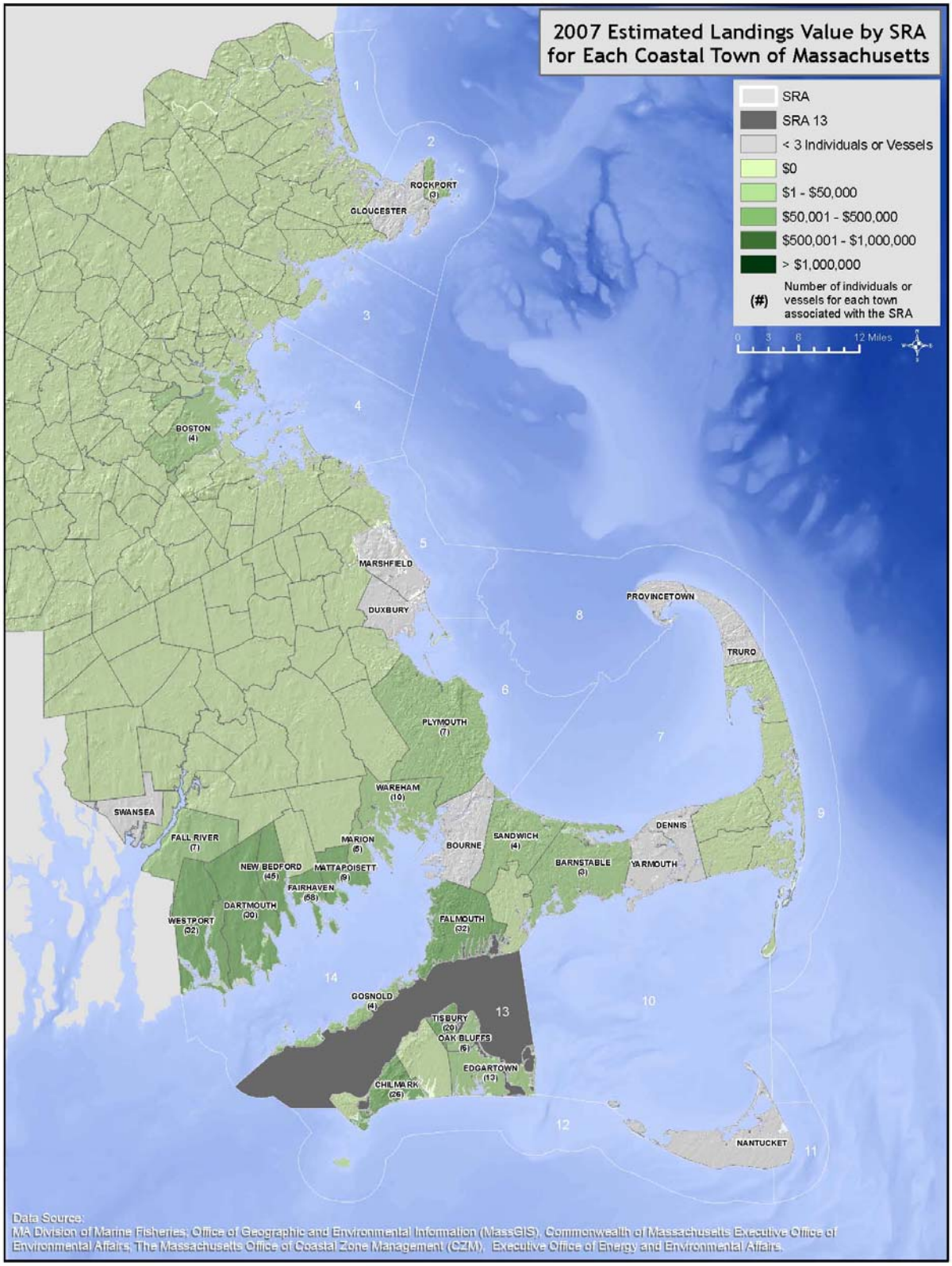


Exhibit A-47: Fishing Effort by Home Port for SRA 13

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	4,500	$11,400	3	26
BOSTON	2,000	$2,400	4	14
BOURNE	Less than 3 Individuals or Vessels			
CHILMARK	30,900	$107,200	26	499
DARTMOUTH	29,300	$75,200	30	263
DENNIS	Less than 3 Individuals or Vessels			
DUXBURY				
EDGARTOWN	29,600	$42,000	13	545
FAIRHAVEN	147,100	$359,100	58	726
FALL RIVER	9,800	$25,500	7	58
FALMOUTH	30,300	$61,700	32	223
GLOUCESTER	Less than 3 Individuals or Vessels			
GOSNOLD	3,700	$18,000	4	57
MARION	15,900	$43,000	5	99
MARSHFIELD	Less than 3 Individuals or Vessels			
MATTAPOISETT	61,100	$153,900	9	252
NANTUCKET	Less than 3 Individuals or Vessels			
NEW BEDFORD	1,455,300	$468,900	45	708
OAK BLUFFS	7,000	$14,900	6	45
PLYMOUTH	20,300	$45,200	7	80
PROVINCETOWN	Less than 3 Individuals or Vessels			
ROCKPORT	3,700	$14,500	3	20
SANDWICH	12,600	$30,400	4	52
SWANSEA	Less than 3 Individuals or Vessels			
TISBURY	23,600	$66,900	20	204
TRURO	Less than 3 Individuals or Vessels			
WAREHAM	19,600	$48,400	10	89
WESTPORT	34,500	$91,800	32	213
YARMOUTH	Less than 3 Individuals or Vessels			

Exhibit A-48: Total Catch and Value - SRA 13

Fishery[1]	Pounds	Value
Skate	1,317,867	$105,444
Fluke	258,309	$622,524
Striped Bass	182,364	$481,442
Lobster	126,798	$494,815
Black Sea Bass Pot	77,124	$192,684
Scup Pot	49,185	$45,742
Flounder	29,235	$60,607
Squid	23,614	$20,602
Groundfish[2]	20,825	$37,874
Dogfish	17,360	$3,944
Monkfish	1,993	$4,651
Bluefish	1,023	$532
Hake	175	$266
Butterfish	145	$91
Tautog	125	$271

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

Exhibit A-49: 2007 Catch for SRA 14 by Coastal Town

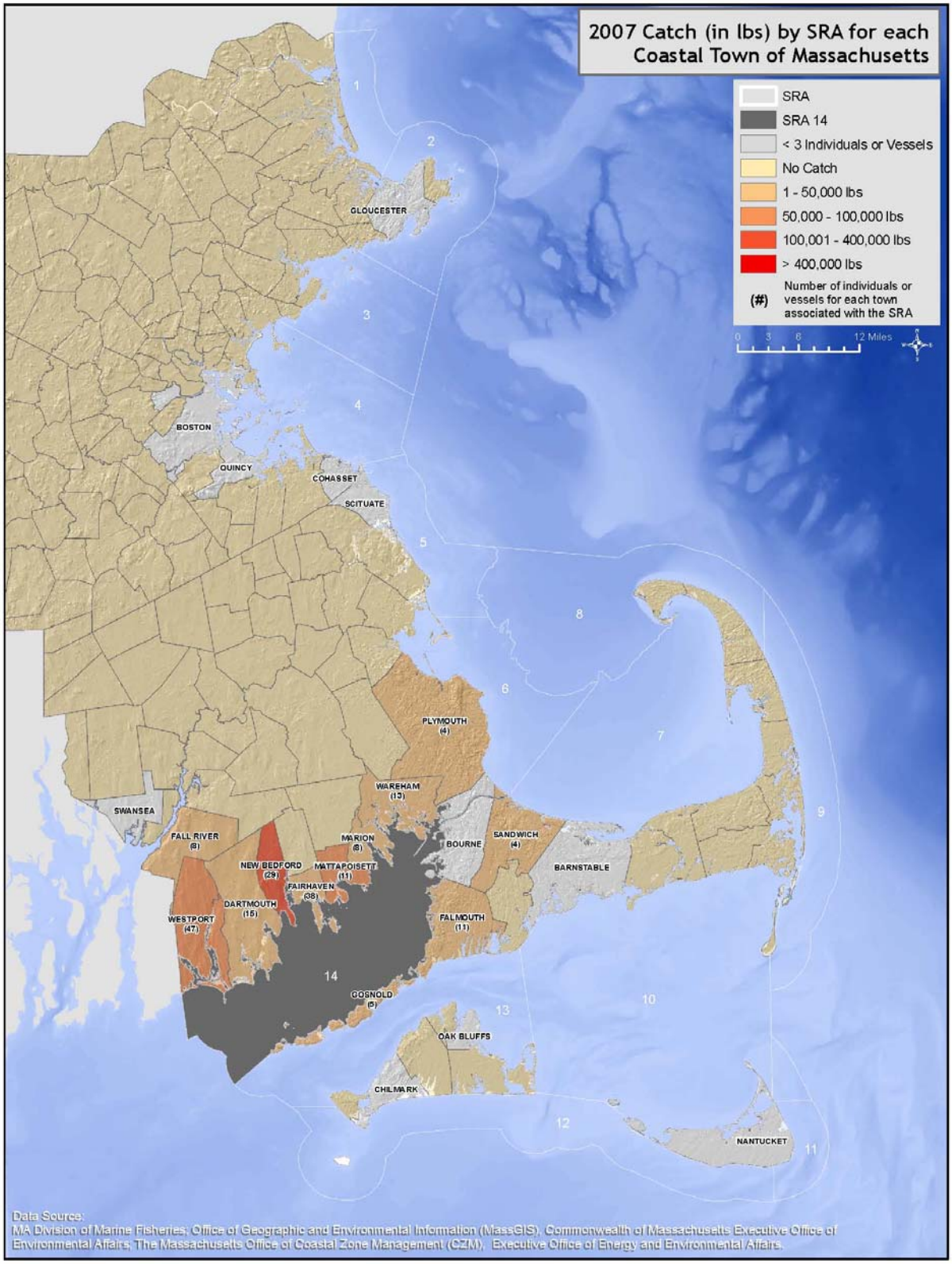


Exhibit A-50: 2007 Estimated Value for SRA 14 by Coastal Town

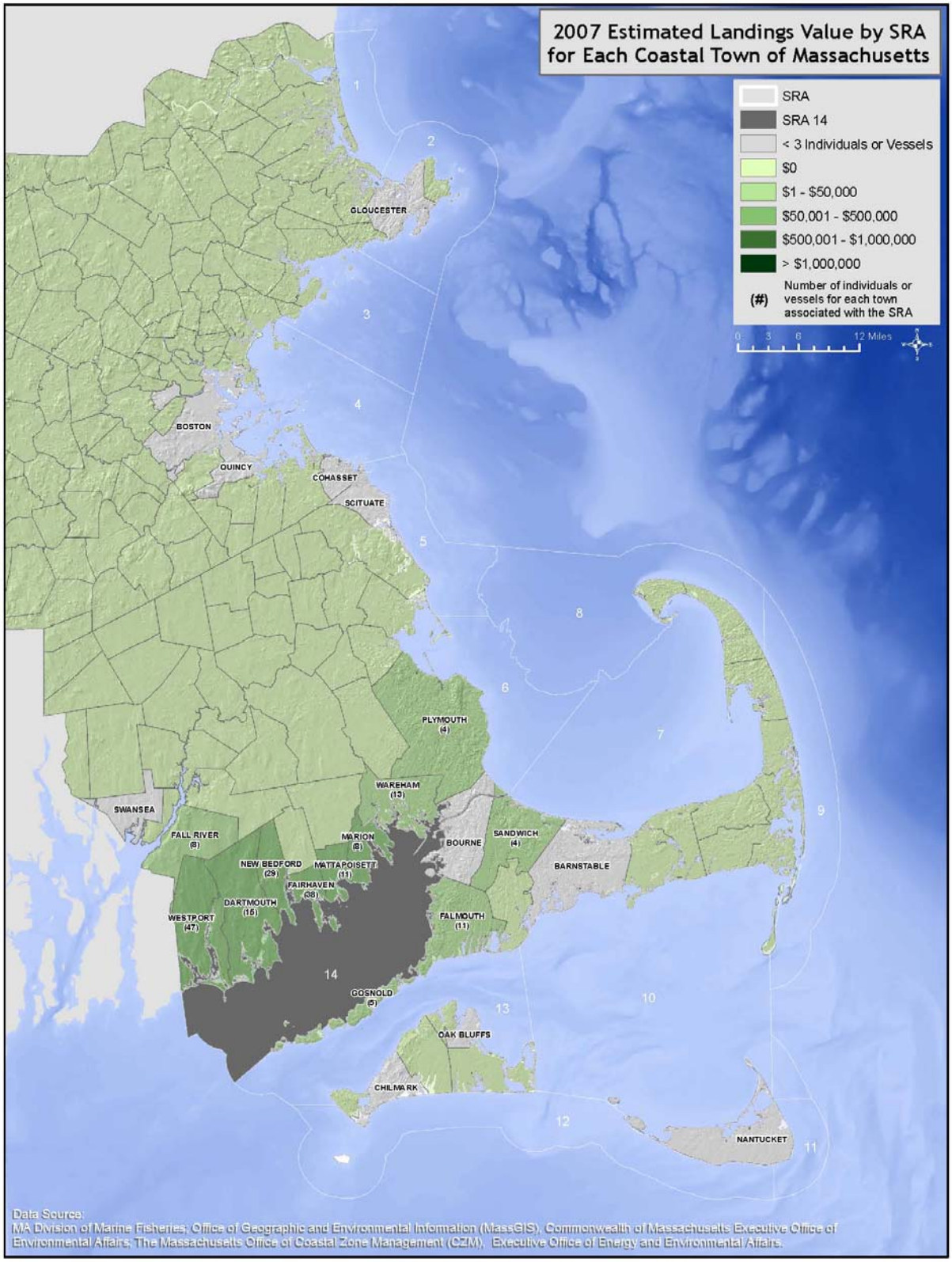


Exhibit A-51: Fishing Effort by Home Port for SRA 14

Town	Catch	Value	Individuals or Vessels	Trips
BARNSTABLE	Less than 3 Individuals or Vessels			
BOSTON				
BOURNE				
CHILMARK				
COHASSET				
DARTMOUTH	24,000	$69,700	15	346
FAIRHAVEN	41,300	$144,300	38	554
FALL RIVER	14,200	$28,800	8	119
FALMOUTH	4,000	$15,500	11	153
GLOUCESTER	Less than 3 Individuals or Vessels			
GOSNOLD	2,300	$9,500	5	54
MARION	46,100	$109,500	8	406
MATTAPOISETT	54,600	$165,800	11	328
NANTUCKET	Less than 3 Individuals or Vessels			
NEW BEDFORD	102,900	$216,800	29	396
OAK BLUFFS	Less than 3 Individuals or Vessels			
PLYMOUTH	3,100	$7,600	4	24
QUINCY	Less than 3 Individuals or Vessels			
SANDWICH	14,600	$35,100	4	99
SCITUATE	Less than 3 Individuals or Vessels			
SWANSEA				
WAREHAM	19,800	$42,200	13	245
WESTPORT	57,100	$191,400	47	488

Exhibit A-52: Total Catch and Value - SRA 14

Fishery[1]	Pounds	Value
Lobster	132,785	$620,238
Black Sea Bass Pot	125,545	$285,596
Striped Bass	73,106	$192,999
Scup Pot	71,545	$66,537
Fluke	44,831	$108,042
Skate	23,300	$1,864
Groundfish[2]	2,190	$3,624
Tautog	1,486	$3,225
Dogfish	1,066	$245
Monkfish	957	$2,198
Flounder	220	$423
Eel	148	$83

Notes:
[1] Fisheries for which fewer than 100 pounds of catch were reported have been omitted.
[2] Fishery grouping as defined by MA DMF via Annual Catch Report data.

This page left intentionally blank

Appendix B: Commercial Shellfish Harvesting by Regional Growing Area

Exhibit B-1: Shellfish Fishing Effort by Landing Port for Buzzard's Bay

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Barnstable	74,200	$44,100	7	24
Boston	18,900	$21,500	4	22
Bourne	210,900	$145,000	29	1,018
Chatham	Less than 3 Permits Identified by DMF			
Dartmouth	121,600	$49,100	9	309
Duxbury	Less than 3 Permits Identified by DMF			
Edgartown				
Essex				
Fairhaven	301,700	$106,900	27	597
Fall River	67,100	$33,500	20	249
Falmouth	135,400	$89,300	49	345
Gloucester	39,900	$9,900	4	5
Gosnold	Less than 3 Permits Identified by DMF			
Ipswich	500	$600	3	4
Marion	74,600	$74,100	14	571
Mashpee	Less than 3 Permits Identified by DMF			
New Bedford	765,400	$586,100	60	920
Newbury	Less than 3 Permits Identified by DMF			
Orleans				
Plymouth				
Quincy				
Sandwich	12,000	$9,900	9	27
Wareham	253,200	$240,100	22	1,008
Wellfleet	6,500	$1,600	4	6
Westport	38,200	$29,400	10	88
Yarmouth	Less than 3 Permits Identified by DMF			

Exhibit B-2: Total Catch and Value by Shellfish Species for Buzzard's Bay

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	1,059,000	$562,700
CLAM, OCEAN QUAHOG	51,500	$9,400
CLAM, SOFT	2,700	$3,200
CLAM, SURF	130,800	$21,400
CLAM, UNC	5,400	$1,200
OYSTER, EASTERN	67,100	$164,900
SCALLOP, BAY	17,100	$38,300
SCALLOP, SEA	545,500	$430,900
SNAILS (CONCHS)	18,000	$20,400
WHELK, CHANNELED	239,000	$198,500
WHELK, KNOBBED	13,900	$13,700

Exhibit B-3: Shellfish Fishing Effort by Landing Port for Cape Cod Bay

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Acushnet	800	$2,100	3	3
Amesbury	Less than 3 Permits Identified by DMF			
Barnstable	296,800	$282,600	43	1,028
Berkley	Less than 3 Permits Identified by DMF			
Boston	10,400	$12,200	4	11
Bourne	Less than 3 Permits Identified by DMF			
Brewster	4,300	$10,200	8	84
Chatham	225,300	$177,700	63	491
Chilmark	Less than 3 Permits Identified by DMF			
Danvers				
Dennis	38,900	$122,300	26	385
Duxbury	1,514,900	$2,381,600	34	2,377
Eastham	619,900	$152,900	23	164
Fall River	Less than 3 Permits Identified by DMF			
Falmouth	22,400	$32,400	27	100
Gloucester	161,900	$43,200	10	36
Harwich	Less than 3 Permits Identified by DMF			
Kingston				
Marion				
Marshfield				
New Bedford				
Orleans	294,000	$111,000	22	198
Plymouth	91,500	$23,500	5	25
Provincetown	51,800	$119,500	12	278
Revere	Less than 3 Permits Identified by DMF			
Sandwich	285,000	$278,200	16	297
Wareham	1,400	$2,500	3	3
Wellfleet	4,048,100	$3,380,600	152	5,031
Yarmouth	1,200	$700	3	9

Exhibit B-4: Total Catch and Value by Shellfish Species for Cape Cod Bay

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	2,854,200	$2,370,400
CLAM, OCEAN QUAHOG	10,100	$2,100
CLAM, RAZOR, ATLANTIC	129,300	$192,000
CLAM, SOFT	216,100	$298,400
CLAM, SURF	1,985,500	$361,200
CLAM, UNC	44,400	$9,500
MUSSEL, BLUE	243,600	$14,800
OYSTER, EASTERN	1,360,800	$3,400,000
SCALLOP, BAY	483,700	$70,600
SCALLOP, SEA	433,700	$455,700
SNAILS (CONCHS)	10,000	$11,800
WHELK, CHANNELED	9,500	$7,000
WHELK, KNOBBED	100	$100

Exhibit B-5: Shellfish Fishing Effort by Landing Port for Elizabethan Islands

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Gosnold	Less than 3 Permits Identified by DMF			
New Bedford	21,900	$19,600	5	56

Exhibit B-6: Total Catch and Value by Shellfish Species for Elizabeth Islands

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	6,300	$6,500
OYSTER, EASTERN	6,300	$30,400
WHELK, CHANNELED	21,900	$19,600

Exhibit B-7: Shellfish Fishing Effort by Landing Port for Greater Boston Harbor

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Acushnet	Less than 3 Permits Identified by DMF			
Boston	150,200	$116,200	18	1,063
Hingham	Less than 3 Permits Identified by DMF			
Hull				
Quincy				
Weymouth				

Exhibit B-8: Total Catch and Value by Shellfish Species for Greater Boston Harbor

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, SOFT	498,100	$602,200

Exhibit B-9: Shellfish Fishing Effort by Landing Port for Massachusetts Bay

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Chatham	Less than 3 Permits Identified by DMF			
Gloucester				
Marshfield				
Plymouth				
Scituate				

Exhibit B-10: Total Catch and Value by Shellfish Species for Massachusetts Bay

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	100	< $100
CLAM, SURF	101,100	$18,900
CLAM , UNC	7,400	$1,600
SCALLOP, SEA	4,300	$3,300

Exhibit B-11: Shellfish Fishing Effort by Landing Port for Mount Hope Bay

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
New Bedford	10,900	$9,800	4	43

Exhibit B-12: Total Catch and Value by Shellfish Species for Mount Hope Bay

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
WHELK, CHANNELED	7,600	$7,900
WHELK, KNOBBED	3,200	$1,900

Exhibit B-13: Shellfish Fishing Effort by Landing Port for North Shore

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Acushnet	Less than 3 Permits Identified by DMF			
Barnstable	94,100	$37,000	5	16
Boston	79,100	$57,500	20	325
Dennis	500	$400	3	5
Eastham	1,100	$1,400	4	5
Edgartown	Less than 3 Permits Identified by DMF			
Essex	1,407,700	$1,813,400	124	6,644
Falmouth	87,700	$104,400	5	70
Gloucester	721,400	$943,900	107	5,134
Ipswich	1,681,700	$2,228,000	187	10,141
Marblehead	5,300	$3,200	13	79
Nantucket	Less than 3 Permits Identified by DMF			
New Bedford	5,800	$5,700	6	14
Newbury	433,500	$582,800	96	2,645
Newburyport	28,400	$31,900	25	235
Oak Bluffs	Less than 3 Permits Identified by DMF			
Peabody	800	$1,100	4	4
Quincy	Less than 3 Permits Identified by DMF			
Revere	57,200	$46,100	20	158
Rockport	Less than 3 Permits Identified by DMF			
Rowley	144,700	$196,900	22	1,063
Salem	1,300	$2,000	7	7
Salisbury	Less than 3 Permits Identified by DMF			
Sandwich				
Wareham				

Exhibit B-14: Total Catch and Value by Shellfish Species for North Shore

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM,RAZOR, ATLANTIC	47,200	$61,200
CLAM, SOFT	4,476,400	$5,811,300
CLAM, SURF	75,400	$12,700
MOLLUSKS, UNC	2,100	$1,500
SCALLOP, SEA	39,400	$39,500
WHELK, CHANNELED	116,500	$134,200
WHELK, KNOBBED	800	$700

Exhibit B-15: Shellfish Fishing Effort by Landing Port for Nantucket Sound

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Barnstable	182,600	$94,600	8	116
Chatham	125,000	$84,400	6	113
Dartmouth	Less than 3 Permits Identified by DMF			
Dennis				
Edgartown	711,000	$697,600	11	475
Fairhaven	Less than 3 Permits Identified by DMF			
Falmouth	183,800	$191,200	12	213
Harwich	332,700	$219,700	3	171
Nantucket	Less than 3 Permits Identified by DMF			
New Bedford	56,700	$49,900	6	33
Oak Bluffs	33,400	$34,800	3	22
Sandwich	Less than 3 Permits Identified by DMF			
Tisbury				
Wellfleet				

Exhibit B-16: Total Catch and Value by Shellfish Species for Nantucket Sound

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	425,500	$272,700
CLAM, SURF	106,900	$18,600
SCALLOP, BAY	400	$600
SNAILS (CONCHS)	100	< $100
WHELK, CHANNELED	978,100	$963,900
WHELK, KNOBBED	136,100	$136,500

Exhibit B-17: Shellfish Fishing Effort by Landing Port for Nantucket

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Barnstable	Less than 3 Permits Identified by DMF			
Chatham				
Falmouth	800	$800	3	4
Gloucester	Less than 3 Permits Identified by DMF			
Nahant				
Nantucket	222,100	$159,600	14	280
New Bedford	Less than 3 Permits Identified by DMF			
Oak Bluffs				

Exhibit B-18: Total Catch and Value by Shellfish Species for Nantucket

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	800	$600
CLAM, SURF	73,700	$12,800
MUSSEL, BLUE	118,700	$1,800
SCALLOP, BAY	102,400	$159,000
SCALLOP, SEA	14,200	$12,400
WHELK, CHANNELED	98,000	$88,800
WHELK, KNOBBED	900	$700

Exhibit B-19: Shellfish Fishing Effort by Landing Port for Outer Cape Cod

Landing Port	Catch (Pounds)	Ex-Vessel Revenue	Total Permits	Total Trips
Barnstable	Less Than 3 Permits Identified By Dmf			
Chatham	13,700	$7,500	24	73
Dartmouth	Less Than 3 Permits Identified By Dmf			
Eastham	61,300	$30,800	8	167
Fall River	13,700	$20,800	4	49
Falmouth	Less Than 3 Permits Identified By Dmf			
Gloucester	13,500	$13,200	3	6
New Bedford	Less Than 3 Permits Identified By Dmf			
Oak Bluffs				
Orleans	303,300	$341,600	78	1,563
Provincetown	25,300	$50,100	4	104
Sandwich	10,900	$17,100	5	12
Wellfleet	8,000	$8,200	5	6

Exhibit B-20: Total Catch and Value by Shellfish Species for Outer Cape Cod

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	55,100	$41,000
CLAM, RAZOR, ATLANTIC	8,800	$20,200
CLAM, SOFT	170,000	$274,600
MUSSEL, BLUE	181,200	$100,800
OYSTER, EASTERN	4,500	$13,800
SCALLOP, BAY	200	$300
SCALLOP, SEA	31,600	$39,600
WHELK, CHANNELED	2,000	$1,600
WHELK, KNOBBED	1,600	$800

Exhibit B-21: Shellfish Fishing Effort by Landing Port for South Cape Cod

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Acushnet	Less than 3 Permits Identified by DMF			
Amesbury	2,100	$600	3	3
Barnstable	1,794,500	$617,400	45	1,257
Boston	Less than 3 Permits Identified by DMF			
Bourne				
Brewster				
Cambridge	1,000	$1,000	8	9
Chatham	3,481,500	$2,410,800	371	12,629
Dennis	26,400	$26,500	14	178
Duxbury	Less than 3 Permits Identified by DMF			
Eastham				
Fairhaven	14,500	$3,500	7	8
Fall River	10,600	$21,300	9	66
Falmouth	844,100	$635,700	87	3,605
Gloucester	Less than 3 Permits Identified by DMF			
Harwich	791,400	$174,900	7	203
Marblehead	Less than 3 Permits Identified by DMF			
Mashpee	102,900	$67,600	8	339
New Bedford	14,000	$12,900	4	59
Orleans	97,700	$138,800	38	511
Provincetown	Less than 3 Permits Identified by DMF			
Revere				
Wareham				
Wellfleet	9,600	$10,000	12	17
Yarmouth	137,300	$93,500	16	530

Exhibit B-22: Total Catch and Value by Shellfish Species for South Cape Cod

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	3,824,300	$1,962,800
CLAM, OCEAN QUAHOG	13,200	$2,400
CLAM, RAZOR, ATLANTIC	15,900	$37,200
CLAM, SOFT	822,200	$1,111,500
CLAM, SURF	1,627,000	$296,200
CLAM, UNC	10,300	$2,200
MUSSEL, BLUE	519,700	$88,000
OYSTER, EASTERN	168,000	$316,900
SCALLOP, BAY	1,000	$2,600
SCALLOP, SEA	444,800	$359,200
SNAILS (CONCHS)	21,200	$19,100
WHELK, CHANNELED	48,500	$46,600
WHELK, KNOBBED	22,800	$22,100

Exhibit B-23: Shellfish Fishing Effort by Landing Port for Martha's Vineyard

Landing Port	Catch (Pounds)	ex-Vessel revenue	Total Permits	Total Trips
Aquinnah	27,000	$47,900	13	100
Chatham	Less than 3 Permits Identified by DMF			
Chilmark	190,100	$221,800	48	772
Edgartown	261,300	$456,000	34	991
Fairhaven	41,900	$40,600	4	52
Falmouth	21,300	$31,000	8	26
Oak Bluffs	77,900	$80,400	15	208
Tisbury	74,800	$90,300	20	255
West Tisbury	16,200	$10,200	5	39

Exhibit B-24: Total Catch and Value by Shellfish Species for Martha's Vineyard

SPECIES	Catch (POUNDS)	EX-VESSEL REVENUE
CLAM, NORTHERN QUAHOG	81,700	$77,200
CLAM, SOFT	44,200	$86,900
OYSTER, EASTERN	154,300	$253,300
SCALLOP, BAY	198,700	$334,200
SCALLOP, SEA	6,900	$5,800
WHELK, CHANNELED	224,800	$221,000

This page left intentionally blank

Appendix C: Overview of NMFS Recreational Fishing Surveys

Introduction[1]

Until the 1970's, it was thought that commercial fisheries took the greater part of the total marine fishery catch in the waters of the United States. However, most species of fish in estuarine and inshore areas, as well as many in open waters, are harvested jointly by recreational and commercial fishermen. Catches by the marine recreational fishery are a significant portion of the total landings of many marine species. The Magnuson Fishery Conservation and Management Act of 1976 mandated collection of data for both commercial and recreational marine fisheries. Following several years of testing, a standard method of data collection and statistical estimation was initiated in 1981. Catch, effort, and participation estimates for marine recreational fisheries have been produced since 1981.

Methodology

The basic design for collecting recreational fishing statistics consists of a complemented surveys approach that includes telephone surveys of fishing effort and an access-site intercept survey of angler catch.

The Coastal Household Telephone Survey (CHTS)

The CHTS collects fishing effort data from shore and private boat anglers. Because the majority of shore and private boat fishing trips are taken by individuals who live in coastal areas, the CHTS is limited to households located in coastal counties. Correction factors derived from the intercept survey are used to account for trips taken by non-coastal resident and out-of-state anglers, as well as anglers who live in households without telephones. Data collection occurs during a two-week period at the end of each two-month sample period (or "wave").

In 2006 the survey was conducted for the entire year (January through December or waves 1-6) on the Pacific coast, the Gulf of Mexico coast, the Atlantic coast of Florida, Hawaii, and Puerto Rico. The survey was conducted for ten months (March through December or waves 2-6) on the Atlantic coast north of Florida, except for Maine and New Hampshire, where it was conducted for six months (May through October or waves 3-5). This regional annual schedule has been maintained since the survey inception in 1979 although not all states, or commonwealths, have been surveyed in all years (see Geographic Coverage section). The CHTS is currently being conducted in the Pacific coast sub-regions (CA, OR, WA) concurrently with Pacific States Marine Fisheries Commission-coordinated state surveys to evaluate alternative angler effort methodologies (Pacific RecFIN hyperlink). The CHTS specifically excludes Texas and Alaska, who conduct their own recreational fishing surveys.

The CHTS utilizes a computer-assisted, random digit dialing (RDD) approach to contact full-time residential households. Contacted households are screened to determine if any household members participated in marine recreational fishing during the previous 2 months, and each active angler is asked to recall the number of saltwater fishing trips that were taken during the wave, as well as provide details about each trip. Institutional housing, businesses, wireless phones, and pay phones are excluded from the survey. Within each state, the sample is allocated among coastal counties in proportion to household populations. For each coastal county, data from the CHTS are used to estimate the average number of trips per household, which is then expanded by the county household population to estimate

[1] The information in this attachment is taken from NMFS' web site, accessed April 28, 2009 (http://www.st.nmfs.noaa.gov/st1/recreational/overview/overview.html).

total trips. County estimates are summed and then expanded by intercept survey adjustment factors to produce state-level effort estimates. All estimates are computed by fishing mode; all mode-level estimates are aggregated to obtain total statewide estimates.

For-Hire Telephone Survey (FHS)

The FHS was developed to resolve under-coverage of Charter and Party boat angler effort by the CHTS. The CHTS does not capture the majority of for-hire angling effort in most states because most anglers who take trips on Charter and Head (or Party) boats do not live in coastal counties. A series of pilot studies to obtain fishing effort information directly from Charter boat operators was conducted in North Carolina and Maine, then throughout the Gulf of Mexico sampling region (Louisiana - West Florida). After several years of testing, the FHS was implemented as the 'official' methodology for obtaining Gulf of Mexico Charter boat effort in January, 2000. This FHS design was then pilot tested against a logbook program and the CHTS in South Carolina in 2000 and included Head boats as well as Charter boats. The FHS was implemented for all Atlantic Coast states from Maine through Georgia in January 2005. It overlaps other charter and headboat monitoring programs, including the Northeast (Maine-Virginia) Vessel Trip Reporting Program (VTR), the Southeast Regional Headboat Survey (SERHS), various state logbook programs, and the ongoing CHTS.

The sampling unit for the FHS is not the household but the individual for-hire vessel. The sample frame is constructed from a comprehensive directory of for-hire boats for all states, from Maine through Georgia. The vessel directory consists of a vessel identifier (vessel name or registration number), the name, address and telephone number of an identified vessel representative (captain or owner), as well as a variety of accessory information, such as eligibility, activity, and cooperation status. Sampling is stratified by vessel type (head boat and charter boat), state, and week, within each two-month sampling wave. Currently, vessels are sampled at a rate of 10 percent within each stratum, with a minimum sample size of 3 vessels.

Data collection is conducted on a weekly basis during all weeks within each wave. The weekly dialing is completed during the week following the specified sample week of fishing. Respondents are asked to report vessel fishing activity for the prior week, and then asked to profile each for-hire fishing trip. Information obtained for each trip includes area fished, number of anglers who fished, hours of actual fishing activity, method of fishing, and target species, if any. Advance notice of selection is mailed to each selected vessel representative and alternative reporting modes are provided for the Atlantic Coast respondents, including an interactive website, a fax number and a phone contact for respondent-initiated interviewing. Effort estimates are produced from the average number of angler-trips per vessel-type per week and the number of vessels per vessel-type in the sampling frame.

Adjustment factors for active for-hire fishing boats that are not in the sample frame (new to fleet, no contact information known, etc.) are produced from field intercept survey questions and applied to the raw effort estimate.

Access-Point Angler Intercept Survey

The access-point angler intercept survey is conducted at public marine fishing access points (boat ramps, piers, beaches, jetties, bridges, marinas, etc.) to collect individual catch data, including species identification, total number of each species, and length and weight measurements of individual fishes, as well as some angler-specific information about the fishing trip and the angler's fishing behavior. The

interviews are conducted in person by trained field staff, and the sites and dates are selected by a proportional random selection process such that those sites that have the most activity within a sample month will be selected for interview collection most often. The sampling schedule is independently determined by fishing mode (shore fishers, charter boat fishers, or private or rental boat fishers) and target sample sizes are based on statistical power and available funds. From these angler-interviews a catch per trip estimate (i.e., catch per unit effort, or CPUE) can be made for each type of fish encountered, either observed or reported. These CPUE estimates are combined with the effort estimates by sampling stratum to produce the catch and harvest estimates. Questions are also asked that provide the information to adjust for non-coastal residents' effort, fishing activity by anglers living in households without traditional landline telephone service, and charter boat anglers fishing from boats that are not in the FHS sample frame for the wave.

The Large Pelagics Survey (LPS)

The Large Pelagics Survey (LPS) is specifically designed to collect information on recreational fishing directed at large pelagic species (e.g., tunas, billfishes, swordfish, sharks, wahoo, dolphin, and amberjack). Offshore trips targeting large pelagics typically make up a relatively small proportion of all recreational fishing trips. Using this specialized survey design allows for higher levels of sampling large pelagic trips, which ultimately improves estimates of catch and effort for large pelagics. The LPS has been conducted since 1992 from Maine through Virginia. The LPS includes two independent, complementary surveys which provide the effort and average catch per trip estimates needed to estimate total catch by species. The Large Pelagics Intercept Survey (LPIS) is a dockside survey of private and charterboat captains who have just completed fishing trips directed at large pelagic species. This survey is conducted at public fishing access sites that are likely to be used by offshore anglers, and is primarily designed to collect detailed catch data. The Large Pelagics Telephone Survey (LPTS) collects fishing effort information directly from captains holding Highly Migratory Species (HMS) permits (required by NMFS to land these species). The LPTS is stratified by permit category: HMS Angling and Atlantic Tunas General permits and HMS Charter/Headboat permits. Data from the phone survey are used to estimate the total number of boat trips on which anglers fished with rod and reel or handline for large pelagic species. The LPS differs from the standard marine recreational fishing surveys mainly in estimating effort and catch by boat, rather than by angler. Information on the number of anglers per boat-trip is collected by the LPIS, but the primary unit for all estimates is the boat-trip, or boat-day of fishing. Additional information collected during LPIS and LPTS interviews include target species, tournament participation, fishing method used, fishing location, water depth, and water temperature.

This page left intentionally blank

Appendix D: Boat Registration Data By Vessel Size Class

Exhibit D-1: Number of Class I Boat Registrations by Community

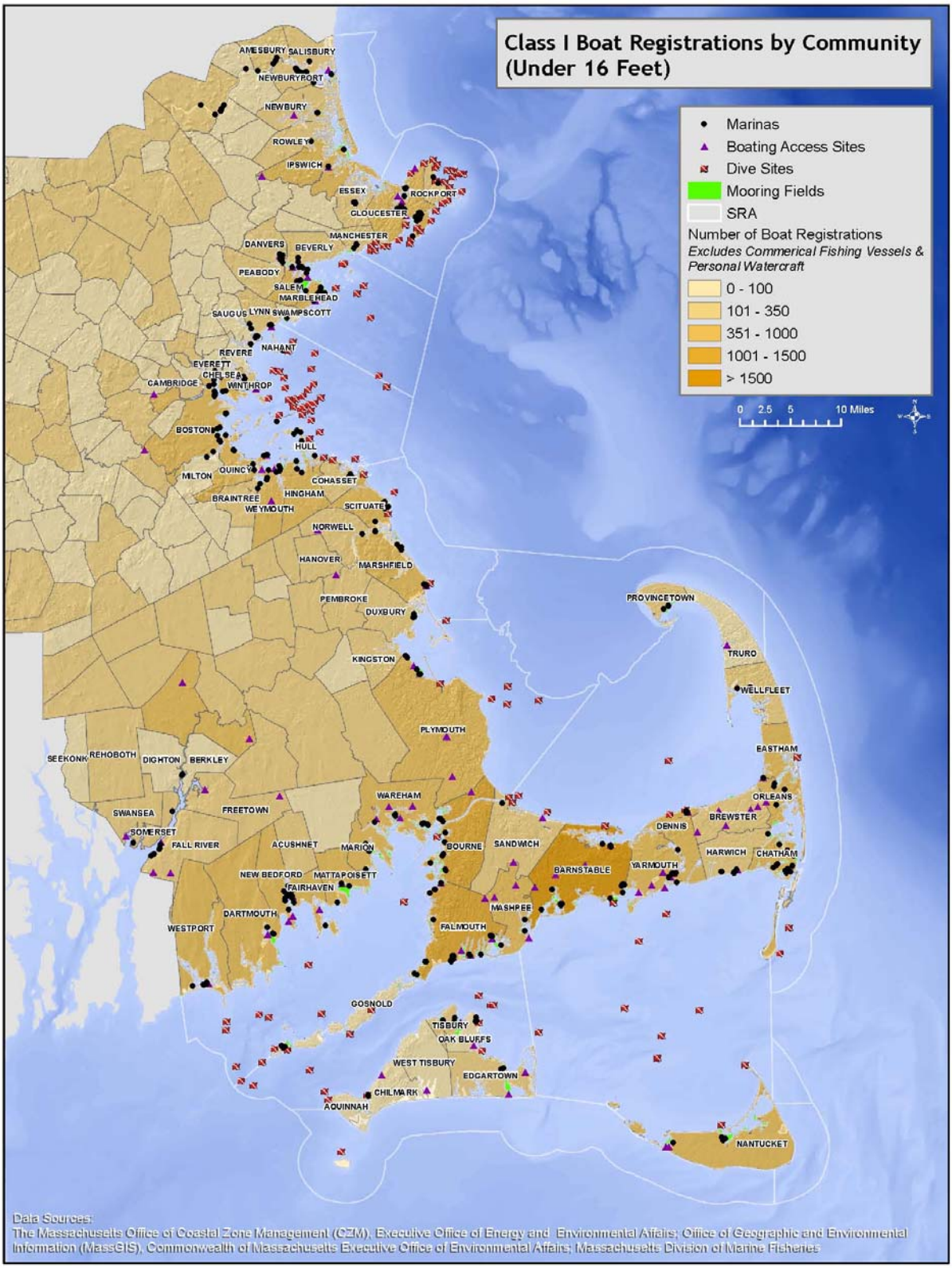


Exhibit D-2: Number of Class II Boat Registrations by Community

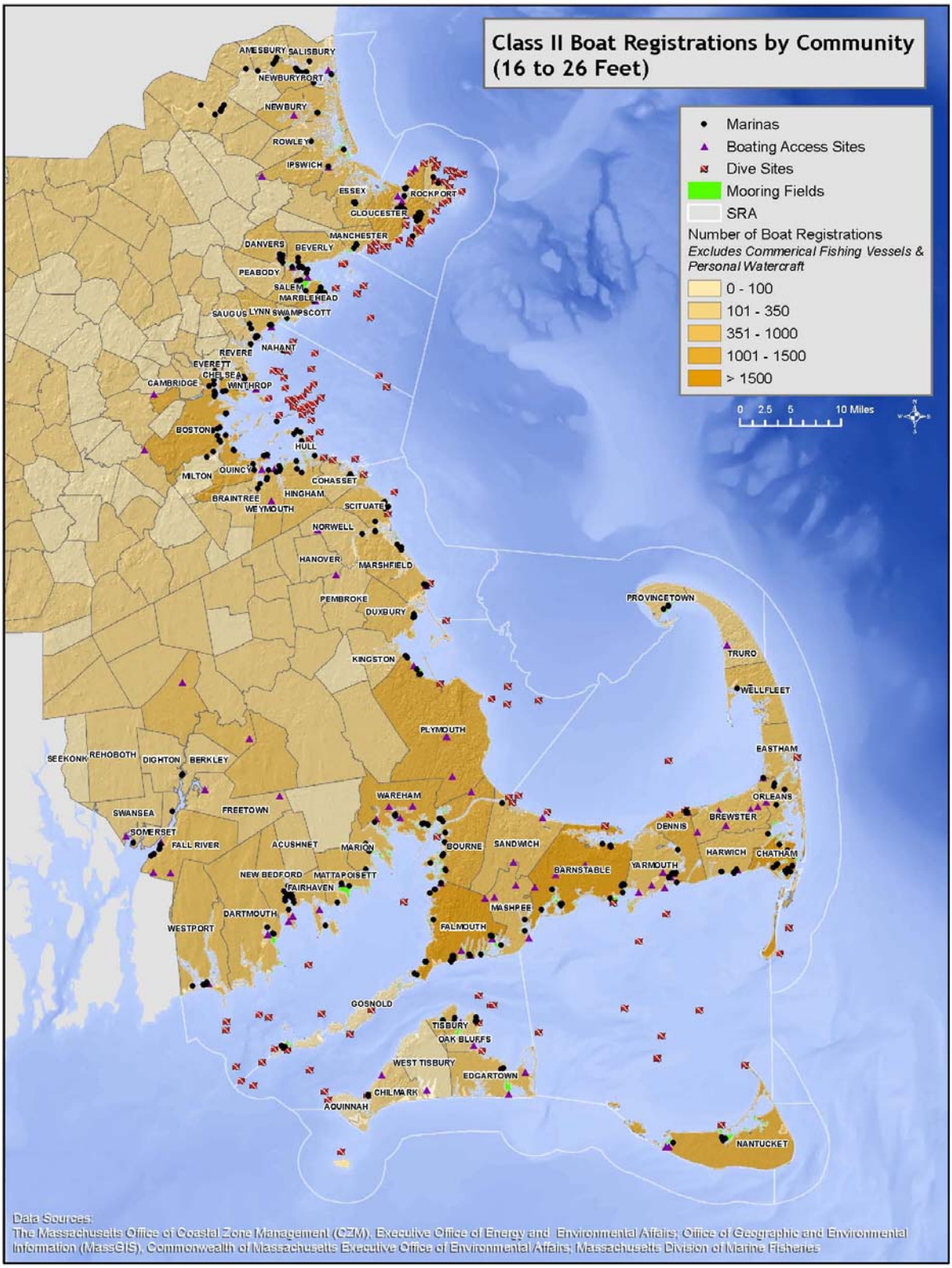


Exhibit D-3: Number of Class III Boat Registrations by Community

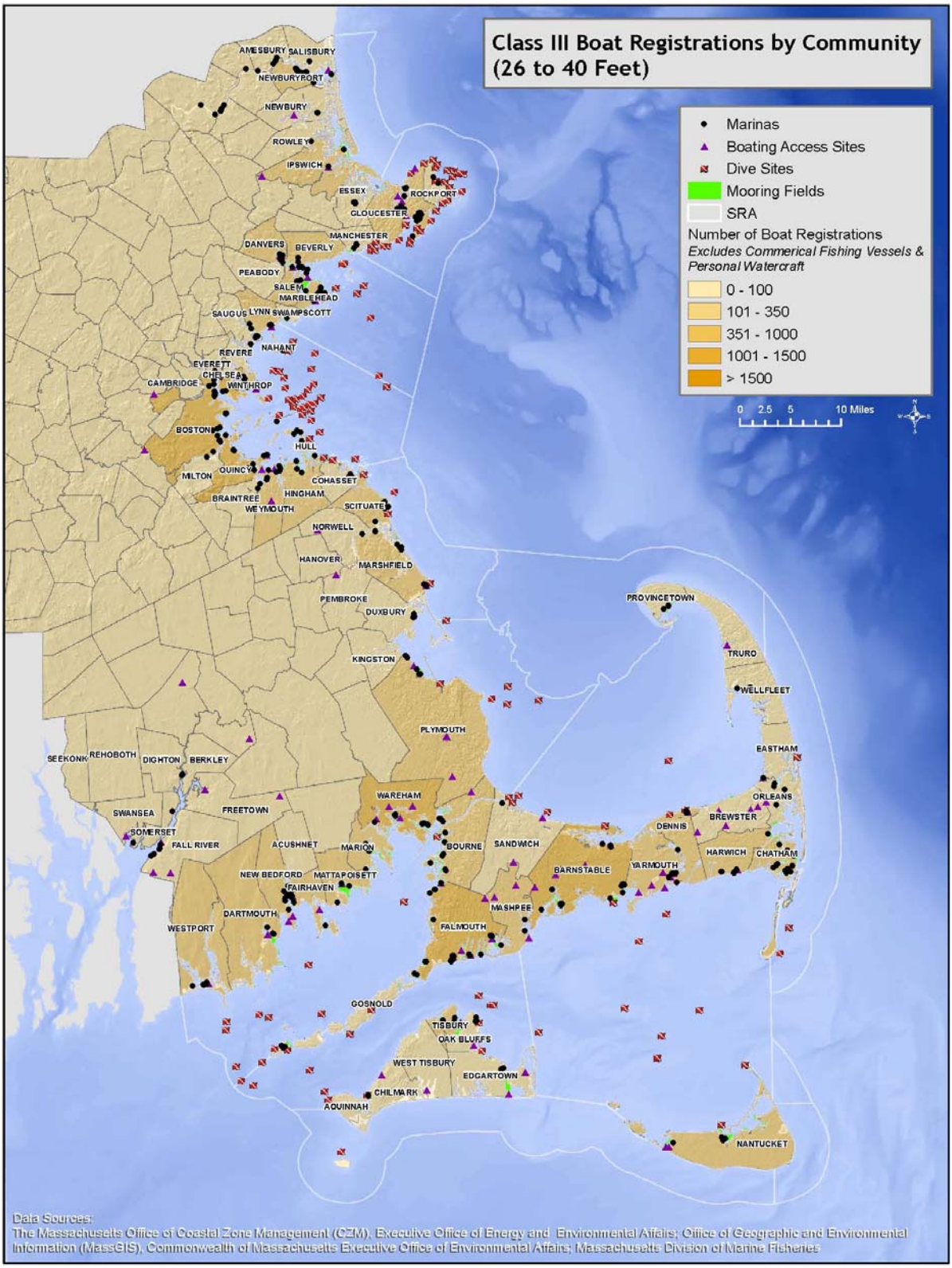


Exhibit D-4: Number of Class IV Boat Registrations by Community

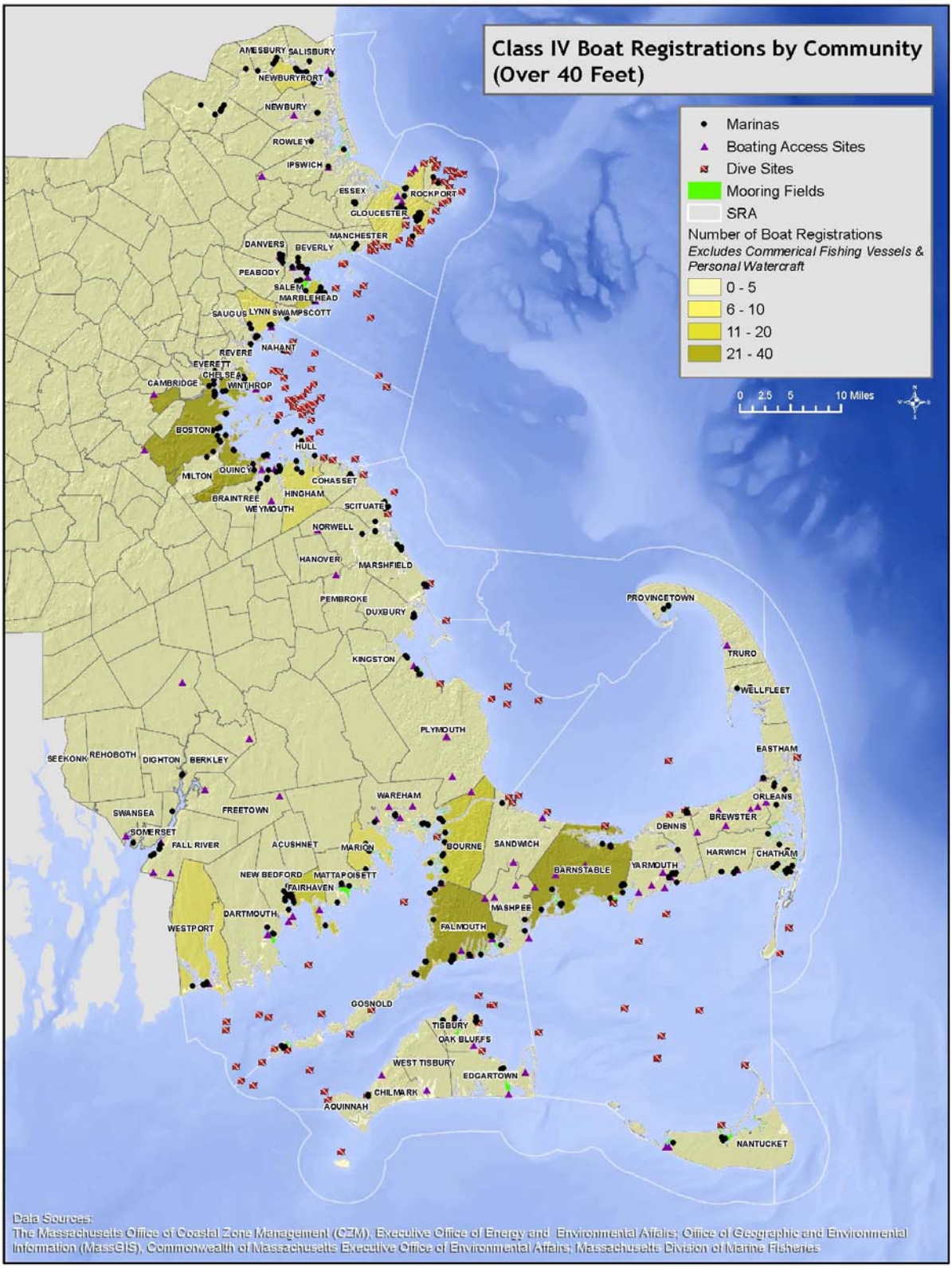


Exhibit D-5: Number of Boat Registrations by Vessel Size Class (Coastal Towns Only)

Town	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)	Total
ACUSHNET	147	126	2	0	275
AMESBURY	161	319	60	0	540
AQUINNAH	18	24	4	1	47
BARNSTABLE	1,586	2,680	568	22	4,856
BERKLEY	95	137	12	0	244
BEVERLY	343	599	171	2	1,115
BOSTON	615	1,219	649	24	2,507
BOURNE	1,013	1,356	329	11	2,709
BRAINTREE	214	225	86	5	530
BREWSTER	204	354	10	0	568
CAMBRIDGE	119	112	46	3	280
CHATHAM	610	1,788	174	1	2,573
CHELSEA	41	88	60	4	193
CHILMARK	61	150	20	0	231
COHASSET	263	322	37	3	625
DANVERS	305	492	248	2	1,047
DARTMOUTH	625	791	179	3	1,598
DENNIS	439	1,140	261	2	1,842
DIGHTON	91	122	47	2	262
DUXBURY	334	913	90	0	1,337
EASTHAM	357	456	13	0	826
EDGARTOWN	324	520	91	3	938
ESSEX	248	445	41	0	734
EVERETT	48	79	3	0	130
FAIRHAVEN	366	549	220	12	1,147
FALL RIVER	312	523	84	5	924
FALMOUTH	1,444	2,585	785	22	4,836
FREETOWN	127	217	13	0	357
GLOUCESTER	930	1,410	283	10	2,633
GOSNOLD	40	65	10	0	115
HANOVER	118	163	17	0	298
HARWICH	335	755	124	3	1,217
HINGHAM	378	826	228	10	1,442
HULL	208	464	147	4	823
IPSWICH	560	737	104	2	1,403
KINGSTON	187	285	18	0	490
LYNN	224	353	108	7	692
MANCHESTER	210	366	99	3	678

Town	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)	Total
MARBLEHEAD	703	1,013	293	15	2,024
MARION	573	412	156	6	1,147
MARSHFIELD	434	845	150	2	1,431
MASHPEE	501	996	207	2	1,706
MATTAPOISETT	410	415	171	2	998
MILTON	64	81	15	0	160
NAHANT	56	93	12	0	161
NANTUCKET	520	1,336	245	2	2,103
NEW BEDFORD	367	472	133	4	976
NEWBURY	221	394	39	0	654
NEWBURYPORT	316	549	196	6	1,067
NORWELL	144	194	15	0	353
OAK BLUFFS	82	243	40	2	367
ORLEANS	526	948	53	0	1,527
PEABODY	174	250	4	0	428
PEMBROKE	224	313	15	0	552
PLYMOUTH	917	1,393	187	3	2,500
PROVINCETOWN	130	230	51	0	411
QUINCY	545	1,017	534	32	2,128
REHOBOTH	101	125	5	0	231
REVERE	82	180	35	0	297
ROCKPORT	109	279	26	2	416
ROWLEY	111	222	22	0	355
SALEM	386	695	323	5	1,409
SALISBURY	105	198	65	1	369
SANDWICH	343	651	47	0	1,041
SAUGUS	94	176	21	0	291
SCITUATE	514	956	269	3	1,742
SEEKONK	70	84	2	0	156
SOMERSET	155	280	73	0	508
SWAMPSCOTT	84	187	28	1	300
SWANSEA	209	320	66	1	596
TISBURY	157	398	106	2	663
TRURO	68	138	13	0	219
WAREHAM	865	1,303	365	2	2,535
WELLFLEET	149	397	56	0	602
WEST TISBURY	41	52	3	0	96

Town	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)	Total
WESTPORT	651	815	143	8	1,617
WEYMOUTH	427	641	164	2	1,234
WINTHROP	200	403	195	9	807
YARMOUTH	539	929	154	2	1,624
Totals	**26,067**	**44,378**	**10,138**	**280**	**80,863**

Exhibit D-6: Percentage of Boat Registrations by Vessel Size Class (Coastal Towns Only)

Town	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)
ACUSHNET	53.5%	45.8%	0.7%	0.0%
AMESBURY	29.8%	59.1%	11.1%	0.0%
AQUINNAH	38.3%	51.1%	8.5%	2.1%
BARNSTABLE	32.7%	55.2%	11.7%	0.5%
BERKLEY	38.9%	56.1%	4.9%	0.0%
BEVERLY	30.8%	53.7%	15.3%	0.2%
BOSTON	24.5%	48.6%	25.9%	1.0%
BOURNE	37.4%	50.1%	12.1%	0.4%
BRAINTREE	40.4%	42.5%	16.2%	0.9%
BREWSTER	35.9%	62.3%	1.8%	0.0%
CAMBRIDGE	42.5%	40.0%	16.4%	1.1%
CHATHAM	23.7%	69.5%	6.8%	0.0%
CHELSEA	21.2%	45.6%	31.1%	2.1%
CHILMARK	26.4%	64.9%	8.7%	0.0%
COHASSET	42.1%	51.5%	5.9%	0.5%
DANVERS	29.1%	47.0%	23.7%	0.2%
DARTMOUTH	39.1%	49.5%	11.2%	0.2%
DENNIS	23.8%	61.9%	14.2%	0.1%
DIGHTON	34.7%	46.6%	17.9%	0.8%
DUXBURY	25.0%	68.3%	6.7%	0.0%
EASTHAM	43.2%	55.2%	1.6%	0.0%
EDGARTOWN	34.5%	55.4%	9.7%	0.3%
ESSEX	33.8%	60.6%	5.6%	0.0%
EVERETT	36.9%	60.8%	2.3%	0.0%
FAIRHAVEN	31.9%	47.9%	19.2%	1.0%
FALL RIVER	33.8%	56.6%	9.1%	0.5%
FALMOUTH	29.9%	53.5%	16.2%	0.5%
FREETOWN	35.6%	60.8%	3.6%	0.0%
GLOUCESTER	35.3%	53.6%	10.7%	0.4%
GOSNOLD	34.8%	56.5%	8.7%	0.0%
HANOVER	39.6%	54.7%	5.7%	0.0%
HARWICH	27.5%	62.0%	10.2%	0.2%
HINGHAM	26.2%	57.3%	15.8%	0.7%
HULL	25.3%	56.4%	17.9%	0.5%
IPSWICH	39.9%	52.5%	7.4%	0.1%
KINGSTON	38.2%	58.2%	3.7%	0.0%
LYNN	32.4%	51.0%	15.6%	1.0%
MANCHESTER	31.0%	54.0%	14.6%	0.4%

Town	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)
MARBLEHEAD	34.7%	50.0%	14.5%	0.7%
MARION	50.0%	35.9%	13.6%	0.5%
MARSHFIELD	30.3%	59.0%	10.5%	0.1%
MASHPEE	29.4%	58.4%	12.1%	0.1%
MATTAPOISETT	41.1%	41.6%	17.1%	0.2%
MILTON	40.0%	50.6%	9.4%	0.0%
NAHANT	34.8%	57.8%	7.5%	0.0%
NANTUCKET	24.7%	63.5%	11.7%	0.1%
NEW BEDFORD	37.6%	48.4%	13.6%	0.4%
NEWBURY	33.8%	60.2%	6.0%	0.0%
NEWBURYPORT	29.6%	51.5%	18.4%	0.6%
NORWELL	40.8%	55.0%	4.2%	0.0%
OAK BLUFFS	22.3%	66.2%	10.9%	0.5%
ORLEANS	34.4%	62.1%	3.5%	0.0%
PEABODY	40.7%	58.4%	0.9%	0.0%
PEMBROKE	40.6%	56.7%	2.7%	0.0%
PLYMOUTH	36.7%	55.7%	7.5%	0.1%
PROVINCETOWN	31.6%	56.0%	12.4%	0.0%
QUINCY	25.6%	47.8%	25.1%	1.5%
REHOBOTH	43.7%	54.1%	2.2%	0.0%
REVERE	27.6%	60.6%	11.8%	0.0%
ROCKPORT	26.2%	67.1%	6.3%	0.5%
ROWLEY	31.3%	62.5%	6.2%	0.0%
SALEM	27.4%	49.3%	22.9%	0.4%
SALISBURY	28.5%	53.7%	17.6%	0.3%
SANDWICH	32.9%	62.5%	4.5%	0.0%
SAUGUS	32.3%	60.5%	7.2%	0.0%
SCITUATE	29.5%	54.9%	15.4%	0.2%
SEEKONK	44.9%	53.8%	1.3%	0.0%
SOMERSET	30.5%	55.1%	14.4%	0.0%
SWAMPSCOTT	28.0%	62.3%	9.3%	0.3%
SWANSEA	35.1%	53.7%	11.1%	0.2%
TISBURY	23.7%	60.0%	16.0%	0.3%
TRURO	31.1%	63.0%	5.9%	0.0%
WAREHAM	34.1%	51.4%	14.4%	0.1%
WELLFLEET	24.8%	65.9%	9.3%	0.0%
WEST TISBURY	42.7%	54.2%	3.1%	0.0%

Town	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)
WESTPORT	40.3%	50.4%	8.8%	0.5%
WEYMOUTH	34.6%	51.9%	13.3%	0.2%
WINTHROP	24.8%	49.9%	24.2%	1.1%
YARMOUTH	33.2%	57.2%	9.5%	0.1%
Totals	**32.2%**	**54.9%**	**12.5%**	**0.3%**

This page left intentionally blank

Appendix E: Boat Registration Analysis Proof of Concept

Introduction

This appendix demonstrates a potential approach to illustrating the links between communities identified in the Massachusetts boat registration data and ocean use areas. Based on a set of hypothetical assumptions regarding typical distances from shore traveled by vessel size classes, along with the boat registration data, this approach attempts to estimate the potential distribution of recreational vessels in Massachusetts waters. As discussed below, refinement of the assumptions inherent in this approach would be needed prior to using the resulting data.

Methodology

The boat registration data provide the number of registered vessels by size class for each Massachusetts community (see Appendix D). For each community, we developed a series of eight concentric areas, ranging from 0.25 kilometers to 250 kilometers from shore. For each vessel size class, we developed a hypothetical distribution for the percentage of time vessels at sea spend within a given distance from shore. These distributions are presented in Exhibit E-1.

Exhibit E-1: Hypothetical Distribution of Vessel Activity (distance from shore) By vessel size class

	Percentage of time typically spent at each distance from shore			
Distance from SHore	Class I (< 16 Feet)	Class II (16 to 26 Feet)	Class III (26 to 40 feet)	Class IV (> 40 feet)
0 to .25 km	75	50	30	20
0.25 to 0.5 km	20	25	20	15
0.5 to 1 km	5	20	20	15
1 to 2 km	0	5	10	10
2 to 5 km	0	0	10	10
5 to 10 km	0	0	5	10
10 to 50 km	0	0	5	10
50 to 250 km	0	0	0	10

For each community, we allocate the number of registered vessels, by size class, to each concentric area based on the assumptions presented above.[1] We repeat this process across all size classes and sum the estimated number of vessels across each concentric area. Then, based on the geometric area of each concentric ring, we apportion vessels to the 250-meter Ocean Management Planning Grid. After repeating this process for each coastal community, we sum the resulting grid values across all communities. As Exhibit E-2 illustrates, the resulting map shows areas of high use near the shoreline, with fewer vessels in waters further from shore.

[1] For example, if a community has 10 Class I vessels, we would allocate 75 percent of the vessels (7.5 boats) to the area within 0.25 kilometers of the community's shoreline. Similarly, we would allocate 20 percent of the vessels (i.e., 2 boats) to the area between 0.25 and 0.5 kilometers from shore, and five percent of the vessels (0.5 boats) to the area between 0.5 and 1 kilometer from shore.

Caveats

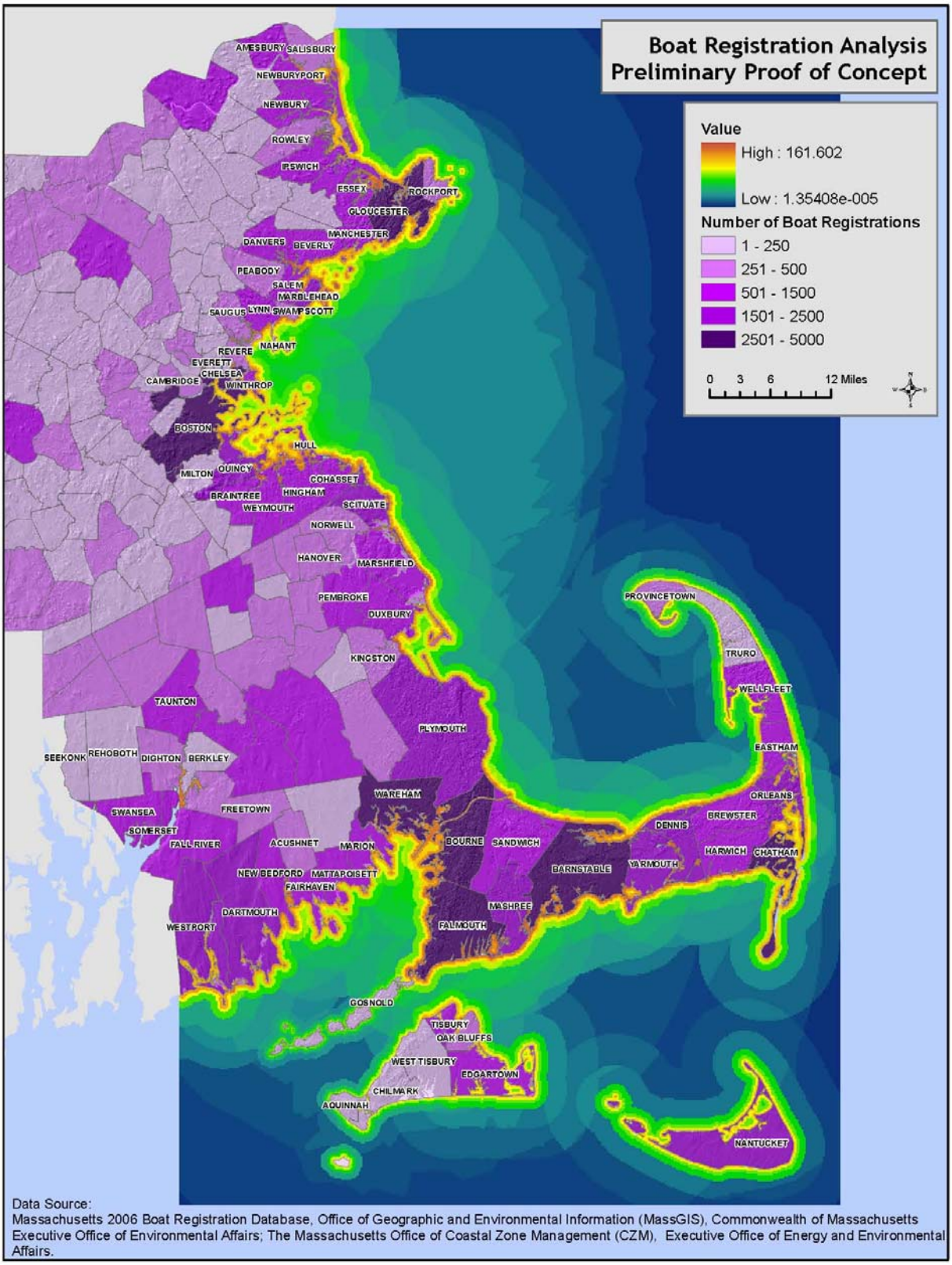
- It is important to recognize that this map relies on *hypothetical* distributions of vessel activity and should be viewed only as an exploration of this concept. If EOEEA and MOP are interested in pursuing the concept further, we will continue to work — through outreach to Steve McKenna, other CZM staff, external outreach, and/or a literature search — to develop defensible assumptions regarding the distribution of vessel activity.

- The concentric areas developed for this analysis are illustrative only. We can adjust the size of the concentric rings to match the data available on vessel size and activity.

- This approach does not identify or account for areas of special interest (e.g., dive sites, recreational fishing grounds, and swimming areas) that may be targeted for use by recreational boaters. Likewise, it does not account for areas that boaters may choose to avoid due to poor or dangerous conditions.

- This illustrative analysis bounded vessel travel at 250 kilometers. Large vessels may travel longer distances from shore; however, these areas would be well beyond the limits of the Massachusetts territorial sea. If necessary, we can work to refine this approach to account for vessels that leave state waters.

Exhibit E-2: Boat Registration Analysis: Preliminary Proof of Concept



Data Source:
Massachusetts 2006 Boat Registration Database, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; The Massachusetts Office of Coastal Zone Management (CZM), Executive Office of Energy and Environmental Affairs.