Standardized Bycatch Reporting Methodology

An Omnibus Amendment to the Fishery Management Plans of the Mid-Atlantic and New England Regional Fishery Management Councils

March 2015

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Amendment 5 to the Atlantic Bluefish Fishery Management Plan (FMP);

Amendment 6 to the Atlantic Herring FMP;

Amendment 4 to the Atlantic Salmon FMP;

Amendment 16 to the Atlantic Sea Scallop FMP;

Amendment 4 to the Deep-Sea Red Crab FMP;

Amendment 15 to the Mackerel, Squid, and Butterfish FMP;

Amendment 7 to the Monkfish FMP;

Amendment 20 to the Northeast Multispecies FMP;

Amendment 4 to the Northeast Skate Complex FMP;

Amendment 4 to the Spiny Dogfish FMP;

Amendment 17 to the Summer Flounder, Scup, and Black Sea Bass FMP;

Amendment 15 to the Surfclam and Ocean Quahog FMP; and

Amendment 4 to the Tilefish FMP

Including a
Final Environmental Assessment,
a Regulatory Flexibility Act Assessment,
and a Regulatory Impact Review

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Executive Summary

This is an omnibus amendment to the fishery management plans (FMPs) of the Mid-Atlantic and New England Fishery Management Councils. This omnibus amendment was developed to address the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to include, in all FMPs, a standardized bycatch reporting methodology (SBRM). A public review draft was prepared to provide the public an opportunity to review the alternatives being considered by the Councils and NOAA's National Marine Fisheries Service (NMFS) and to comment on the document and/or the actions proposed by the Councils and NMFS. Following the formal public review phase, the Councils selected preferred alternatives and revisions were made to the document to reflect the Council's preferred alternatives and to address and respond to the comments provided by the public.

The purpose of the amendment is to: Explain the methods and processes by which bycatch is currently monitored and assessed for Greater Atlantic Region fisheries; determine whether these methods and processes need to be modified and/or supplemented; establish standards of precision for bycatch estimation for all Greater Atlantic Region fisheries; and, thereby, document the SBRM established for all fisheries managed through the FMPs of the Greater Atlantic Region. An objective of the SBRM is to establish, maintain, and utilize biological sampling programs designed to minimize bias to the extent practicable, thus promoting accuracy while maintaining sufficiently high levels of precision. The scope of the amendment is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through an FMP developed by either the Mid-Atlantic or New England Council.

There are 13 FMPs to be amended through this action, and these FMPs address fisheries for 40 species. Five FMPs were developed by the Mid-Atlantic Council, six by the New England Council, and two were developed jointly by both Councils. Many of these FMPs have a long history dating back to the time the Magnuson-Stevens Act was first enacted, while others are relatively new and have only been in place for a few years. There have been a variety of amendments, framework adjustments, and other actions to modify the management measures implemented under these FMPs.

Although management measures are typically developed and implemented on an FMP-by-FMP basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently. For example, New England vessels using extra-large mesh gillnets catch monkfish, skates, and Northeast multispecies, often on the same fishing trip, and, therefore, most participants in this fishery must operate according to the regulations implemented under three different FMPs. To distinguish between the management units identified in individual FMPs and the fisheries that operate under the aegis of one or more FMPs, the SBRM is designed around "fishing modes" defined by the type of fishing gear used and the area from which the vessels depart. There are 56 fishing modes defined in the SBRM, some of which further subdivide a fishery by the mesh size of the gear used (for gillnets and otter trawls), or by the type of permit and access area program (for sea scallop dredges). Although there are differences among the modes, the participants in these fishing modes fish throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight, and land their catch across a large number of fishing ports from the Outer Banks of North Carolina to Downeast Maine.

Information related to discards in a fishery can be collected and monitored in a variety of ways, but the primary sources of information on discards are at-sea fishery observers, recreational fisheries surveys, and fishing vessel trip reports (FVTRs). Information gained from primary sources on fishery discards is used in conjunction with information from fishery independent surveys, seafood dealer purchase reports, and FVTRs to conduct stock assessments and provide scientific advice to fishery managers. Although their application is generally quite limited, supplemental information on discards and fisheries can be obtained from industry-based surveys, study fleets, and alternate monitoring platforms. In addition to these sources of information, there are several new and developing technologies that could one day be used to collect information related to discards, and these include electronic video monitoring, image capture and processing, and other specialized monitoring programs.

Generally, an SBRM can be viewed as the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Several specific analyses are conducted to calculate a measure of the variance associated with the data collected by fisheries observers and to determine the most appropriate fisheries observer coverage levels and the optimal allocation of observer effort across the fisheries in order to minimize the variance to the degree practicable. Given a target level of data precision desired by fisheries scientists and managers, fisheries observer coverage levels can be calculated that would be expected to provide data of the desired precision. Both precision and accuracy are addressed in analyses conducted using observer data and to determine the appropriateness of the data for use in stock assessments and by fishery managers.

Greater Atlantic Region fisheries were stratified into 39 fishing modes and discard rates of 60 species/species groups of fish, sea turtles, marine mammals, and sea birds were examined using 2004 Northeast Fisheries Observer Program (NEFOP) and FVTR data. Data from 2004 were used because 2004 was the most recent year for which complete data were available at the time the 2007 SBRM Omnibus Amendment and associated analysis was initiated. Two ratio estimators were used: Discard-to-days–absent (d/da) and discard-to–kept (d/k) pounds of all species. Three computational methods were employed to derive these ratio estimates: A separate ratio method; a combined ratio method; and a simple expansion method. In general, estimation of total discards was comparable for each ratio estimator and method. The analysis of ratio estimates was published and reviewed at the time of the 2007 SBRM Omnibus Amendment. Since that time additional fishing modes have been identified and incorporated into the SBRM process. The validity of this analysis is not dependent on a specific year's catch data. Therefore, it was unnecessary to duplicate this work for this new amendment document and the analysis used in the 2007 SBRM Omnibus Amendment has been retained. Analyses to refine and improve discard estimations that was conducted after the 2007 SBRM Omnibus Amendment are included and discussed in this amendment. Throughout this document, landings data have been updated where appropriate to characterize the current condition of the fishery.

The precision associated with all six estimates for each fleet and species/species group combination was examined. Again, precision levels were comparable for each estimator and method. In the end, the combined ratio method was selected using discard-to-kept pounds. Data for kept pounds are more easily verified than data for days absent, and the combined ratio method better utilized information associated with kept pounds. A coefficient of variation (CV) of 30 percent was selected as a standard level of precision based upon the recommendation of the National Working Group on Bycatch. The number of observed sea days (and trips) necessary to achieve a CV of 30 percent for species was derived for each fishing mode and species/species group combination. The total estimated number of sea days necessary to achieve a 30 percent CV in 2004, would have exceeded 71,000 days, but this amount can be substantially reduced through the application of several "importance filters." Analyses were performed to evaluate potential sources of bias in the 2004 NEFOP data in order to characterize the accuracy of the data. In general, there was no evidence of a systematic bias in the amount of kept pounds, trip duration, or area fished between the NEFOP and FVTR data, indicating that the data are sufficiently accurate. Additional analyses of potential sources of bias in observer data have been conducted since the 2007 SBRM Omnibus Amendment, and continue to find no evidence of a systematic bias in these data.

To meet the purpose and need for this amendment, the Councils considered alternatives for seven principal components of the SBRM: (1) Bycatch reporting and monitoring mechanisms; (2) analytical techniques and allocation of fisheries observer effort; (3) a performance standard for the SBRM; (4) an SBRM reporting and review process; (5) framework adjustment provisions; (6) a process to prioritize the observer coverage allocations calculated based on the SBRM; and (7) provisions to allow industry-funded observers and/or observer set-aside programs. In addition to the status quo bycatch reporting and monitoring mechanisms, the Councils considered whether to implement electronic video monitoring to supplement or replace at-sea fisheries observers. The Councils considered four alternatives relative to the process used to determine the appropriate allocation of fisheries observer effort: The pre-2007 SBRM Omnibus Amendment process; the integrated allocation approach; the integrated allocation approach with importance filters (the status quo since adoption of the 2007 SBRM Omnibus Amendment); and an alternative that would establish the target observer coverage levels at 20 percent for fisheries that catch common species and 50 percent for fisheries that catch rare species.

Currently, there is no formal SBRM performance standard, so in addition to the status quo, the Councils considered adoption of a coefficient of variance (CV) of 30 percent of the total discards as the performance standard for the SBRM. Although there is currently no required process to provide periodic evaluations of the effectiveness of the

SBRM, the Councils considered requiring specific information to be provided at regular intervals for all of the subject FMPs. In addition, the Councils considered incorporating elements of the SBRM into the framework adjustment and annual specification provisions of each FMP.

To clearly and effectively prioritize the observer coverage allocations based on the SBRM, the Councils are considered alternatives for two different aspects of this prioritization process. The Councils considered two alternatives for how to determine whether the available Federal budget is insufficient to fully implement the SBRM across all fishing modes: The status quo, and identifying specific SBRM funding sources. The Councils considered three alternatives for a prioritization process to distribute the available observer sea days if resources are limiting: Consultation with the Councils, a reduction to all fleets proportional to the funding shortfall, or an approach that uses an iterative process to use the penultimate cell for each fleet. In the unlikely event that Federal funding is so restricted in a given year that there are not enough observer sea days to achieve the minimum pilot coverage in each fleet, the Councils considered three alternatives for allocating the available coverage: Prioritizing fleets ad-hoc, reducing the shortfall by sequentially eliminating coverage in fleets which have the highest minimum coverage days, and reducing the shortfall by sequentially eliminating coverage in fleets that had the highest ratio of minimum pilot coverage to actual days fished in the previous year. In anticipation of future management actions, the Councils also considered creating a framework for industry-funded observer programs including the development of observer set-aside programs.

The preferred alternatives (shaded) of the Mid-Atlantic and New England Councils are identified below.

<table>
<tr><th>SBRM Element</th><th colspan="7">Alternatives Under Consideration</th></tr>
<tr><td>1. Bycatch Reporting and Monitoring Mechanisms</td><td colspan="4">Status quo</td><td colspan="3">Implement electronic video monitoring</td></tr>
<tr><td>2. Analytical Techniques and Allocation of Observers</td><td colspan="2">Pre-2007 SBRM Amendment</td><td colspan="2">Integrated allocation approach</td><td colspan="2">Integrated allocation approach w/ importance filter</td><td>Minimum percent observer coverage</td></tr>
<tr><td>3. SBRM Performance Standard</td><td colspan="4">No performance standard</td><td colspan="3">Establish a CV standard</td></tr>
<tr><td>4. SBRM Review/ Reporting Process</td><td colspan="3">Status quo</td><td colspan="2">Specify an SBRM review process</td><td colspan="2">Require periodic discard reports</td></tr>
<tr><td>5. Framework Adjustment Provisions</td><td>Status quo</td><td colspan="2">Framework adjustment</td><td colspan="2">Frameworks and annual adjustments</td><td colspan="2">Frameworks and annual adjustments excluding fishing modes</td></tr>
<tr><td colspan="8">6. Prioritization Process</td></tr>
<tr><td>6.1 Funding trigger</td><td colspan="3">Status quo</td><td colspan="4">Identify specific SBRM funding sources</td></tr>
<tr><td>6.2 Reallocation</td><td colspan="3">Council consultation</td><td colspan="2">Proportional adjustment</td><td colspan="2">Penultimate Cell Approach</td></tr>
<tr><td>6.3 Less than Minimum Pilot Coverage</td><td colspan="3">Ad hoc prioritization</td><td colspan="2">Remove fleets with high MPC</td><td colspan="2">Remove fleets with high MPC to days absent ratio</td></tr>
<tr><td>7. Industry-Funded Observer Programs</td><td colspan="3">Status quo</td><td colspan="2">Observer provider approval</td><td colspan="2">Framework provisions</td></tr>
</table>

Consideration of the potential and expected environmental impacts of the alternatives described in this amendment illustrates that, because this amendment is focused entirely on the procedural elements (i.e., the methodology) associated with the development and implementation of an SBRM, there are no direct, indirect, or cumulative effects expected on biological resources (including fishery resources, protected resources, or other non-fishery resources), or on the physical environment (including essential fish habitat) for any of the alternatives, and there are no expected socio-economic effects associated with any of the preferred alternatives. Economic impacts on fishing vessel permit holders associated with the non-preferred alternative to implement electronic video monitoring could be substantial, as the cost to purchase, install, and maintain these systems is still quite high.

List of Acronyms and Abbreviations

ABC	Acceptable Biological Catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACFCMA	Atlantic Coastal Fishery Cooperative Management Act
ACL	Annual Catch Limit
AM	Accountability Measure
APA	Administrative Procedure Act
APAIS	Access Point Angler Intercept Survey
ASMFC	Atlantic States Marine Fisheries Commission
CEQ	Council of Environmental Quality
CFDBS	Commercial Fisheries Database System
CV	Coefficient of Variation
CZMA	Coastal Zone Management Act
d/da	Discard-to-days-absent ratio
d/e	Discard-to-effort ratio
d/k	Discard-to-kept ratio
DAS	Days-at-sea
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
eVTR	Electronic Fishing Vessel Trip Report
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FONSI	Finding Of No Significant Impact
FVTR	Fishing Vessel Trip Report
GAM	Generalized Additive Model
GARFO	Greater Atlantic Regional Fisheries Office (formerly NERO)
GPS	Global Positioning System
IBS	Industry-Based Survey
ICNAF	International Commission for the Northwest Atlantic Fisheries
IFQ	Individual Fishing Quota
IQA	Information Quality Act (also known as the Data Quality Act or DQA)

IRFA	Initial Regulatory Flexibility Analysis
ITQ	Individual Transferable Quota
km	Kilometer
lb	Pounds
MA	Mid-Atlantic
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Statistics Survey
MSR	Master Site Register
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NE	New England
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office (renamed GARFO in 2014)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council of the National Academies of Science
NWGB	National Working Group on Bycatch
OLE	NOAA Office of Law Enforcement
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
PSP	Paralytic Shellfish Poisoning
QA/QC	Quality Assurance/Quality Control
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SAFIS	Standard Atlantic Fisheries Information System
SAP	Special Access Program
SAW/SARC	Stock Assessment Workshop/Stock Assessment Review Committee

SBRM	Standardized Bycatch Reporting Methodology
SFCPO	State-Federal Constituent Programs Office
SSC	Scientific and Statistical Committee
TAC	Total Allowable Catch
TAL	Total Allowable Landings
U.S.	United States
USFWS	United States Fish and Wildlife Service
VEC	Valued Ecosystem Component
VMS	Vessel Monitoring System

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APPENDICES

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Chapter 1
Introduction and Background

1.1 Introduction

This document amends the fishery management plans (FMPs) of the Greater Atlantic Region developed according to the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) under the jurisdiction afforded by the Magnuson-Stevens Act to the Mid-Atlantic and New England Fishery Management Councils (Councils). These FMPs (see Table 1) were developed by the Councils in the years since the original Fishery Conservation and Management Act was enacted in 1976, and represent the primary means by which commercial and recreational fishing activities are managed in the Federal waters of the U.S. Exclusive Economic Zone (EEZ).

The fisheries of the Greater Atlantic Region represent a wide variety of target species, fishing operations, and public interests. In many of these fisheries, some proportion of the fish that are caught are not kept to be sold or consumed, but are instead returned to the ocean (discarded). These discards are also known as bycatch, and the Magnuson-Stevens Act directs the Councils and NMFS to address bycatch in all FMPs. This amendment will examine, for these Greater Atlantic Region fisheries, how information on bycatch is collected and assessed, explore alternative methods of collecting information on bycatch, and consider whether any changes to current methods are warranted.

Although this amendment has been prepared primarily in response to the requirements of the Magnuson-Stevens Act, it also addresses the requirements of the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Regulatory Flexibility Act (RFA), the Paperwork Reduction Act (PRA), the Coastal Zone Management Act (CZMA), Executive Orders (EO) 12866 and 13132, the Administrative Procedure Act (APA), and the Information Quality Act (IQA, also known as the Data Quality Act, or DQA). These other applicable laws and directives help ensure that, in developing a fishery management action, the Councils and NMFS fully consider the expected impacts the action may have on the marine environment, living marine resources, and human communities. This integrated amendment document contains all elements of an FMP amendment, an Environmental Assessment (EA), a Regulatory Impact Review (RIR), and a Regulatory Flexibility Assessment.

1.2 The Magnuson-Stevens Act, National Standard 9, and the Required Provisions

In 1996, President Clinton signed into law the Sustainable Fisheries Act that, among other things, added three new National Standards to address fishing communities, bycatch, and safety at sea, put additional emphasis on conserving fish stocks, and added provisions related to essential fish habitat (EFH). The Sustainable Fisheries Act amendments to the Magnuson-Stevens Act included defining the term “bycatch,” adding National Standard 9 to require bycatch to be minimized to the extent practicable, and requiring FMPs to establish a standardized bycatch reporting methodology (SBRM) to assess bycatch.

The Magnuson-Stevens Act now defines bycatch as “fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards.” The Magnuson-Stevens Act expands upon this to say “[bycatch] does not include fish released alive under a recreational catch and release fishery management program.” Also, the Magnuson-Stevens Act defines fish as “finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.” Thus, under the Magnuson-Stevens Act, the term bycatch includes all regulatory and economic discards of finfish, shellfish and other invertebrates, sea turtles, marine plants, corals, etc., but does not include marine mammals or seabirds.

National Standard 9 states that “conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.” Section 303(a) identifies the required provisions of any FMP prepared by a Council or NMFS (acting on behalf of the Secretary of Commerce) and includes (at § 303(a)(11)) the requirement to “establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority—(A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided.” The focus of this amendment is on the requirement to establish an SBRM for each fishery managed under a Mid-Atlantic or New England Council FMP.

In January 2007, President Bush signed the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (Magnuson-Stevens Reauthorization Act) into law. This Act reauthorized the Magnuson-Stevens Act and, among other things, requires the use of annual catch limits and accountability measures to prevent overfishing, provides for widespread market-based fishery management through limited access privilege programs, strengthens the role of science in decision-making, and calls for increased international cooperation. Although the Magnuson-Stevens Reauthorization Act touches on many aspects of fisheries management, nothing in the Act changes the SBRM provisions of the Magnuson-Stevens Act, or any of the associated provisions relevant to this amendment (National Standard 9, definitions of bycatch and fish).

1.3 Statement of the Problem

For most, if not all, fisheries, some proportion of discards die as a result of being caught and/or being discarded. The mortality rate of discarded catch is not known for many resource species and can vary under different conditions. Bycatch can affect fisheries and fishery resources in several important ways: (1) Uncertainty related to the amount and mortality of discards increases the uncertainty associated with stock assessments, diminishing managers' ability to accurately set and achieve optimum yield from a fishery; (2) time spent sorting and discarding unwanted catch reduces the efficiency of fisheries; and (3) mortality of discarded fishery resources precludes other, more valuable, uses of those resources (as future landings, prey for other species, etc.).

In some fisheries, catch rates of unwanted fish, or the mortality rates of discarded fish, may be sufficiently low that bycatch problems are minimal. In other fisheries, however, if both the catch rates of unwanted fish and the mortality of the discards are sufficiently high, bycatch problems may warrant significant management attention. The first step in understanding the scope and extent of any bycatch problems that may be associated with a fishery is to establish the means by which information on bycatch in the fishery can be collected. Scientists and managers must be able to ensure that the bycatch information collection program is adequately reliable and accurate to identify and address the relevant scientific and management needs (e.g., that the lack of information on bycatch and bycatch mortality does not compromise the ability to conduct stock assessments on which to base management decisions). Therefore, the primary purpose of bycatch reporting and monitoring is to collect information that can be used reliably as the basis for making sound fisheries management decisions.

1.4 Purpose and Need

This amendment is needed to ensure that all FMPs of the Greater Atlantic Region, developed under the jurisdiction of the New England and Mid-Atlantic Councils, comply with the SBRM requirements of the Magnuson-Stevens Act. The purpose of this amendment is to:

(1) Explain the methods and processes by which bycatch is currently monitored and assessed for Greater Atlantic Region fisheries;

(2) Determine whether these methods and processes need to be modified and/or supplemented;

(3) Establish standards of precision for bycatch estimation for all Greater Atlantic Region fisheries; and, thereby,

(4) Document the SBRMs established for all fisheries managed through the FMPs of the Greater Atlantic Region.

The scope of this amendment is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through an FMP developed by either the Mid-Atlantic or the New England Council (see Table 1). This amendment does not address fisheries managed through an FMP developed by any other regional fishery management council, the Highly Migratory Species branch of NMFS, the Atlantic States Marine Fisheries Commission (ASMFC) (except those joint FMPs established by both the ASMFC and either the Mid-Atlantic or New England Council), or under the aegis of the Atlantic Coastal Fishery Cooperative Management Act (ACFCMA) (including American lobster and northern shrimp).

It is an objective of the SBRM to be implemented through this amendment that the resulting biological sampling programs be designed to minimize bias to the extent practicable, thus promoting the accuracy of the data, while maintaining a high level of precision.[1] Although throughout this document the Northeast Fisheries Observer Program (NEFOP) will be repeatedly referenced as the primary source of discard data on which the SBRM is based, the purpose and need (objectives) of this amendment should not be confused with the objectives of the Observer Program. The objectives of the Observer Program are broad and extend well beyond the scope of this amendment, including: Estimating takes of species protected under the Marine Mammal Protection Act and/or the Endangered Species Act; collecting biological information about fisheries catches; monitoring experiments and experimental fishing; learning about the economics of fishing; measuring fishing gear performance and characteristics; monitoring international fishing in U.S. waters; and maintaining links between scientists, managers, and fishermen. The objectives of the SBRM Omnibus Amendment, however, are quite specific to meeting the SBRM-related provisions of the Magnuson-Stevens Act. For more information about the objectives and operations of the NEFOP, see the Fisheries Observer Program Manual (NEFSC 2013a) and the Biological Sampling Manual (NEFSC 2013b).

[1] For a more detailed discussion of sampling design, bias (accuracy), and precision, please see Chapter 5 of this document.

FMP	Managed Species
Atlantic Bluefish	Atlantic bluefish (*Pomatomus saltrix*)
Atlantic Herring	Atlantic herring (*Clupea harengus*)
Atlantic Salmon	Atlantic salmon (*Salmo salar*)
Deep-Sea Red Crab	deep-sea red crab (*Chaceon quinquedens*)
Mackerel, Squid, and Butterfish	Atlantic mackerel (*Scomber scombrus*) longfin squid (*Doryteuthis pealeii*) shortfin squid (*Illex illecebrosus*) butterfish (*Peprilus triacanthus*)
Monkfish	monkfish (*Lophius americanus*)
Northeast Multispecies	LARGE-MESH American plaice (*Hippoglossoides platessoides*) Atlantic cod (*Gadus morhua*) Atlantic halibut (*Hippoglossus hippoglossus*) haddock (*Melanogrammus aeglefinus*) ocean pout (*Zoarces americanus*) pollock (*Pollachius virens*) redfish (*Sebastes faciatus*) white hake (*Urophycis tenuis*) windowpane (*Scopthalmus aquosus*) winter flounder (*Pseudopleuronectes americanus*) witch flounder (*Glyptocephalus cynoglossus*) yellowtail flounder (*Limanda ferruginea*) Atlantic wolffish (*Anarhichas lupus*) SMALL-MESH offshore hake (*Merluccius albidus*) red hake (*Urophycis chuss*) silver hake/whiting (*Merluccius bilinearis*)
Northeast Skate Complex	barndoor skate (*Dipturus laevis*) clearnose skate (*Raja eglanteria*) little skate (*Leucoraja erinacea*) rosette skate (*Leucoraja garmani*) smooth skate (*Malacoraja senta*) thorny skate (*Amblyraja radiata*) winter skate (*Leucoraja ocellata*)
Sea Scallop	Atlantic sea scallop (*Placopecten magellanicus*)
Spiny Dogfish	spiny dogfish (*Squalus acanthias*)
Summer Flounder, Scup, Black Sea Bass	black sea bass (*Centropristis striata*) scup (*Stenotomus chrysops*) summer flounder (*Paralichthys dentatus*)
Surfclam and Ocean Quahog	Atlantic surfclam (*Spisula solidissima*) ocean quahog (*Arctica islandica*)
Tilefish	golden tilefish (*Lopholatilus chamaeleonticeps*)

Table 1. List of affected FMPs and managed species.

1.5 Issues to be Resolved

What is the reason this amendment is being developed?

In 2003, the New England Council submitted to NMFS (acting on behalf of the Secretary of Commerce) Amendment 13 to the Northeast Multispecies FMP and, separately, Amendment 10 and Framework Adjustment 16 to the Atlantic Sea Scallop FMP. Both amendments and the framework adjustment proposed substantial changes to the management structures for the groundfish and sea scallop fisheries, including new areas closed to fishing, changes to and reductions in allowable fishing days-at-sea (DAS), and new fishing gear requirements, among other things. Both amendments and the framework adjustment were approved in 2004, and plaintiffs Oceana, the Conservation Law Foundation, and the Natural Resources Defense Council filed suit in the U.S. District Court for the District of Columbia challenging several aspects of Amendment 13. Oceana also later filed suit challenging several aspects of Amendment 10 and Framework 16. In both suits, the Court found the SBRM elements of the amendments and the framework to be inconsistent with the provisions of the Magnuson-Stevens Act.

In *Oceana, Inc., et al.,* v. *Donald L. Evans, et al.*, challenging Amendment 13 (*Oceana* v. *Evans I*), the Court found that the amendment failed to fully evaluate reporting methodologies to assess bycatch, did not mandate an SBRM, and failed to respond to potentially important scientific evidence. In *Oceana, Inc.,* v. *Donald L. Evans, et al.*, challenging Amendment 10 and Framework 16 (*Oceana* v. *Evans II*), the Court similarly found that the amendment and framework did not fully evaluate reporting methodologies, did not sufficiently address potentially important scientific evidence, and did not mandate a methodology for bycatch monitoring. In both cases, the Court remanded to the Secretary for further action the SBRM aspects of Amendment 13 and Amendment 10.

In order to comply with the two Court orders, NMFS and the New England Council were required therefore to amend the Northeast Multispecies and Atlantic Sea Scallop FMPs to ensure they comply with the SBRM provisions of the Magnuson-Stevens Act. Because many bycatch reporting and monitoring methods apply to and are interrelated with all Greater Atlantic Region fisheries, and because some of the weaknesses in the SBRM aspects of Amendment 13 and Amendment 10 may exist in other Greater Atlantic Region FMPs, NMFS and both Councils agreed to amend all Greater Atlantic Region FMPs in one “omnibus” amendment.

After the 2007 SBRM Omnibus Amendment was implemented, a legal challenge was filed (*Oceana* v *Locke*). The U.S. District Court initially found in favor of the Government on all counts. However, that ruling was appealed by the plaintiffs, and the U.S. Court of Appeals issued an opinion that found fault with one element of the amendment, the “prioritization process.” In its decision, the Court found that NMFS had too much discretion when determining if there were sufficient resources available to fund the SBRM and too much discretion in how the available observer sea days would be reallocated. The Court ordered the amendment be vacated and remanded to the agency for further proceedings. To comply with this Court order, both Councils and NMFS agreed to develop an omnibus amendment based on the extensive work already completed for the 2007 amendment, which also addressed the Court's concerns regarding the prioritization process.

What is meant by a "standardized" bycatch reporting methodology?

Although the Magnuson-Stevens Act includes the requirement for an SBRM, it does not define or explain what is meant by a "standardized" reporting methodology. The NOAA Office of General Counsel provided additional guidance on this issue by explaining that the provision does not require regional or national standardization, but rather that the requirement applies to each FMP for the fishery managed under it (NOAA Office of General Counsel 1997). The methodology used could, therefore, vary from one gear type to another, as long as the bycatch reports yield compatible data. For example, under one FMP, a dock intercept interview survey may be the most appropriate methodology to collect bycatch data in a shore-side recreational fishery, while an at-sea observer program may be the most appropriate methodology used to collect bycatch data from commercial fishing vessels. Under this definition, as long as the bycatch data reporting/collection is standardized for each reporting/collection method (i.e., the dock intercept survey is done the same way for all participants in the relevant fishery), then the Magnuson-Stevens Act requirement for an SBRM would be satisfied.

What types of discards are we concerned with?

Fish are discarded for a variety of reasons. Some fish are discarded because the regulations prohibit their retention under all circumstances (e.g., barndoor skates), other fish are discarded because they are smaller than the regulated minimum size (e.g., summer flounder smaller than 14 inches), and some fish are discarded because a possession limit for one species has already been reached but fishing has continued for other species. In other cases, some fish are discarded because there is no market for that species (e.g., sculpin), other fish are discarded because they have low economic/market value relative to other fish the fishermen would rather catch and land (e.g., small skates for the bait market versus large skates for the wing market), and some fish are discarded (particularly by recreational fishermen) simply because they are less desirable than the target species. Fish that are discarded consistent with regulations are called regulatory discards, while fish that are discarded based on economic decisions or personal choices made by the fisherman are called economic discards. Both types of discards represent bycatch that must be accounted for, and all bycatch reporting methods considered in this amendment must address both types. Where practicable, it is useful for the bycatch reporting mechanism to indicate the reason for the discards (regulatory or economic).

What is the focus of this amendment?

While it is important to understand the distinction between regulatory and economic discards, and to account for the reason behind the discards to the extent practicable in the bycatch reporting, the reasons fish are discarded and, therefore, measures that could be used to reduce discards, are not the focus of this amendment. The reasons for discards will not be addressed in detail in this amendment, other than to ensure that the resulting bycatch reporting methods are appropriate and sufficiently sensitive to capture information on both types of discards. Section 303(a)(11) of the Magnuson-Stevens Act addresses both the requirement to establish an SBRM for each FMP and the requirement to include conservation and management measures to minimize bycatch and bycatch mortality to the extent practicable, but this amendment is focused solely on the former requirement. Although these two issues are related, in the ruling on *Oceana v. Evans I*, the D.C. Circuit Court held that "the only part of Amendment 13 [to the Northeast Multispecies FMP] remanded to the Secretary concerns the bycatch reporting methodology" and also concluded that "this provision is severable from the balance of the Amendment." Therefore, the focus of this amendment is limited to the SBRM provision of the Magnuson-Stevens Act. Any further action(s) that may be warranted to address bycatch reduction in one or more of the subject FMPs will be the subject of separate action by the Mid-Atlantic and/or New England Councils and NMFS.

Will this amendment address the reporting of protected species caught as bycatch?

As noted above, the Magnuson-Stevens Act specifically excludes marine mammals and seabirds from its definitions of fish and bycatch, but includes sea turtles. Thus, for the purposes of this amendment, the SBRM discussed herein will not specifically address reporting methodologies for marine mammals or seabirds. However, NMFS has similar obligations under the MMPA and ESA, so where these obligations are interrelated with the provisions of the Magnuson-Stevens Act, this amendment will identify existing methods used to identify, report, and monitor interactions with marine mammals and seabirds. Because sea turtles are specifically included in the Magnuson-Stevens Act definitions of fish and bycatch, this amendment will address the reporting and monitoring of sea turtles caught as bycatch in the subject fisheries.

1.6 Structure of the Amendment

This document amends all existing Greater Atlantic Region FMPs that have been developed by either the Mid-Atlantic or the New England Council. This amendment is focused on identifying, evaluating, and, where appropriate, strengthening the SBRM that applies to all relevant fisheries in the Greater Atlantic Region. In order to present the information contained in this "omnibus" amendment in as clear a manner as possible, the amendment is organized as follows.

Chapter 2 is organized by FMP, and provides a brief overview of each Greater Atlantic Region FMP amended herein. This overview describes the history and management structure associated with the FMP, characterizes where and when the fisheries managed under the FMP primarily take place, identifies the relationship of the primary fishery(ies) to other fisheries in the region, identifies the proportion of catch associated with the recreational and commercial fishery(ies) managed under the FMP, and identifies the primary ports associated the fishery(ies). This chapter also identifies the fishing gears that are used to catch the relevant species and further identifies the primary fishing modes used in the fishery(ies). This last section is intended to serve as a bridge between the consideration of an FMP as the operational unit for Magnuson-Stevens Act compliance and the primary fishing modes as the operational unit for an SBRM.

Chapter 2 is the only one organized by FMP. Chapter 3 introduces the concept of the fishing mode, which, for the purposes of this amendment, is defined as a category of fishing activity (gear- and/or area-based) that can be used to distinguish the common elements of one fishery from those of another. Whereas a single FMP may cover multiple fisheries with substantial differences among them that would affect the design of the most effective SBRM for that FMP, a fishing mode would share many of the relevant characteristics that can be exploited to design an SBRM to be as effective as possible. For example, the Mid-Atlantic Council's Summer Flounder, Scup, and Black Sea Bass FMP encompasses a large-mesh otter trawl commercial fishery (for summer flounder, scup, and, to some degree, black sea bass), a handline/rod and reel commercial fishery (for black sea bass and, to a lesser extent, scup), a commercial pot fishery (for black sea bass), and a variety of recreational fisheries. Other than the target species, these fisheries have more in common with other fisheries that employ the same gear types and occur in the same areas than with each other, and this is true for many FMPs. For example, the Atlantic mackerel pair trawl fishery shares more traits with the Atlantic herring pair trawl fishery than with the squid fisheries, which themselves share many traits with the silver hake fishery managed under the Northeast Multispecies FMP. In some cases, a fishing mode may represent only one FMP, which itself is limited to only one fishing mode (the crab pot/trap fishery and the Deep-Sea Red Crab FMP is an example). In most other cases, however, each fishing mode incorporates subset fisheries managed under multiple FMPs, such as the New England gillnet mode, which includes subset fisheries managed under the Northeast Multispecies, Monkfish, and Northeast Skate FMPs (by "subset," we mean that each of these FMPs is also represented in other fishing modes).

The development of an SBRM must consider how, where, and when it is most appropriate to collect information on and monitor bycatch occurring in a fishery, and the most effective SBRM will be designed at the appropriate operational level. Thus, the organization of this amendment reflects this objective and focuses on fishing modes rather than on the subject FMPs. Chapter 3 describes the fishing modes that are the focus of the rest of the amendment. This chapter identifies the various species caught in each fishing mode, linking back to the description of the FMPs in chapter 2.

Chapter 4 introduces a variety of bycatch reporting and monitoring mechanisms that have been or are being employed in various fisheries around the U.S. and around the world. This chapter does not evaluate the efficacy of these mechanisms (this is done in a later chapter), but simply serves to provide background information and to establish that there are a variety of techniques that can be used to collect this information.

Chapter 5 addresses the analytical components of an SBRM to describe how assessments are done once data are collected and how bycatch data are used to determine the appropriate allocation of at-sea observer effort. The chapter discusses the concepts of precision and accuracy and identifies various problems that can affect the precision and accuracy of bycatch estimates. This chapter focuses largely, but not exclusively, on data collected by at-sea observers, and explains the various techniques that are used to maximize precision and minimize bias.

Chapter 6 identifies the specific management alternatives, including the proposed action, considered by the Councils. This chapter presents alternatives regarding setting a bycatch reporting standard for each fishery, and describes the processes that are to be used to determine whether the standards are being met. This chapter also describes briefly the alternatives that were considered but rejected from further analysis.

Chapter 7 presents the expected environmental consequences of the alternatives considered by the Councils. This chapter describes the affected environment, the impacts associated with the preferred alternative and the other alternatives, and the expected cumulative effects associated with the action.

Chapter 8 describes the relationship of this action to all other applicable laws and directives, including NEPA, the RFA, the CZMA, the ESA, and the MMPA. This chapter documents compliance with these other laws and directives, and includes a Finding of No Significant Impact (FONSI) statement, an assessment under the RFA, and an RIR. Chapter 9 presents a glossary of terms used in this amendment, and chapter 10 lists all the reference materials cited in the amendment. In addition to the main amendment document, there are several appendices.

This structure was selected in order to avoid the duplication and redundancy that would result from maintaining an FMP-based structure throughout the whole amendment. Some degree of duplication is unavoidable in a document such as this, given the many subject FMPs and the multiple legal requirements that apply to its development.

1.7 Proposed Action

The Councils propose management measures and provisions such that, upon implementation of the SBRM Omnibus Amendment to all Greater Atlantic Region FMPs, the following elements would comprise the SBRM, as more fully described in chapters 4, 5, and 6:

1. Bycatch reporting and monitoring mechanisms – This element addresses the methods by which data and information on discards occurring in Greater Atlantic Region fisheries are collected and obtained. The amendment proposes to maintain the status quo. The SBRM shall employ sampling designs developed to minimize bias to the maximum extent practicable. The NEFOP shall serve as the primary mechanism to obtain data on discards in all commercial fisheries managed under one or more of the subject FMPs. All subject FMPs shall continue to require vessels permitted to participate in said fisheries to carry an at-sea observer upon request, and all data obtained by the NEFOP under this SBRM shall be collected according to the techniques and protocols established and detailed in the Fisheries Observer Program Manual (NEFSC 2013a) and the Biological Sampling Manual (NEFSC 2013b). Data collected by the NEFOP shall include, but not be limited to, the following items:

Vessel name, hull number, and permit number; date/time sailed; date/time landed; steam time; crew size; home port; port landed; dealer name; fishing vessel trip report (FVTR) serial number; gear type(s) used; number/amount of gear; number of hauls; weather; location of each haul (beginning and ending latitude and longitude); species caught; disposition (kept/discarded); reason for discards; and weight of catch.[2] These data shall be collected on all species of biological organisms caught by the fishing vessel and brought on board, including species managed under the subject FMPs but also including species of non-managed fish, invertebrates, and marine plants.[3] To obtain information on discards occurring in recreational fisheries subject to a Greater Atlantic Region FMP, the SBRM shall fully incorporate, to the extent practicable and appropriate for the Region, all surveys and data collection mechanisms implemented by NMFS and affected states as part of the Marine Recreational Information Program (MRIP).

2. Analytical techniques and allocation of at-sea fisheries observers – This element addresses the methods by which the data obtained through the mechanisms included above are analyzed and utilized to determine the appropriate allocation of at-sea observers across the subject fishing modes. The amendment proposes to maintain the status quo. The 2007 SBRM Omnibus Amendment substantially expanded and refined observer allocation methods in the Region to fully incorporate all managed species and all relevant fishing gear types in the Region. Since the 2007 SBRM Amendment was vacated, these improved methods have been maintained, and so represent the current status quo. By maintaining the status quo, at-sea fisheries observers shall, to the maximum extent possible and subject to available resources, be allocated and assigned to fishing vessels according to the procedures established through this amendment, as described in chapter 5 to the amendment and in Rago et al. (2005) and Wigley et al. (2007). All appropriate filters identified in chapters 5 and 6 shall be applied to the results of the analysis to determine the observer coverage levels needed to achieve the objectives of the SBRM.

3. SBRM performance standard – The amendment proposes to ensure that the data collected under the SBRM are sufficient to produce a coefficient of variation (CV) of no more than 30 percent, in order to ensure that the effectiveness of the SBRM can be measured, tracked, and utilized to effectively allocate the appropriate number of observer sea days. Each year, the Regional Administrator and the Science and Research Director shall allocate sufficient at-sea observer coverage to the applicable fisheries in order to achieve a level of precision (measured as the CV) no greater than 30 percent for each applicable species and/or species group, subject to the use of the filters noted above and described in chapters 5 and 6.

[2] For detailed lists of the data elements collected by NEFOP observers, by type of fishing trip, see the Fisheries Observer Program Manual (NEFSC 2013a).
[3] For a complete list of the species for which the above listed data elements are collected, see Appendix O of the Fisheries Observer Program Manual (NEFSC 2013a).

4. SBRM review and reporting process – The amendment proposes to require an annual report on discards occurring in Greater Atlantic Region fisheries to be prepared by NMFS and provided to the Councils, and also to require a report every 3 years that evaluates the effectiveness of the SBRM. Every 3 years, the Regional Administrator and the Science and Research Director shall appoint appropriate staff to work with staff appointed by the Executive Directors of the Councils to obtain and review available data on discards and to prepare a report assessing the effectiveness of the SBRM. This report would provide the following information: (1) A review of the recent levels of observer coverage in each applicable fishing mode; (2) a review of recent observed encounters with each species in each fishery (or by gear type for turtles), and a summary of observed discards by weight; (3) a review of the CV of the discard information collected for each fishery; (4) a review of recent estimates of the total amount of discards associated with each fishing mode (these estimates may differ from estimates generated and used in stock assessments, as different methods and stratification may be used in each case); (5) an evaluation of the effectiveness of the SBRM at meeting the performance standard for each fishery; (6) a description of the methods used to calculate the reported CVs and to determine observer coverage levels, if the methods used are different from those described and evaluated in this amendment; (7) an updated assessment of potential sources of bias in the sampling program and analyses of accuracy; and (8) an evaluation of the implications of the discard information collected under the SBRM. Once per annum, the Science and Research Director shall present to the Councils a report on catch and discards occurring in Greater Atlantic Region fisheries, as reported to the NEFOP by at-sea fisheries observers. This annual discard report shall include summaries of the trips observed, fishing modes in the relevant time period, funding issues and other related issues and developments, and projections of coverage across fisheries for upcoming time period. More detailed information would be provided in tables and figures that addressed: The number of observer trips and sea days scheduled that were accomplished for each fishing mode and quarter, as well as the number of trips and sea days of industry activity; the kept weight from unobserved quarters and statistical areas summarized by fishing mode; the amount kept and estimated discards of each species by fishing mode; and the relationship between sample size and precision for relevant fishing.

5. Framework adjustment and/or annual specification provisions – The amendment proposes a measure to enable the Councils to make changes to certain elements of the SBRM through framework adjustments and/or annual specification packages rather than full FMP amendments. All subject FMPs shall provide for an efficient process to modify aspects of the SBRM, as relates to each specific FMP, should the need arise and the appropriate Council determine that a change to the SBRM is warranted and needed to address a contemporary management or scientific issue. Depending on the provisions of each FMP, changes to the SBRM may be effected either through a framework adjustment to the FMP or through annual or periodic specifications. Such changes to the SBRM may include modifications to the CV-based performance standard, the means by

which discard data are collected/obtained in the fishery, or reporting on discards or the SBRM. Such changes may also include the establishment of a requirement for industry-funded observers and/or observer set-aside provisions. The amendment further proposes that changes to the stratification (modes) used as the basis for SBRM-related analyses can be made without requiring formal Council action to ensure that the SBRM stratification accurately reflects changes in the fishing operations.

6. Prioritization process – The amendment proposes a formulaic process to address prioritization of at-sea observer coverage allocations, if the expected funding resources necessary may not be available. NMFS will identify specific funding sources to be used to fund coverage under the SBRM each year. If this funding in a given year is sufficient to fully implement the observer coverage levels estimated to achieve the target CV-based performance standard, then no further prioritization would be necessary that year. If the funding available through these specified sources is not sufficient to fully implement the estimated observer coverage levels in a given year, then an additional prioritization process would be used to determine how the available observer sea days would be allocated across the fisheries. If the available funding is deemed to be not sufficient, but is more than the amount needed to achieve the minimum pilot coverage on all fleets, a process referred to as the Penultimate Cell Approach will be utilized to prioritize coverage across the various agency-funded fishing modes such that the fewest number of fishing mode and species group combinations have a CV that is higher than the CV-based performance standard. If the available funding for SBRM observers in a given year is so restricted that the minimum pilot coverage for each fleet could not be achieved, a formulaic process would be used to eliminate coverage on fleets that had the highest ratio of minimum pilot coverage days to actual days absent from port, as reported by FVTRs from the previous year, until the shortfall in minimum pilot coverage days is removed. Details of these formulaic prioritization processes are described in Chapter 6 and Appendix H.

7. Industry-funded observers and observer set-aside program provisions – The amendment proposes to implement consistent, cross-cutting observer service provider approval and certification procedures and to enable the Councils to implement either a requirement for industry-funded observers and/or an observer set-aside program through a framework adjustment rather than an FMP amendment.

This amendment proposes no additional actions other than those summarized above and described in chapter 6 of this document. No other regulatory changes or management actions are proposed or intended to be implemented at this time. Any further actions or changes to management measures would require an additional action (i.e., annual specifications, framework adjustment, or amendment) by a Council.

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Description of the Fisheries

All of the FMP summaries below incorporate data from the seafood dealer purchase report database, from 2007-2011, inclusive. For some FMPs, the fishing year is offset from the calendar year, and starts on March 1 (Sea Scallops and Deep-Sea Red Crab), May 1 (Northeast Multispecies, Spiny Dogfish, and Skates), or on November 1 (Tilefish). For ease of analysis and consistency of presentation, the landings data for these FMPs are summarized based on calendar year, not fishing year.

2.1 Atlantic Bluefish FMP

Bluefish is a migratory pelagic species found in most temperate and tropical marine waters throughout the world. Along the U.S. Atlantic coast, bluefish commonly are found in estuarine and continental shelf waters. Bluefish are a schooling species that migrate in response to seasonal changes, moving north and inshore during spring and south and offshore in the late autumn. The Atlantic bluefish fishery exploits what is considered to be a single stock of fish.

The Mid-Atlantic Council began developing the Atlantic Bluefish FMP in 1979 in response to a petition by concerned fishermen reacting to developments in international markets for bluefish. The final FMP was adopted as a joint plan between the Council and the ASMFC in 1989. The FMP was approved and implemented in 1990. Amendment 1 to the FMP was developed in response to the Sustainable Fisheries Act amendments to the Magnuson-Stevens Act and implemented in 2000. Amendment 2 to the FMP was the 2007 SBRM Omnibus Amendment. In order to come into compliance with the revised Magnuson-Stevens Act, the Mid-Atlantic Council developed an Annual Catch Limit (ACL) and Accountability Measure (AM) Omnibus Amendment for all of its FMPs. The ACL/AM Omnibus Amendment (Amendment 3 to Atlantic Bluefish FMP) implemented ACLs and AMs for this fishery.

The FMP established a state-by-state commercial quota system and a coastwide recreational harvest limit. The Council and the ASMFC decide annually on a total allowable landings (TAL) level, that is divided between the commercial and recreational sectors (the commercial quota is further allocated to the states from Maine through Florida based on percentage shares specified in the FMP). The FMP calls for 83 percent of the TAL to be allocated to the recreational sector and 17 percent allocated to the commercial sector, but provides for a transfer of quota to the commercial sector from the recreational sector within certain limits. The Bluefish FMP is the only Greater Atlantic Region FMP that allocates specific quota to the states of South Carolina, Georgia, and Florida.

Amendment 1 to the FMP established a plan to rebuild the stock within 9 years through a gradual reduction in fishing mortality rate. The bluefish stock was declared to be rebuilt in 2009. In recent years, commercial catch has ranged from 7.0 million lb in

2007 down to 5.1 million lb in 2011, and recreational catch has ranged from 21.7 million lb in 2007 down to 11.5 million lb in 2011 (see Table 2). The major ports associated with bluefish are listed in Table 3.

The primary gear types used in the commercial fisheries that land bluefish include gillnets, rod and reel, and otter trawls, although there are small localized fisheries, such as the beach seine fishery that operates along the Outer Banks of North Carolina that also catch bluefish. Many of these fisheries do not fish exclusively for bluefish, but target a combination of species including croaker, mullet, Spanish mackerel, spot, striped bass, and weakfish. Recreational fishing, which dominates the catch of bluefish, is almost exclusively rod and reel, and includes shoreside recreational anglers, party/charter boats, and private recreational boats. There is a lot of seasonality to both the commercial and recreational fisheries for bluefish due to the migratory nature of the species.

	Commercial Landings	Recreational Landings
2007	7,006,000	21,690,000
2008	5,718,000	19,672,000
2009	6,469,000	14,513,000
2010	6,968,000	16,194,000
2011	5,077,000	11,499,000

Table 2. Recent commercial and recreational landings (lb) of bluefish.

Primary Ports	Commercial Landings	Ex-vessel Value of Landings
Wanchese, NC	1,585,400	$620,400
Long Beach/Barnegat Light, NJ	665,200	$296,400
Point Judith, RI	290,600	$118,600
Hampton Bays, NY	277,000	$169,800
Montauk, NY	272,000	$169,200
Belford, NJ	*	$*
Hatteras, NC	237,600	$69,200

Table 3. Primary ports associated with the bluefish fishery (values are averaged for 2007-2011). *Data excluded for confidentiality.

2.2 Atlantic Herring FMP

Atlantic herring are distributed along the Atlantic coast from North Carolina to the Canadian Maritime provinces. Schooling, or the formation of large aggregations for feeding and migration, is characteristic of herring species. This behavior begins as early as the onset of metamorphosis during larval development. Although herring schools are sometimes visible at the water's surface during the day, they typically undertake diurnal vertical migrations, sinking to the seafloor during the day and rising to the surface after dusk. Schools of adult herring make extensive migrations to areas where they feed, spawn, and overwinter.

Atlantic sea herring stocks were first managed in 1972 through the International Commission for the Northwest Atlantic Fisheries (ICNAF),[4] which regulated the high-seas international fishery. Upon implementation of the original Magnuson Fishery Conservation and Management Act in 1976, the New England Council developed an FMP for herring. This FMP was implemented in late 1978; however, the FMP was withdrawn in 1982 due to concerns over the lack of enforcement of state waters quotas. In 1996, the Council began development of a new FMP for herring that was intended to closely coordinate Federal management with that of the ASMFC. This FMP was implemented in 2000.

The Atlantic Herring FMP established total allowable catches (TACs) for each of four management areas in the Gulf of Maine and Georges Bank. This FMP established requirements for vessel, dealer, and processor permits, as well as reporting requirements and restrictions on the size of vessels that can catch herring. Amendment 1 to the FMP was completed in 2006 and implemented a limited access qualification program, changes to management areas, and improved monitoring of catch. Amendment 2 to the FMP was part of the 2007 SBRM Omnibus Amendment. In 2011, Amendment 4 implemented a process for establishing ACLs and AMs in the herring fishery and brought the Herring FMP into compliance with the recently reauthorized Magnuson-Stevens Act.

Although some herring are caught incidentally in recreational fisheries for Atlantic mackerel and silver hake, this is limited to coastal New Jersey, and almost all herring are caught for commercial purposes. There are two primary uses of commercially-caught herring: As bait (in either the tuna fishery or the lobster fishery) or as a food fish. Other than tuna vessels catching their own herring to use as bait, almost all herring is caught with either mid-water trawls (single and paired) or purse seines. The majority of herring landings are made with mid-water trawls; purse seines accounted for approximately one-fifth of landings from 2000-2004.

While herring is caught over a wide range, there are seasonal patterns to the fishery. During the winter months (December-March), the fishery is most active in the coastal waters south of New England, as adult herring move into this area. The fishery generally moves offshore and into the Gulf of Maine as spring approaches, and by late

[4] ICNAF formerly coordinated management of many fisheries off the east coast of North America. ICNAF lasted until 1979, when it was partly replaced by Northwest Atlantic Fisheries Organization (NAFO).

summer or early fall, the fishery concentrates on the coastal waters of Maine, New Hampshire, and Massachusetts as herring move into these areas prior to spawning. The Georges Bank fishery is most active in summer and early fall. Table 4 lists recent landings, and Table 5 identifies the major herring ports.

	Commercial Landings	Recreational Landings
2007	163,049,000	139,000
2008	174,400,000	113,000
2009	224,558,000	55,000
2010	144,915,000	46,000
2011	177,165,000	58,000

Table 4. Recent commercial and recreational landings (lb) of herring.

Primary Ports	Commercial Landings	Ex-vessel Value of Landings
Gloucester, MA	51,077,600	$6,051,600
New Bedford, MA	34,077,600	$2,671,400
Portland, ME	28,329,600	$3,764,200
Rockland, ME	27,384,600	$3,562,800
Cape May, NJ	*	$*
Stonington, ME	5,955,600	$772,200
Point Judith, RI	4,160,000	$424,800
Prospect Harbor, ME	3,179,200	$388,400

Table 5. Primary ports associated with the herring fishery (values are averaged for 2007-2011). *Data excluded for confidentiality.

2.3 Atlantic Salmon FMP

Atlantic salmon are a migratory anadromous fish with a complex life history, going through several distinct phases marked by changes in physiology and behavior. Spawning and juvenile development of Atlantic salmon occur in fresh water New England streams, with adults undergoing a highly migratory life on the open ocean and returning to fresh water to reproduce. North American origin Atlantic salmon are either from migratory stocks, undergoing long ocean migrations, or resident stocks, with more limited ocean migrations. Northern Canadian stocks are residential, while New England stocks tend to be migratory, traveling vast distances across open ocean to feeding grounds off the coast of southwestern Greenland and later returning to their New England spawning grounds. Although rivers from Maine to Connecticut once supported healthy populations of Atlantic salmon, native Atlantic salmon have since become extirpated in all but a portion of Maine supporting the remaining Gulf of Maine Distinct Population Segment.

The New England Council developed an FMP for Atlantic salmon that was implemented by NMFS in 1988. The FMP established explicit U.S. management authority over all Atlantic salmon of U.S. origin. The plan was intended to complement state management programs in coastal and inland waters and Federal management authority on the high seas (conferred to the U.S. as a signatory nation to the North Atlantic Salmon Conservation Organization).

The FMP prohibits possession of Atlantic salmon and any directed or incidental (bycatch) commercial fishery for Atlantic salmon in Federal waters. The Council's Atlantic salmon plan strengthens the efforts of local groups, such as the Connecticut River Atlantic Salmon Commission, that are working towards the restoration of salmon stocks in New England river systems. The first change to the Atlantic Salmon FMP, Amendment 1, was implemented in 1999 to designate essential fish habitat and provide for a framework adjustment mechanism related to aquaculture. Amendment 2 to this FMP was the 2007 SBRM Omnibus Amendment.

The Atlantic salmon fishery expanded during the late 1800s from a reported 183 weirs and nets capturing 7,320 salmon in 1867, to 230 weirs and 36 gillnets capturing over 10,016 salmon in 1880. The catch peaked in 1889 with over 17,000 salmon and began a steady decline during the 20th century, with landings falling to as low as 40 salmon in 1947 (Collette and Klein-MacPhee 2002). Because no reporting requirements were established for the fishery, landings data are incomplete. In 1989, all state and Federal commercial salmon fisheries in New England were closed by law. Recreational fishing for sea-run Atlantic salmon is currently prohibited in all New England States. A small local fishery is ongoing for captive reared domestic Atlantic salmon released into select rivers in Connecticut and New Hampshire, these fisheries are individually regulated by each State. In spite of the decline of wild salmon populations, Atlantic salmon remains an important fishery resource in New England through the development of fish farming efforts (aquaculture and mariculture). Salmon mariculture is especially important in Maine, where harvest of farmed Atlantic salmon typically averages between 10 to 12 million pounds and reached almost 25 million pounds in 2010.

2.4 Atlantic Sea Scallop FMP

The Atlantic sea scallop is a bivalve mollusk that is highly valued for the meat in the large adductor muscle that holds the top and bottom portions of the shell together. Sea scallops are semi-mobile, bottom dwelling organisms. They are most abundant on coarse sand, gravel, and cobble. Mature females are highly fecund and produce millions of eggs during the late summer and autumn months. The Atlantic sea scallop is managed as a single unit throughout its range in United States waters. Five stock components are recognized: The Gulf of Maine; eastern Georges Bank; the Great South Channel; the New York Bight; and the waters adjacent to Delaware, Maryland, and Virginia.

The Atlantic Sea Scallop FMP, prepared by the New England Council, was implemented in 1982 to restore adult scallop stocks and reduce year-to-year fluctuations in stock abundance caused by variation in recruitment. Amendments 4 and 7 significantly reduced fishing effort by limiting access to the resource, instituting DAS allocations (limiting the number of days a vessel is allowed to fish for scallops each year), implementing gear restrictions to improve escapement of small scallops and finfish, and limiting crew size. Area closures in New England and the Mid-Atlantic and above-average recruitment have resulted in increased scallop biomass both within and outside of the groundfish closed areas.

One of the foundations of the Scallop FMP is its area rotational management programs, established in 2004 under Amendment 10. Under this program, areas are defined and closed and reopened to fishing on a rotational basis, depending on the condition and size of the scallop resource in the areas. As a result of Amendment 10, controls on scallop effort differ depending on whether a fishing trip occurs in an access area or in an open area. Vessels either fish in access areas under allocated trips, or in open areas under DAS. Amendment 12 was the 2007 SBRM Omnibus Amendment, and Amendment 13 permanently re-activated the industry funded observer program in the same year. Amendment 11, implemented in 2008, included measures to control capacity and mortality in the general category scallop fishery. Primary measures included a limited entry program for general category vessels, as well as other permit provisions including an individual fishing quota program (IFQ). The most recent amendment, Amendment 15, introduced annual catch limits and accountability measures to the Scallop FMP in 2011, as required by the Magnuson-Stevens Act. Various frameworks have set annual or biennial scallop specifications and have included a variety of other management measures aimed at improving the effectiveness of the various aspects of scallop fishery management.

Under current regulations, the scallop fleet can be differentiated by vessel permit category: Limited access vessels that are subject to area-specific DAS controls and trip allocations; and limited access general category vessels that are not subject to DAS controls, but are subject to a possession limit per fishing trip. There are three types of limited access general category permits: Individual fishing quota (IFQ) permits with a possession limit of 600 lb per trip; Northern Gulf of Maine permits with a possession limit of 200 lb per trip; and incidental permits with a possession limit of 40 lb. per trip. The limited access and limited access general category scallop fleets receives a total allocation of 94.5 percent and 5 percent, respectively, of the scallop fishery's ACL, with the remaining 0.5 percent allocated to IFQ permits on vessels that have both limited access general category IFQ and limited access scallop permits. There are no open access permits in this fishery.

Another unique aspect of the Scallop is its industry-funded observer program. Every year, 1 percent of the ACL allocated to the scallop fishery is set-aside to be used as compensation for limited access or limited access general category IFQ vessels that are assigned an observer in open or access areas. If a limited access vessel is assigned an observer while fishing on an open area DAS trip, it will accrue DAS at a reduced rate for the trip. For limited access vessels on access area trips, and IFQ vessels on any trip, vessels receive additional scallop catch above the possession limit on observed trips in order to pay for the observer. If the set-aside is exhausted in a given fishing year, vessel owners must continue to pay for observers assigned to their vessel without receiving any compensation. NMFS sets the compensation rates (i.e., the appropriate scallop lb/trip for each observed trip) at the start of each fishing year based on that year's observer set-aside allocation and closely monitors the set-aside usage each year to avoid fully harvesting it whenever possible.

Scallops are harvested primarily through the use of scallop dredges and trawls. In recent years (2007-2011), almost 98 percent of all scallop landings are by dredge vessels. During the 2007-2011 fishing years, trawl vessels landed another 1-2 percent, with other gear types contributing only trace amounts of scallop landings.

The Atlantic sea scallop fishery is rebuilt to sustainable levels, following declines in fishing mortality from effort reductions, gear restrictions, and closed areas, combined with above average recruitment in some areas and in multiple years since 1999. Revenues from commercial scallop landings for New England and Mid-Atlantic states in the year 2000 were estimated at $161 million. Increased landings since the early 2000's were made possible by an increase in scallop biomass and favorable recruitment. In recent years, total commercial landings have remained relatively constant while revenue has increased by over 50 percent (see Table 6). The majority of limited access vessels are based in Massachusetts, Virginia, New Jersey, and North Carolina, and the primary scallop ports are located in New Bedford, MA, Cape May, NJ, and Newport News, VA (see Table 7).

	Commercial Landings (lb)	Ex-vessel Value
2007	58,521,000	$386,468,000
2008	53,388,000	$370,117,000
2009	57,714,000	$373,735,000
2010	57,058,000	$450,808,000
2011	58,838,000	$580,527,000

Table 6. Recent commercial landings of Atlantic sea scallops.

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
New Bedford, MA	28,502,000	$220,117,000
Cape May, NJ	8,081,400	$59,567,000
Newport News, VA	5,339,600	$38,535,400
Long Beach/Barnegat Light, NJ	2,365,600	$18,781,400
Seaford, VA	*	$*
Hampton, VA	*	$*

Table 7. Primary ports associated with the sea scallop fishery (values are averaged for 2007-2011). *Data excluded for confidentiality.

2.5 Deep-Sea Red Crab FMP

The deep-sea red crab is a deep-water brachyuran crab that occurs in a patchy distribution on the continental shelf and slope from Nova Scotia to Florida. Though the species is found primarily within a 200-1800 meter depth band along the continental shelf and slope, red crabs have also been located in some deep-water canyons along the coast and can also be found in the Gulf of Maine. Preferred depth depends, in part, on the characteristics of individual crabs. Young crabs dwell in considerably deeper water than adults and males are typically found deeper than females. The red crab is a slow-growing species that may not spawn annually. It is long-lived, with some individuals surviving for up to 15 years. These characteristics make it particularly susceptible to depletion by overfishing.

There has been a small directed fishery off the coast of New England and in the Mid-Atlantic for deep-sea red crab since the early 1970s. Though the size and intensity of this fishery has fluctuated, it has remained consistently small relative to more prominent New England fisheries such as groundfish, sea scallops, and lobster. Landings increased substantially after 1994, when implementation of Amendment 5 to the Northeast Multispecies FMP may have led some fishing effort to redirect onto "under-exploited" fishery resources such as red crab.

In 1999, at the request of members of the red crab fishing industry, the New England Council began development of an FMP to prevent overfishing of the red crab resource and address a threat of overcapitalization of the red crab fishery. A control date was established in 2000 to discourage "speculative entry," or rapid entry of new vessels into the fishery and, in 2001, NMFS implemented emergency regulations to prevent overfishing of the resource during the time the FMP was being developed. The FMP was implemented in 2002. The primary management control was to establish a limited access permit program for qualifying vessels with documented history in the fishery. Other measures implemented under the FMP included DAS limits, trip limits, gear restrictions, and limits on processing crabs at sea. Framework Adjustment 1 provided for a 3-year, rather than annual, specification-setting process. Amendment 3 was implemented in 2011 to bring the FMP into compliance with the revised Magnuson-Stevens Act by implementing annual catch limits and accountability measures. Amendment 3 also revised the management measures, by eliminating DAS and the vessel trip limit. The directed, limited access red crab fishery is a male-only fishery, that is currently managed with a "hard" quota (i.e., the fishery is closed when the quota is reached), gear restrictions, and limits on processing crabs at sea.

Although there is an open access permit category, the small possession limit of 500 lb per trip has kept this sector of the fishery very small. The directed red crab fishery is limited to using parlor-less crab pots, and is considered to have little, if any, incidental catch of other species. There is no known recreational fishery for deep-sea red crab. Landings of red crab varied somewhat before the implementation of the FMP, but have stabilized since (see Table 8). All vessels with limited access permits now fish out of Fall River, MA.

	Commercial Landings (lb)	Ex-vessel Value
2007	2,650,000	$2,615,000
2008	2,744,000	$3,153,000
2009	2,188,000	$2,140,000
2010	3,124,000	$3,060,000
2011	3,598,000	$3,488,000

Table 8. Recent commercial landings of deep-sea red crabs.

2.6 Mackerel, Squid, and Butterfish FMP

Atlantic mackerel, *Illex* and longfin squids, and butterfish are all schooling pelagic species that range from at least the Gulf of St. Lawrence south to at least Cape Lookout, NC.[5] Butterfish and the two squids are fast-growing, short-lived species, while Atlantic mackerel grows more slowly and lives several years longer. All four species are most abundant from Georges Bank to Cape Hatteras, NC, and follow seasonal migration patterns based largely on water temperature. Longfin inshore squid was previously referred to as *Loligo* squid. Due to a recent change in the scientific name of longfin inshore squid from *Loligo pealeii* to *Doryteuthis (Amerigo) pealeii*, the common name ''longfin squid'' is now used in all official documents to avoid confusion.

[5] Atlantic mackerel ranges from the Gulf of St. Lawrence to Cape Lookout, NC; *Loligo* squid ranges from Newfoundland to the Gulf of Venezuela; *Illex* squid ranges from the Labrador Sea to the Florida Straits; and butterfish range from the Gulf of St. Lawrence to the coast of Florida.

The FMP was developed by the Mid-Atlantic Council and was implemented in 1983. Early amendments to the FMP changed permit and reporting requirements, the fishing year, quota adjustment mechanisms, foreign fishing and joint venture provisions, and implemented limited access systems for butterfish and the two squid fisheries. In recent years, amendments have been implemented to rebuild the butterfish stock and address bycatch in the longfin squid fishery (Amendment 10, in 2010), limit access in the mackerel fishery (Amendment 11, in 2011), and establish ACLs and AMs for the mackerel and butterfish fisheries (Amendment 13, in 2012). Amendment 12 to this FMP was the 2007 SBRM Omnibus Amendment. Amendment 14 was adopted to improve monitoring in the mackerel, squid, and butterfish fisheries and reduce river herring and shad bycatch, and Amendment 17 was the Omnibus Recreational Accountability Measures Amendment. Amendments that are currently under development would consider adding river herrings and shads as stocks in the Mackerel, Squid, and Butterfish FMP, and address interactions with deep-sea corals.

The mackerel, squid, and butterfish fisheries are all managed by directly controlling harvest. The directed mackerel fishery can be closed when landings are projected to reach 95 percent of the total domestic harvest. The mackerel incidental catch fishery can be closed when landings are projected to reach 100 percent of the total domestic harvest. The directed longfin squid fishery is managed via trimester quota allocations and the directed fishery is closed when 90 percent of the trimester quota allocations or 95 percent of the total domestic harvest is projected to be landed. There is also a cap on butterfish discards in the longfin squid fishery that is allocated by trimester, and closes the longfin squid fishery to directed harvest once it has been exceeded. The directed *Illex* fishery closes when 95 percent of the total domestic harvest is projected to be landed. Finally, butterfish is managed using a phased system. The system triggers butterfish possession limit reductions at different points to ensure quota is available for directed harvest throughout the fishing year. During closures of the directed longfin squid, *Illex*, or butterfish fisheries, incidental catch fisheries for these species are permitted.

Although 1.5 percent of butterfish landed from 2007-2011 were reported as caught with gillnets, and trace amount of these species were reported as caught with a variety of fishing gears, more than 98 percent of reported landings of all four species during this period were caught with otter trawls (midwater and bottom). Management measures implemented under this FMP restrict only the commercial fishing sectors, although there is a recreational fishery for Atlantic mackerel.

Fishing for Atlantic mackerel occurs year-round, although most fishing activity occurs from January through April. The *Illex* squid fishery occurs largely from June through October, although this can vary somewhat from year to year. In some years, the longfin squid fishery remains relatively consistent throughout the year, but in most years, landings peak during October through April. Butterfish are landed year-round, with no apparent seasonal patterns. Table 9 lists the estimated recreational landings of Atlantic mackerel from 2007-2011. Table 10 and Table 11 identify the recent landings, ex-vessel value, and primary ports for these fisheries.

	Recreational Landings (lb)
2007	1,287,000
2008	1,726,000
2009	1,330,000
2010	1,672,000
2011	2,056,000

Table 9. Recreational landings of Atlantic mackerel.

	Atlantic mackerel		Butterfish		Illex squid		Loligo squid	
	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)
2007	56,321	$6,603	1,496	$1,088	19,890	$3,863	27,236	$23,240
2008	47,934	$6,316	996	$758	35,054	$8,346	25,125	$23,460
2009	49,900	$7,978	958	$611	40,606	$9,667	20,517	$18,313
2010	21,775	$3,179	1,269	$829	34,887	$10,758	14,875	$15,366
2011	1,170	$356	1,463	$1,124	41,440	$18,832	21,046	$24,131

Table 10. Recent commercial landings in the Atlantic mackerel, butterfish, and squid fisheries.

Atlantic mackerel		Butterfish		Illex squid		Longfin squid	
Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value
North Kingstown, RI	$*	Point Judith, RI	$270,000	Cape May, NJ	$5,013,000	Point Judith, RI	$7,742,000
Gloucester, MA	$1,200,400	Montauk, NY	$211,400	North Kingstown, RI	$*	Montauk, NY	$3,203,600
New Bedford, MA	$1,163,200	North Kingstown, RI	$54,600	Hampton, VA	$*	North Kingstown, RI	$2,727,400
Cape May, NJ	$743,800	New Bedford, MA	$44,400	Point Judith, RI	$129,600	Cape May, NJ	$2,114,600
Fall River, MA	$277,000	Hampton Bays, NY	$35,400	Wanchese, NC	$127,400	Hampton Bays, NY	$1,430,800

Table 11. Primary ports associated with the Atlantic mackerel, butterfish, and squid fisheries (values are averaged for 2007-2011). *Data excluded for confidentiality.

2.7 Monkfish FMP

The monkfish (also known as goosefish) is a member of the anglerfish family Lophiidae, fishes distinguished by an appendage on the head known as the illicium which has a fleshy end (esca) that acts as a lure to attract prey to within range of its large mouth. Monkfish have a large, bony head and are harvested for their livers and the tender meat in their tails. The species is distributed widely throughout the Northwest Atlantic, from the northern Gulf of St. Lawrence to Cape Hatteras, NC, and is known to inhabit waters from the tide-line to depths as great at 840 meters across a wide range of temperatures.

Adults have been found on a variety of substrate types including hard sand, gravel, broken shell, and soft mud. Spawning occurs in May and June from Cape Hatteras to southern New England. Mature females, which are slightly larger than males, produce a non-adhesive, mucoid egg raft or veil which can reach 20-40 feet in length and ½-5 feet in width. During spawning, this large mass of eggs can account for up to 50 percent of a female's body mass. Monkfish are managed as two stocks, a northern stock from Maine to Cape Cod, MA, and a southern stock from Cape Cod to North Carolina.

During the early 1990s, fishermen and dealers in the monkfish fishery addressed both the New England and Mid-Atlantic Councils with concerns about the increasing amount of small fish being landed, the increasing frequency of gear conflicts between monkfish vessels and those in other fisheries, and the expanding directed trawl fishery. In response, the Councils developed a joint FMP that was implemented in 1999. The FMP was designed to stop overfishing and rebuild the stocks through a number of measures, including: Limiting the number of vessels with access to the fishery and allocating DAS to those vessels; setting trip limits for vessels fishing for monkfish; minimum fish size limits; gear restrictions; mandatory time out of the fishery during the spawning season; and a framework adjustment process.

Reported landings of monkfish increased dramatically from the late 1970s until the mid-1990s and have remained high (see Table 12). Burgeoning markets for monkfish tails and livers in the 1980s allowed fishermen to fish profitably for monkfish, landing increasingly smaller monkfish as the stocks became depleted. Since the implementation of the FMP, however, vessels are more commonly landing large, whole monkfish for export to Asian markets. Revenues have generally increased since the mid-1980s and the relative value of monkfish is currently at its highest point since 1996 (see Table 12 and Table 13).

	Commercial Landings (lb)	Ex-vessel Value
2007	14,440,000	$28,797,000
2008	13,013,000	$27,195,000
2009	10,392,000	$19,513,000
2010	8,790,000	$18,985,000
2011	10,672,000	$26,333,000

Table 12. Recent commercial landings of monkfish.

Primary Ports	Commercial Landings	Ex-vessel Value of Landings
New Bedford, MA	2,244,400	$5,407,600
Long Beach/Barnegat Light, NJ	1,360,600	$2,343,800
Gloucester, MA	1,205,000	$3,569,000
Point Judith, RI	886,200	$1,972,600
Boston, MA	603,400	$1,777,800
Chatham, MA	580,200	$908,400
Montauk, NY	501,800	$801,000
Little Compton, RI	468,200	$679,200
Point Pleasant, NJ	392,200	$628,000

Table 13. Primary ports associated with the monkfish fishery (values are averaged for 2007-2011).

The majority of commercial landings are made using gillnets (67 percent) with another 26 percent landed by otter trawls (according to the fishing vessel trip report (FVTR) database, 2007-2011). Scallop dredges also catch monkfish, but in much smaller amounts (7 percent of reported landings, 2007-2011). No other gear types account for more than trace landings of monkfish. There is no recreational component to this fishery.

The Monkfish FMP has been modified by three amendments and 7 framework adjustment actions since 1999. Amendments have implemented more substantial changes to the FMP, while framework adjustments implement less substantive revisions to existing measures, or specify annual catch levels. Amendment 1 implemented the EFH provisions of the Magnuson-Stevens Act in 1999. Amendment 2, implemented in 2005, included restrictions on otter trawls in certain areas, made the minimum fish size consistent in all areas, closed two offshore canyons to monkfish fishing, created a monkfish research DAS set-aside program, and created new permit categories for fishing in designated areas, among other measures. Amendment 3 was the 2007 SBRM Omnibus Amendment. In 2011, Amendment 5 implemented a process to establish acceptable biological catch amounts and annual catch limits, along with accountability measures to prevent overfishing if such catch limits are exceeded, to bring the FMP into compliance with the Magnuson-Stevens Reauthorization Act. Framework adjustments have generally specified appropriate fishing measures (DAS and trip limits) for each management area to achieve, but not exceed annual catch targets.

2.8 Northeast Multispecies FMP

Sixteen species of groundfish are managed under this FMP (see Table 1). Thirteen species are managed as part of the large-mesh complex, based on fish size and type of gear used to harvest the fish, and three species are included in this FMP as the small-mesh complex but are managed under a separate small-mesh multispecies program. While these sixteen groundfish species exhibit unique body types, behaviors, and habitat preferences, all are demersal, living near the bottom and feeding on benthic organisms. Groundfish are found throughout New England waters, from the Gulf of Maine to southern New England.

In 1977, the New England Council's first groundfish FMP, including only cod, haddock, and yellowtail flounder, was implemented. This plan was primarily developed by NMFS and its individual species quotas were a continuation of the ICNAF quota-based management system. Although the quotas did reduce the catch of these species, the system had a number of serious flaws. Because there was no limit on the number of participants, the number of vessels increased dramatically as the stocks improved between 1977 and 1980. The increasing number of vessels caught the quota in less time causing the fishery to be closed more frequently and for longer periods of time. The quotas forced vessels to catch fish as fast as possible to get the largest possible share before the fishery was closed (known as a "derby" fishery). In 1977, the Gulf of Maine cod quota was taken in 5 months and the Georges Bank quota was caught in 6 months.

The Council implemented a system of individual vessel trip limits that helped to prevent long closures that disrupted market supplies. This action was also intended to mitigate the derby fishery, which caused safety concerns, and to give small boats a greater chance to catch a share of fish proportional to their traditional participation levels. Limits were set for each species and stock area for each of three vessel categories. Because of problems associated with data reliability, enforcement, and equity among the vessel sectors, the Council eliminated the quota-based management system when it adopted the Interim Groundfish FMP in 1982. This plan replaced the catch quotas with minimum fish size and codend mesh size regulations for Georges Bank and the Gulf of Maine. It also allowed small-mesh fishing to continue throughout the Gulf of Maine. Closed areas intended to protect spawning haddock were left in place.

What we now consider the Northeast Multispecies FMP was implemented in 1986. It was the first plan in the world to set biological targets in terms of maximum spawning potential. This mechanism allows the Council to meet its biological objectives either by increasing the age-at-first capture (size of fish caught) or by controlling fishing mortality. The plan also greatly expanded the number of species included in the management unit. In its first year, the plan set minimum fish sizes for some species and changed minimum fish sizes for others. The plan also enlarged one of the haddock spawning closed areas, Area I, and established a large closed area off of southern New England to protect spawning yellowtail and to help reduce fishing mortality. The Exempted Fisheries Program substantially reduced the area and time period available for small-mesh fishing in the Gulf of Maine.

In 1987, the Council adopted Amendment 1 to the FMP, which decreased the area for the silver hake exempted fishery, increased the large-mesh area to include some important yellowtail flounder grounds to the south, and tightened existing mesh size regulations and regulations for the southern New England yellowtail flounder area. Amendment 2 eliminated a scheduled increase in codend mesh size, and implemented the following measures: (1) Trip bycatch limits and stricter non-reporting penalties in the Exempted Fisheries Program; (2) increased some minimum fish sizes; (3) established a seasonal large-mesh area on Nantucket Shoals to protect cod; (4) applied mesh size regulations to the whole nets rather than only to the codend; (5) set all recreational minimum sizes to be consistent with commercial minimum sizes; and (6) excluded trawlers from Closed Area II during the closure to improve enforcement of the closure.

Amendment 3, implemented in 1989, established the Flexible Area Action System. Its purpose was to enable the Council and NMFS to respond quickly to protect large concentrations of juvenile, sub-legal (smaller than the minimum legal size) and spawning fish. Amendment 4 was implemented in 1991 and added more restrictions to the Exempted Fisheries Program; established a procedure for the Council to make recommendations for modifying northern shrimp gear to reduce the bycatch of groundfish; expanded the management unit to include silver hake, ocean pout, and red hake; established management measures for the Cultivator Shoals silver hake fishery; further tightened restrictions on the carrying of small mesh while fishing in the Regulated Mesh Area; and established a minimum mesh size in the southern New England yellowtail flounder area.

Amendment 5 was implemented in 1994 to address the overfishing of principal groundfish stocks that occurred in the late 1980s and early 1990s and reflected a significant turning point in the management of the Northeast multispecies fishery. Amendment 5 established a moratorium on new vessel permits during the rebuilding period (creating the current limited access permit system based on history in the fishery), implemented a DAS effort reduction program (the first of its kind), added additional mesh size restrictions, and also included interim gillnet regulations to reduce harbor porpoise bycatch, a mandatory vessel trip reporting system for landings, a prohibition on pair-trawling, a requirement for a finfish excluder device for shrimp fishery, changed some minimum fish sizes, and expanded the size of Closed Area II. Amendment 6 followed shortly after to implement additional haddock conservation measures.

Amendment 7, implemented in 1996, accelerated the DAS effort reduction program established in Amendment 5, eliminated significant exemptions from the current effort control program, provided incentives to fish exclusively with mesh larger than the minimum required, broadened the area closures to protect juvenile and spawning fish, and increased the haddock possession limit. It established a rebuilding program for Georges Bank and Southern New England yellowtail flounder, Georges Bank and Gulf of Maine cod, and Georges Bank haddock based primarily on DAS controls, area closures, and minimum mesh size. Additionally, the amendment changed existing permit categories and initiated several new ones, including an open access multispecies permit for limited access sea scallop vessels. Amendment 7 also created a program for reviewing the management measures annually and making changes to the regulations through the framework adjustment process to insure that plan goals would be met.

Amendment 8 was implemented to address gear conflict issues between the mobile gear participants of the groundfish and scallop fisheries and the fixed gear participants of the lobster fishery. Amendment 9 established new status determination criteria (overfishing definitions) and set optimum yield for twelve groundfish species to bring the plan into compliance with the Sustainable Fisheries Act. Amendment 9 also added Atlantic halibut to the FMP's management unit. Amendment 10, known as the "consistency amendment," was developed to make the vessel upgrading and replacement provisions consistent across all New England and Mid-Atlantic Council FMPs. Amendment 11 addressed the Sustainable Fisheries Act EFH requirements. Amendment 12 addressed the Sustainable Fisheries Act requirements for silver hake, red hake, and offshore hake through a separate small-mesh multispecies management program implemented in 2000.

In addition to the amendments implemented prior to Amendment 13, the FMP was modified through a number of framework adjustments designed to achieve the Amendment 7 fishing mortality targets or to fulfill the requirement for annual adjustments to management measures. Several joint frameworks with the Sea Scallop FMP were implemented to provide scallop vessels access to the groundfish closed areas. Frameworks 32, 35, 37, and 38 instituted additional changes to management of the small-mesh fishery, including several new small-mesh gear exemption areas and elimination of default rebuilding measures.

The Council began work in Amendment 13 in February 1999. The purpose for this amendment included a need to develop rebuilding programs to meet the Amendment 9 status determination criteria and to address problems identified with the effort control program (DAS). After this amendment was begun, the Council submitted Framework 33 to meet the Amendment 7 requirement for an annual adjustment to the FMP. This framework was implemented May 1, 2000. On May 19, 2000, a coalition of conservation organizations challenged Framework 33 alleging that it failed to implement programs necessary to rebuild groundfish stocks to the Amendment 9 targets and did not meet bycatch requirements of the Magnuson-Stevens Act (*Conservation Law Foundation et al*. v. *Evans et al*.). The Court found in favor of the plaintiffs on December 28, 2001. After a series of negotiations among various parties, interim measures were adopted by the Court in 2002 and NMFS was instructed to submit a management plan that complied with the Magnuson-Stevens Act. Amendment 13–already in development–was recognized as the most appropriate vehicle to meet the Court's requirement.

Amendment 13 was implemented in 2004, and included several new management features. The amendment classified multispecies DAS into three categories (unrestricted A DAS, restricted use B DAS, and C DAS, which cannot be used at this time); enables the Council to create/allow "special access programs" (SAPs)[6] for healthy stocks, such as Georges Bank haddock; allows sectors of the groundfish fishing industry to develop their own sector allocation plan; includes an adaptive approach for rebuilding groundfish stocks that requires biennial adjustments to management measures; and implements several provisions of the U.S./Canada Resource Sharing Understanding.[7] Since Amendment 13 was implemented, several framework adjustments have been developed to modify, fully implement, and/or comply with various provisions of Amendment 13. Several environmental groups challenged Amendment 13, claiming that the rebuilding programs did not comply with the Magnuson-Stevens Act, the management measures would be ineffective, an SBRM was not included, and the amendment did not consider a sufficiently broad range of alternatives. The Court upheld the amendment with the exception of the reference to the SBRM.

Amendment 16 was implemented May 1, 2010 and provided major changes in the realm of groundfish management. Notably, it greatly expanded the sector program and implemented Annual Catch Limits in compliance with 2006 revisions to the Magnuson-Stevens Act. As a result of this amendment, about 95 percent of the fishery chose to operate in a form of cooperative referred to as a sector, subject to strict limits on catch. These vessels are not subject to trip limit or days-at-sea controls. This management system drastically changed the way the fishery operates. At the time of its implementation, Amendment 16 was expected to reduce bycatch as it reduces regulatory discards. Possession of some species was prohibited to reduce catches (ocean pout, windowpane flounder, wolffish, SNE/MA winter flounder). The amendment also included a host of mortality reduction measures for "common pool" (i.e. non-sector) vessels and the recreational component of the fishery.

The New England Council developed Amendment 19 with the initial goal of bringing the small-mesh multispecies portion of the NE Multispecies FMP into compliance with the ACL and AM requirements of the reauthorized Magnuson-Stevens Act. However, development of Amendment 19 was delayed for several reasons, so NMFS implemented ACLs and AMs for the small-mesh multispecies in 2012 through a Secretarial Amendment. The Council continued development of Amendment 19 in order to adopt the ACL framework used by the Secretarial Amendment, as well as to modify

[6] There are three SAPs currently in place: The Closed Area I Hook Gear Haddock SAP is open to NE multispecies DAS vessels fishing with hook gear in a portion of Closed Area I; the Eastern U.S./Canada Haddock SAP Pilot Program is open to NE multispecies DAS vessels using a haddock "separator" trawl in portions of the Eastern U.S./Canada Area and Closed Area II; and the Closed Area II Yellowtail Flounder SAP is open to NE multispecies DAS vessels fishing for yellowtail flounder in the southern portion of Closed Area II.

[7] The U.S./Canada Resource Sharing Understanding (Understanding) was reached between the United States and Canada regarding the management of Georges Bank cod, Georges Bank haddock, and Georges Bank yellowtail flounder resources found within the waters of both countries in an area known as the U.S./Canada Management Area. Amendment 13 implements certain measures consistent with the Understanding, including a requirement to use VMS, an area declaration requirement, and specific gear requirements (flatfish net or haddock separator trawl).

other management measures for the small-mesh multispecies fishery. The management measures in the Secretarial Amendment and Amendment 19 include an incidental trip limit trigger to prevent the ACL from being exceeded, a year-round trip limit for red hake, and the potential to implement a quarterly quota system in the southern area, should landings increase rapidly. Because these species are caught incidentally in many fisheries, landings are never prohibited if a quota is projected to be reached, just reduced to an incidental limit to discourage directed fishing. In general, the small-mesh multispecies portion of the fishery is managed using mesh-size dependent trip limits for whiting (silver and offshore hake, combined), area restrictions on small-mesh, and a new year-round trip limit for red hake.

The NE Multispecies FMP has been modified through a number of framework adjustments designed to achieve fishing mortality targets or to fulfill the requirement for annual adjustments to management measures. Several joint frameworks with the Atlantic Scallop FMP were implemented to provide scallop vessels access to the groundfish closed areas. Frameworks 32, 35, 37, and 38 each instituted additional changes to management of the small-mesh fishery, including several new small-mesh gear exemption areas and elimination of default rebuilding measures.

There are a variety of fishing gears used in the commercial groundfish fishery. Otter trawls are the primary gear type used for all species in both the large-mesh and small-mesh complexes and flatfish and silver hake are caught almost exclusively with otter trawls. Based on FVTR data for 2007-2011, gillnets contribute substantial amounts of Atlantic cod, pollock, redfish, and white hake. Other gears identified in the FVTR data associated with landings of groundfish include handlines, longlines, and fish pots. Recreational fishing for groundfish is focused primarily Atlantic cod, pollock, haddock, red hake, and winter flounder. Recreational fishing is conducted by shore-based anglers and anglers with private boats, as well as by anglers aboard party/charter vessels. See below for recent commercial and recreational landings of large-mesh (Table 14) and small-mesh (Table 16) multispecies, aggregated across the complexes. Table 15 and Table 17 identify the primary ports associated with the large-mesh and small-mesh multispecies complexes, respectively, along with the average recent landings and ex-vessel values for each of the primary ports.

	Commercial Landings	Recreational Landings[8]
2007	57,403,000	5,407,000
2008	67,286,000	6,841,000
2009	62,854,000	5,900,000
2010	62,166,000	7,498,000
2011	63,164,000	8,044,000

Table 14. Recent commercial and recreational landings (lb) of large-mesh multispecies (aggregated).

Primary Ports	Commercial Landings	Ex-vessel Value of Landings
Gloucester, MA	21,434,000	$27,510,000
New Bedford, MA	18,053,000	$25,869,000
Boston, MA	7,631,000	$9,290,000
Portland, ME	5,010,000	$6,324,000
Chatham, MA	1,925,000	$2,797,000

Table 15. Primary ports associated with the large-mesh multispecies fishery (values are aggregated and averaged for 2007-2011).

	Commercial Landings	Recreational Landings
2007	15,762,000	44,000
2008	15,026,000	188,000
2009	17,790,000	326,000
2010	19,017,000	237,000
2011	18,330,000	257,000

Table 16. Recent commercial and recreational landings of small-mesh multispecies (aggregated).

[8] There are no data currently available on the recreational landings of witch flounder.

Primary Ports	Commercial Landings	Ex-vessel Value of Landings
New Bedford, MA	4,594,000	$2,596,000
Point Judith, RI	3,856,000	$1,861,000
Montauk, NY	2,962,000	$1,996,000
New London, CT	899,000	$600,000
Gloucester, MA	657,000	$418,000

Table 17. Primary ports associated with the small-mesh multispecies fishery (values are aggregated and averaged for 2007-2011).

2.9 Northeast Skate FMP

There are seven species included in the Northeast skate complex: Barndoor skate, clearnose skate, little skate, rosette skate, smooth skate, thorny skate, and winter skate. The Northeast skate complex is distributed along the coast of the northeastern United States from near the tide line to depths exceeding 700 meters. Within the complex, the ranges of the individual species vary. The center of distribution for little and winter skates is Georges Bank and southern New England. Barndoor skate is most common in the offshore Gulf of Maine, on Georges Bank, and in southern New England. Thorny and smooth skates are commonly found in the Gulf of Maine. Clearnose and rosette skates have a more southern distribution, and are found in southern New England and the Chesapeake Bight. Skates are not known to undertake large-scale migrations, but they do move seasonally in response to changes in water temperature, moving offshore in summer and early autumn and returning inshore during winter and spring.

A Northeast Skate Complex FMP was developed by the New England Council and was implemented in 2003. The regulations implementing the FMP require the Council to monitor the status of the subject skates and the fishery on an annual basis. The initial regulations under the FMP included the following: Permit requirements for vessels possessing skates and dealers purchasing skates; reporting requirements; a possession limit for skate wings; an exemption from the wing possession limit for vessels fishing only for skates for the bait market; and prohibitions on the possession of smooth skates from or in the Gulf of Maine, and barndoor and thorny skates throughout their range. The original FMP also incorporated a baseline of management measures implemented under other FMPs (Northeast Multispecies, Sea Scallops, and Monkfish) that directly or indirectly control fishing effort on skates. Any proposed changes to these FMPs that could result in an increase in fishing effort on skates were required to first undergo a “skate baseline review” to determine whether, and to what degree, the change may have an impact on skate conservation. The FMP was developed, in part, to collect more complete and accurate information on the catch and disposition of skates in Northeast fisheries, at the species level. Stock assessments and efforts to manage fishing mortality have been hampered by a lack of species-specific catch information. The first amendment to the Skate FMP was the 2007 SBRM Omnibus Amendment.

Amendment 3 to the Skate FMP was implemented in 2010, to establish ACLs and AMs for the skate complex as required by the re-authorized Magnuson-Stevens Act, and to implement measures to rebuild overfished skate stocks. Amendment 3 implemented a stock complex ACL for skates, but created separate landing quotas for the skate wing and bait fisheries, and reduced the skate wing and bait possession limits. The skate bait fishery annual total allowable landings were divided into three separate seasonal quotas to maintain year-round supply of bait. AMs would be triggered if the total allowable landings or ACL were exceeded. Amendment 3 also replaced the skate baseline review with annual review and specification procedures. Framework Adjustment 1 to the Skate FMP was subsequently implemented in 2011, to further reduce the skate wing possession limits, and adjust the in-season trigger of the incidental possession limit. Skates are harvested for two very different commercial markets—one market supplies whole skates to be used as bait in the lobster fishery, and one market supplies skate wings for human consumption. The skate bait fishery is a directed fishery and is more traditional, involving vessels primarily from southern New England ports that target a combination of little skates (>90 percent) and, to a much lesser extent, juvenile winter skates (<10 percent). The vessels supplying skates for the bait market tend to make dedicated trips targeting skates and land large quantities of skates per trip.

The skate wing fishery developed in the 1990s when skates were promoted as "underutilized species," and fishermen shifted effort from groundfish and other fisheries to skates and spiny dogfish. The wing fishery is largely an incidental catch fishery that involves vessels that also participate in the groundfish and/or monkfish fisheries. Although some vessels will make trips specifically targeting winter skates for the wing market, most skates caught for this market are retained by vessels engaged in other fisheries. Most skates are caught using an otter trawl (according to the FVTR) database for 2007-2011, almost 65 percent of landings were from an otter trawl), although gillnets are also used (the remaining 35 percent of 2007-2011 landings were from gillnets). Small amounts of landings are associated with hook and line gear and scallop dredges.

Even though skates are now managed under a Federal FMP, reported landings remain incomplete at the species level. Although some skates are caught by recreational fishermen, recreational landings of skates are negligible both in the context of all recreational fisheries and in the context of the overall skate fisheries. Thus, Table 18 reports recent commercial landings and the ex-vessel value of skates aggregated across all species. Table 19 identifies the primary ports associated with the skate fishery.

	Commercial Landings (lb)	Ex-vessel Value
2007	24,752,000	$8,686,000
2008	24,945,000	$7,224,000
2009	23,977,000	$6,780,000
2010	23,583,000	$7,508,000
2011	22,165,000	$7,640,000

Table 18. Recent commercial landings of skates (aggregated).

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
New Bedford, MA	6,691,000	$2,952,000
Point Judith, RI	5,605,000	$927,000
Chatham, MA	2,880,000	$1,388,000
Newport, RI	2,098,000	$344,000
Fall River, MA	1,070,000	$121,000

Table 19. Primary ports associated with the skate fishery (2007-2011 values are averaged).

2.10 Spiny Dogfish FMP

Spiny dogfish are the most abundant sharks in the western North Atlantic, and range from Labrador to Florida, although they are most abundant from Nova Scotia to Cape Hatteras, North Carolina. Spiny dogfish are highly migratory, often traveling in large troops, and they move northward in the spring and summer and southward in the fall and winter. Spiny dogfish are known to be opportunistic predators, consuming whatever prey are readily abundant in their environment, including pelagic and benthic invertebrates and fishes. Although dogfish have a varied diet, most of what they eat are invertebrates (ctenophores in particular) and a recent study of 40,000 stomachs found that less than 1 percent of their diet was composed of principal groundfish species (Link et al. 2002).

In spite of their large numbers and opportunistic feeding, spiny dogfish, like many elasmobranches, suffer from several reproductive constraints. Females may take 7-12 years to reach maturity, growing more than one-third larger than their mature male counterparts before becoming sexually mature. Fertilization and egg development are internal, and gestation takes roughly 2 years, resulting in litters that usually average 6-7 dogfish "pups." As a result of these factors (long time to maturity, long gestation periods, and low fecundity), spiny dogfish are vulnerable to overfishing, particularly if fishing activities focus on the largest individuals, which are almost all mature females.

As a result of increased fishing pressure, spiny dogfish were classified as overfished in 1998. The Mid-Atlantic and New England Councils jointly developed an FMP for spiny dogfish. This plan was partially approved in 1999 and implemented in 2000 and the management measures included an overall commercial quota, allocated into two semiannual periods; restrictive trip limits; a prohibition on finning; an annual quota adjustment process; and permit and reporting requirements. The Atlantic States Marine Fisheries Commission implements complementary management measures for spiny dogfish in state waters. The most significant effect of the original FMP measures was the elimination of the directed dogfish fishery in Federal waters.[9] Framework Adjustment 1 to the FMP, implemented in 2006, provided for a multi-year, rather than annual, specification-setting process. Framework Adjustment 2, implemented in 2009, adjusted the FMP to allow for more efficient implementation of new scientific information on stock status and biological reference points. The spiny dogfish stock was officially declared to be rebuilt in 2010, and commercial quotas have been significantly increased in recent years. Amendment 1 to the Spiny Dogfish FMP was the 2007 SBRM Omnibus Amendment. Amendment 2 was implemented in 2011 to bring the FMP into compliance with the revised Magnuson-Stevens Act by implementing annual catch limits and accountability measures.

By far most spiny dogfish landings are the result of commercial fishing activities, as reported recreational landings comprise less than 2 percent of the total catch. Sink gillnets, bottom longlines, and bottom otter trawls are the primary commercial fishing gears that catch spiny dogfish and these three gear types accounted for 97 percent of all dogfish landed in 2007-2011. Over the last several years, commercial landings ranged from 6.6 million lb in 2007 up to as 20.9 million lb in 2011 (see Table 20). For fishing years 2007-2011 combined, the Massachusetts ports had the most commercial landings (42.5 percent), with another 19 percent made in Virginia, and 10 percent in New Hampshire. Table 21 identifies the primary ports of spiny dogfish landings from 2007 to 2011.

[9] Directed fishing for spiny dogfish continued in state waters until 2004, by which time the states had followed suit to implement restrictive trip limits and eliminate the directed dogfish fishery.

	Commercial Landings (lb)	Ex-vessel Value
2007	6,628,000	$1,387,000
2008	9,051,000	$2,242,000
2009	11,666,000	$2,543,000
2010	12,139,000	$2,478,000
2011	20,900,000	$4,544,000

Table 20. Recent commercial landings of spiny dogfish.

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
Gloucester, MA	1,904,200	$418,800
Chatham, MA	1,465,400	$298,600
Virginia Beach, VA	*	$*
Hatteras, NC	450,200	$66,200
Seabrook, NH	*	$*
Lynnhaven, VA	*	$*
Long Beach/Barnegat Light, NJ	403,200	$87,000
New Bedford, MA	391,800	$111,200

Table 21. Primary ports associated with the spiny dogfish fishery (values averaged for 2007-2011). *Data excluded for confidentiality.

2.11 Summer Flounder, Scup, and Black Sea Bass FMP

Summer flounder, scup, and black sea bass are three demersal finfish species that occur primarily in the Middle Atlantic Bight from Cape Cod, MA, to Cape Hatteras, NC.[10] All three species exhibit seasonal movement or migration patterns. Summer flounder move inshore to shallow coastal and estuarine waters during warmer months and move offshore during colder months. Scup is a schooling species that undertakes extensive migrations between the coastal waters in the summer and outer continental shelf waters in the winter. Black sea bass are most often found in association with structured habitats, and they migrate offshore and to the south as waters cool in the fall, returning north and inshore to coastal areas and bays as waters warm in the spring.

[10] Summer flounder range from Nova Scotia to Florida; scup range from the Bay of Fundy to Florida; and black sea bass range from southern Nova Scotia to southern Florida and into the Gulf of Mexico.

The FMP was developed by the Mid-Atlantic Council, initially just for summer flounder, and approved by the Secretary of Commerce in 1988. This original Summer Flounder FMP was based largely on the ASMFC plan. The first major amendment, Amendment 2, was implemented in 1993 and it established much of the current management regime, including a commercial quota allocated to the states, a recreational harvest limit, minimum size limits, gear restrictions, permit and reporting requirements, and an annual review process to establish specifications for the coming fishing year. Amendments 4 through 7 made relatively minor adjustments to the management program.

Although initially intended to be separate FMPs, work on the development of the Scup FMP and the Black Sea Bass FMP was folded into the Summer Flounder FMP, which was broadened to incorporate management measures for scup and black sea bass through Amendments 8 and 9, respectively. These amendments included management measures for scup and black sea bass such as commercial quotas and quota periods, commercial fishing gear requirements, minimum fish size limits, recreational harvest limits, and permit and reporting requirements. Both amendments were implemented in 1996. Amendments 10 and 11 made relatively minor changes to the management systems for these fisheries, including removing the sunset provisions related to the limited access (moratorium) permits, gear requirements, and to achieve consistency among all Mid-Atlantic and New England Council FMPs regarding vessel replacement and upgrade provisions.

Amendment 12 was developed to bring the FMP into compliance with the provisions of the Sustainable Fisheries Act. This amendment included revised overfishing definitions for all three species, established rebuilding programs, addressed bycatch and habitat issues, and established a framework adjustment procedure for the FMP to allow relatively minor changes to management measures to be implemented through a streamlined process. Amendment 12 was implemented in 1999, although not all of the elements of the amendment were approved by NMFS. In particular, the EFH provisions for all three species and the rebuilding program for scup were not approved.

Implemented in 2003, Amendment 13 focused primarily on the commercial black sea bass fishery, although it also served to bring the FMP into compliance with the Sustainable Fisheries Act regarding the EFH requirements for all three species. The most significant change to the commercial black sea bass fishery eliminated the quarterly quota system, replaced with an annual coastwide quota. This change provided a framework for the ASMFC to allocate the annual quota on a state-by-state basis.

Amendment 14 to the FMP, implemented in 2007, addressed the requirement to establish a rebuilding program for scup, which was declared in 2005 to be overfished. Scup was declared rebuilt as of 2009, and is no longer under a rebuilding plan. An upcoming amendment (Amendment 18) is planned to address a wide range of issues associated with the management of scup (including the commercial/recreational split and the allocation of commercial scup quota among the three quota periods, among other issues). Amendment 17 has been initiated, but not yet completed, to discuss the potential for the black sea bass recreational fishery to be managed using conservation equivalency

In order to come into compliance with the revised Magnuson-Stevens Act, the Mid-Atlantic Council developed an omnibus amendment for all of its FMPs. The ACL/AM Omnibus Amendment (Amendment 15 to the Summer Flounder, Scup, and Black Sea Bass FMP) implemented ACLs and AMs for these three fisheries. Amendment 16 to the FMP was the 2007 SBRM Omnibus Amendment.

For each of these three species, an annual acceptable biological catch (ABC) is established by the Council. The ABC is then divided, using percentages identified in the FMP[11], into a commercial ACL and a recreational ACL. The Council then sets corresponding annual catch targets (ACT) for each fishing sector. The commercial quota and recreational harvest limit are the amount of landings remaining after deducting discards from the respective ACTs. The commercial fisheries for all three species are managed through a combination of limited access (moratorium) fishing vessel permits, annual quotas that result in closures of the fisheries upon reaching the quota, gear restrictions, and minimum fish sizes. The summer flounder and black sea bass commercial quotas are managed on an annual basis, but the scup commercial quota is sub-divided into three quota periods (Winter I, Summer, and Winter II); although the black sea bass and scup quotas are managed on a coastwide basis, the summer flounder quota is managed on a state-by-state basis.[12] The annual specifications for these three fisheries may be set each year or for up to 3 years in advance.

The recreational fisheries are not subject to a "hard" quota, but instead are subject to a set of management measures designed to constrain catch to a target level. Management measures used include minimum fish sizes, bag (possession) limits, and fishing seasons. AMs for the recreational fisheries include a pound-for-pound payback of any overage of the ACL.[13] Party/charter vessels operating in Federal waters are required to obtain Federal permits. Coastwide management measures are established for the black sea bass and scup recreational fisheries operating in Federal waters, but for summer flounder, the states have the option to develop state-by-state measures that, in sum, would achieve the equivalent level of conservation as would the coastwide measures. All decisions regarding annual quotas and management measures for these commercial and recreational fisheries are made in conjunction with the ASMFC.

All three of these species support significant recreational as well as commercial fisheries. On average, commercial landings over the last several years accounted for slightly more than half to two-thirds of the total landings of summer flounder and scup, while black sea bass recreational landings typically exceed commercial landings (see Table 22). The primary gears used in the commercial fisheries for these species vary.

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[11] The summer flounder TAL is allocated 60 percent to the commercial fishery and 40 percent to the recreational. The scup TAL is allocated 78 percent to the commercial fishery, while 22 percent is allocated to the recreational fishery. The black sea bass TAL is allocated 49 percent to the commercial fishery, with 51 percent allocated to the recreational fishery.

[12] Similar to the percentage allocation of the TAL to the commercial and recreational fisheries, the FMP allocates the commercial summer flounder quota among the states from North Carolina to Maine according to specific percentage shares.

[13] An Omnibus Amendment (Amendment 19 to the Summer Flounder, Scup, and Black Sea Bass FMP) is under development that may revise the AMs for the Mid-Atlantic Council's recreational fisheries.

Based on fishing vessel trip report data from 2007-2011, summer flounder are caught almost exclusively (95 percent) with bottom otter trawls; scup are caught primarily (92 percent) with bottom otter trawls, but handlines/rod and reel combined with pots, traps, and weirs accounted for another 6 percent; and black sea bass are caught in roughly equal amounts by bottom otter trawls (47 percent), and pots and traps (46 percent), and to a much lesser extent by handlines/rod and reel (5 percent), . Recreational fishing for these species is enjoyed by shore-based anglers, private recreational boat anglers, and anglers on party and charter vessels. Table 22 and Table 23 identify the recent commercial and recreational landings as well as the primary ports and ex-vessel value of the commercial fishery.

	Summer Flounder		Scup		Black Sea Bass	
	Commercial Landings	Recreational Landings	Commercial Landings	Recreational Landings	Commercial Landings	Recreational Landings
2007	10,037,000	9,257,000	9,284,000	4,594,000	2,286,157	2,641,000
2008	9,213,000	8,151,000	5,225,000	3,763,000	1,930,425	2,402,000
2009	11,052,000	6,023,000	8,204,000	3,221,000	1,168,873	2,781,000
2010	13,386,000	5,122,000	10,415,000	5,980,000	1,733,355	3,719,000
2011	16,569,000	5,963,000	15,032,000	3,663,000	1,688,820	1,544,000

Table 22. Recent commercial and recreational landings in the summer flounder, scup, and black sea bass fisheries.

Summer Flounder		Scup		Black Sea Bass	
Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value
Point Judith, RI	$4,051,000	Point Judith, RI	$1,764,000	Point Judith, RI	$433,000
Point Pleasant, NJ	$1,635,000	Montauk, NY	$1,078,000	Ocean City, MD	$417,000
Wanchese, NC	$1,633,000	Point Pleasant, NJ	$562,000	Cape May, NJ	$403,000
Newport News, VA	$1,544,000	Little Compton, RI	$485,000	Point Pleasant, NJ	$313,000
Montauk, NY	$1,530,000	New Bedford, MA	$437,000	Montauk, NY	$295,000
Hampton, VA	$1,469,000	Hampton Bays, NY	$382,000	New Bedford, MA	$233,000

Table 23. Primary ports associated with the summer flounder, scup, and black sea bass commercial fisheries (values are averaged for 2007-2011).

2.12 Surfclam and Ocean Quahog FMP

The Atlantic surfclam and ocean quahog are both bivalve mollusks that are found in continental shelf waters from Cape Hatteras, NC, north to the Gulf of St. Lawrence/Newfoundland. Major concentrations of surfclams are found on Georges Bank, south of Cape Cod, off Long Island, southern New Jersey, and the Delmarva Peninsula. The greatest concentrations of ocean quahogs are fished in offshore waters south of Nantucket to the Delmarva Peninsula. In general, surfclams are found in water shallower than that in which ocean quahogs are found.

The Mid-Atlantic Council developed the FMP in the mid 1970's (it was the first FMP the Council developed) and the FMP was implemented in 1977. Initially, the FMP instituted a moratorium on participation in the surfclam fishery, while a more detailed limited entry system could be developed, and established quarterly quotas for surfclams and an annual quota for ocean quahogs. The first several amendments dealt mostly with the duration of the management measures and permit moratorium (made indefinite in Amendment 3), reporting requirements, management areas (Amendment 2 divided the surfclam portion of the management unit into the New England and Mid-Atlantic areas) minimum size limits, cage tags, and quota period issues.

Amendment 8 to the FMP, implemented in 1990, established an individual transferable quota (ITQ) system for the fisheries. The fishing vessel owners that received allocation under the ITQ system were those whose vessels had reported landings under the mandatory logbook requirement in place since 1978. The initial allocation was based on the vessel's average historical catch and vessel size, calculated as a percentage of historical quota allocations. Quota shareholders are allowed to purchase, sell, or lease quota to and from other shareholders. This amendment also merged the Mid-Atlantic and New England management areas back into a single management area.

Amendment 9 revised the overfishing definitions, and Amendment 10 incorporated management measures for the Maine "mahogany clam."[14] Amendment 11 represented the "consistency amendment" to bring all New England and Mid-Atlantic Council FMPs into consistency in regards to vessel replacement and upgrade provisions. Amendment 12 was intended to bring the FMP into compliance with the provisions of the Sustainable Fisheries Act, and included revisions to overfishing definitions, the designation of EFH, a provision allowing framework adjustments to the FMP, and a requirement for an operator permit. Amendment 13 rectified aspects of Amendment 12 that were not approved (surfclam overfishing definition and an analysis of the impacts of fishing on EFH), and included provision for multiple year quota setting. A framework adjustment in 2007 implemented a requirement to use VMS for all vessels participating in the surfclam or ocean quahog fisheries. Amendment 14 to this FMP was the 2007

[14] The Maine mahogany clam is the same species as the ocean quahog, but is found in the inshore waters of the State of Maine and supports a small artisanal fishery. This fishery had been operating on an experimental basis since 1990, but was beginning to move offshore into Federal waters.

SBRM Omnibus Amendment, and Amendment 16 was the 2011 ACL/AM Omnibus Amendment.

Both species live in the sediment and are not vulnerable to most types of fishing gears. Almost 100 percent of landings are associated with the hydraulic clam dredge, although the relatively small Maine fishery uses the so-called "dry" dredge. Landings of surfclams and ocean quahogs from recreational fishing are negligible. Table 24 identifies the recent commercial landings and ex-vessel value of both species, and Table 25 identifies the primary ports of landings for both species.

Waters of the Gulf of Maine and Georges Bank are subject to intermittent harmful algal blooms, or "red tide," caused by the dinoflagellate *Alexandrium fundyense*, which produces a toxin known to cause paralytic shellfish poisoning (PSP) in people consuming contaminated clams. Because of a history of harmful algal blooms and limited testing in the area, eastern Georges Bank has been closed to the harvest of clams since 1990. In 2013 a portion of Georges Bank was opened for the harvest of surfclams and ocean quahog by vessels using a new PSP testing protocol. Other areas in the Gulf of Maine and western Georges Bank have been closed since 2005 due to an outbreak of *A. fundyense* in these areas.

	Atlantic Surfclam		Ocean Quahog	
	Commercial Landings (lb)	Ex-vessel Value	Commercial Landings (lb)	Ex-vessel Value
2007	66,152,000	$41,032,000	34,688,000	$20,607,000
2008	61,177,000	$39,440,000	34,354,000	$20,353,000
2009	50,644,000	$34,050,000	34,909,000	$21,919,000
2010	44,043,000	$30,240,000	36,072,000	$23,185,000
2011	43,888,000	$29,732,000	31,771,000	$22,095,000

Table 24. Recent commercial landings and ex-vessel values in the surfclam and ocean quahog fisheries.

Atlantic Surfclam			Ocean Quahog		
Primary Ports	Landings (lb)	Ex-vessel Value	Primary Ports	Landings (lb)	Ex-vessel Value
Atlantic City, NJ	28,600,000	$18,184,000	New Bedford, MA	*	$*
Ocean City, MD	4,916,000	$3,119,000	Pt Pleasant, NJ	*	$*
New Bedford, MA	3,454,000	$2,786,000	Atlantic City, NJ	3,828,000	$2,614,000
Pt Pleasant, NJ	5,081,000	$2,568,000	Jonesport, ME	553,000	$1,787,000
Oceanside, NY	2,201,000	$1,603,000	Ocean City, MD	2,123,000	$1,681,000

Table 25. Primary ports associated with the surfclam and ocean quahog commercial fisheries (values are averaged for 2007-2011). *Data excluded for confidentiality.

2.13 Tilefish FMP

The golden tilefish is the largest and longest lived of all the tilefish species, and in U.S. waters ranges from Georges Bank to Key West, FL, and throughout the Gulf of Mexico. Golden tilefish occupy a fairly restrictive band along the outer continental shelf and are most abundant in depths of 100-240 meters. Temperature may also constrain their range, as they are most abundant near the 15° C isotherm. Although this species occupies a variety of habitats, it is somewhat unique in that they create and modify existing vertical burrows in the sediment as their dominant habitat in U.S. waters.

The Tilefish FMP was developed by the Mid-Atlantic Council to implement management measures for the tilefish fishery north of the Virginia/North Carolina border intended to address the overfished status of the species.[15] The FMP was implemented in 2001, and in the FMP's short existence it has been the subject of two legal challenges. *Natural Resources Defense Council* v. *Evans* (2001) challenged the essential fish habitat provisions of the FMP, and *Hadaja* v. *Evans* (2001) challenged the ban on trawl gear and the permit category designations. The latter temporarily voided the limited access permit categories in the FMP.

Amendment 1 to the Tilefish FMP, implemented in 2009, eliminated the limited access permit categories and adopted an IFQ program. Initially, thirteen allocation holders received quota share based primarily on historical participation in the fishery. Any vessel is required to have an open access permit in order to land tilefish. The open access permit alone authorizes a vessel to land tilefish under a 500 lb per trip incidental possession limit. If the vessel is authorized to land under tilefish an IFQ allocation permit, it is exempt from the possession limit. Each year, 95 percent of the total allowable landings are allocated to the IFQ fishery. The remaining 5 percent is allocated

[15] The tilefish fishery south of the Virginia/North Carolina border is currently managed as part of the Snapper-Grouper Complex FMP developed by the South Atlantic Fishery Management Council.

to the incidental fishery. If landings in the incidental fishery reach or exceed the amount allocated, the incidental fishery would be shut down for the remainder of the fishing year. Amendment 2 was the 2007 SBRM Omnibus Amendment, and Amendment 3 was the 2011 ACL/AM Omnibus Amendment.

The commercial tilefish fishery is relatively small, with only a dozen vessels participating in the IFQ fishery. Tilefish are primarily caught with bottom longlines (98 percent of landings reported in the fishing vessel trip report database from 2007-2011), and approximately 1.8 percent of landings are associated with bottom otter trawls. There is a minimal recreational fishery for this species, with less than 8,300 lb landed annually for the last 30 years and in only two years since 2000 does the MRIP database report trips with tilefish as the primary target species. Table 26 and Table 27 identify the recent commercial landings as well as the primary ports and ex-vessel value of the commercial fishery.

	Commercial Landings (lb)	Ex-vessel Value
2007	1,514,000	$4,493,000
2008	1,491,000	$4,279,000
2009	1,748,000	$4,202,000
2010	1,865,000	$5,183,000
2011	1,750,000	$5,633,000

Table 26. Recent commercial landings of golden tilefish.

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
Montauk, NY	1,132,000	$3,273,000
Long Beach/Barnegat Light, NJ	321,000	$880,000
Hampton Bays, NY	170,000	$505,000
Point Judith, RI	17,000	$28,000
Shinnecock, NY	4,000	$12,000

Table 27. Primary ports for the golden tilefish fishery (values are averaged for 2007-2011).

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Description of Fishing Modes

As described in chapters 1 and 2, an FMP is the operational unit used for managing a fishery (or collection of fisheries) that targets the species specifically addressed in the FMP. For example, regulations promulgated under the Summer Flounder, Scup, and Black Sea Bass FMP address commercial and recreational fishing activities along the Atlantic coast of the U.S. that, although they use different gear types, share the characteristic of targeting summer flounder, scup, and/or black sea bass. Thus, the minimum fish size for summer flounder landed by commercial vessels is 14 inches, regardless of whether a fish is caught with an otter trawl, a gillnet, or on hook and line. Similarly, the total allowable catch for black sea bass applies jointly to the commercial and recreational fishing sectors, also without regard to the fishing gear used.

While the FMP works very well as the operational unit for devising and implementing fishing regulations, it is not the most efficient or appropriate operational unit for devising and implementing an SBRM. The most efficient designs for collecting information on and monitoring discards occurring in a fishery recognize and incorporate the unique characteristics of each fishery. The way in which the fishing takes place affects the mechanisms that may be appropriate for collecting relevant bycatch information. Thus, there are information collection tools more appropriate for shore-side recreational fisheries, and other tools more appropriate for offshore commercial fisheries. There are tools appropriate for collecting basic information on discards in a fishery for use in a stock assessment that may not be the most appropriate for real-time monitoring of bycatch against a bycatch quota.

Another factor pertinent to determining the most appropriate operational unit for an SBRM is the efficiencies gained by capitalizing on shared characteristics and overlaps in catch among several fisheries. For example, commercial fishing vessels operating out of New England ports that use gillnets often target, and catch, monkfish, skates, and some groundfish species. Even though monkfish, skates, and groundfish fishing regulations are implemented under three separate FMPs, in many cases the same vessels are catching and landing these species. It would be inefficient to develop three separate bycatch sampling strategies and protocols to implement on these vessels. Instead, the goal would be to develop an SBRM that most effectively captures the discards associated with the New England gillnet fishery. Thus, the operational unit for an SBRM is the fishing "mode," where a fishing mode is defined according to the fishing gear used and the area from which the vessels depart, rather than by FMP. If a vessel fishes with more than one gear type, it could be represented in more than one fishing mode.

Because the fishing mode is a more appropriate operational unit for the SBRM than the FMP, the expected biological, physical, and socio-economic impacts associated with this amendment are not analyzed at the level of the FMP, but are more broadly considered across the range of fishing modes directly or indirectly affected by this amendment. This chapter will identify and describe the fishing modes that serve as the basis for describing and evaluating the SBRM to be implemented under the subject

FMPs. Each relevant combination of area[16] and fishing gear type is described below, and the description includes an overview of the fishery, the species landed in the fishery, and a reference to the pertinent FMPs that regulate the fishing activity. With the exception of the clam dredge, Ruhle Otter Trawl, and Haddock Separator Otter Trawl fisheries, the information summarized in the following sections was derived from FVTR data from 2007-2011, inclusive, to provide a 5-year snapshot to characterize the recent activity in each fishing mode that would most likely be relevant to the SBRM Omnibus Amendment. For a summary reference of the information presented, see Table 28**Error! Reference source not found.** at the end of the chapter.

Note that for some fishing modes, substantial fishing effort occurs in state waters by vessels that do not hold any Federal fishing permits and are, therefore, not required to submit Federal trips reports on their fishing activity. Vessels that hold no Federal permits other than for American lobster are also not required to submit Federal trip reports. Because trip reports required under Federal fishing permits are the sole source of information used to develop the summary characterizations below, the information presented below will be incomplete for the fishing modes with substantial participation by vessels with state permits only. Most notably, this applies to Mid-Atlantic crab pots, fish pots, and lobster pots, along with New England lobster pots. The lack of a reporting requirement in the Federal lobster regulations (50 CFR part 697) results in incomplete data on lobster fishing activities, even in Federal waters.

3.1 Clam Dredge Fishery

As noted above, the clam dredge fishery is the only fishing mode for which FVTR data were not the sole source of information used to develop the following fishing activity characterization. The regulations at 50 CFR 648.7(b) exempt vessel owners and operators fishing under a Federal surfclam or ocean quahog permit from the requirement to submit the FVTR required of most other Federal permit holders, except when landing other species besides surfclams and/or ocean quahogs. Instead, the regulations require these permit holders to submit a separate surfclam and ocean quahog log report. The data collected from the surfclam and ocean quahog log reports are maintained separately from the FVTR data, and these data are organized slightly differently, making them difficult to integrate into the FVTR data.

Data from the surfclam and ocean quahog log reports for 2007-2011, inclusive, are summarized below to provide a 5-year snapshot of the fishing activities of vessels using clam dredges. Due to complications associated with the database, landings information is not organized based on the port of departure (New England vs. Mid-Atlantic), but is instead presented for the whole Greater Atlantic Region. Area fished and total landings information has been separated by regions and is presented below. This information focuses on landings of surfclam and ocean quahogs only. Supplemental

[16] For the purposes of the SBRM, the area associated with a fishing mode is based on the port of departure of a fishing vessel, regardless of where the fishing activity occurred. A more detailed explanation of this characteristic is provided in Chapter 5.

information derived from the FVTR database provides information on the relative landings of other species by participating vessels.

Over the 5-year period of 2007-2011, the number of participants in this fishing mode was consistent, with an average of 66 vessels each year. On average, these vessels made between 65 and 78 fishing trips per year. Fishing trips lasted less than 1 day, on average, and although the majority of trips were less than 1 day in duration, longer trips of up to 4 days did occur. As indicated above, surfclams and ocean quahogs are the only species recorded in the primary clam log report database, and ocean quahogs accounted for just over half (56 percent) of the cumulative landings of these species over the 5-year period. Clam dredge vessels landed almost 3.4 million bushels of ocean quahogs and over 2.5 million bushels of surfclams per year, on average.[17]

The majority of clam dredge landings come into two New Jersey ports (Atlantic City and Point Pleasant, together accounting for 53 percent of average annual landings). Atlantic City (2.1 million bushels per year, on average) and Point Pleasant (1.2 million bushels per year, on average) have traditionally been the two primary ports for this fishing mode, but New Bedford, MA, has recently experienced an increase in landings with over 1.9 million bushels per year, on average (for 31 percent of total landings). Ocean City, MD, receives a smaller share (505,000 bushels), but still accounts for 8.2 percent of total annual landings. Although there have been up to 16 separate ports of landing in this fishing mode in any 1 year, these four ports account for over 92 percent of total landings.

3.1.1 New England

In addition to landings of surfclams and ocean quahogs reported on the clam log reports, vessels using clam dredges reported landings of other species on the FVTR. In each year from 2007-2011, there were an average of 15vessels fishing from New England ports that submitted FVTRs (roughly 50 percent of those reporting via the clam log reports). These vessels reported taking between 10 and 30 trips per vessel each year, on average. These trips account for 24.6 percent, on average, of the trips reported via the clam log report, some proportion of which may be separate trips. The species most commonly reported on the FVTR include sea scallops, mussels, hard clams, monkfish, and whelks were also reported during this timeframe. Most of the reported landings were sea scallops, with an average of 163,000 lb per year. Mussels and hard clams landings were much less, only 52,000 lb and 35,000 lb per year, respectively.

Figure 1 displays the top ports and primary fishing areas utilized by participants in this fishing mode. In Figure 1, and in all figures to follow in this chapter, fishing effort in the primary fishing areas is presented by shading in statistical areas according to the average number of "days absent" attributed to each statistical area. The statistical area fished is one of the data elements reported on both the FVTR and the clam log report, and days absent are calculated as the length of each fishing trip. While this is not an absolute

[17] Note that landings of surfclams and ocean quahogs are reported in bushels (bu) rather than in pounds (lb). Landings of all other species are reported in pounds.

measure of the fishing time or effort spent in each statistical area (for example, it does not account for steaming time to and from an area), it represents an approximate relative measure of where most of the fishing effort is concentrated.

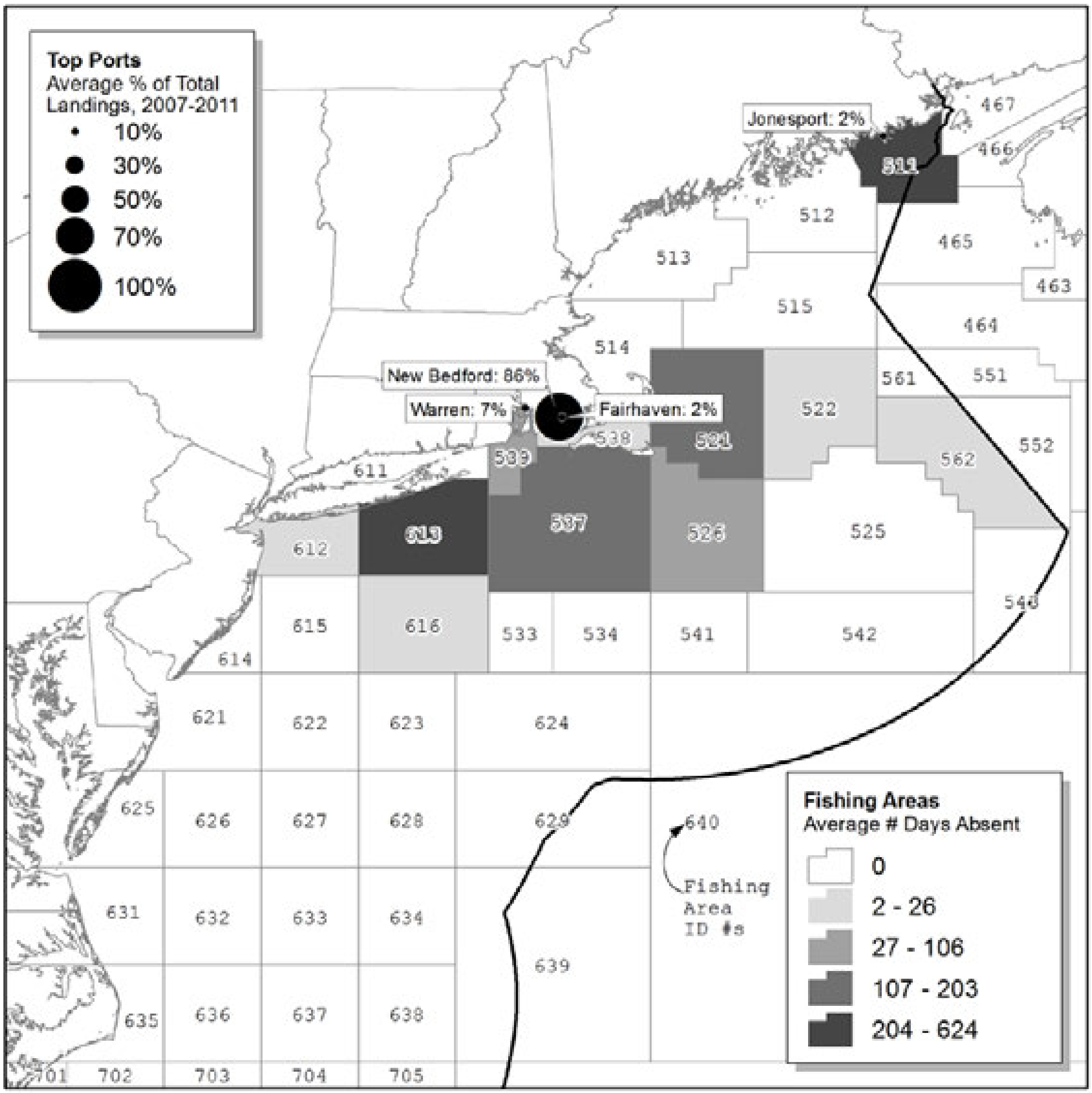

Figure 1. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England clam dredge fishing mode.

3.1.2 Mid-Atlantic

In the Mid-Atlantic region, an average of 34 vessels submitted FVTRs each year from 2007-2011 (roughly the same number of vessels as reporting via the clam log reports). These vessels reported taking between 19 and 30 trips per vessel each year, on average. These trips account for 37 percent, on average, of the trips reported via the clam log report, some proportion of which may be separate trips. The species most commonly reported on the FVTR include sea scallops, blue crabs, croaker, hard clams, horseshoe crabs, and monkfish, although small amounts of whelks and skates were also reported during this timeframe. Most of the reported landings were sea scallops, with an average of 125,000 lb per year. Blue crab landings were much less, only 33,000 lb and croaker was only 14,600 lb per year.

Figure 2 displays the top ports and primary fishing areas utilized by participants in this fishing mode

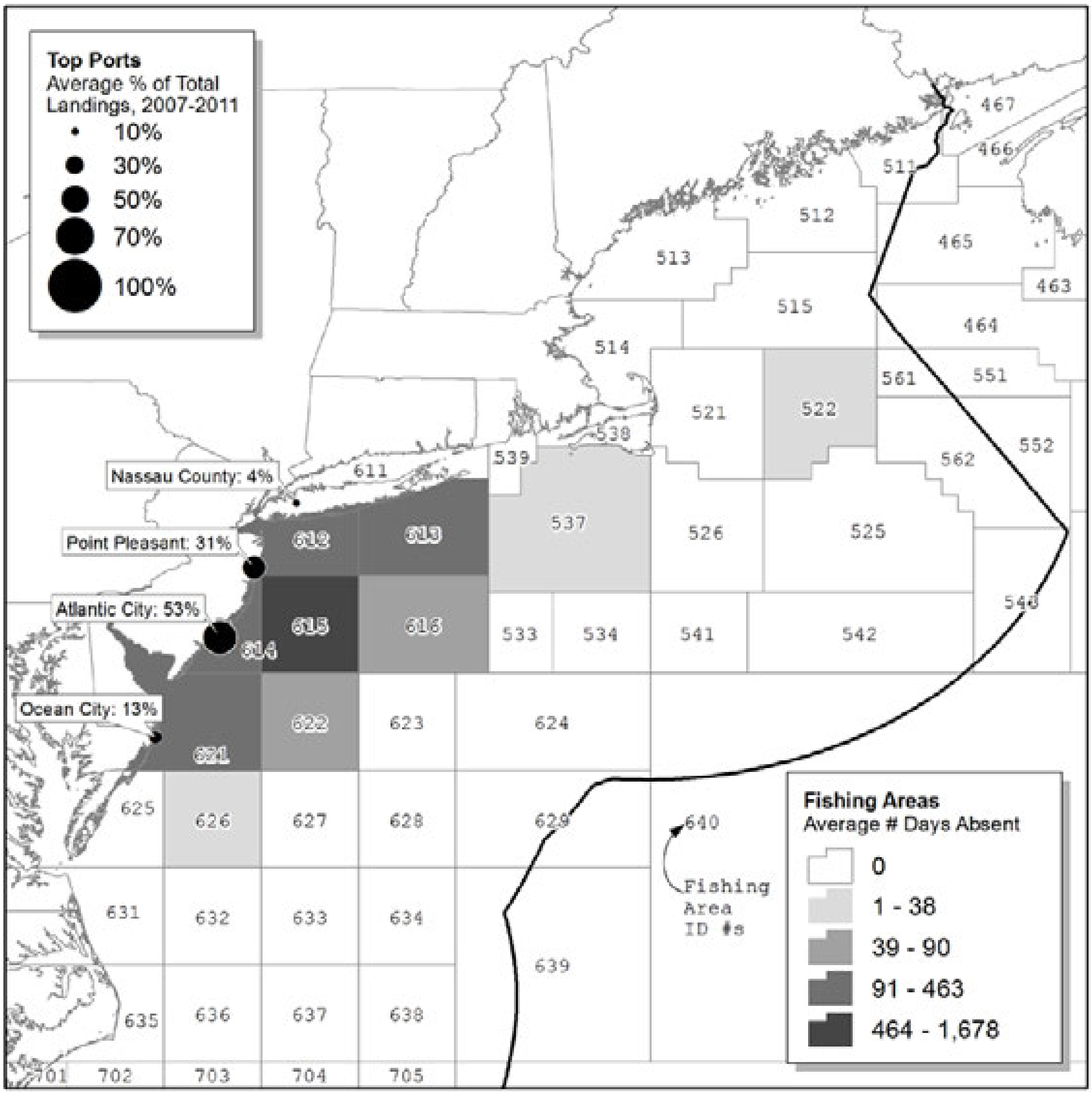

Figure 2. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic clam dredge fishing mode.

3.2 Crab Pot Fishery

3.2.1 New England

The New England crab pot fishing mode is primarily represented by a small, very targeted fishery for deep-sea red crab, although some vessels fish for Jonah or other species of crab. There have been about seven vessels participating in this fishery, on average, over the last 5 years, and each vessel takes an average of 17 trips annually. The majority of fishing trips in this mode (68 percent) were less than a day, likely representing a large number of small, near-shore vessels. Another 21 percent of fishing trips in this mode average between 8 and 12 days in duration, which is more likely to represent vessels fishing for deep-sea red crab.

As noted, red crab is the dominant target species for this fishing mode, with just under 2.5 million lb of landings per year. This represents 92 percent of the total landings by this fishery, although small amounts of whelks (118,200 lb per year), Jonah crab (46,500 lb per year), rock crab (26,100 lb per year), and American lobster (14,000 lb per year) are also landed. During the period from 2007-2011 the principle port for this fishing mode shifted from Fall River, MA (90 percent of mode landings in 2009), to New Bedford, MA, (98 percent of mode landings in 2011). Figure 3 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

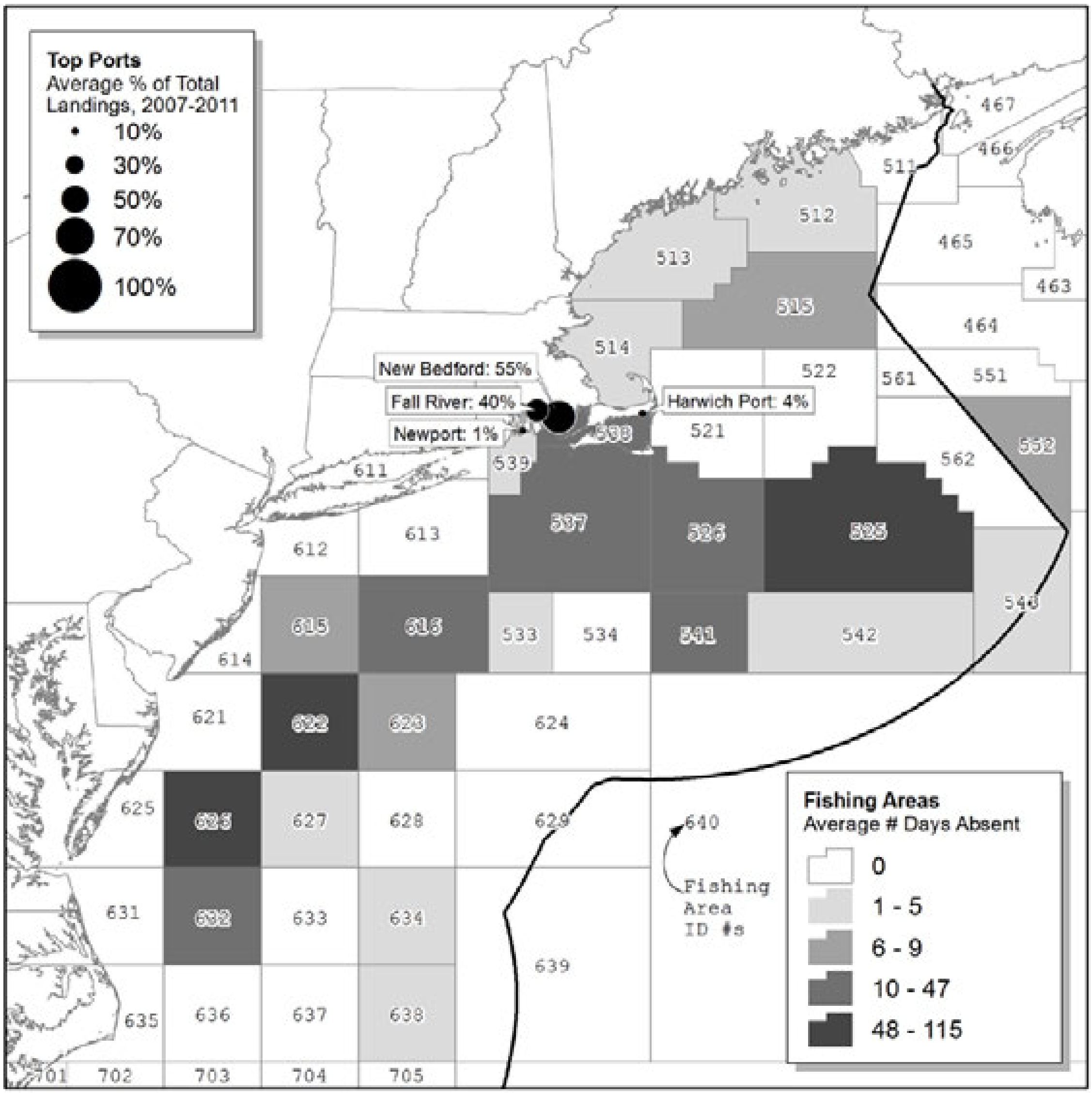

Figure 3. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England crab pot fishing mode.

3.2.2 Mid-Atlantic

Much of the crab pot fishing effort in this region cannot be quantified using the FVTR database because of the number of smaller vessels operating in fisheries that do not require a Federal permit. However, development of the deep sea red crab fishery in the Mid-Atlantic has resulted in that species representing 68 percent of the landings of federally permitted vessels participating in the Mid-Atlantic crab pot fishery. Blue crabs comprise over 24 percent of the landings reported by federally permitted vessels. The federally permitted vessels land mostly in Newport News, VA and Engelhard, NC. Figure 4 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

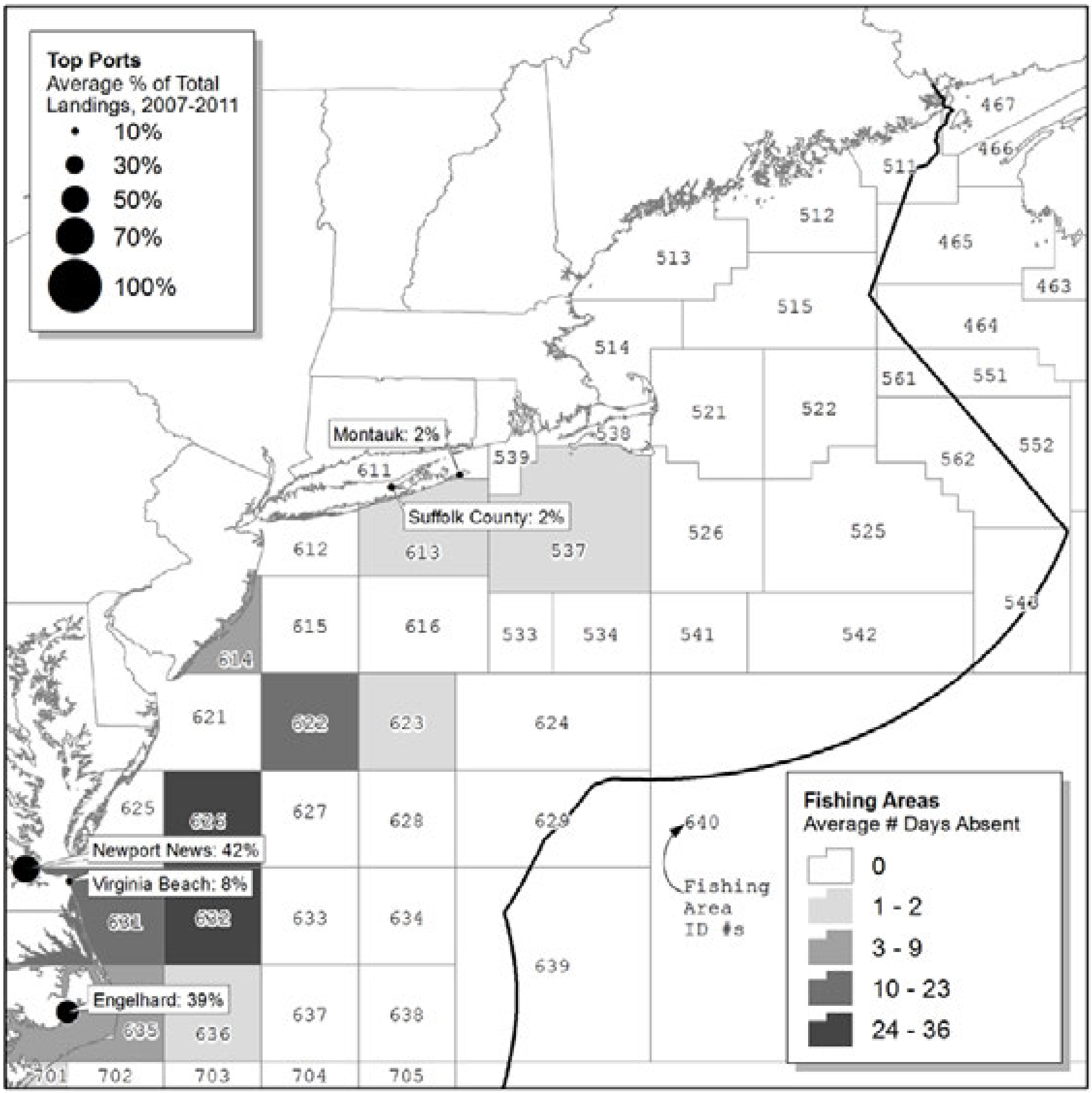

Figure 4. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic crab pot fishing mode.

Overall, the Mid-Atlantic crab fishery is the largest fishery in the region—in 2011, for example, over 28 million lb of blue crabs were landed in North Carolina, and blue crab landings from Chesapeake Bay averaged over 80 million lb from 2007-2011. However, most of these landings are made by fishing vessels without any Federal permits fishing in state waters. Thus, this summary is not a complete characterization of the crab pot fishery in the Mid-Atlantic and should be viewed with caution, other than to understand the scope of the fishing effort relevant to the SBRM.

3.3 Fish Pot Fishery

3.3.1 New England

The New England fish pot fishing mode has generally been a fairly stable fishery for scup and black sea bass with approximately 34 participating vessels each year. These vessels make an average of nearly 20 short (less than a day, on average) fishing trips each year, although longer trips (as long as 11 days) do occur.

Scup is the top species landed by participants in this fishing mode, accounting for almost 46 percent (121,000 lb per year) of the total annual landings and black sea bass accounts for another 39 percent (102,000 lb per year). Channeled whelk represented another 4 percent (11,000 lb per year) of annual landings. The primary port for this fishing more was Little Compton, RI (77,000 lb per year). Point Judith, RI, (44,000 lb per year) and Harwichport, MA (27,000 lb per year) were also important ports for this mode. Figure 5 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

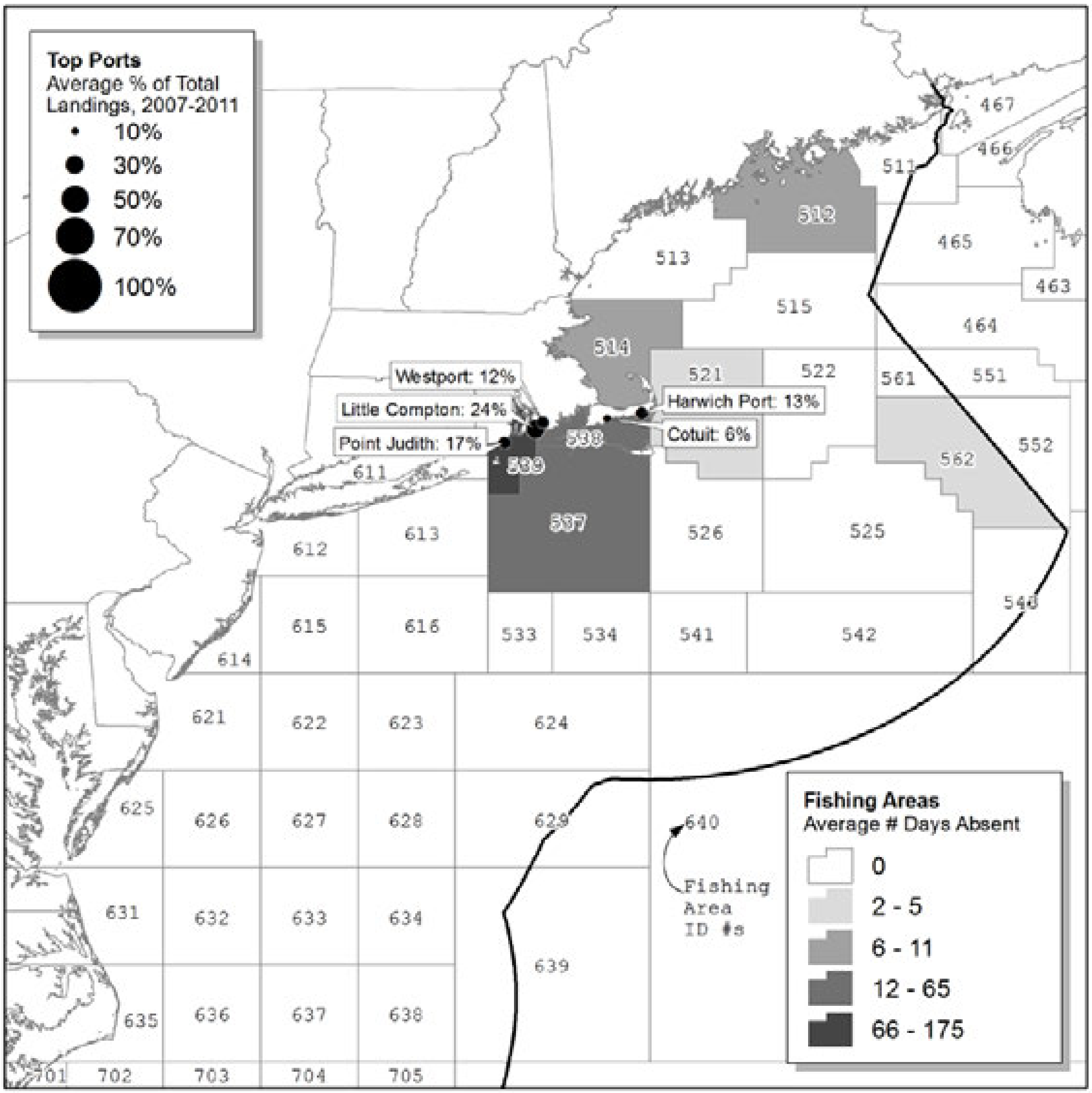

Figure 5. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England fish pot fishing mode.

3.3.2 Mid-Atlantic

Similar to its New England counterpart, the Mid-Atlantic fish pot fishing mode is primarily a black sea bass fishery, with 64.4 percent of all landings (total landings for this mode average 732,000 lb per year). Participation averaged 65 fishing vessels per year, each taking an average of 22 relatively short fishing trips (98 percent of trips were less than a day and the longest trips average only 6 days).

Although over 40 different species are landed each year in this mode, seven species account for 90 percent of all landings by weight. Black sea bass landings, as noted above, predominate, with an average of 472,000 lb per year. Tautog (56,000 lb per year), American lobster (37,000 lb per year), channeled whelks (31,000 lb per year), scup

(21,000 lb per year), eels (20,000 lb per year), and Jonah crab (20,000 lb per year) together comprise 26.7 percent of the total annual landings. Cape May, NJ and Ocean City, MD, are the top ports, each with over 110,000 lb of landings each year (15 percent of the total landings). Sea Isle City, NJ, Indian River, DE and Virginia Beach, VA are also primary ports for this mode, and together take in 30 percent of the annual landings. Figure 6 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

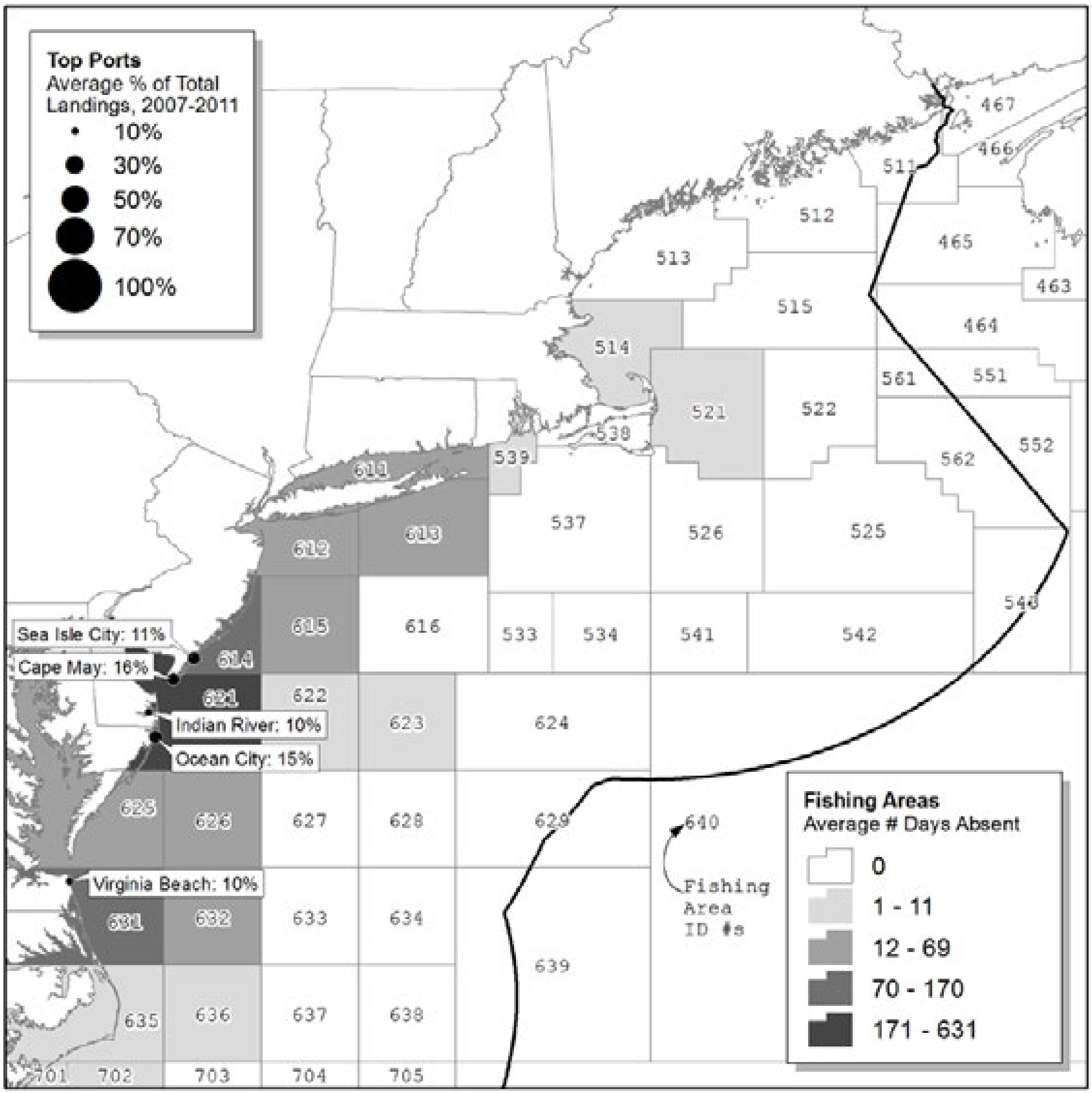

Figure 6. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic fish pot fishing mode.

3.4 Hagfish Pot Fishery

3.4.1 New England

Hagfish are not currently the subject of an FMP and there is no Federal vessel permit. Characterizing the New England and Mid-Atlantic hagfish pot fishing modes may be limited by the lack of data from participants who are not required to submit FVTRs because they do not hold a Federal permit with a FVTR requirement. The development of a Hagfish FMP is presently being considered by the New England Council. In 2007, at the request of the New England Council, NMFS implemented an information collection program for hagfish to help the Council determine if future management measures are necessary. Under the information collection program all dealer/processors that purchase hagfish caught from the EEZ must have a federal hagfish permit and submit the required weekly reports of trip-level information for all purchases from fishing vessels.

Hagfish pots are highly selective for the target species, and hagfish represented 95 percent of total landings by this mode. Atlantic herring was another 5 percent of total mode landings. Gloucester, MA was the top port followed by Portland, ME, and Point Judith, RI. Figure 7 displays the top ports and primary fishing areas utilized by participants in this fishing mode who do submit FVTRs.

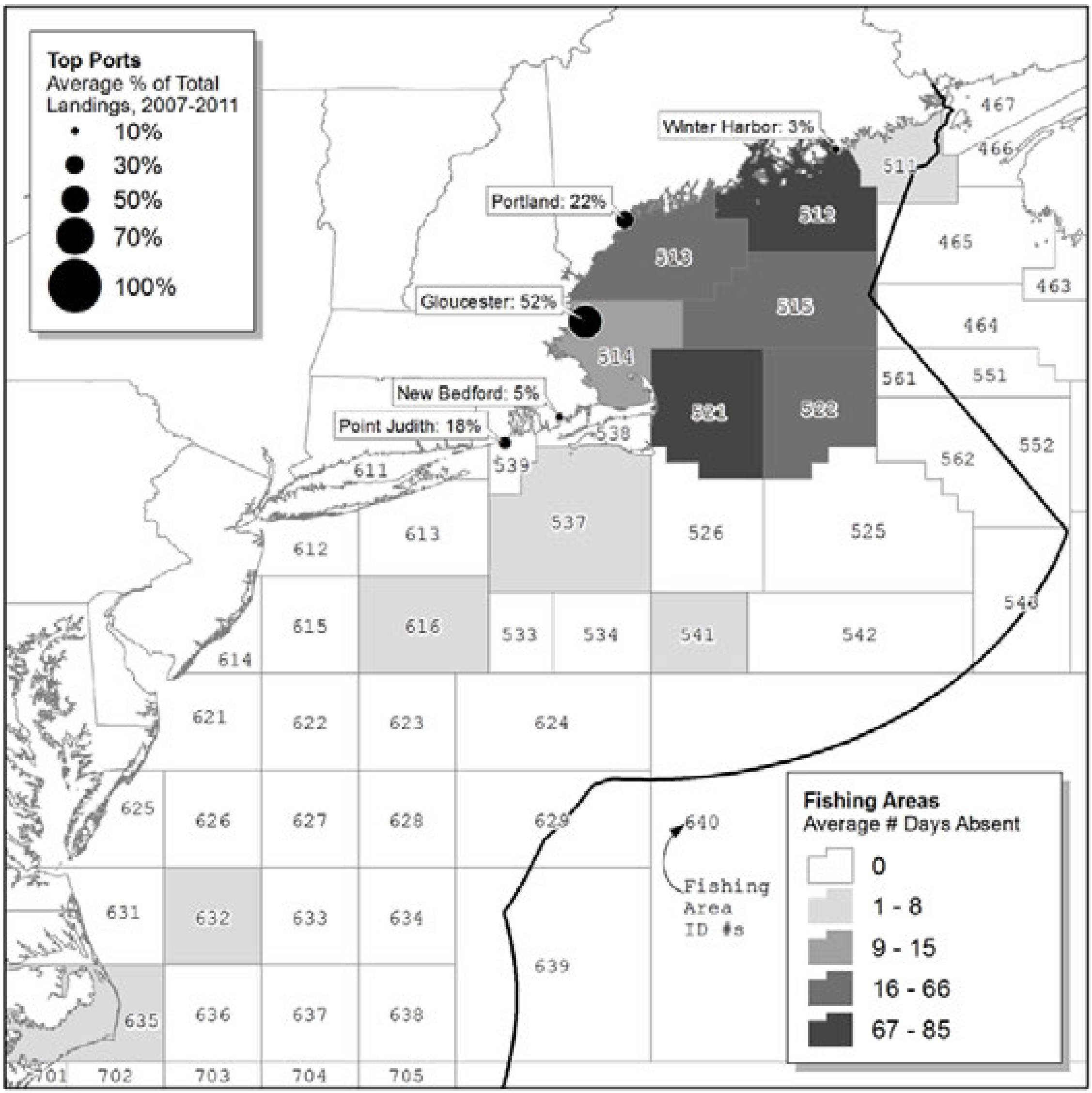

Figure 7. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England hagfish pot fishing mode.

3.4.2 Mid-Atlantic

Landings of the Mid-Atlantic hagfish pot fishery consist of over 99 percent hagfish. The primary port is Newport News, VA with 93 percent of the total mode landings. Figure 8 displays the top ports and primary fishing areas utilized by participants in this fishing mode who do submit FVTRs.

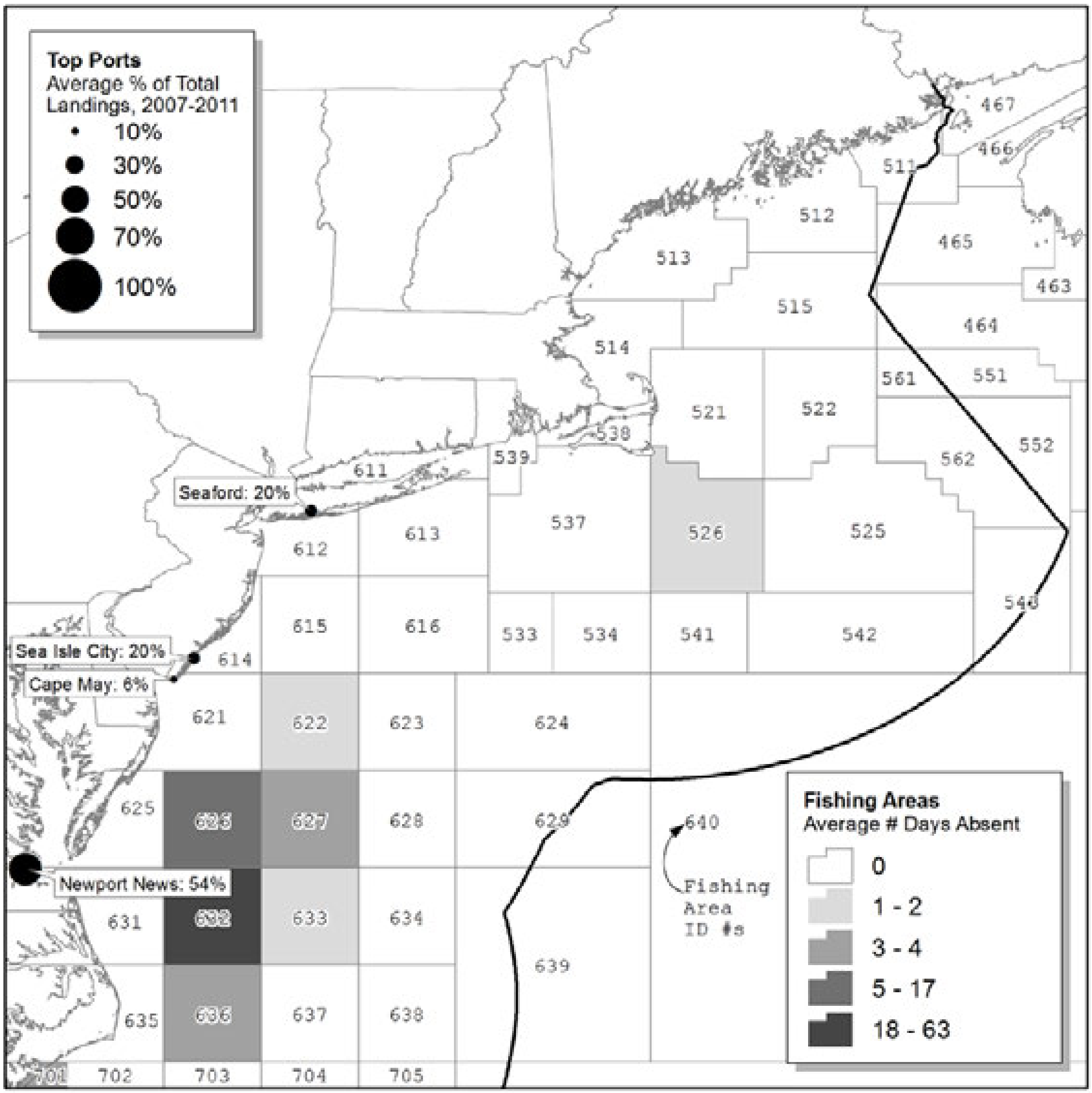

Figure 8. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic hagfish pot fishing mode.

3.5 Gillnet Fishery

Within the overall gillnet fishery, there are three mesh size categories used to define the fishing modes for the purposes of the SBRM: Small mesh (less than 5.5 inches); large mesh (5.5 inches or greater and less than 8 inches); and extra-large mesh (8 inches and greater). For each mesh size category, the two focus areas (New England and Mid-Atlantic) will be addressed.

3.5.1 Small-Mesh Gillnets

3.5.1.1 New England

The New England small-mesh gillnet fishery is a fairly small fishing mode, with a relatively small fleet that averaged 12 vessels participating in any one year. For the most part, these vessels have taken no more than one to two trips each per year, with trips averaging less than 1 day in duration.

Total landings of fish for this fishing mode have averaged 43,600 lb, a very small component of the overall groundfish-type fisheries in the Greater Atlantic Region. Top species landed include bluefish (just over 15,000 lb per year, on average), cod (under 7,000 lb per year), sea scallop (3,600 lb per year), and scup (just over 3,500 lb per year). The primary port for this fishing mode is Point Judith, RI, with just under 50 percent of landings. Gloucester, New Bedford, and Chatham, MA, were also important ports with just over 30 percent of all landings coming in to these three ports. Figure 9 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

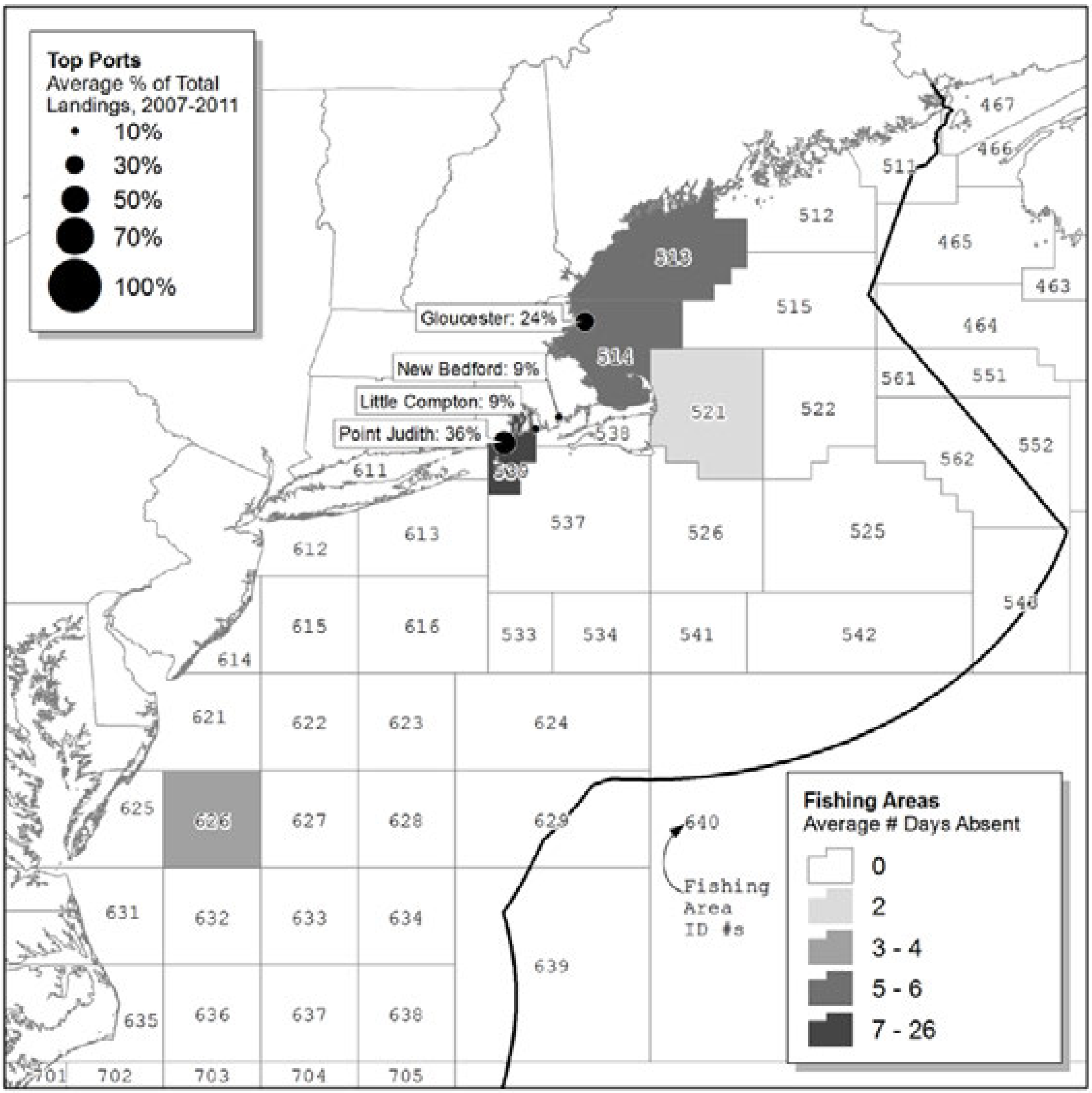

Figure 9. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England small-mesh gillnet fishing mode.

3.5.1.2 Mid-Atlantic

In contrast, the Mid-Atlantic small-mesh gillnet fishery is a much larger fishing mode, with over 100 participating vessels, on average, and average annual landings of over 4.6 million lb. These vessels together take an average of over 2,600 fishing trips per year (for an average of 24 trips per vessel per year). Trips generally last less than 1 day, but can exceed 10 days in duration. Vessels participating in this fishery primarily land at ports in North Carolina (Wanchese and Hatteras), New Jersey (Barnegat and Long Beach), and Virginia (Virginia Beach and Chincoteague).

Atlantic croaker and bluefish are the primary species landed by participants in this fishing mode, together comprising almost three-quarters of all landings. Landings of croaker exceeded 2.3 million lb, on average, over the 5-year timeframe examined. Bluefish landings were just under 980,000 lb per year. Landings of menhaden, spot, and spiny dogfish together averaged another 950,000 lb. Figure 10 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

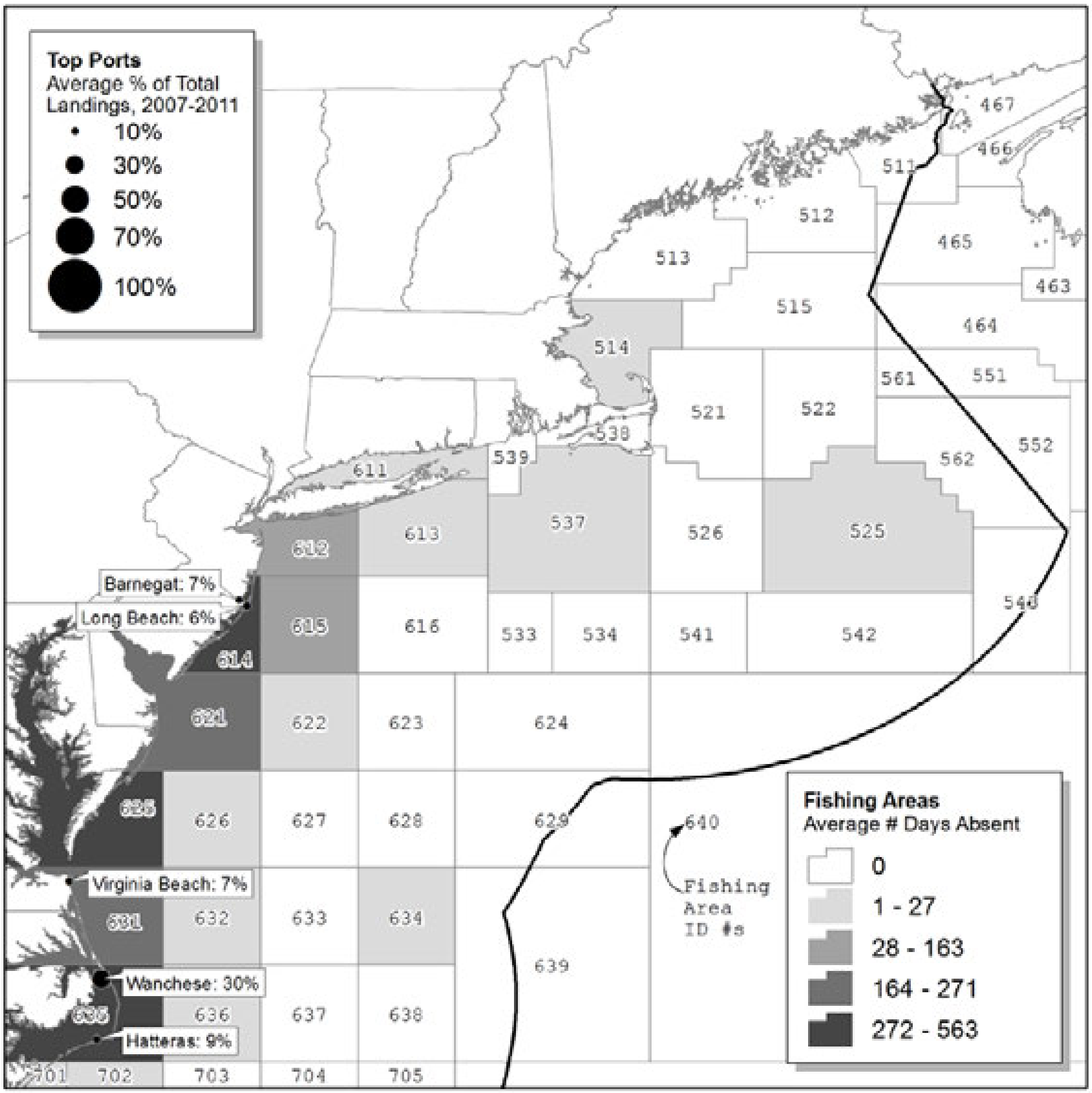

Figure 10. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic small-mesh gillnet fishing mode.

3.5.2 Large-Mesh Gillnets

3.5.2.1 New England

The biggest component of the New England gillnet fishery is the large-mesh gillnet fishing mode. Between 2007 and 2011, an average of 134 vessels participated. These vessels averaged 60 trips each year, landing over 80 different species at over 35 different New England ports. As with other gillnet fisheries, trips averaged less than 1 day in duration, but longer trips, up to 18 days in duration, are also reported.

Total landings of fish in this mode exceeded 15.3 million lb per year, with pollock and cod the primary species. Together, pollock (over 5.3 million lb per year) and cod (4.6 million lb per year) accounted for just over 65 percent of total landings, and spiny dogfish (over 3 million lb per year) comprised another 21 percent of total landings for the fishing mode. Most landings were made in Gloucester, MA (over 35 percent), Portland, ME (14 percent), and Chatham, MA (12 percent). Figure 11 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

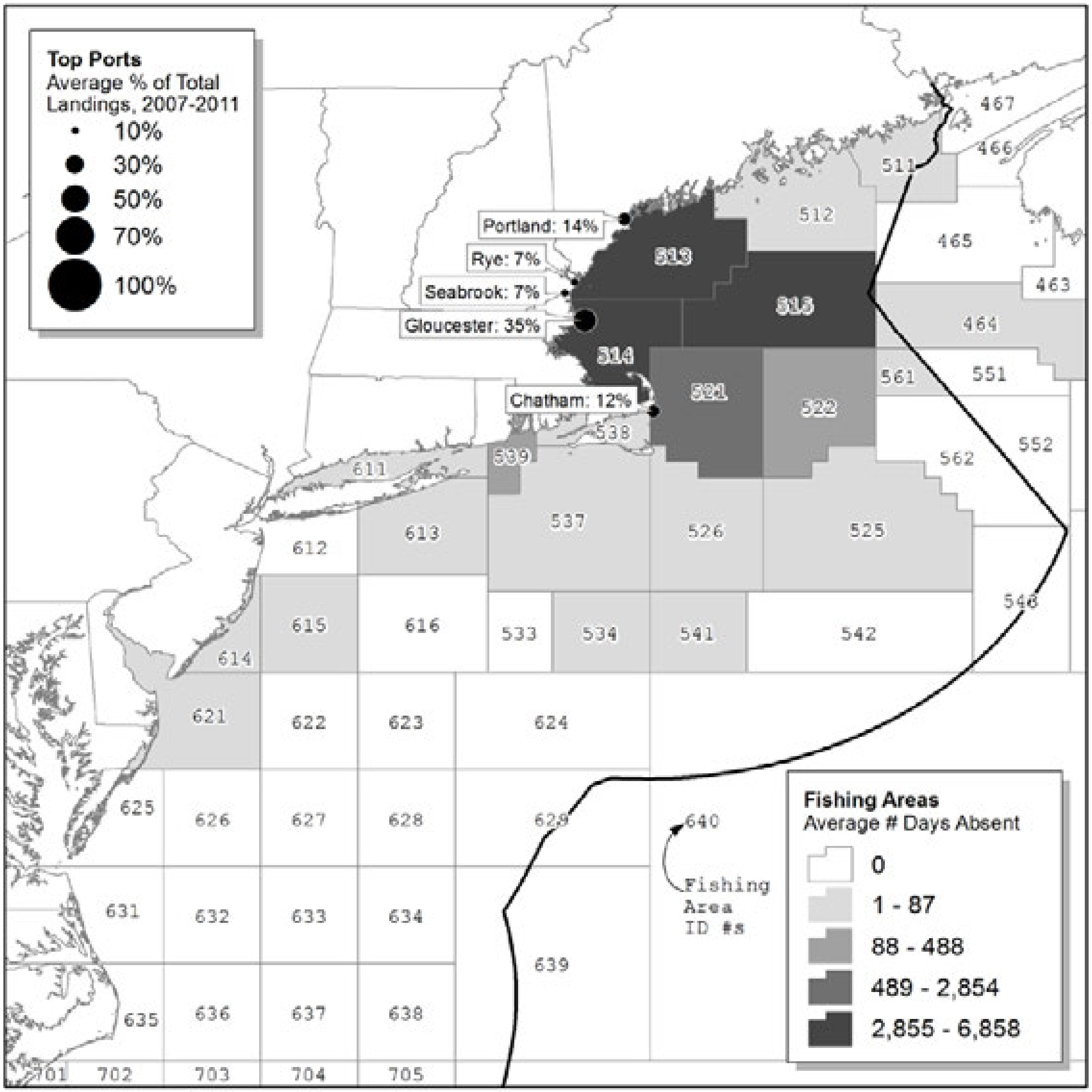

Figure 11. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England large-mesh gillnet fishing mode.

3.5.2.2 Mid-Atlantic

The Mid-Atlantic large-mesh gillnet fishery is smaller than the New England large-mesh gillnet fishery, but remains a substantial fishery nonetheless. An average of 119 vessels participates in this fishing mode each year, making an average of 15 trips each. Average trip duration is less than 1 day, but the longest trips are 13 days or less.

The majority of landings in this fishing mode are of either spiny or smooth dogfish (an average of 1.5 million lb and 800,000 lb per year, respectively). Bluefish are also a substantial component of the landings (1.2 million lb per year). Together, these three species comprise 88 percent of the 4.0 million lb in total annual landings. Most landings are made in Barnegat, NJ (18 percent), Wanchese, NC (16 percent) Ocean City, MD (12 percent), or Chincoteague, VA (11 percent). Figure 12 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

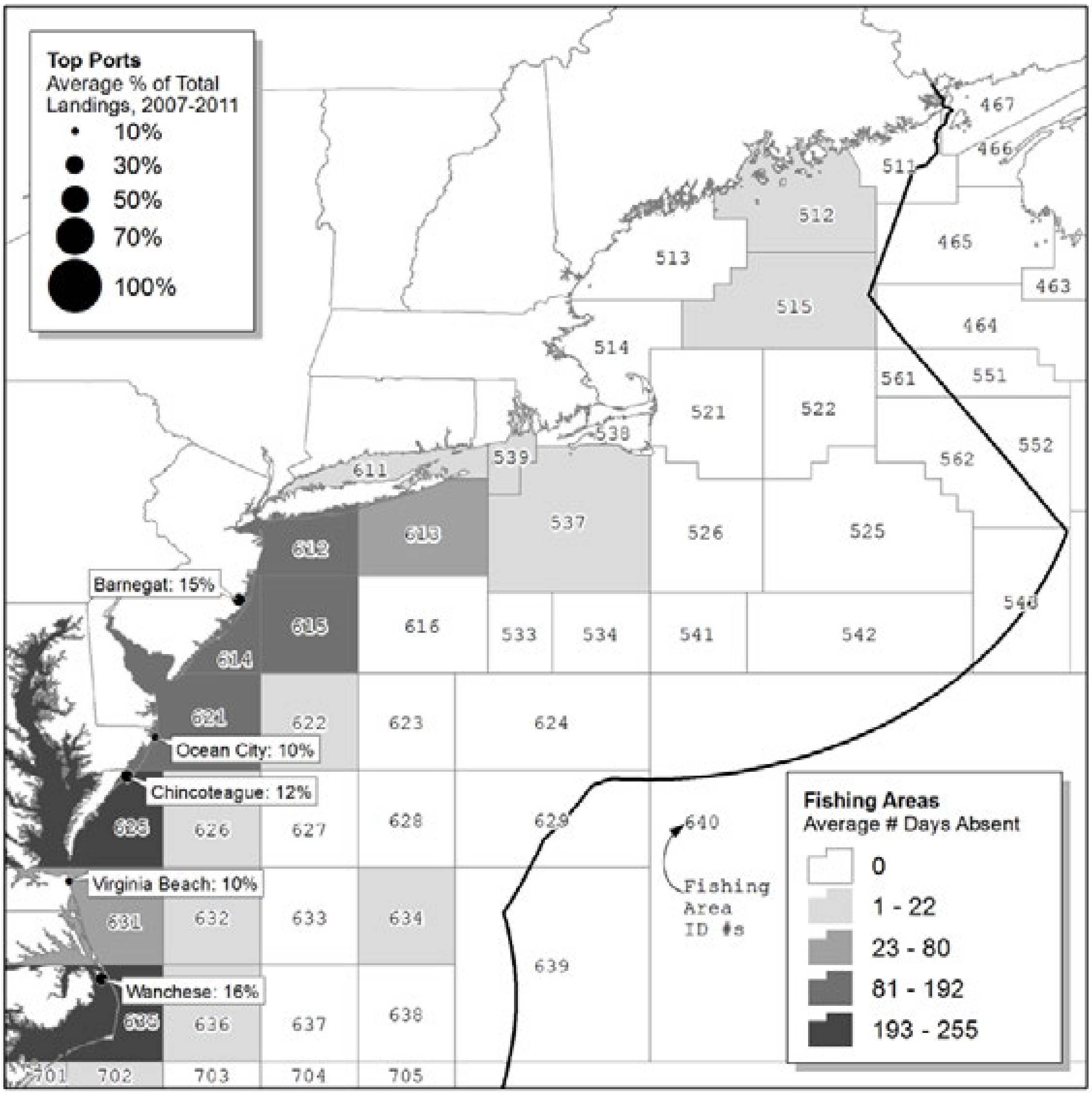

Figure 12. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic large-mesh gillnet fishing mode.

3.5.3 Extra-Large-Mesh Gillnets

3.5.3.1 New England

Participation in the New England extra-large mesh gillnet fishery has averaged 108 participating vessels from 2007 through 2011. Over this time, participating vessels made an average of fewer than 33 fishing trips each per year. Trip duration for all participating vessels averaged just under 1 day, with some trips up to 10 to 20 days in duration.

This is a fairly targeted fishing mode, with most landings (over 60 percent) of skate alone. There were over 7.5 million lb of skate landed, on average, between 2007 and 2011. Monkfish represented the second largest component of landings, with 3.2 million lb per year (25 percent of total landings). Some Northeast multispecies were also landed, but the primary groundfish species, cod and pollock, together comprised only 7 percent of total landings for this fishing mode. The primary ports for this fishing mode were Chatham, MA (30 percent of total landings) and New Bedford, MA (26 percent of total landings). Gloucester, MA, Little Compton, RI, and Point Judith RI, were also important, with just under 24 percent of all landings coming in to these three ports. Figure 13 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

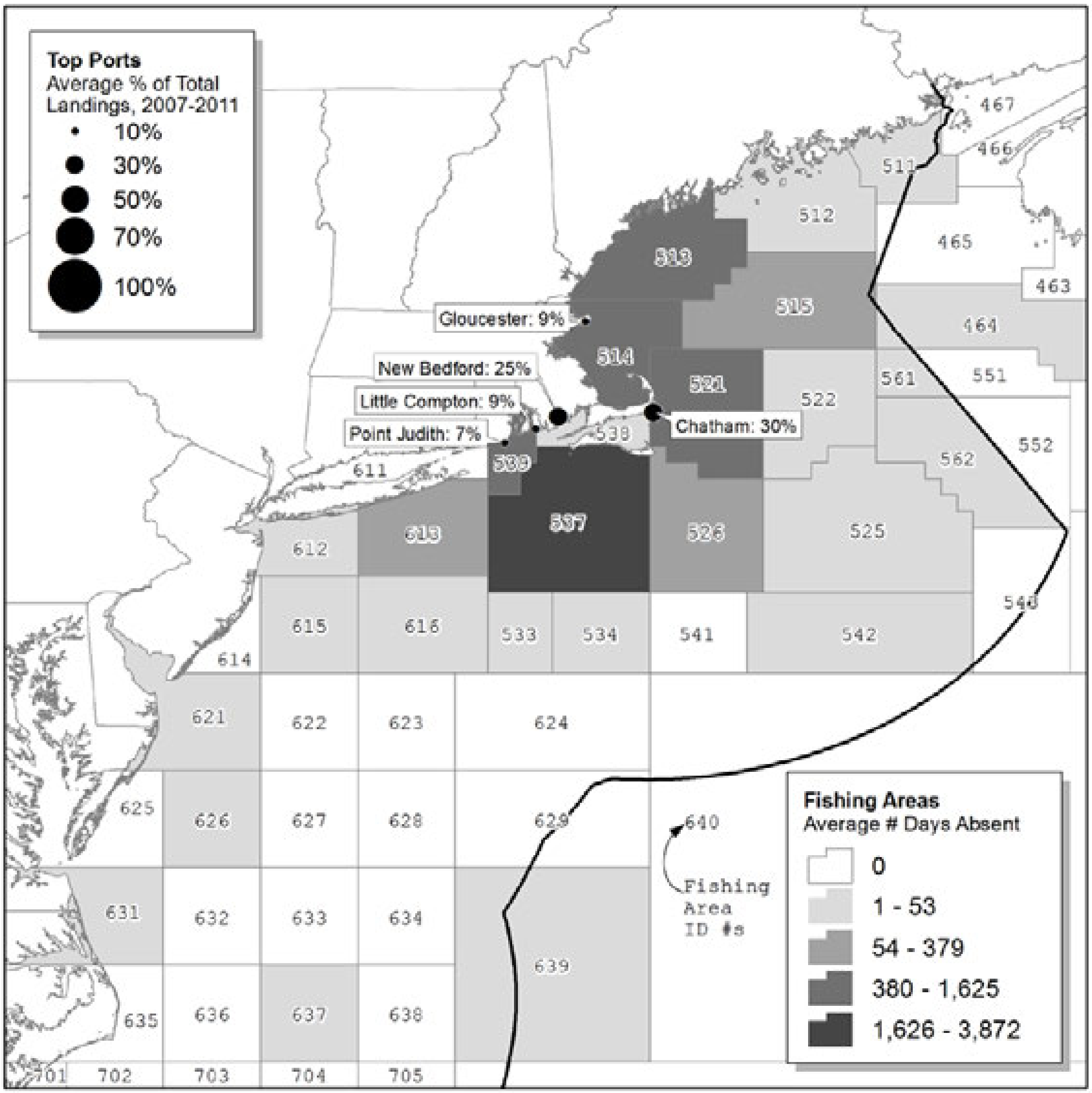

Figure 13. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England extra-large-mesh gillnet fishing mode.

3.5.3.2 Mid-Atlantic

Among the gillnet modes, the extra-large mesh gillnet category has the most similarity between the New England and the Mid-Atlantic components. In the Mid-Atlantic, there was an average of 109 participating fishing vessels that made an average of over 25 trips each per year. Fishing trips averaged less than 1 day, however trips from 10 to 20 days in duration were reported.

The strongest similarity between the two regions for this fishing mode is in species landed, with monkfish and skates being the primary species in the Mid-Atlantic as well. The Mid-Atlantic fishery is more targeted than New England on monkfish, over 69 percent of all landings in this mode (over 3.2 million lb per year) are monkfish. Skates represent another 15 percent of landings, while the rest of the landings are spiny dogfish, striped bass, and bluefish (each under 2 percent).

Three of the top five ports for Mid-Atlantic extra-large mesh gillnet landings are in New Jersey: Barnegat, Long Beach, and Point Pleasant (21 percent, 14 percent, and 11 percent, respectively). Montauk, NY (12 percent), Chincoteague, VA (10 percent), and New London, CT (8 percent) are also important. Figure 14 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

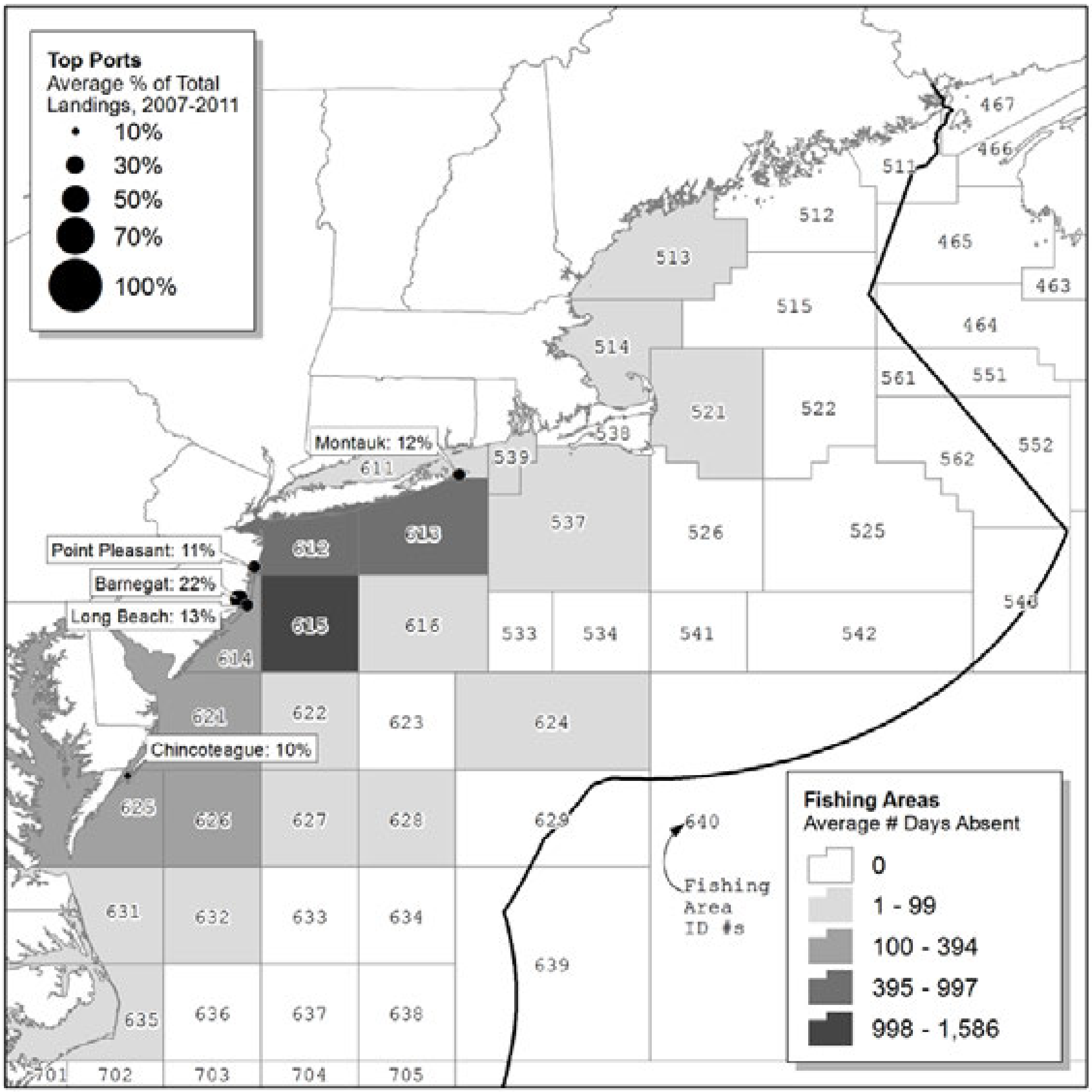

Figure 14. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic extra-large-mesh gillnet fishing mode.

3.6 Handline and Rod and Reel Fishery

3.6.1 New England

The New England handline and rod and reel fishing mode has 258 vessels, on average, reporting via FVTRs per year. On average, participants in this fishing mode take 11 fishing trips per year, and trips averaged less than a day in duration but longer trips, up to 10-15 days, were reported.

This fleet primarily targets cod (29 percent of landings) and spiny dogfish (26 percent of landings), although a number of these vessels target bluefin tuna and striped bass (14.5 percent of landings, each). In spite of the substantial numbers of participants, the amount of cod landed (1.1 million lb per year) remains less than one-quarter of the cod landings of the large-mesh gillnet fleet.

The New England handline and rod and reel fleet reports landings at over 90 ports but 78 percent of landings are concentrated at just 5 ports: Chatham, MA (246,000 lb per year); Gloucester, MA (159,000 lb per year); Harwichport, MA (88,000 lb per year); Marshfield, MA (43,000 lb per year); and Point Judith, RI (41,000 lb per year). Figure 15 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

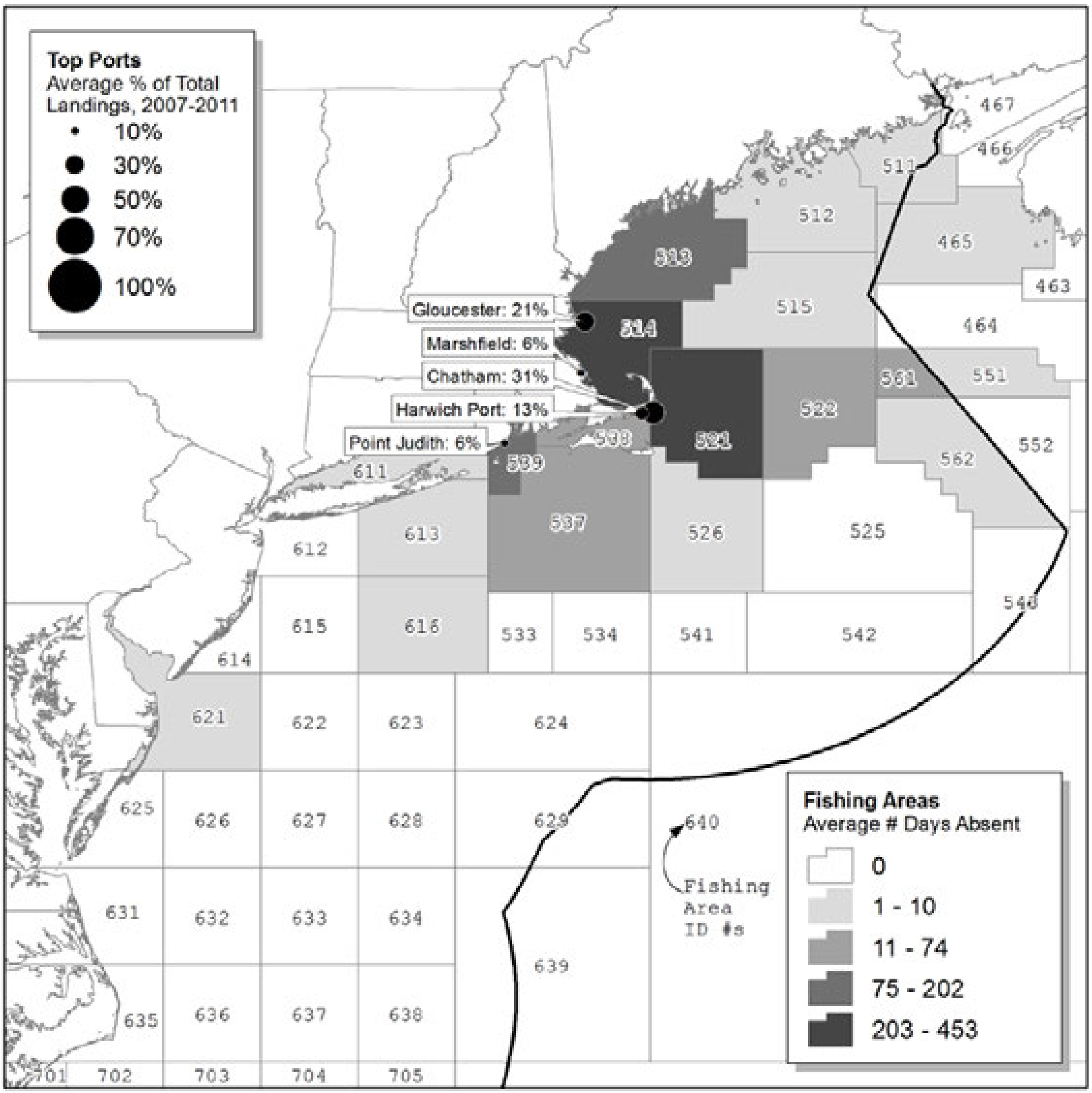

Figure 15. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England handline/rod and reel fishing mode.

3.6.2 Mid-Atlantic

A similarly sized fleet, with over 208 participating vessels per year, the Mid-Atlantic handline and rod and reel fishing mode shares many functional characteristics with the New England mode, but targets different species. Each participating vessel, on average, made 21 trips per year, landing at 90 ports. Trips generally last less than a day, but trips over 10 days in duration have occurred in most years.

As noted above, the similarities between the New England and Mid-Atlantic modes end when it comes to the species landed. The primary targets of this fishing mode were striped bass (195,000 lb per year, 28 percent of total landings), bluefish (124,000 lb per year), scup (104,000 lb per year), summer flounder (86,000 lb per year), and black sea bass (332,000 lb per year). Although over 115 species are landed by participants in this fishery, these five species represent over 82 percent of total landings. Over 56 percent of all landings are made in Montauk, NY, with an average 396,000 lb annually. Virginia Beach, VA, Point Lookout, NY, Island Park, NY, Shinnecock, NY, and Point Pleasant, NJ combine for another 16 percent of total landings for this fishing mode Figure 16 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

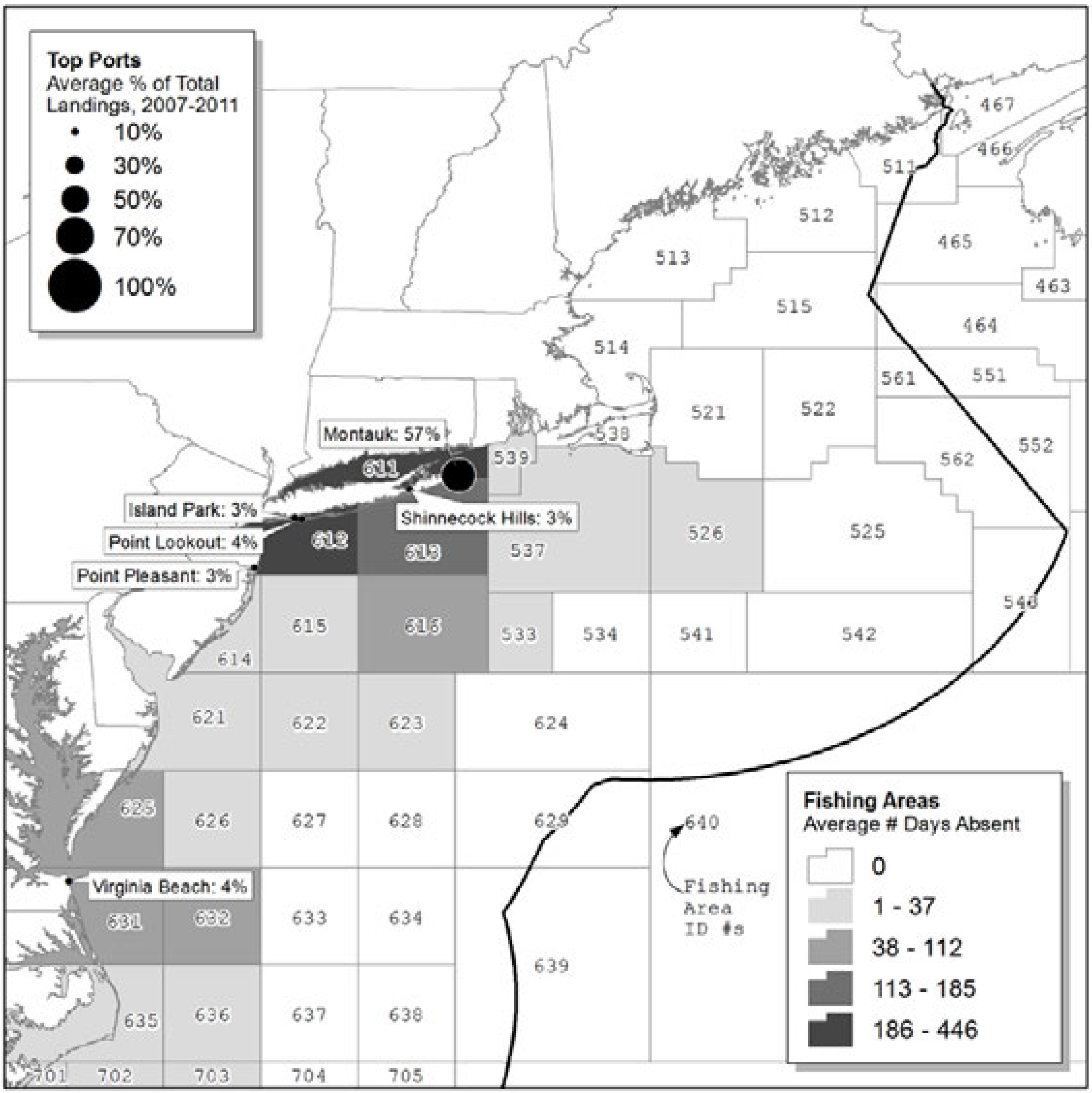

Figure 16. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic handline/rod and reel fishing mode.

3.7 Lobster Pot Fishery

Characterizing the New England and Mid-Atlantic lobster pot fishing modes is limited by the lack of data from many participants who are not required to submit FVTRs because they do not hold a Federal permit with a FVTR requirement.

3.7.1 New England

While FVTR information is not available for vessels that hold no Federal permits or no Federal permits other than for lobster, a substantial number of participants in the New England lobster pot fishing mode hold at least one Federal permit with a requirement to submit FVTRs. There are, on average, over 480 participants in the New England lobster pot fishing mode that submit FVTRs each year, and these participants take an average of 64 fishing trips each year. Most fishing trips are under 1 day in duration, although trips lasting 15-20 days do occur each year.

American lobster is the primary species landed in this fishing mode, with an average of nearly 15 million lb landed each year by participants that submit FVTRs. This represents over 63 percent of the total landings by these participants. Jonah crab is also a significant component of this fishing mode, with an average of nearly 8 million lb landed annually. Together, lobster and Jonah crab comprise 97 percent of the total reported landings in this mode. Various crab species (rock, blue, and red, among others) also factor as landings, but in much smaller amounts.

Landings in this fishing mode are fairly spread out among almost 140 ports in New England, and the top 5 ports (Point Judith, RI, New Bedford, MA, Newport, RI, Newington, NH, and Sandwich, MA) together account for 53 percent of the landings made by reporting participants. Point Judith averaged 3.7 million lb (16 percent of the total reported landings) and New Bedford averaged 3.4 million lb (15 percent of total reported landings), while the other three each average 1.5-2.0 million lb (6-9 percent of total reported landings). Figure 17 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

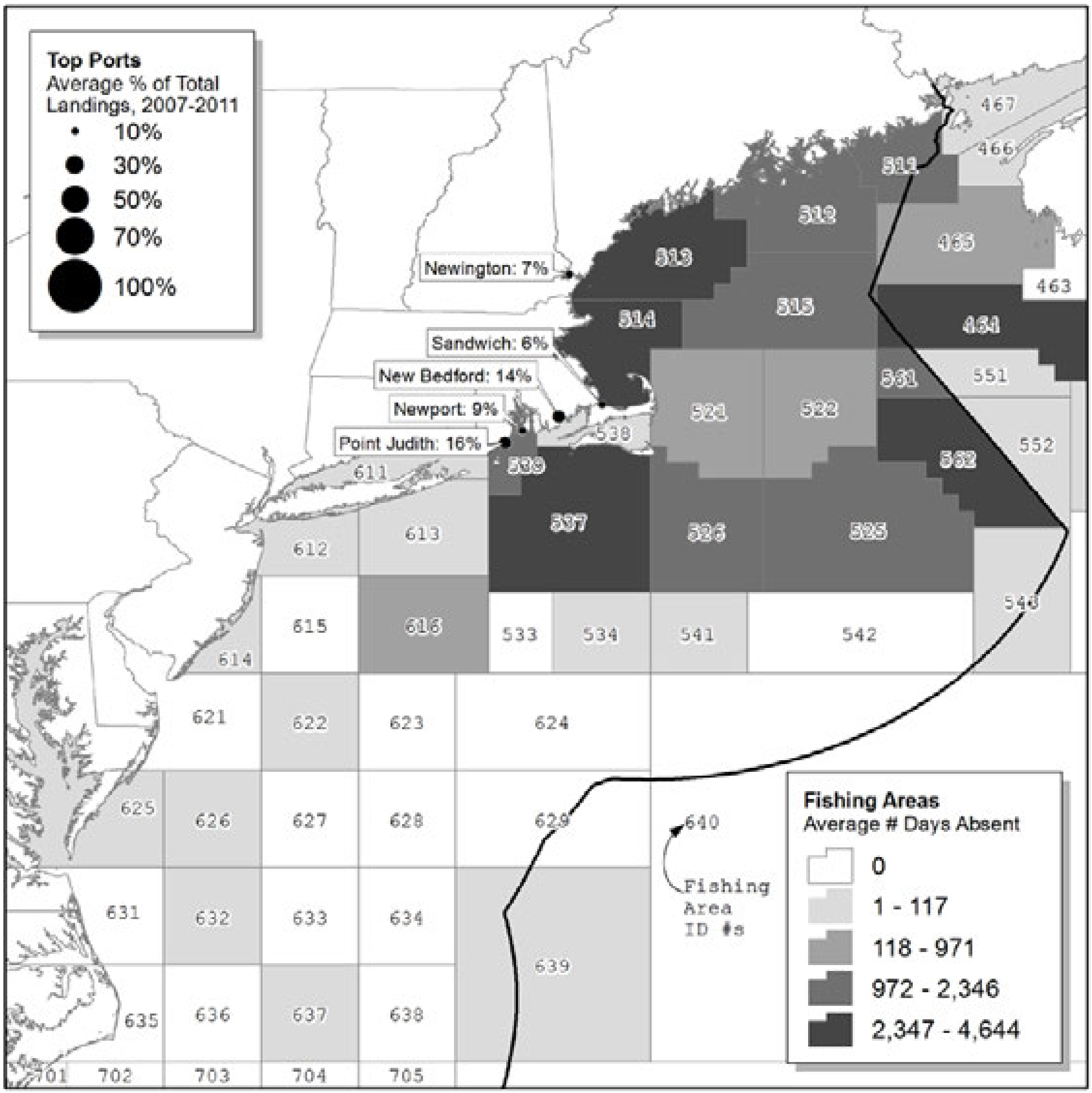

Figure 17. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England lobster pot fishing mode.

3.7.2 Mid-Atlantic

There are many fewer participants in the lobster pot fishing mode that report via FVTRs in the Mid-Atlantic than in New England, as the average number of reporting participants is just over 88 per year. These participants take fewer fishing trips, about 36, per year. Most trips last under 1 day, and the longest trips tend to be between 10 and 15 days in duration.

As expected, American lobster is the primary species landed, although at just over 1 million lb per year, these landings represent a small fraction of the 15 million lb per year landed in New England. Lobsters comprise almost 64 percent of the annual landings, with Jonah crab (493,000 lb) adding another 28 percent of total landings. The rest of the top five species landed include whelk (32,000 lb per year), black sea bass (31,000 lb per year), and red crab (24,000 lb per year) and combine for only 5 percent of total landings. Montauk, NY (494,000 lb per year), Point Pleasant, NJ (388,000 lb per year), and Sea Isle City, NJ (268,000 lb per year), are the top ports for participants in this fishing mode that report via FVTR. Together these three ports take in over 64 percent of the total reported landings for this mode. Cape May, NJ, and Ocean City, MD, together account for another 12 percent of the reported landings each year. Figure 18 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

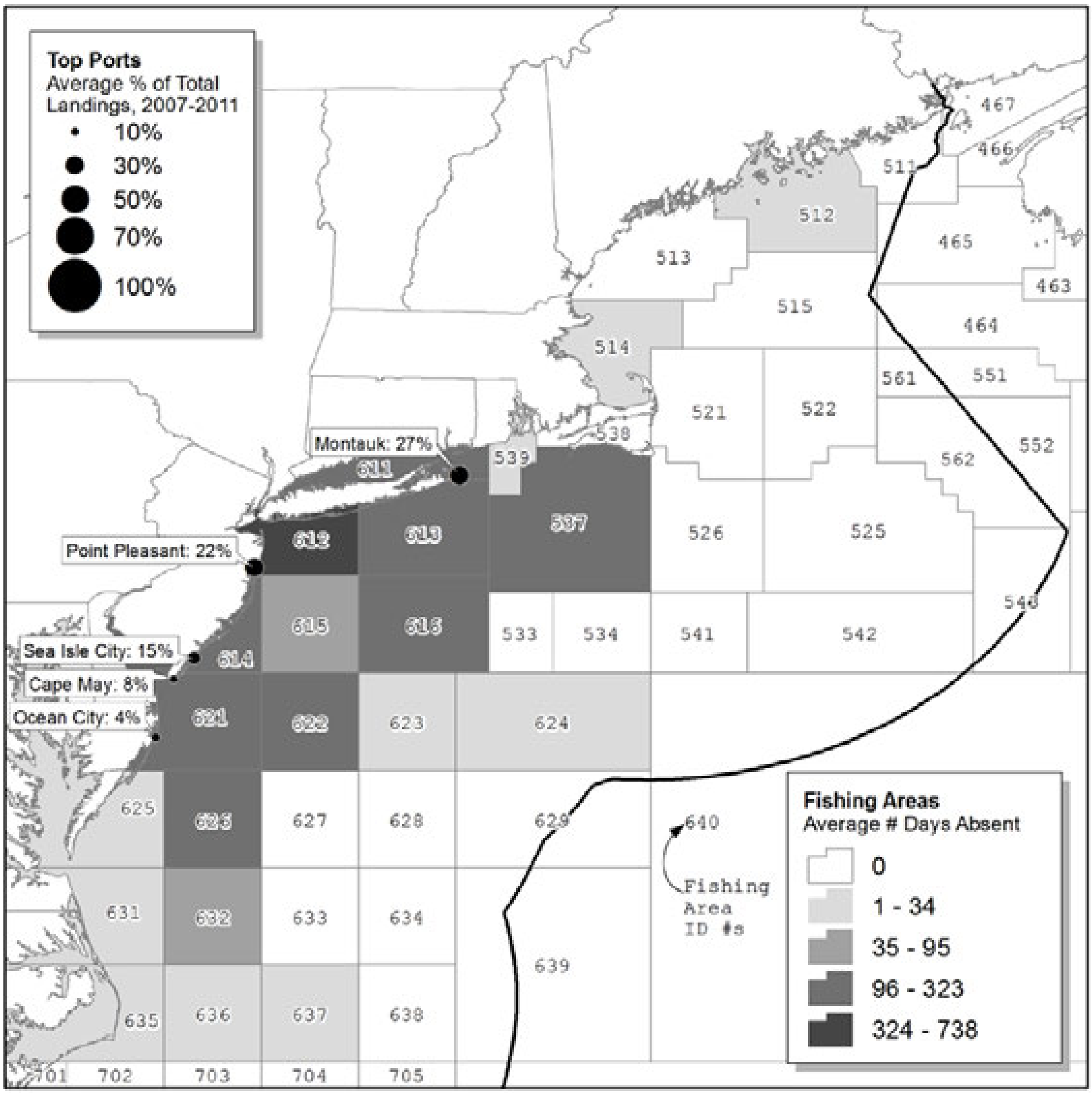

Figure 18. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic lobster pot fishing mode.

3.8 Bottom Longline Fishery

As explained in chapter 5, for the purposes of allocating fishery observer effort within the groundfish fisheries, some New England longline fishing trips are differentiated according to the type of trip (if the trip participates in a SAP). However, this information is not available on the FVTR, and so the following summaries do not specifically address the differences between these types of trips and other longline trips.

3.8.1 New England

The number of participants in the New England bottom longline fishing mode has had an average of 73 participating vessels each year. These vessels take an average of 15 fishing trips each per year, each lasting an average of under 1 day, while trips of 10 to 12 days are reported each year.

Haddock (744,000 lb per year), Spiny dogfish (634,000 lb per year) and cod (429,000 lb per year) are the primary species landed by participants in this fishing mode, together representing over 93 percent of the total mode landings. The predominant port for the New England bottom longline fleet is Chatham, MA (44 percent), but Gloucester, MA (16 percent) and Harwichport, MA (12 percent) are also very important. Secondary ports include Scituate, MA (7.4 percent) and Marshfield, MA (5.5 percent). Figure 19 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

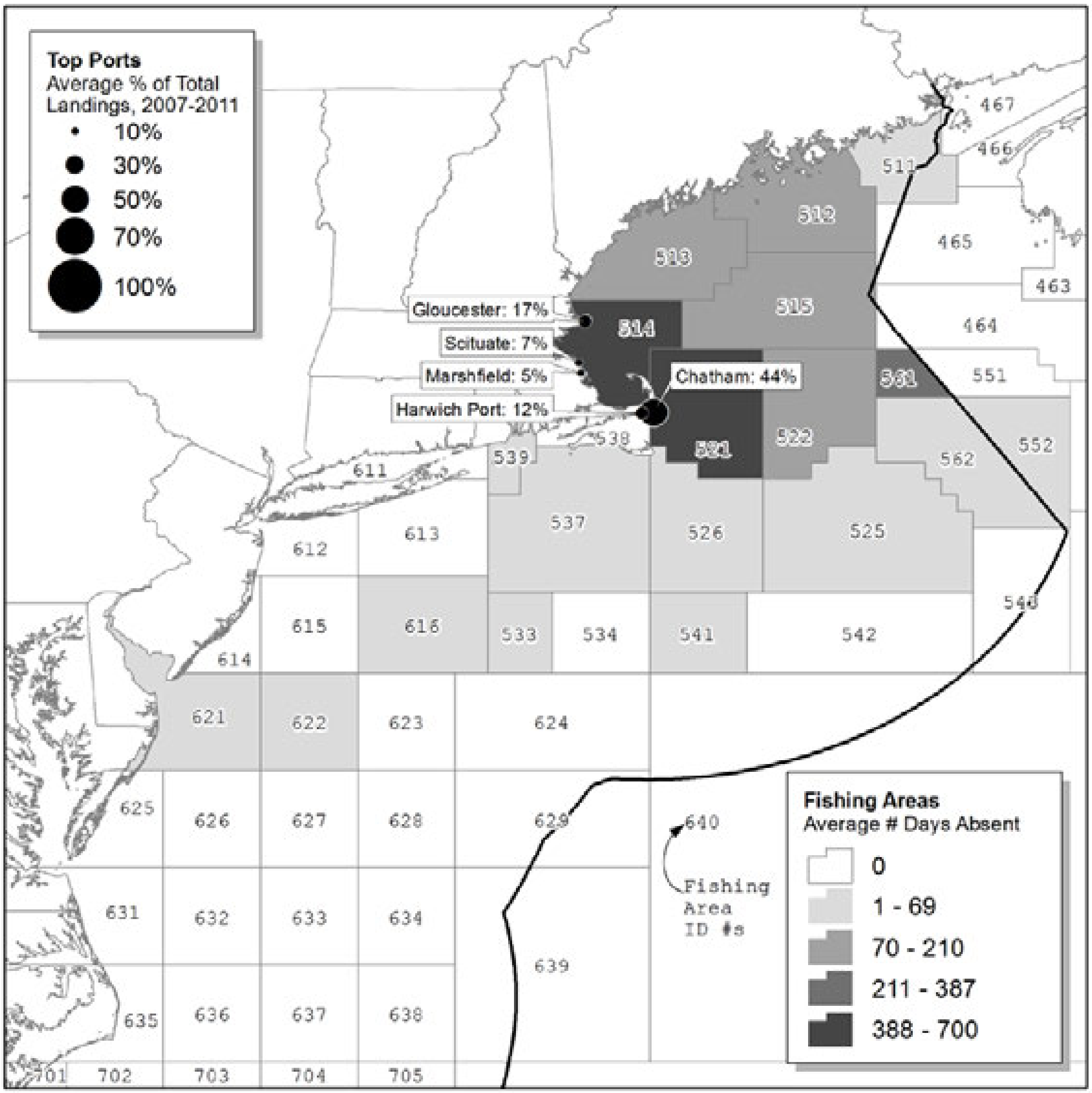

Figure 19. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England bottom longline fishing mode.

3.8.2 Mid-Atlantic

The Mid-Atlantic bottom longline fishery is a much smaller, much more focused fishing mode that primarily targets tilefish. On average, 20 vessels participate each year, making an average of fewer than 9 fishing trips per year. Fishing trips are typically 4-12 days in duration, but trips up to 20 days occur.

As noted, this is a much more focused fishing mode than many others, with 89 percent of landings being golden tilefish. Another 7 percent of total landings consist of swordfish, yellowfin tuna, spiny dogfish, and bigeye tuna, combined. Nearly 64 percent of the landings are made in Montauk, NY (1.1 million lb per year), while Barnegat, NJ, accounts for 16 percent of total landings. Secondary ports include Long Beach, NJ (6.7

percent of landings) and Hampton Bays, NY (5.3 percent of landings). Figure 20 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

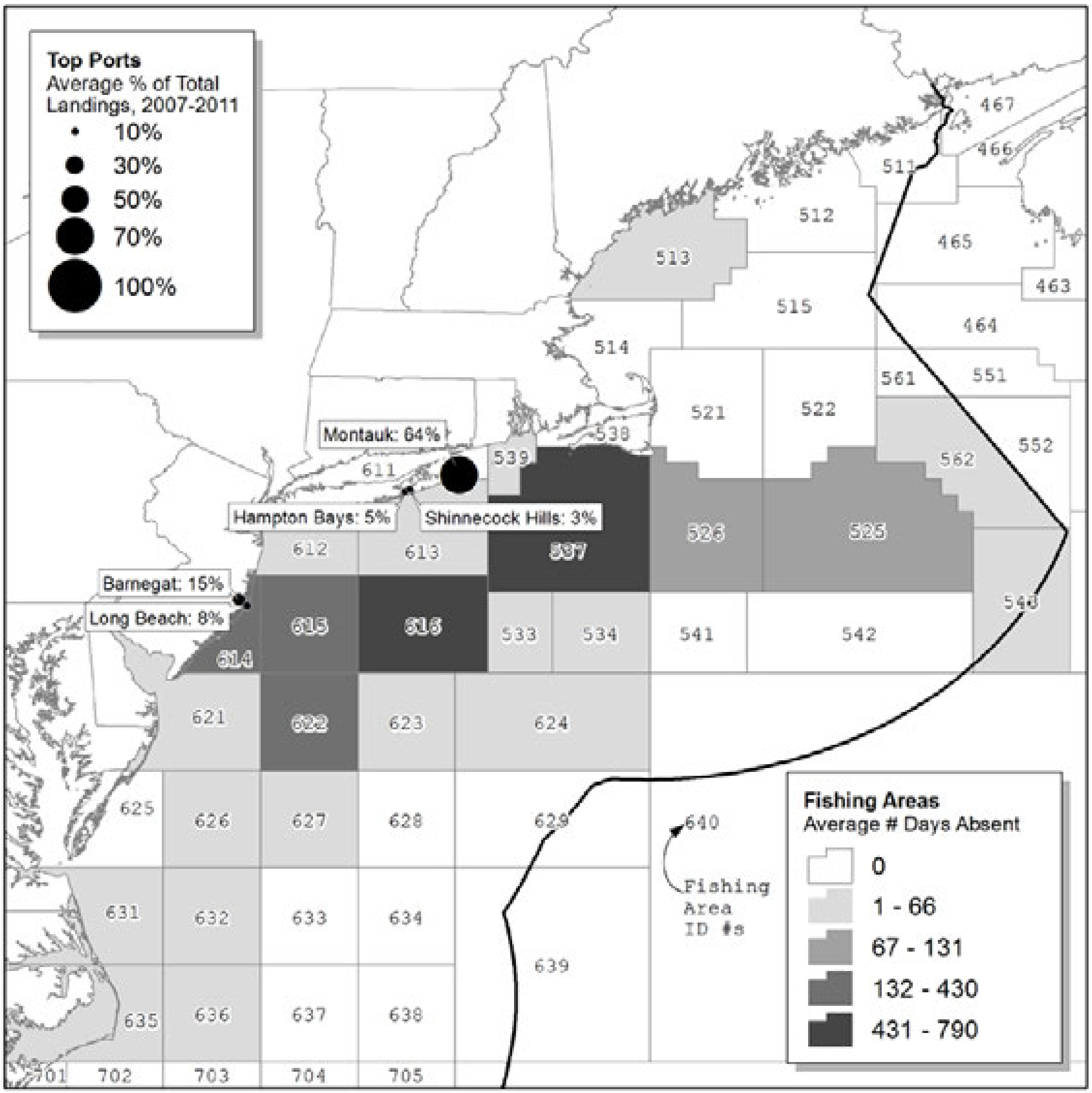

Figure 20. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic bottom longline fishing mode.

3.9 Mid-Water Single and Pair Trawl Fisheries

For the purposes of the development and application of the SBRM, paired and single midwater trawls are considered together in the stratification of observer data and the allocation of observer effort.

3.9.1 New England Midwater Single and Pair Trawl

Midwater trawl fisheries are large volume fisheries with relatively few participants. The New England single and pair trawl mode averages 21 active participants each year, and each participant takes, on average, nearly 22 fishing trips per year. Most trips are relatively short, typically 1 to 4 days, but longer trips 10-20 days in duration do occur. The New England midwater trawl fishing mode is an extremely targeted fishery, with over 80 percent of the annual landings from Atlantic herring (nearly 120 million lb per year), and Atlantic mackerel (19 percent, or 28 million lb, per year) generally comprises the remainder. Occasional landings of longfin squid (186,000 lb per year), menhaden (55,000 lb per year), and haddock (41,000 lb per year), but the amounts are negligible compared to the two primary species.

Gloucester, MA, is the top port for this fleet, receiving over 40 percent of the annual landings (60 million lb). New Bedford, MA, and Portland, ME, rank second and third, respectively, with 48 million lb (32 percent of the total) landed each year in New Bedford, and 19.5 million lb (13 percent) coming in each year to Portland. Rockland, ME, and Fall River, MA, complete the top five ports, with a total of 12.6 million lb (8.5 percent of the total) between them. Figure 21 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

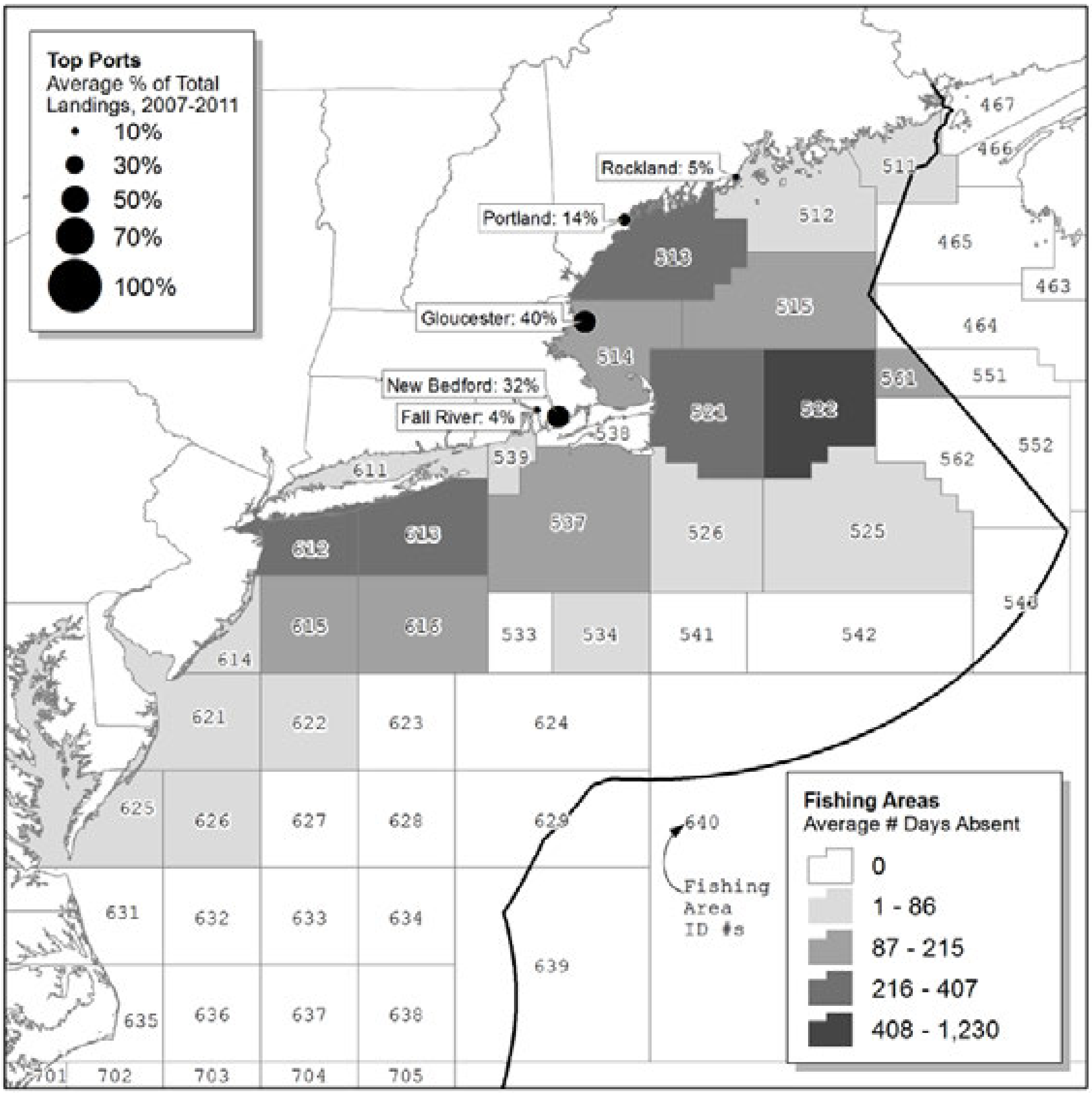

Figure 21. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England midwater single and pair trawl fishing mode.

3.9.2 Mid-Atlantic Midwater Single and Pair Trawl

The Mid-Atlantic midwater single and pair trawl mode is smaller than its New England counterpart. The Mid-Atlantic single and pair trawl mode has averaged just eight vessels per year. Trips are typically 3 to 4 days in duration, and each vessel took, on average, over 5 trips each year. In contrast to the New England midwater trawl fishing mode, for which Atlantic herring is the primary target species, in the Mid-Atlantic, Atlantic herring and Atlantic mackerel are targeted more evenly.

Nearly 52 percent of all landings by Mid-Atlantic midwater trawls is Atlantic herring, averaging over 5.7 million lb per year. Just over 5.1 million lb per year of Atlantic mackerel (46 percent of total mode landings) are landed by this fleet, and relatively insignificant amounts of *Illex* squid, menhaden, and scup are also landed, although these last three species together account for less than 1.5 percent of total annual landings.

Cape May, NJ, the top port for this fishing mode. Figure 22 displays primary fishing areas utilized by participants in this fishing mode.

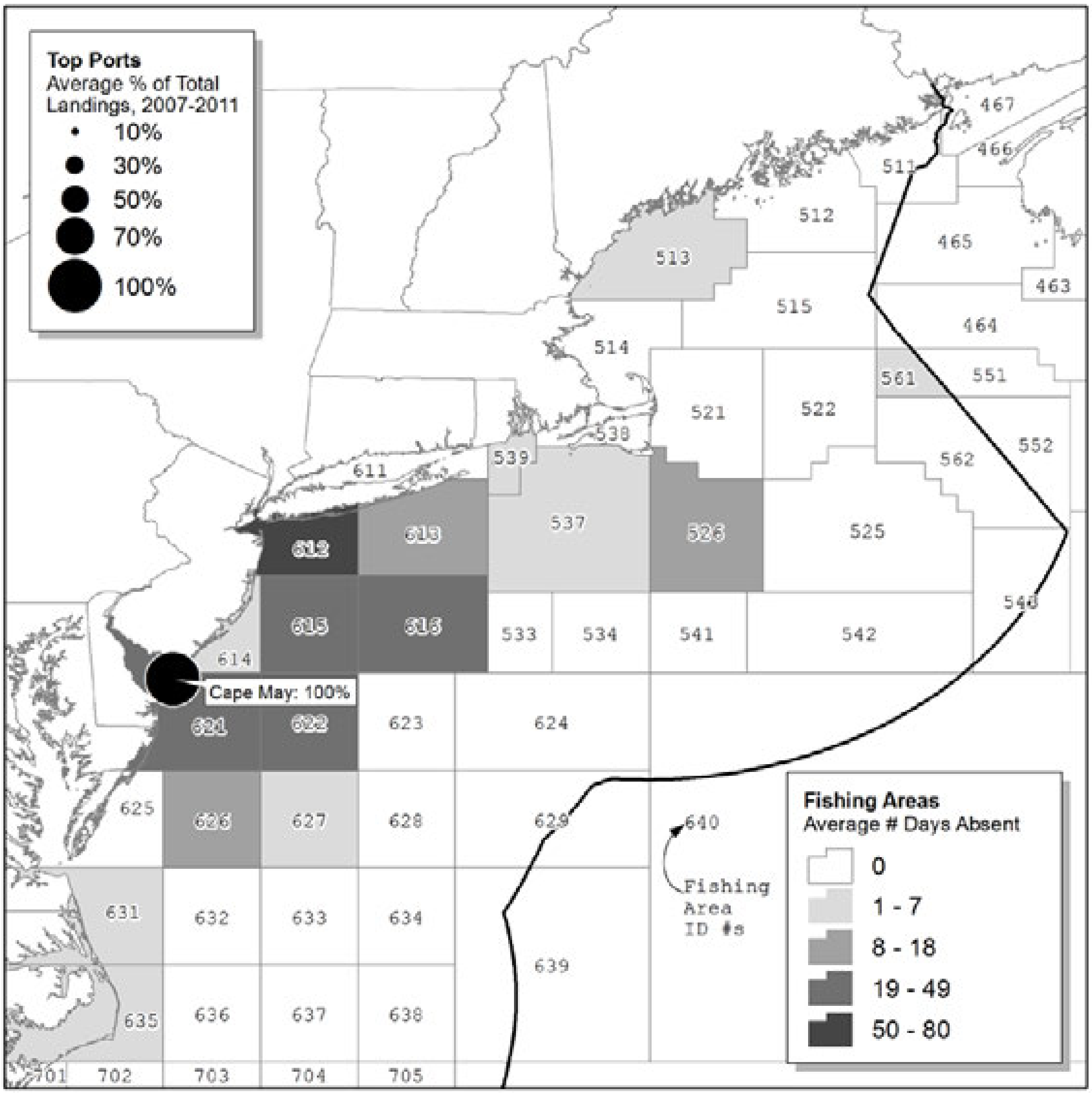

Figure 22. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic midwater single and pair trawl fishing mode.

3.10 Otter Trawl Fishery

Within the overall bottom otter trawl fishery, there are two mesh size categories used to define the fishing modes for the purposes of the SBRM: Small mesh (less than

5.5 inches) and large mesh (5.5 inches and greater). For each mesh size category, the two focus areas (New England and Mid-Atlantic) will be addressed. As explained in chapter 5, for the purposes of allocating fishery observer effort within the groundfish fisheries, some New England large-mesh otter trawl fishing trips are differentiated according to the type of trip (if the trip is to the U.S/Canada management area or uses B-Regular DAS). However, this information is not available on the FVTR and so the following summaries do not specifically address the differences between these types of trips and other large-mesh otter trawl trips.

3.10.1 Small-Mesh Otter Trawls

3.10.1.1 New England

The New England small-mesh otter trawl fishing mode has 148 participants, on average, landing over 50 million lb of fish each year. These vessels take, on average, almost 24 fishing trips per year, and the trips average just under 2 days in duration (although longer trips up to 20-25 days do occur).

Squid comprise the majority of catch for the participants of this fishing mode, with more than 13 million lb and 12 million lb of Longfin and *Illex* squid, respectively, landed on average each year. Together, these two species account for 51 percent of all landings in this mode. Also very important are silver hake with over 8.7 million lb (17 percent of the total landings), and Atlantic herring with7.7 million lb (15 percent of the total landings) landed each year. In addition to these four species, Atlantic mackerel (3 million lb) accounts for another 6 percent of annual landings.

The majority of landings made by participants in this fishing mode come into either North Kingstown or Point Judith, RI. Together, these two Rhode Island ports receive over 38 million lb (77 percent) of all small-mesh otter trawl landings in New England each year. New Bedford, MA (6 million lb annually), Newport, RI (2 million lb annually), and Gloucester, MA (826,000 lb annually), also constitute major ports for this fishing mode. Figure 23 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

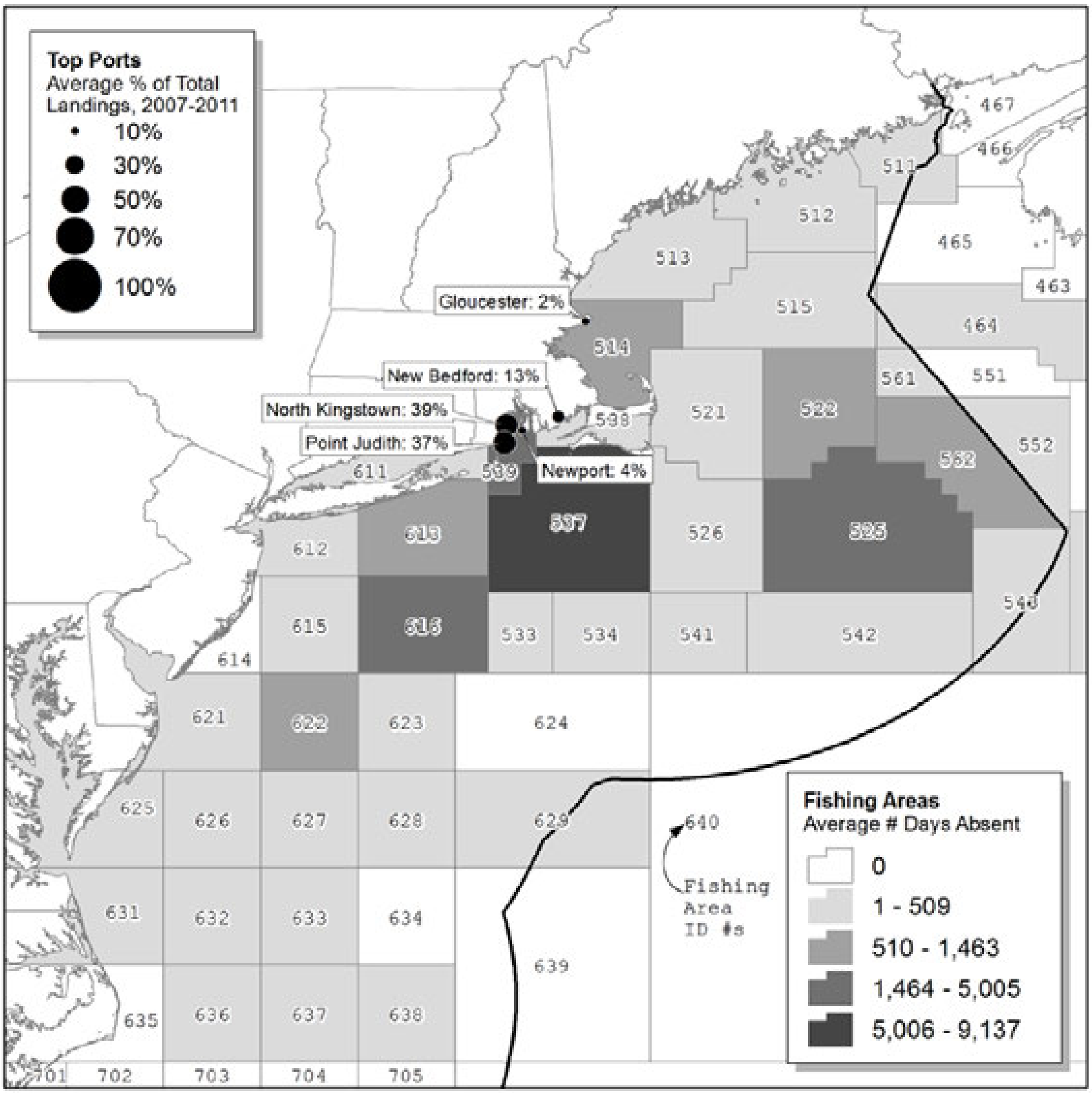

Figure 23. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England small-mesh otter trawl fishing mode.

3.10.1.2 Mid-Atlantic

There are many similarities between the New England and Mid-Atlantic modes of this fishery—not only in the species landed, but there is also an overlap in the areas fished (see Figure 23 and Figure 24). Participation in the Mid-Atlantic fishing mode averages 170 vessels per year, slightly more than the number of New England participants. On average, each Mid-Atlantic vessel takes almost 24 fishing trips per year, and like the New England mode, trips lasted almost 2 days on average Longer trips up to 15-20 days also occurred.

As in New England, squids comprise the majority (60 percent) of landings, with over 19 million lb of *Illex* squid and over 9 million lb of Longfin squid landed each year.

Silver hake also comprises a substantial amount of the annual catch, with over 6 million lb. Atlantic croaker (4 million lb) and scup (2.6 million lb) account for almost 14 percent of annual landings.

Cape May, NJ, is the top port for this fishing mode, with over 24 million lb of landings (50 percent of total landings for this mode) each year. Montauk, NY, takes in another 16 percent of annual landings, with Wanchese, NC (4.3 million lb annually), Shinnecock, NY (2.2 million lb annually), and New London, CT (1.7 million lb annually), also accounting for another 17 percent of total landings. Figure 24 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

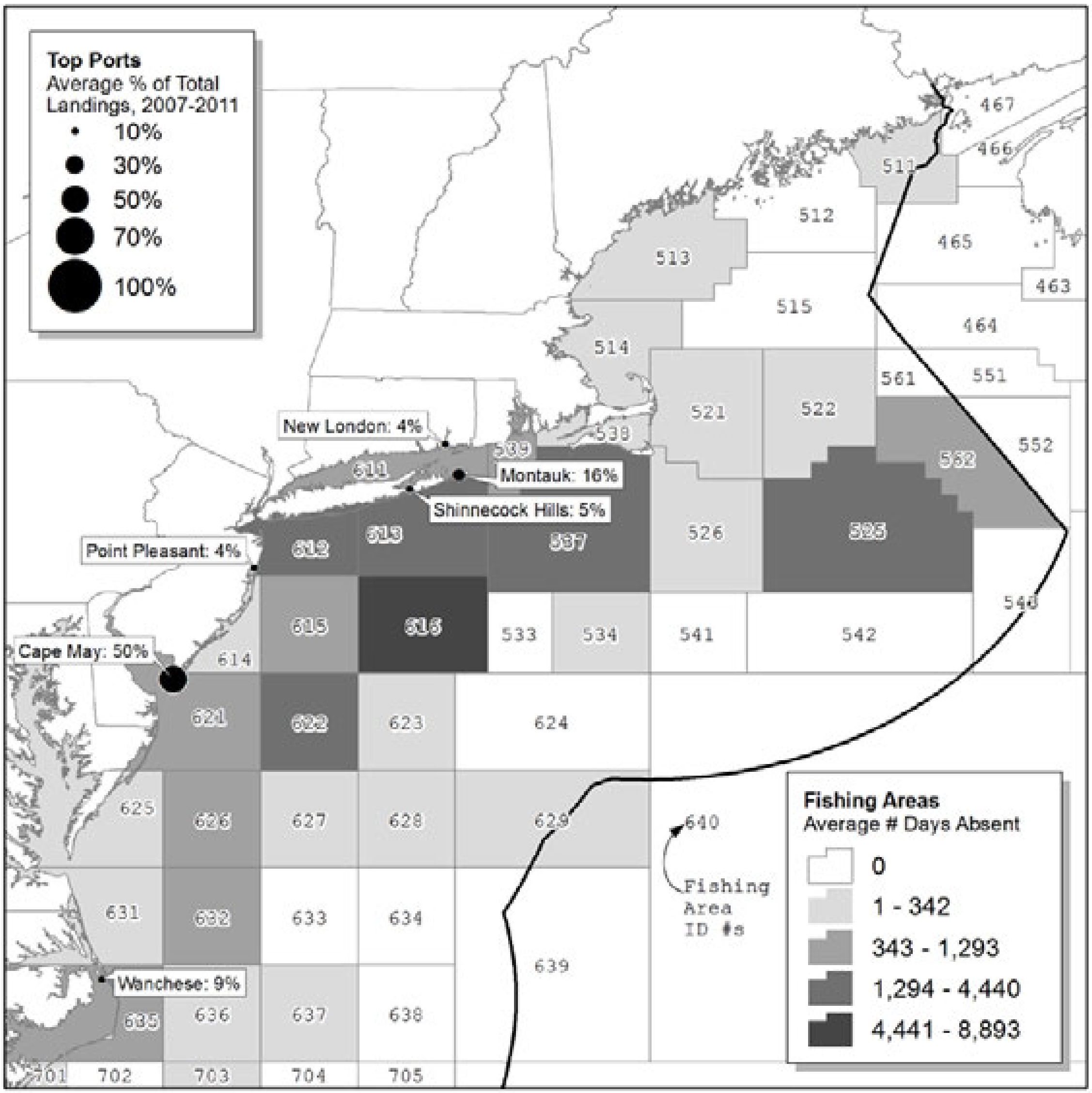

Figure 24. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic small-mesh otter trawl fishing mode.

3.10.2 Large-Mesh Otter Trawls

3.10.2.1 New England

The New England large-mesh otter trawl fishing mode is the fourth largest mode (behind the New England lobster pot and New England and Mid-Atlantic scallop dredge modes) of all Greater Atlantic Region fisheries, with an average of 293 active participating vessels. In total, the participants in this fishing mode land an average of 64 million lb of fish annually. Each of these participating vessels takes, on average, 35 fishing trips per year, although there is a lot of variability within the mode that correlates to vessel size, areas fished, and DAS available. Fishing trips tend to last 2 ½ days each, on average, but there are many vessels that take trips lasting 1 day or less, and other vessels that take longer trips, lasting up to 20days.

In spite of the large-mesh otter trawl mode's association with the groundfish fishery, the top species landed are skates (over 14.8 million lb per year; 23 percent of total landings for the fishing mode). Landings of haddock, Atlantic cod, and pollock average 8-9 million lb per year. Winter flounder landings average 4 million lb per year. Together, these four groundfish species comprise 47 percent of the total landings of the fishing mode.

New Bedford, MA, is the top port for this fishing mode, with over 22 million lb of fish (35 percent of the total annual landings) coming in each year. Other important ports include Gloucester, MA (22 percent of total landings), Point Judith, RI (14 percent of total landings), and Boston, MA (12 percent of total landings), Figure 25 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

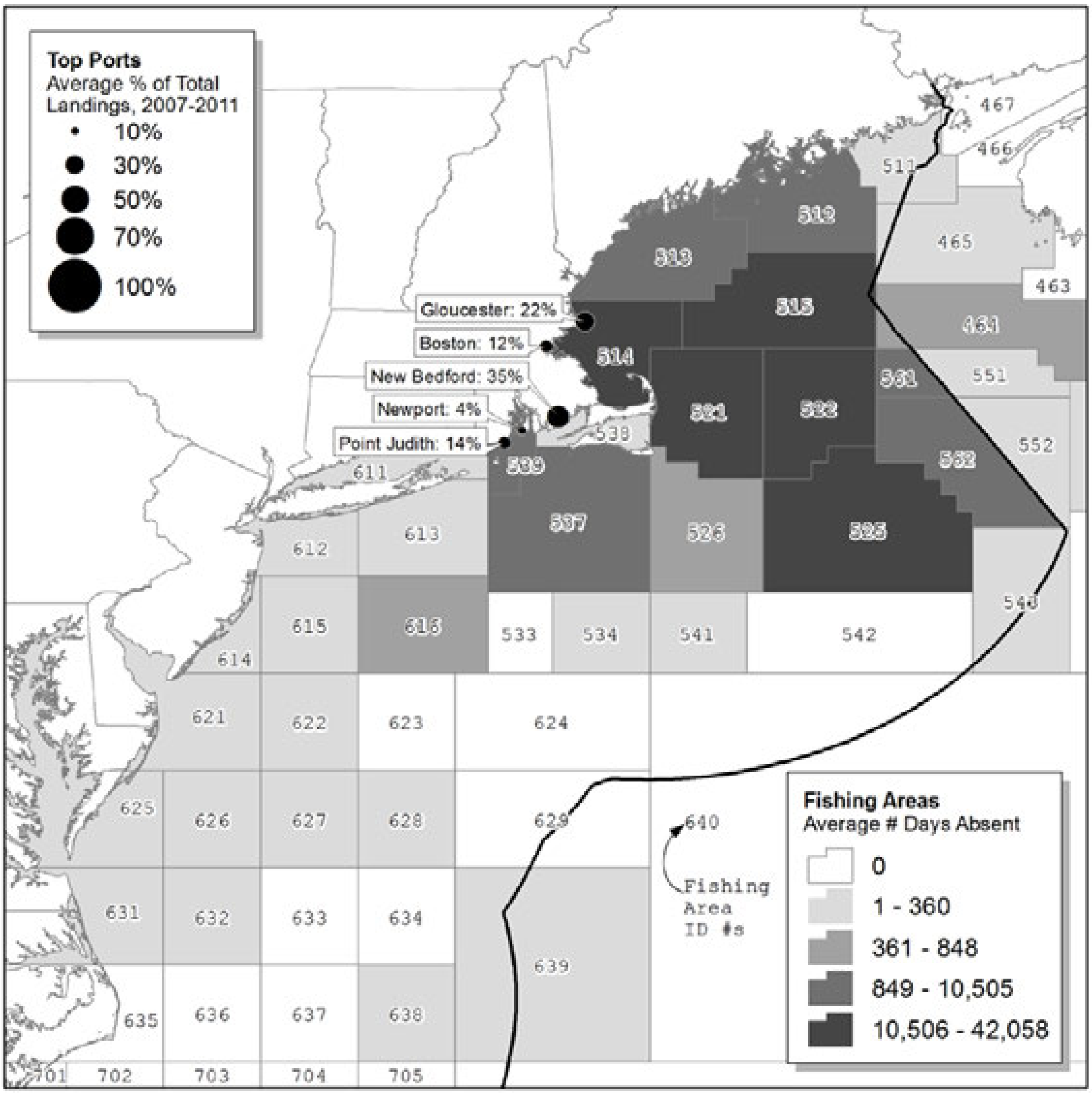

Figure 25. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England large-mesh otter trawl fishing mode.

3.10.2.2 Mid-Atlantic

With almost 225 vessels participating in this fishing mode each year, the Mid-Atlantic large-mesh otter trawl fishing mode is smaller than its New England counterpart as total landings average just over 15 million lb per year (just under 25 percent of the landings associated with the New England large-mesh otter trawl fleet). Mid-Atlantic vessels take, on average, 29 1-day fishing trips per year, although trips as long as 17-24 days have been taken in some years.

Summer flounder is the primary species landed, representing almost half—7.4 million lb—of the total annual landings. Skates, scup, sea scallop, and spiny dogfish together account for another 29 percent of the total annual landings. Skate landings average just over 1.5 million lb per year and scup average almost 1.4 million lb annually, while sea scallop landings average 1.0 million lb and spiny dogfish landings average over 900,000 lb. Landings in this fishing mode are fairly evenly divided between a number of ports in New Jersey, New York, North Carolina, and Virginia. Point Pleasant, NJ, Montauk, NY, Wanchese, NC, Shinnecock, NY, and Newport News, VA, and, comprise the top five ports each with over 1.1 million lb (8-10 percent of the total) of landings each year. Figure 26 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

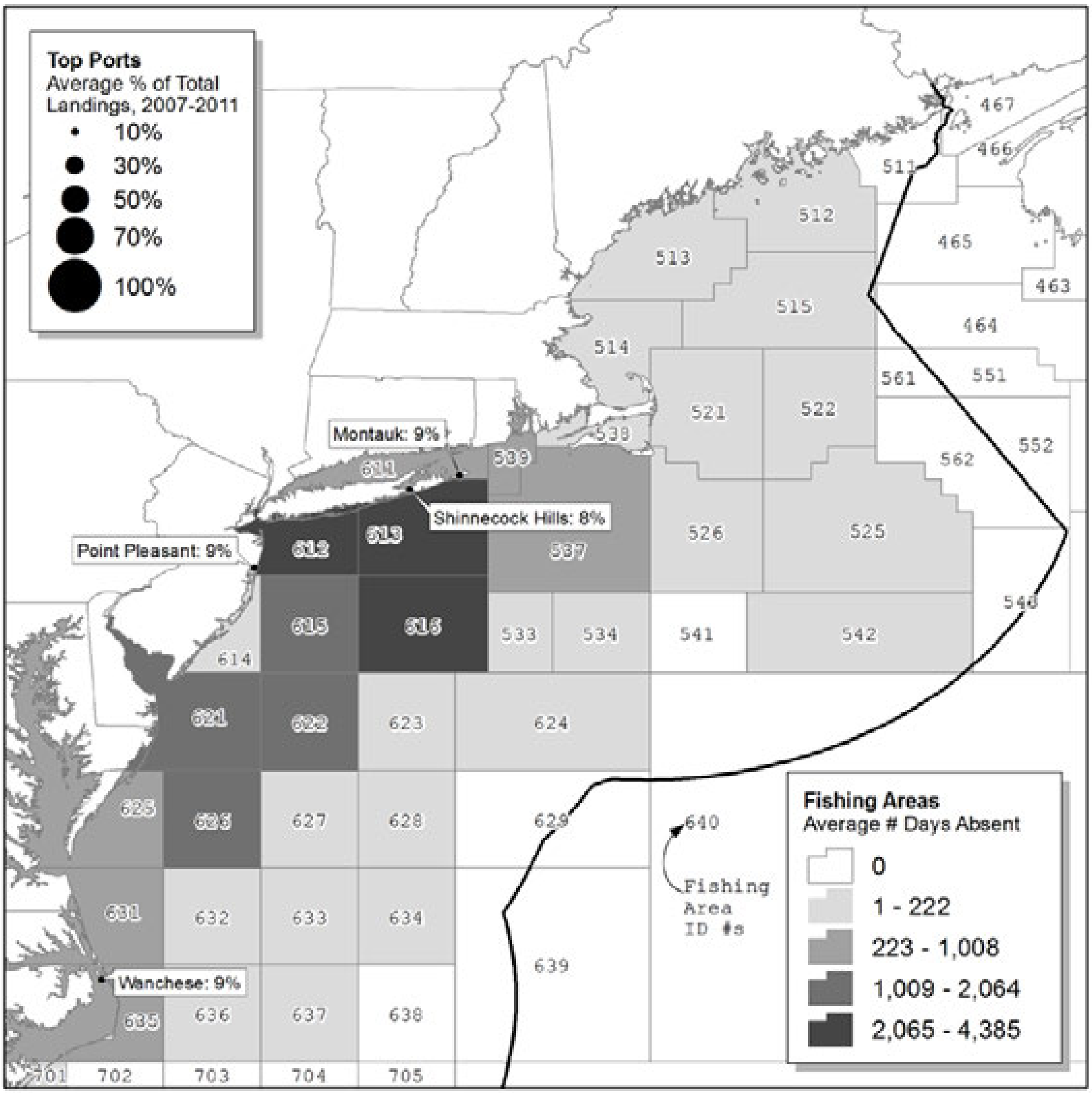

Figure 26. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic large-mesh otter trawl fishing mode.

3.10.3 Large-Mesh Haddock Separator Otter Trawls

3.10.3.1 New England

The haddock separator trawl is a specialized gear designed to exploit fish behavior to preferentially catch haddock over cod when compared to a traditional otter trawl net. Use of a selective gear, such as the haddock separator trawl, has been required in order to fish in some Special Access Programs under the NE Multispecies FMP. This gear is new, and specific gear codes have only recently been added to FVTRs, therefore the catch data provided here are only from 2010 and 2011. Over that time, an annual average of 26 vessels participated in this fishing mode each taking 6 trips, which are typically 5 to 10 days in duration. This fishing mode lands over 4 million lb of fish annually, with over 73 percent of those landings (2.9 million lb) being haddock. Other important species in this mode are pollock at 10 percent of landings (nearly 400,000 lb per year) and cod at 5 percent of landings (over 200,000 lb per year). Landings of winter flounder and redfish each average over 100,000 lb annually (2.7 percent of total landings).

The primary port for this mode is New Bedford with over 56 percent of landings (2.3 million lb per year). Gloucester, MA is also significant at 38 percent (1.5 million lb per year), while Boston represents just 5 percent of landings (110,000 lb per year). Figure 27 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

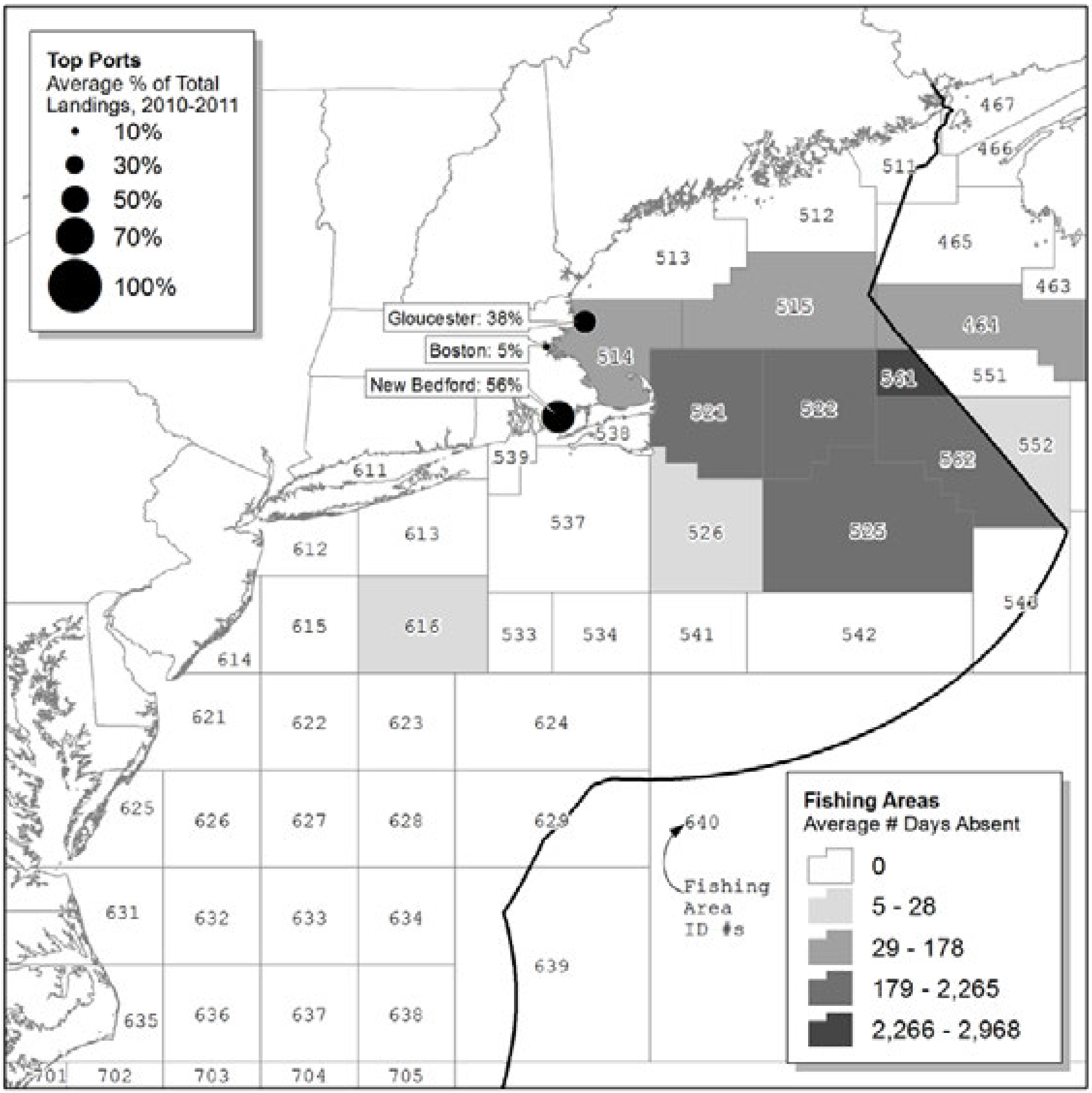

Figure 27. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England large-mesh haddock separator otter trawl fishing mode, 2010-2011.

3.10.3.2 Mid Atlantic

Due to the small number of participants in the Mid-Atlantic large-mesh haddock separator otter trawl fishing mode, summary information characterizing fishing effort, landings, ports utilized, and areas fished cannot be reported in order to protect the confidentiality of the data provided by the participants.

3.10.4 Large-Mesh Ruhle Otter Trawls

3.10.4.1 New England

Like the haddock separator trawl, the Ruhle trawl is a recently developed gear designed to preferentially catch haddock over cod. A gear code specific to the Ruhle trawl was added to FVTRs in 2009, so landings information presented here represents 2009 through 2011. There has been a rapid expansion in the adoption of this gear from 1 vessel in 2009 to 15 vessels in 2011. Trips average just over 4 days, although trips as short as 1 day and up to 12 days have been reported.

This mode has over 400,000 lb of annual landings with over 85 percent consisting of haddock (over 300,000 lb per year). Redfish is 5 percent of landings (22,000 lb per year), and cod is less than 4 percent (16,000 lb per year). Yellowtail flounder, pollock, and winter flounder each make up less than 2 percent of total mode landings.

The primary port is New Bedford, MA with 75 percent (over 300,000 lb per year) of the 400,000 lb total average landings in this fishery. Point Judith, RI is also a significant port with over 75,000 lb of landings on average (17 percent of total mode landings. Gloucester, MA, Seabrook, NH, and Portland, ME have also reported landings, but specific numbers cannot be presented in order to protect the confidentiality of the data provided by the participants. Figure 28 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

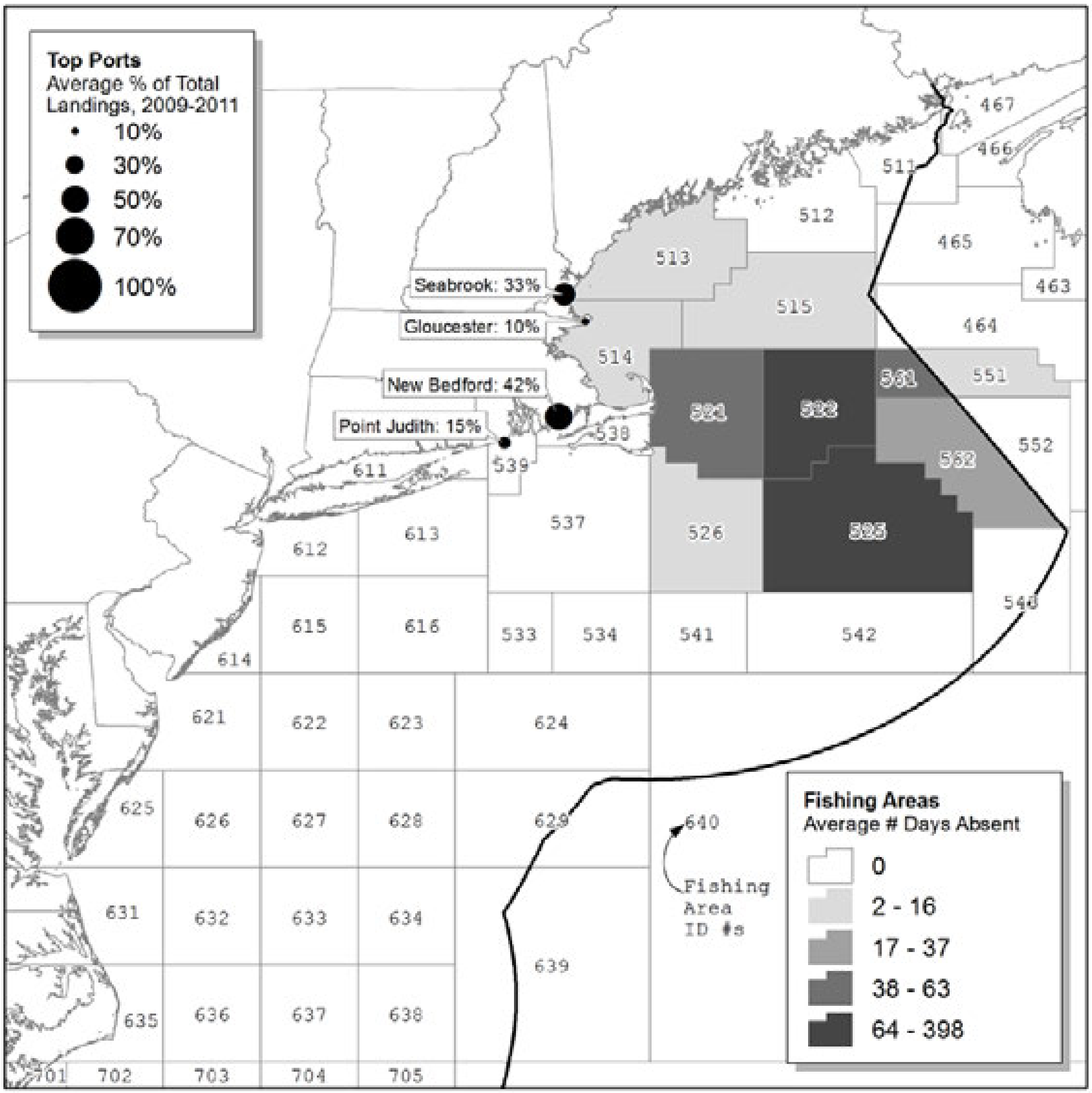

Figure 28. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England large-mesh Ruhle otter trawl fishing mode, 2009-2011.

3.10.4.2 Mid Atlantic

The mid-Atlantic large-mesh Ruhle trawl fishery is smaller than the New England mode of this fishery. An average of only 4 vessels participates in this fishery, taking an average of only 2 trips per year. Trips average less than half a day, but trips as long as 11 days have been reported.

A total of 10,000 lb of fish are landed by this mode annually. The primary species landed is summer flounder, accounting for 40 percent of total mode landings, followed by spiny dogfish (30 percent) and Atlantic croaker (21 percent). The top ports are all in New Jersey: Barnegat, Belford, and Point Pleasant. However, the number of vessels landing in some ports is small enough that port-specific landings information cannot be reported to protect the confidentiality of the data provided by the participants. Figure 29 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

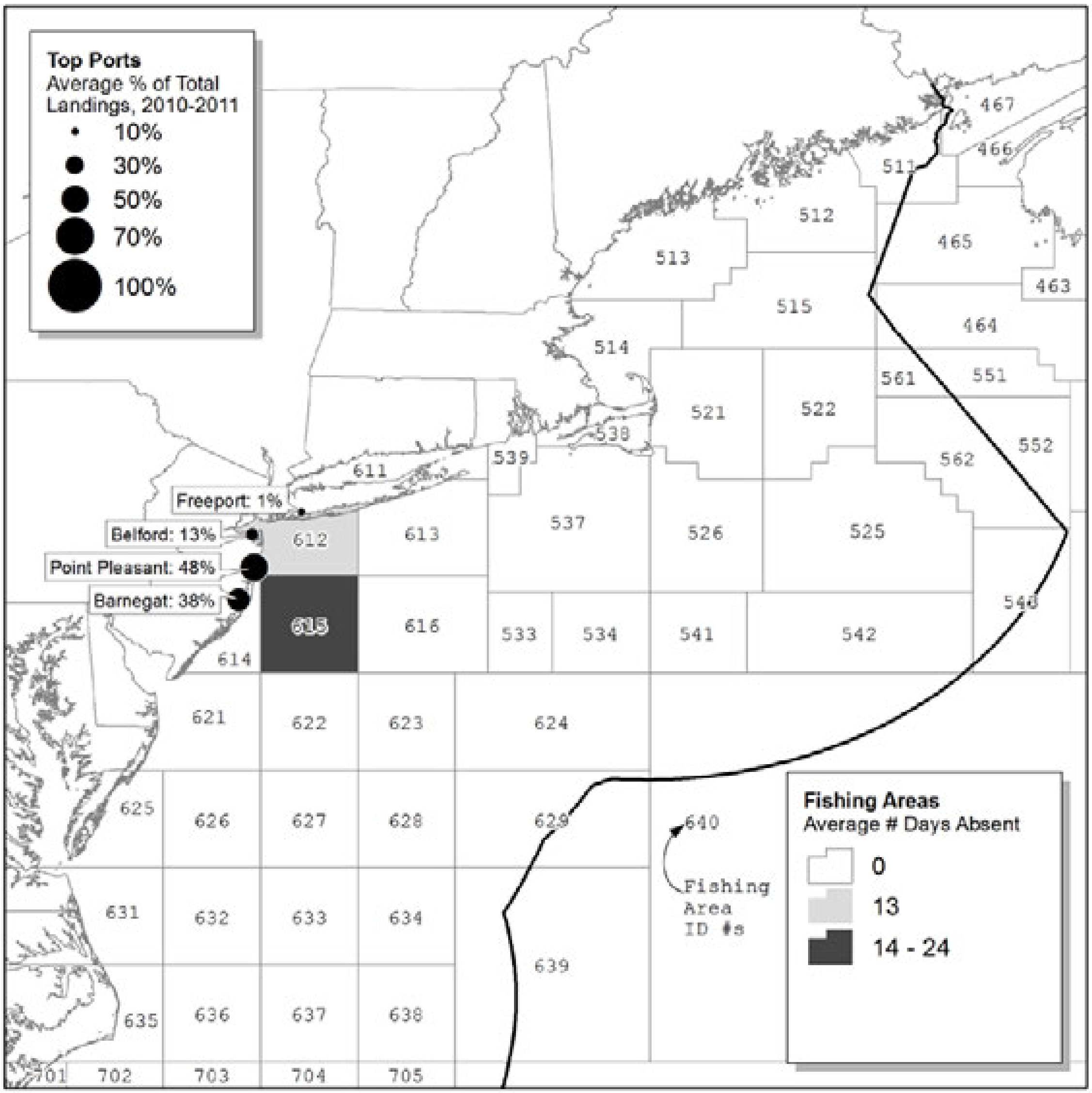

Figure 29. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic large-mesh Ruhle otter trawl fishing mode 2010-2011.

3.11 Purse Seine Fishery

3.11.1 New England

The New England purse seine fishing mode primarily targets Atlantic herring. The number of active participants averages just over 17 vessels per year, and each vessel takes, on average, 19 fishing trips each year. These fishing trips tend to last less than 1 day in duration, although longer trips of up to 9 days occur.

Landings of Atlantic herring average 46.8 million lb per year, second in herring catch after the midwater and single pair trawl mode. The purse seine fishing mode is highly directed, with herring comprising over 87 percent of total annual landings by weight. Menhaden comprise another 12.6 percent (6.7 million lb per year) of total mode landings Although the amounts are much smaller, bluefin tuna landings are important, with over 13,000 lb per year. Other species landed include blueback herring (5,000 lb per year) and negligible amounts of longfin squid and Atlantic mackerel.

Most of the landings made by vessels participating in this fishing mode come to Maine ports, with Rockland (20.5 million lb per year), Portland (9.5 million lb per year), Stonington (7.6 million lb per year), and Prospect Harbor (3.6 million lb per year) accounting for over 77 percent of the total landings. Another 12 percent (6.6 million lb per year) of the total landings come into Gloucester, MA. Figure 30 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

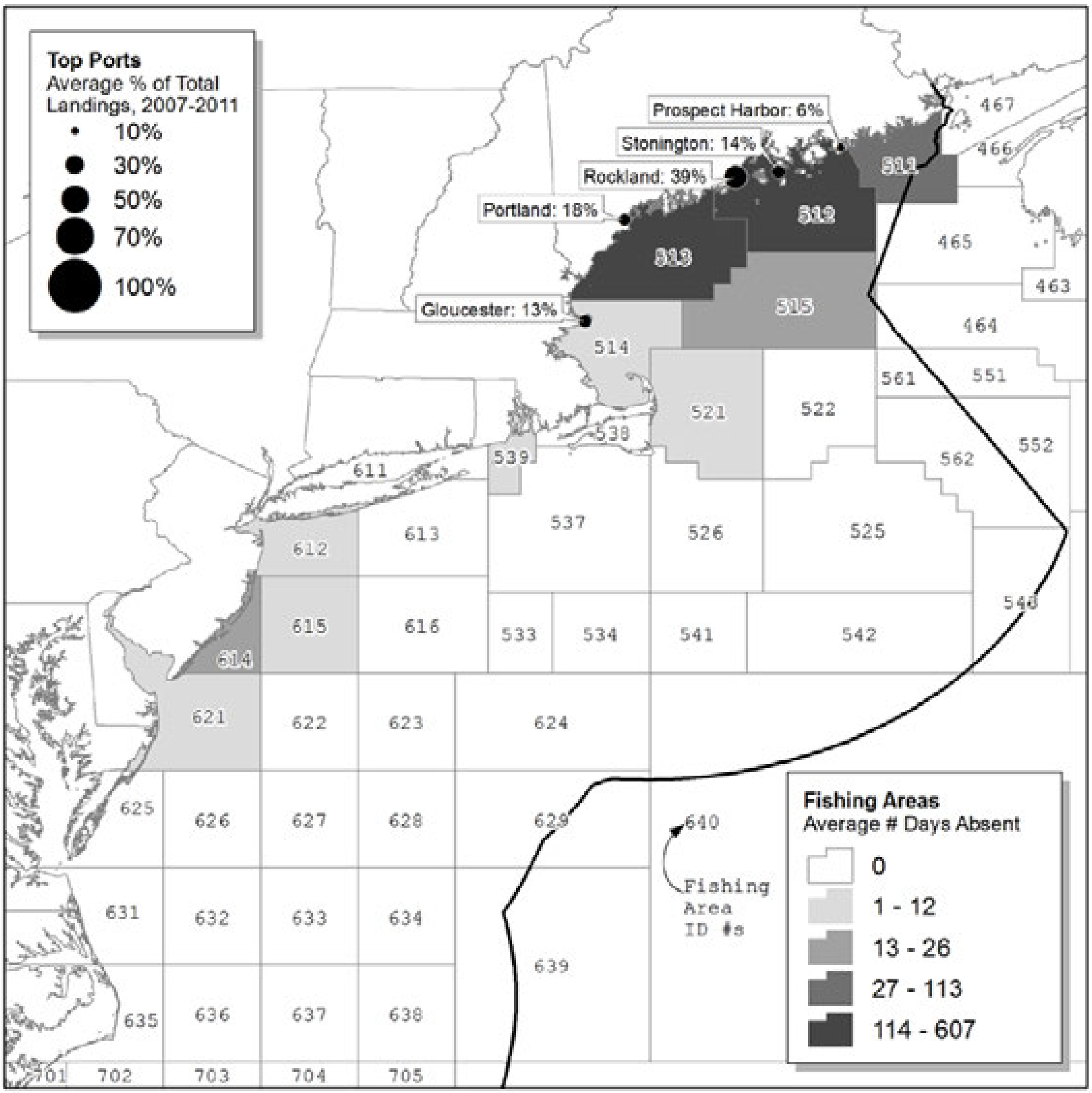

Figure 30. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England purse seine fishing mode.

3.11.2 Mid-Atlantic

The Mid-Atlantic purse seine mode is the most targeted in its region: Over 99.9 percent of all landings in this mode are menhaden. The six active participating vessels take, on average, 38 fishing trips each year, with most trips lasting less than a ½ day. Even the longest trips most years last less than 2 days, although there were 4-day trips reported in 2008 and 2010.

Menhaden landings in this fishery average almost 35 million lb annually. While other species (spiny dogfish, striped bass, silversides, etc.) are occasionally landed, the amounts tend to be limited to a few hundred lb at most in any year. The top ports in this fishery are all in New Jersey. Cape May, NJ is the leading port, receiving over 33 million lb (95 percent of the total landings) each year. Relatively small amounts are also landed in Belford, Point Pleasant, and Atlantic City, NJ. Figure 31 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

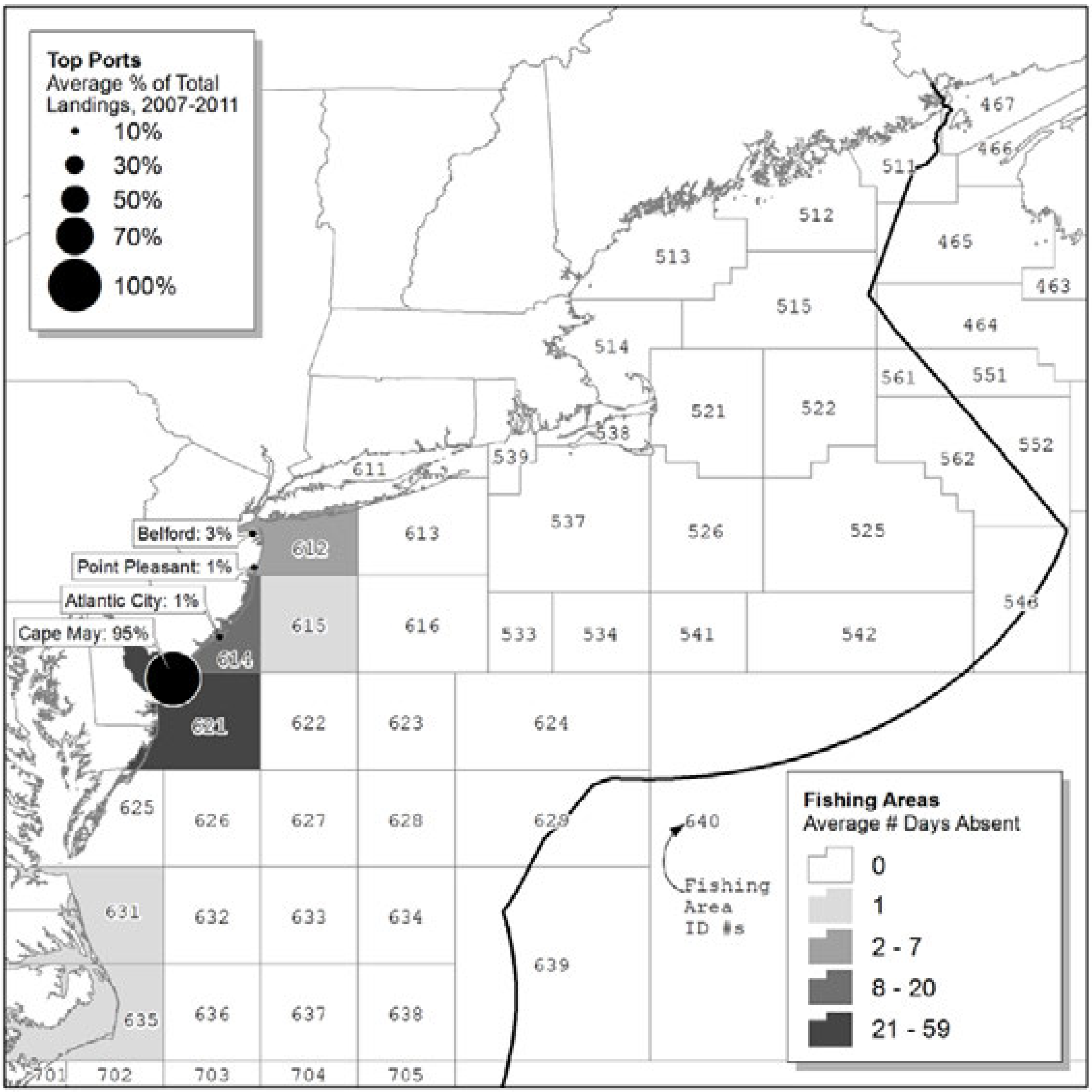

Figure 31. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic purse seine fishing mode.

3.12 Scallop Dredge Fishery

As explained in chapter 5, for the purposes of allocating fishery observer effort within the overall sea scallop dredge fishery, New England and Mid-Atlantic sea scallop dredge fishing trips are further differentiated according to the type of permit (limited access or general category) and the type of trip (open area or scallop access area). The following sections are not subdivided based on these attributes, but instead provide summaries consistent with the rest of this chapter. While the differences among these trips (general category vs. limited access and open area vs. access area) are important for allocating observer effort in a representative way across the larger scallop dredge fishery, unlike the gillnet and otter trawl mesh size categories, there are not substantial differences among these trips in the species targeted, areas fished, or ports landed.

3.12.1 New England

The New England scallop dredge fishing mode averages over 354 active participating vessels each year. Although the number of annual fishing trips varies with permit category and available DAS, on average these vessels each take over 13 fishing trips per year. While the average trip length for all participating vessels is just over 4 days per trip, much longer trips, up to 25 days, do occur. On average, the participants in this fishing mode land 31.7 million lb of fish each year, of which over 31 million (98 percent) are sea scallops. Other than monkfish (nearly 417,000 lb per year), only relatively negligible amounts of *Illex* squid, mussels, and silver hake, are landed each year.

New Bedford, MA, is the top scallop port in New England, accounting for over 90 percent of the total annual landings for this fishing mode. Fairhaven, MA (over 1.0 million lb per year), Point Judith, RI (359,000 lb per year), Newport, RI (348,000 lb per year), and Chatham, MA (300,000 lb per year) also rank in the top five scallop dredge ports in New England. Figure 32 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

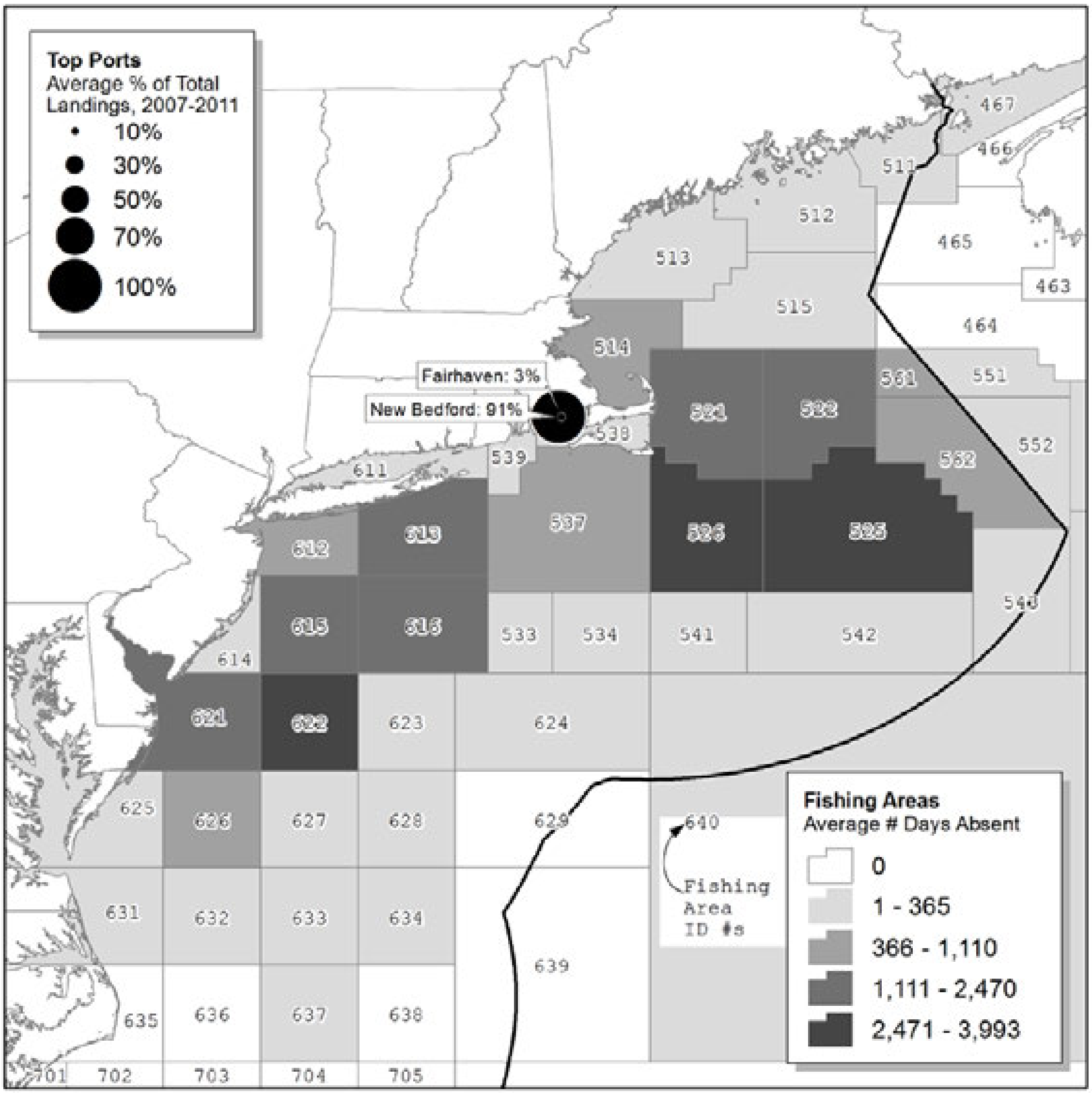

Figure 32. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England scallop dredge fishing mode.

3.12.2 Mid-Atlantic

Only slightly smaller than its New England counterpart in terms of number of participants and the amounts of sea scallops landed, the Mid-Atlantic sea scallop dredge fishing mode has averaged over 342 active vessels from 2007 to 2011, landing almost 25 million lb of fish each year . On average, participating vessels take 22 fishing trips per year, although, as with the New England mode, the number of trips varies among vessels with permit category and available DAS. Trips average 2.5 day in duration, although longer trips 20-30 days in duration occur.

As with the New England mode, sea scallops are the primary target and the top species landed, comprising, on average, 97 percent of the total annual landings by the participating vessels. In addition to scallops, an average of 252,000 lb of monkfish is landed each year, along with small amounts of knobbed whelks and summer flounder (each less than 100,000 lb per year).

Mid-Atlantic scallop dredge vessels utilize several ports for landing their product. Cape May, NJ, is the top port, with an average of 8.3 million lb of landings each year (33 percent of the total landings). Newport News, VA, ranks second with 5.2 million lb of annual landings (21 percent of the total), and the City of Seaford, NY (2.0 million lb per year), Hampton, VA (1.9 million lb per year), and Point Pleasant, NJ (1.6 million lb per year), complete the top five ports for this fishing mode. Figure 33 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

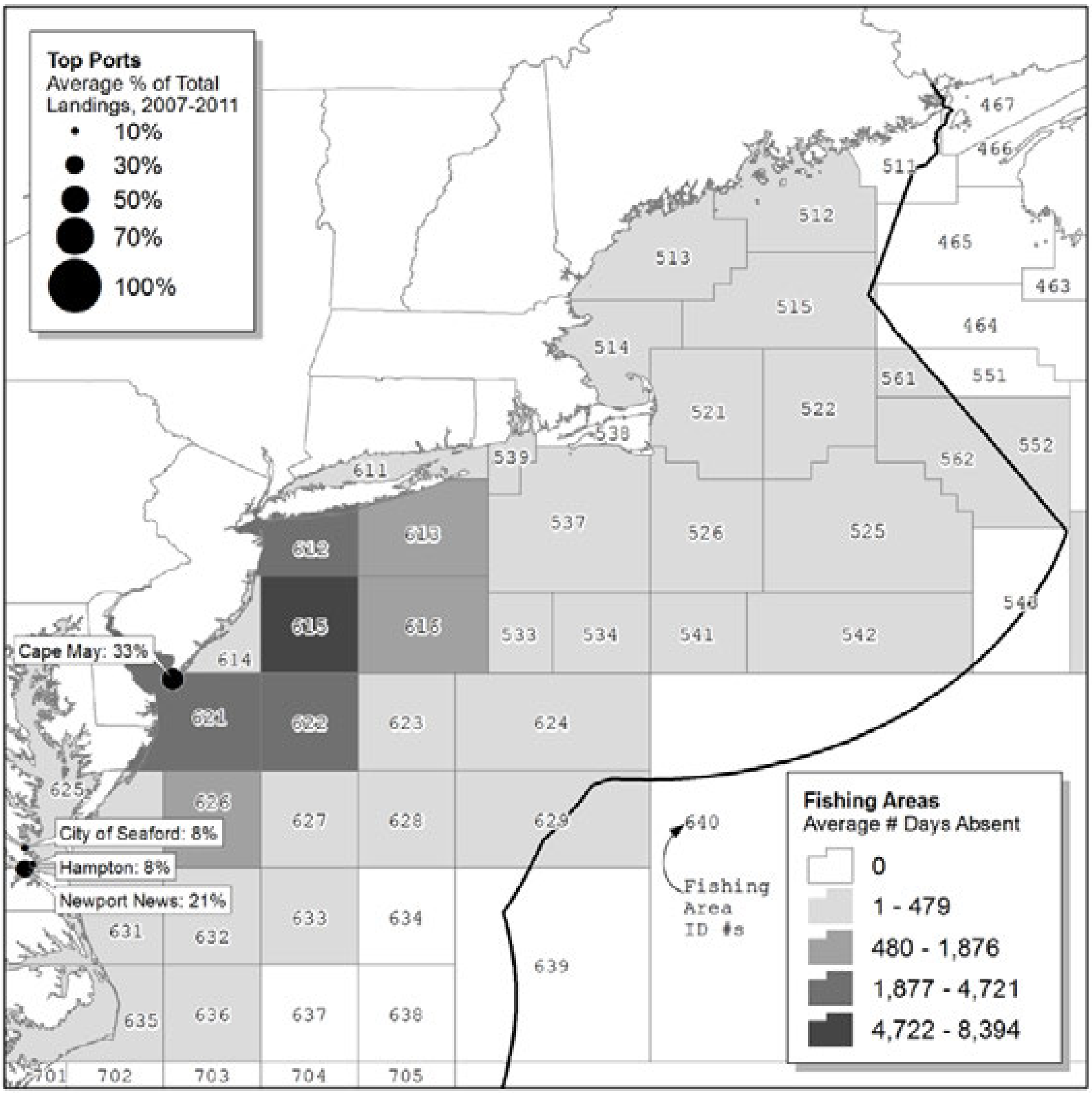

Figure 33. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic scallop dredge fishing mode.

3.13 Scallop Trawl Fishery

3.13.1 New England

Compared to the other sea scallop fishing modes in the Northeast, the New England sea scallop trawl mode is relatively small. There are only three participants, on average, each year, each making four fishing trips. Fishing trips average 5 days in length and the longest trips are 12-16 days in duration.

Sea scallops are the top species landed, but these landings average less than 117,000 lb per year (less than 0.1 percent of the sea scallops landed using scallop dredges). Small amounts of longfin squid, skate, monkfish, and summer flounder are also landed by the participants of this fishing mode, but landings of these fish average less than 600 lb each per year. As with the New England scallop dredge mode, New Bedford, MA, is the top port, with over 97 percent of total scallop trawl landings. Chatham, MA, Newport, RI, Point Judith, RI, and New Harbor, ME, each account for small amounts of the total landings made by this fishing mode. Figure 34 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

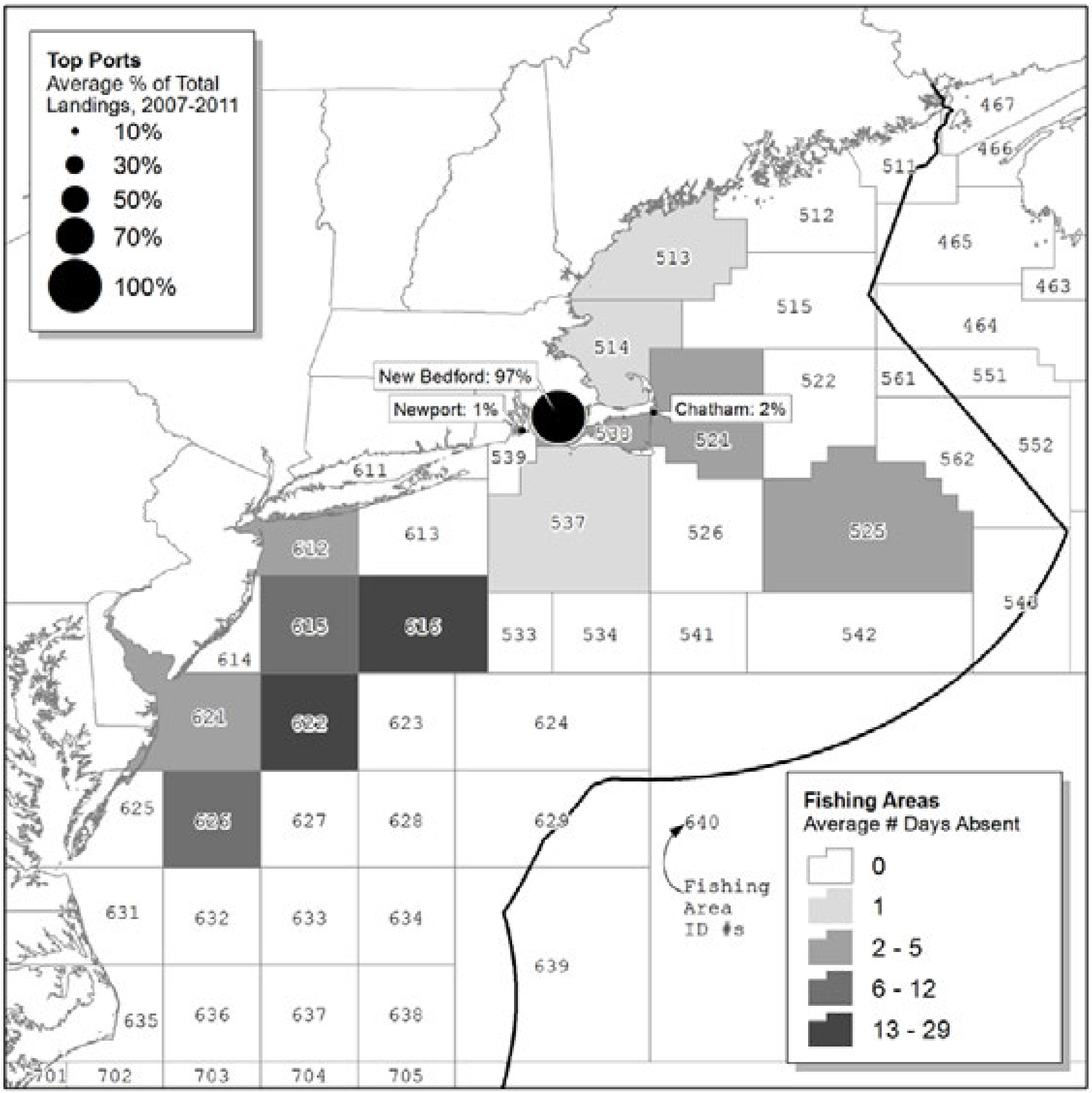

Figure 34. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England scallop trawl fishing mode.

3.13.2 Mid-Atlantic

Much larger than its New England counterpart, but still smaller than the scallop dredge modes, the Mid-Atlantic scallop trawl fishing mode averages over 33 participating vessels each year. On average, each of these participating vessels takes over 26 fishing trips each year. Trips average just over 1 day in duration, although longer trips of 15-20 days occur.

Unlike other sea scallop fishing modes, scallops account for over 58 percent of the annual landings. In the Mid-Atlantic scallop trawl mode, total annual landings are just over 628,000 lb, of which almost 342,000 lb are sea scallops. Other species landed by the participants in this fishing mode include summer flounder (98,000 lb per year), blue crab (60,000 lb per year), penaeid shrimp (30,000 lb per year), and pandalid shrimp (22,000 lb per year). Point Lookout, NY, is the top port for this fishing mode, receiving on average almost 97,000 lb of landings each year. Engelhard, NC, and Point Pleasant, NJ each take in 75,000 lb each year. Cape May, NJ, (66,000 lb per year) and Freeport, NY, (60,000 lb per year) are also important ports in this fishery. Figure 35 displays the top ports and primary fishing areas utilized by participants in this mode.

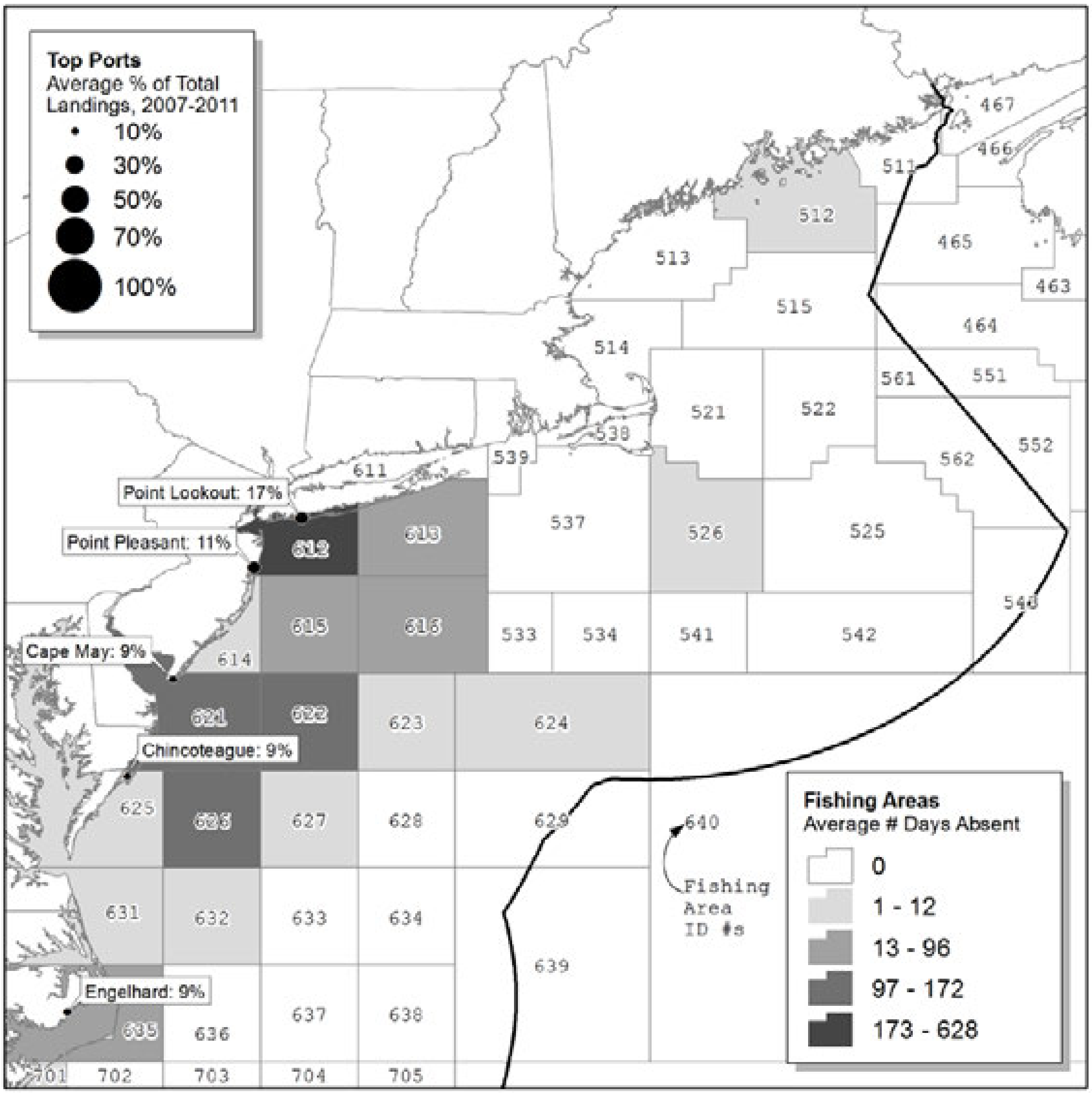

Figure 35. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic scallop trawl fishing mode.

3.14 Scottish Seine Fishery

There have been no FVTRs reporting the use of Scottish seine in either New England or the Mid-Atlantic during 2007-2011. The 2007 SBRM Omnibus Amendment reported limited use of this gear, but could not report summary information for this fishing mode in order to protect the confidentiality of the data provided by the participants. While this gear type has not been reported in recent years, it may be in the future.

3.15 Shrimp Trawl

3.15.1 New England

The New England shrimp trawl fishing mode includes, on average, 99 participating vessels per year. These vessels take, on average, approximately 25 fishing trips each year, and most fishing trips last less than 1 day, although longer trips occur, up to 11 days in duration.

The primary target for this fishing mode is Northern (pandalid) shrimp, and over 91 percent of the 7 million lb of fish landed, on average, each year in this fishing mode are pandalid shrimp. Unspecified shrimp species and penaeid shrimp comprise another 4 percent of annual landings, so, together, shrimp account for 95 percent of the total landings in this fishing mode. Another 3 percent of total landings are Atlantic herring. The remainder is largely longfin squid and silver hake, although these species each account for less than 1 percent of total annual landings.

The primary ports for this fishing mode are mostly located in Maine, as landings in the top four ports (Portland, South Bristol, Port Clyde, and Cundy’s Harbor, New Harbor) account for 49 percent of the total landings. Half of these (24 percent of total landings, 1.7 million lb per year) come in to Portland, ME. Portsmouth, NH, accounts for another 7 percent of total landings. Figure 36 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

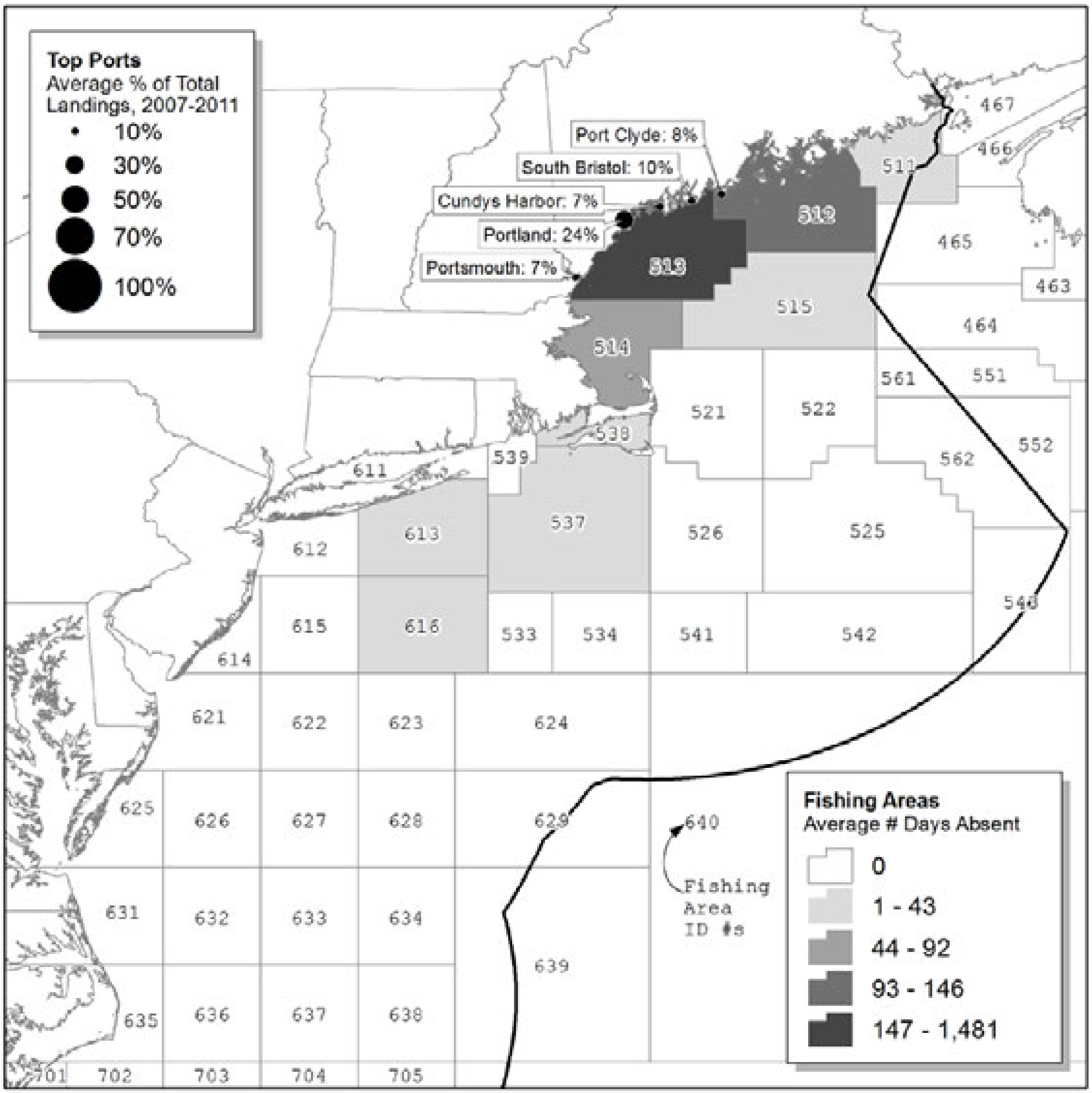

Figure 36. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England shrimp trawl fishing mode.

3.15.2 Mid-Atlantic

The Mid-Atlantic shrimp trawl fishing mode has fewer participants than the New England mode, with an average of 52 vessels participating over the years 2007-2011. These vessels take, on average, just under 10 fishing trips per vessel per year. Fishing trips last, on average, considerably longer than in the New England shrimp trawl mode, with most trips being 4-5 days in duration. The longest trips last 20-30 days.

As with the New England shrimp trawl fishing mode, the primary target for this mode is pandalid shrimp (64 percent of total landings), along with penaeid shrimp (6.8 percent of total landings), and mantis shrimp (4 percent of total landings). Combined, shrimp landings average just over 2 million lb per year, and *Illex* squid (580,000 lb per year, on average) and king whiting (25,000 lb per year, on average) are also important components of this fishing mode. Total landings for the Mid-Atlantic shrimp trawl mode average 2.7 million lb per year.

The number one port for this fishing mode is Cape May, NJ, (593,000 lb per year, on average) with almost 22 percent of total landings in this fishing mode. The rest of the top five ports for this fishing mode are all located in North Carolina, with Engelhard (542,000 lb per year, on average), Wanchese (524,000 lb per year, on average), Oriental (432,000 lb per year, on average), and Beaufort (288,000 lb per year, on average), North Carolina, together accounting for over 65 percent of annual landings, on average. Figure 37 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

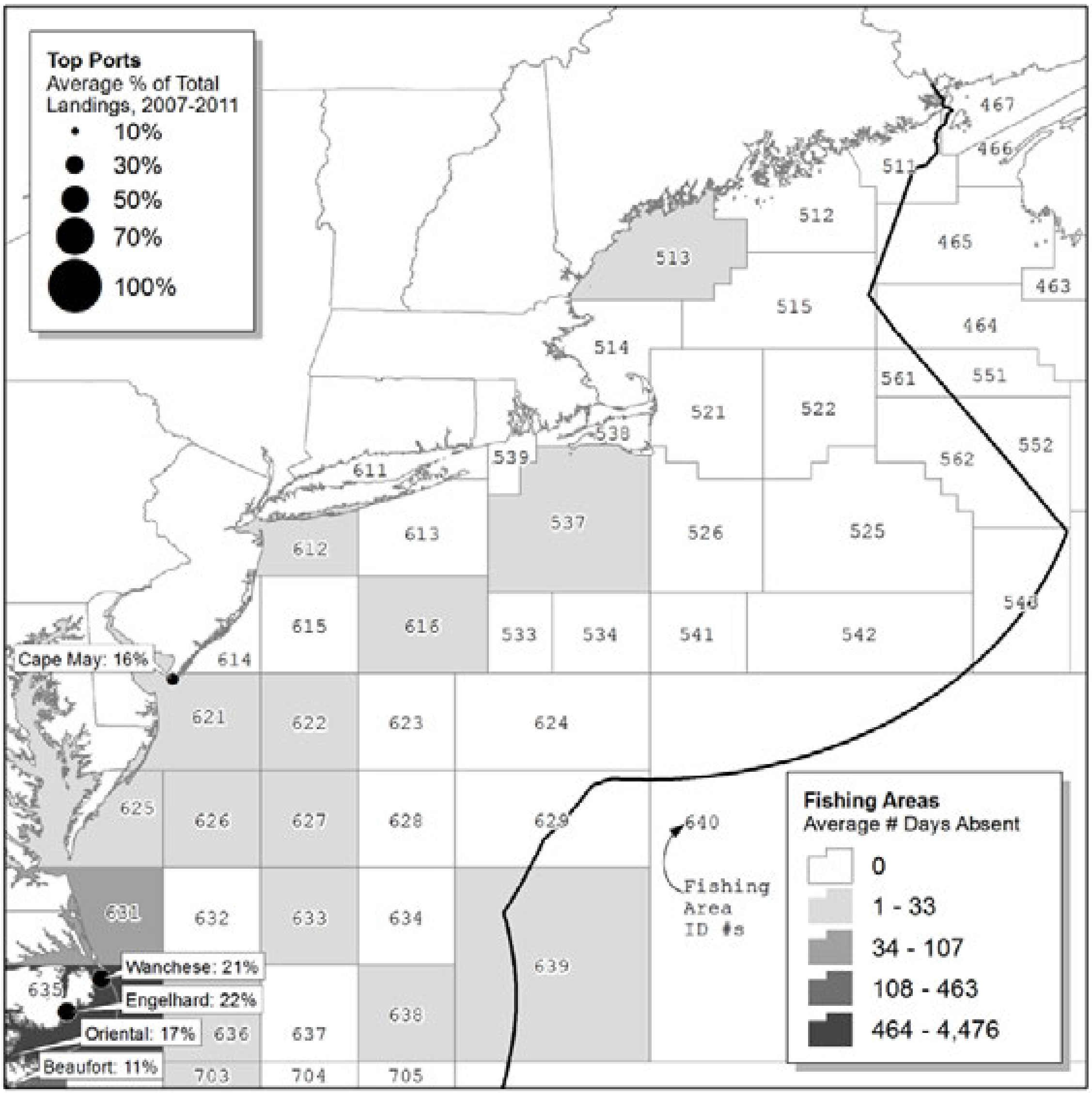

Figure 37. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic shrimp trawl fishing mode.

3.16 Floating Trap

3.16.1 New England

The New England floating trap fishing mode has four vessels participating, each taking over 33 trips on average, landing 260,000 lb of fish each year. Trips are almost exclusively less than a day, with the average trip being only three hours.

The principle target species is scup accounting for over 70 percent of landings (184,000 lb per year on average), while Atlantic mackerel comprises 11 percent of total landings. Striped bass, Atlantic herring, and frigate mackerel comprise the remainder of the top five species landed and represent 8 percent of total landings, combined. The largest port in this fishing mode is Little Compton, RI, with over 82 percent of total landings (215,000 lb per year on average). Gloucester, MA, Islesford, ME, and West Point, ME, are also important ports with 14 percent of total mode landings, combined. Figure 38 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

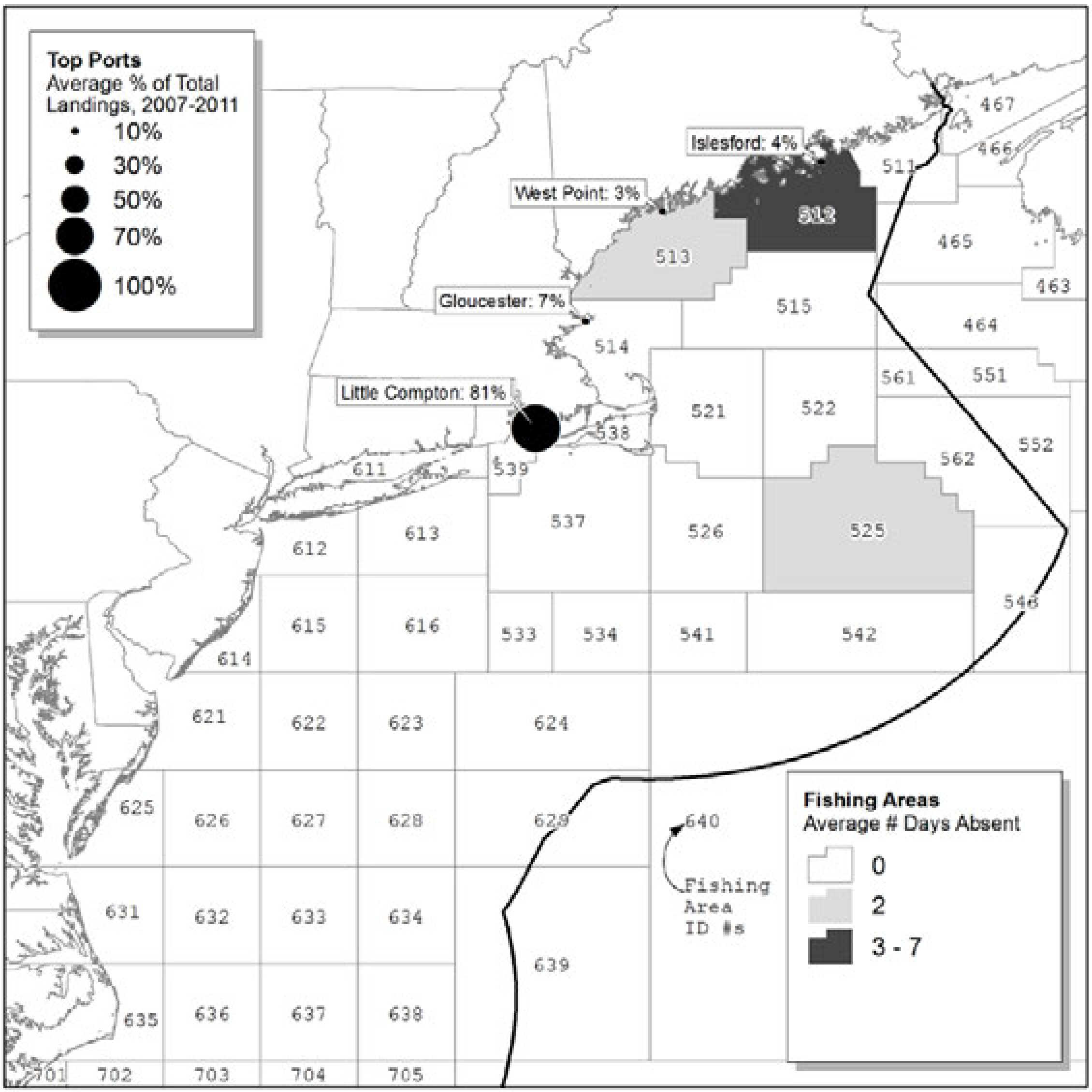

Figure 38. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England floating fish trap fishing mode.

3.16.2 Mid-Atlantic

The Mid-Atlantic floating trap fishery is slightly larger than its New England counterpart. On average, 7 vessels take 37 trips each, and land a total of 299,000 lb of fish each year. Trips average about ½ day.

A wider range of fish species are caught in the Mid-Atlantic than in New England. The primary target species are menhaden with 50 percent of total landings (150,000 lb per year) and bluefish with 34 percent of total landings (100,000 lb per year). Scup constitutes another 7 percent of landings (21,000 lb per year) and summer flounder 3 percent (8,000 lb per year). Over 69 percent of total landings came into Belford, NJ (207,000 lb per year). The rest of the top five ports are all in New York, the largest being Greenport, with 15 percent of total landings (44,000 lb per year). East Hampton, Wainscott, and Amagansett, NY, combined, represent 11 percent of total landings. Figure 39 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

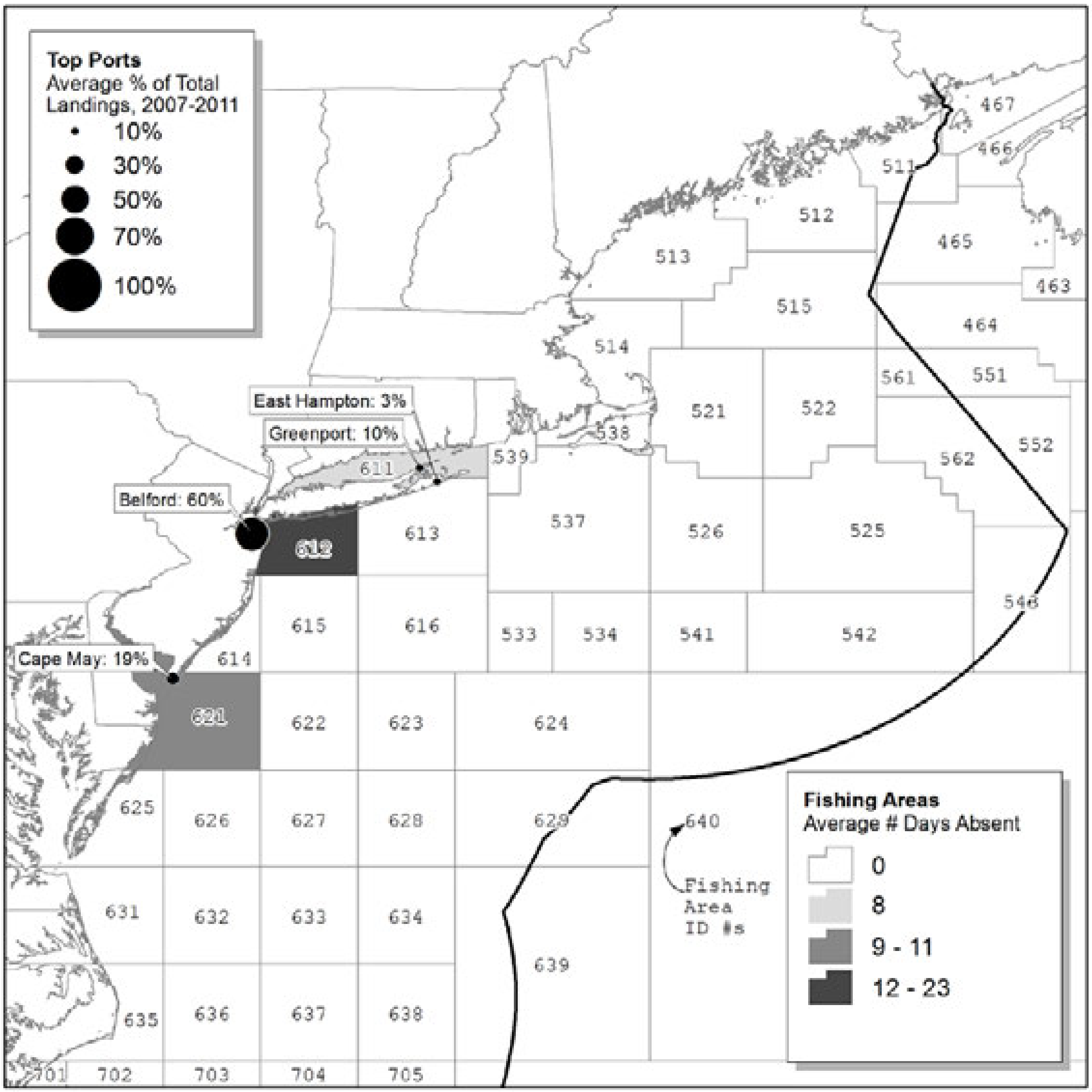

Figure 39. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic floating fish trap fishing mode.

3.17 Beam Trawl

3.17.1 New England

The New England beam trawl fishery consists of eight participating vessels making 20 trips per year, on average. Fishing trips average less than a day. This fishing mode lands an average of 100,000 lb of fish each year. The primary species caught is Northern (pandalid) shrimp (over 45,000 lb per year), which represents 45 percent of total mode landings. Landings of summer flounder (16,000 lb per year) represent another 16 percent of landings, while cod (7,000 lb per year), skate (5,000 lb per year), and yellowtail flounder (4,000 lb per year) round out the top five species landed.

The primary port of landing for the New England beam trawl fishery is Port Clyde, ME with 40 percent of landings. Other important ports include Plymouth, MA (14 percent); Nantucket, MA (13 percent); Harpswell, ME (11 percent); and Woods Hole, MA (6 percent). Figure 40 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

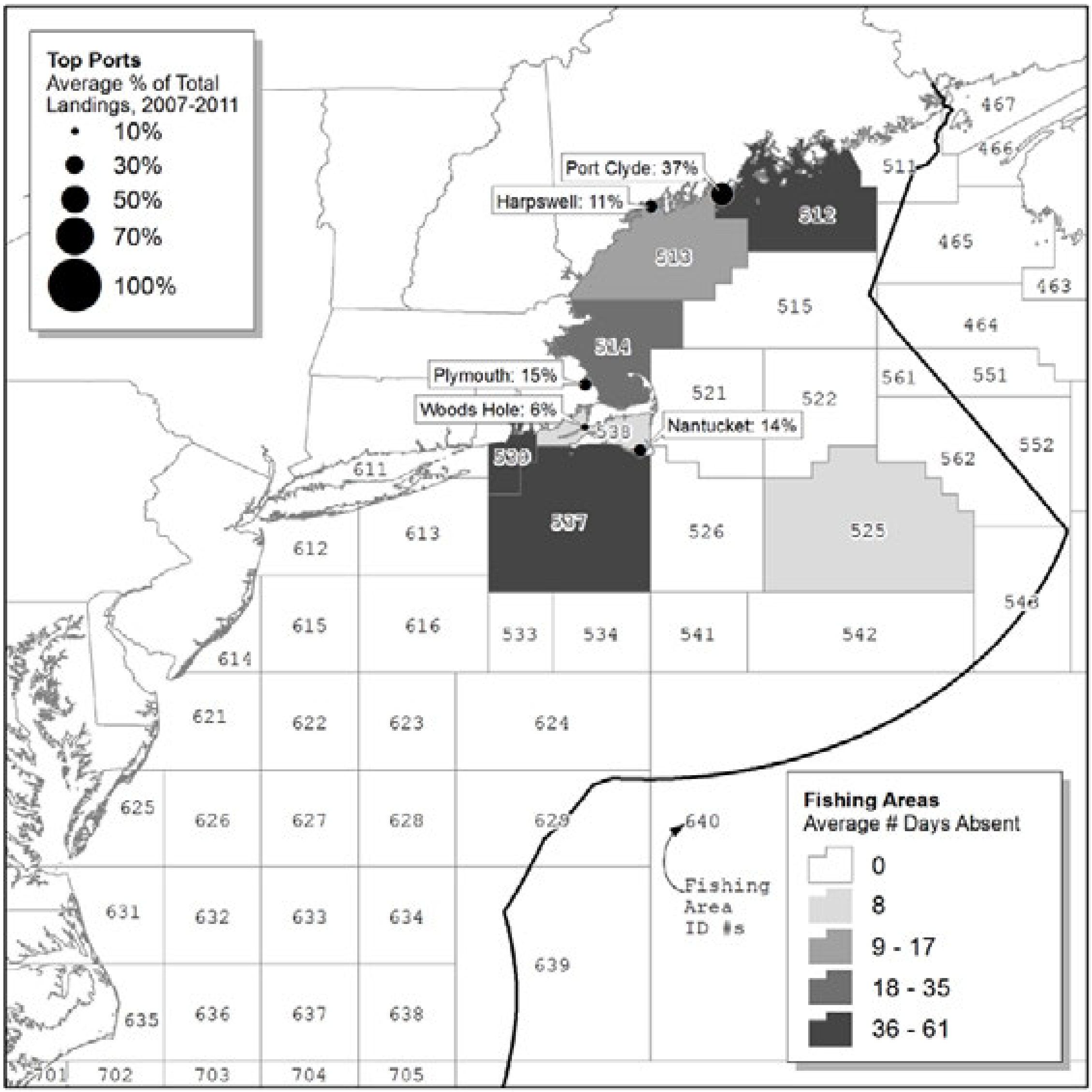

Figure 40. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the New England beam trawl fishing mode.

3.17.2 Mid-Atlantic

The Mid-Atlantic beam trawl fishery has an average of 11 participating vessels that made an average of 14 trips each in 2007-2011. Trip lengths averaged just over one day with most trips lasting less than a day. However, trips as long as 8 or 9 days are reported each year. An average of 450,000 lb of fish is landed annually by this fishing mode.

The primary species landed is Illex squid (21 percent), Atlantic croaker (18 percent), summer flounder (12 percent), longfin squid (12 percent), and blue crab (10 percent). The top ports in this fishing mode are Cape May, NJ (37 percent); Wanchese, NC (16 percent); Engelhard, NC (15 percent); Hampton, VA (9 percent); and Point Pleasant, NJ (4 percent). Figure 41 displays the top ports and primary fishing areas utilized by participants in this fishing mode.

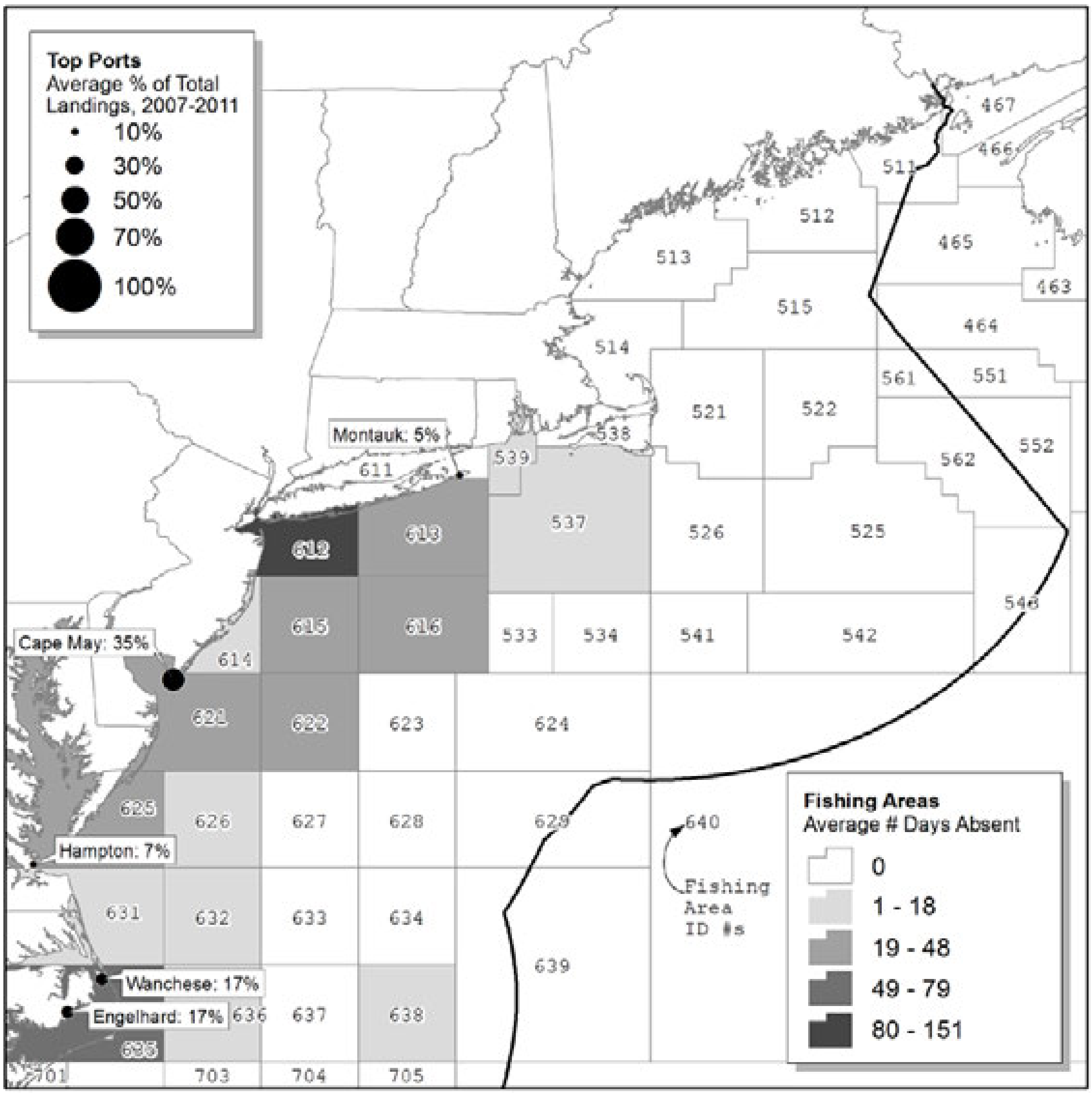

Figure 41. The primary ports of landings (dots are scaled proportional to the average percent of landings at each port), and the primary areas fished (reported as average days absent by statistical area) in the Mid-Atlantic beam trawl fishing mode.

Fishing Mode	Primary Regulating FMP(s) (includes only those Federal FMPs subject to the SBRM Omnibus Amendment)	Average Number of Participating Vessels	Average Total Annual Landings (in million lb)	Top 3 Species Landed
NE Clam Dredge	Surfclam and Ocean Quahog	15.0		ocean quahog; surfclam; sea scallop
MA Clam Dredge	Surfclam and Ocean Quahog	34.2	5.96**	ocean quahog; surfclam; sea scallop
NE Crab Pot	Deep-Sea Red Crab	10.2	2.7	red crab; whelk; Jonah crabs
MA Crab Pot	(none)	9.6	0.52	blue crab; red crab; whelk
NE Fish Pot	Summer Flounder, Scup, Black Sea Bass	34	0.26	scup; black sea bass; whelk
MA Fish Pot	Summer Flounder, Scup, Black Sea Bass	65.2	0.73	black sea bass; tautog; American lobster
NE Hagfish Pot	(none)	6.2	2.05	hagfish; herring
MA Hagfish Pot	(none)	2.6	0.71	hagfish; American eel; whelk
NE Small-mesh Gillnet	Northeast Multispecies	11.8	0.04	bluefish; cod; sea scallop
MA Small-mesh Gillnet	Atlantic Bluefish	109.8	4.65	Atlantic croaker; bluefish; menhaden
NE Large-mesh Gillnet	Northeast Multispecies; Spiny Dogfish; Monkfish	134.2	15.34	pollock; cod; spiny dogfish
MA Large-mesh Gillnet	Spiny Dogfish; Atlantic Bluefish	119.4	4.05	spiny dogfish; bluefish; smooth dogfish
NE Extra-large-mesh Gillnet	Northeast Multispecies; Monkfish; Skate Complex	108.4	12.67	skates; monkfish; cod
MA Extra-large-mesh Gillnet	Monkfish; Skate Complex; Spiny Dogfish	108.6	5.27	monkfish; skates; spiny dogfish
NE Handline/Rod & Reel	Northeast Multispecies; Spiny Dogfish; Summer Flounder, Scup, Black Sea Bass	258.4	0.74	cod; spiny dogfish; striped bass
MA Handline/Rod & Reel	Summer Flounder, Scup, Black Sea Bass; Atlantic Bluefish	208.6	0.70	striped bass; bluefish; scup
NE Lobster Pot	(none)	480.4	23.48	American lobster; Jonah crab; rock crab
MA Lobster Pot	(none)	88.6	1.79	American lobster; Jonah crab; whelk
NE Bottom Longline	Spiny Dogfish; Northeast Multispecies	73.0	1.95	haddock; spiny dogfish; cod
MA Bottom Longline	Golden Tilefish	20.2	1.75	tilefish; swordfish; yellowfin tuna
NE Midwater Trawl (paired & single)	Atlantic Herring; Mackerel, Squid, Butterfish	21.4	148.22	Atlantic herring; Atlantic mackerel; longfin squid
MA Midwater Trawl (paired & single)	Mackerel, Squid, Butterfish; Atlantic Herring	8.0	11.07	Atlantic herring; Atlantic mackerel; *Illex* squid
NE Small-mesh Otter Trawl	Mackerel, Squid, Butterfish; Northeast Multispecies	147.8	50.11	longfin squid; *Illex* squid; silver hake
MA Small-mesh Otter Trawl	Mackerel, Squid, Butterfish; Northeast Multispecies	169.8	48.12	*Illex* squid; longfin squid; silver hake
NE Large-mesh Otter Trawl	Northeast Multispecies; Monkfish; Skate Complex	292.6	64.32	haddock; cod; skate
MA Large-mesh Otter Trawl	Summer Flounder, Scup, Black Sea Bass; Northeast Multispecies; Skate Complex	225.2	15.13	summer flounder; scup; skates
NE Large-mesh Haddock Separator Otter Trawl	Northeast Multispecies; Monkfish; Skate Complex	26.5	1.61	haddock; pollock; cod
MA Large-mesh Haddock Separator Otter Trawl	Northeast Multispecies; Skate Complex	3.0	0.002	cod; yellowtail flounder; skates
NE Large-mesh Ruhle Otter Trawl	Northeast Multispecies; Skate Complex	7.7	0.26	haddock, redfish, cod
MA Large-mesh Ruhle Otter Trawl	Summer Flounder, Scup, Black Sea Bass; Spiny dogfish; Skate Complex	4.0	0.01	summer flounder, spiny dogfish, Atlantic croaker
NE Purse Seine	Atlantic Herring	17.2	53.57	Atlantic herring; menhaden; bluefin tuna
MA Purse Seine	(none)	6.8	34.92	menhaden; spiny dogfish; striped bass
NE Scallop Dredge	Sea Scallop; Monkfish	354.6	31.70	sea scallops; monkfish; *Illex* squid
MA Scallop Dredge	Sea Scallop; Monkfish	342.6	24.86	sea scallops; monkfish; whelks
NE Scallop Trawl	Sea Scallop	3.0	0.12	sea scallops; longfin squid; skates
MA Scallop Trawl	Sea Scallop	33.8	0.63	sea scallops; summer flounder; blue crab
NE Scottish Seine	Northeast Multispecies	-	-	N/A
NE Shrimp Trawl	(none)	99.0	7.03	Pandalid shrimp; other shrimp; Atlantic herring
MA Shrimp Trawl	(none)	52.0	2.73	Pandalid shrimp; *Illex* squid; Penaeid shrimp
NE - Floating Trap	Summer Flounder, Scup, Black Sea Bass; Bluefish	4.2	0.26	scup; Atlantic mackerel; striped bass

MA - Floating Trap	Summer Flounder, Scup, Black Sea Bass; Bluefish	6.8	0.30	menhaden; bluefish; scup
NE - Beam Trawl	(none)	7.6	0.10	Pandalid shrimp; summer flounder; cod
MA - Beam Trawl	Mackerel, Squid, Butterfish; Summer Flounder, Scup, Black Sea Bass	11.6	0.45	*Illex* squid; Atlantic croaker; summer flounder

Table 28. Summary information on the fishing modes addressed in chapter 3. Averages reflect data from 2007-2011, except as noted in the text. Top species are based on the cumulative landings from 2007-2011 VTR reports. (Clam dredge landings are New England and Mid-Atlantic combined and given in millions of bushels)**

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Bycatch Reporting Mechanisms

4.1 Introduction

Around the country and around the world, various methods are used to collect information on catch and catch disposition in commercial and recreational fisheries. The variety of methods and tools in use and under development reflect the variety of fisheries on which catch and catch disposition information is collected. Developing a complete understanding of the catch in a fishery, and the implications that the catch and any associated discards may have on fishery resources, involves information collected from a variety of sources utilized in a comprehensive manner. This may include information reported by the fishing industry (e.g., dealer purchase reports and/or FVTRs), fishing-related information collected by independent sources (e.g., fishery observers and/or electronic monitoring), or information about fishery resources collected independent of fishing activities (e.g., resources surveys). This chapter identifies and describes several mechanisms that may be used to collect information on fishery resources and fishing activities to develop a complete understanding of fishing activities and their implications for fishery resources in the Greater Atlantic Region.

This chapter first provides a general overview of the variety of fishery information collection methods evaluated as part of the development of this amendment in order to establish a general understanding of the types of information collected and how these methods function. Following the general overview discussion of each method, this chapter evaluates the feasibility for utilizing each mechanism for collecting information on bycatch occurring in the variety of fishery modes employed in the Greater Atlantic Region (described in chapter 3). The various fishing modes represent different fishing gears and fishery operating characteristics, and are associated with different bycatch levels and rates. These factors must be taken into account when determining the most appropriate methods with which to collect catch and catch disposition information. This chapter provides a general overview of how the variety of information collection methods described here may be applied to the various Greater Atlantic Region fisheries in order to assess bycatch in the most appropriate manner.

4.2 Fishery Independent Surveys

4.2.1 Description

A fishery independent resource survey is a catch-all description for a variety of scientific fishery resource assessments conducted by NMFS and state fisheries agencies in the Greater Atlantic Region conducted onboard NOAA or state agency research and chartered vessels. The surveys are specifically designed to gather data on the abundance, distribution, size, and age composition of economically and ecologically important marine species of concern (NMFS 2004). A wide array of at-sea sampling techniques and several different types of fishing gear are used to collect data on finfish and shellfish species. The majority of fishery independent surveys are conducted using a stratified random sampling design and are conducted over the entire range of a particular species distribution at various times through the year (NMFS 2001). The time series of data for some surveys, such as the bottom trawl survey, date back to 1963 (Azarovitz 1981).

The fishery independent surveys conducted in the Greater Atlantic Region by NMFS are designed and conducted by the Ecosystems Survey Branch of the Northeast Fisheries Science Center (NEFSC). Table 29 lists the surveys conducted by the NEFSC, their frequency and season of occurrence, and the participating NOAA research vessels.

NOAA Research Surveys	Frequency-Season	NOAA Research Vessels
Bottom trawl	Annual – Spring/Fall	R/V Albatross IV, R/V Delaware II, R/V Henry B. Bigelow
Sea scallop dredge	Annual – Summer	R/V Albatross IV, R/V Hugh R. Sharp
Hydraulic clam dredge	Triennial	Delaware II, ESS Pursuit (commercial vessel)
Gulf of Maine Shrimp trawl	Annual – Summer	R/V Gloria Michelle
Continental shelf trawl	Annual – Winter	
Marine mammal sighting	Variable – All surveys	
Fish egg and larvae	Several times per year	R/V Albatross IV, R/V Delaware II, and various other ships

Table 29. NOAA Fishery Independent Surveys in the Greater Atlantic Region.

Fishery independent surveys conducted by state fisheries agencies from North Carolina to Maine are typically coordinated through the ASMFC. A committee composed of scientists and staff from state marine fisheries agencies, the ASFMC, the NEFSC, and academia provides oversight and coordination of surveys in the Greater Atlantic Region. Some details of the resulting program, called the Northeast Area Monitoring and Assessment Program (NEAMAP), are listed in Table 30 below (P. Kilduff, pers. comm., ASMFC).

For many of the fishery independent surveys, the primary purpose is to provide estimates of relative abundance for a specific finfish or shellfish species or species assemblage (NMFS 2001, 2004). The fishing methodology and gear utilized may differ substantially from those employed in a commercial fishing operation. Many of the sampling protocols employed include speciation and detailed biological data collection on all captured species.

Agency or Institution	Survey Name / Gear Type	Time Series
NC Division of Marine Fisheries	*Alosa* spp. seine Juvenile fish trawl Pamlico Sound trawl Pamlico Sound gillnet	1972 - present 1979 - present 1987 - present 2001 - present
VA Institute of Marine Science	Small mesh trawl Large mesh trawl	50+ years 2002 - present
DE Natural Resources and Environmental Control	Juvenile species trawl Adult fish species trawl	1980 - present 1966-1971, 1979-1984, 1990 - present
NJ Dept. of Fish and Wildlife	Ocean stock assessment trawl Delaware Bay trawl	1989 - present 1991 - present
NY State Dept. of Environmental Conservation	Small mesh trawl	1987 - present
CT Dept. of Environmental Protection	Long Island Sound trawl	1984 - present
RI Dept. of Fish and Wildlife	Marine fisheries trawl	1979 - present
MA Division of Marine Fisheries	Inshore bottom trawl	1978 - present
NH Dept. of Fish and Game	Estuarine juvenile finfish seine	1997 - present
Maine Dept. of Marine Resources	ME/NH inshore trawl	2000 - present

Table 30. State agency fishery independent surveys in the Greater Atlantic Region.

4.2.2 Evaluation and Applicability

Fishery independent surveys are not a means to directly collect bycatch and discard data. Though some detailed information is often collected on a subsample of the catch or for many species of interest, the fishing practices, gears, and the spatial and temporal areas of operation utilized in surveys are often different than those of commercial fisheries. Because of these independent characteristics, fishery survey data are not typically used as a substitute for missing information on commercial fishery bycatch frequency or occurrence within the same spatial or temporal areas. Further, these differences make it difficult to take the data gathered in the fishery survey and expand it to the commercial fishing effort level. In some instances where sufficient observer data are unavailable, research survey abundance data have been used to develop an indirect estimate of discards using regression and ratio analytic techniques (Mayo et al. 1992; NEFSC 2001; NEFSC 2003).

Fishery independent survey data may have some limited utility in providing insight on species occurrence or interaction that could be further investigated through fishery dependent monitoring programs. The systematic design of a fishery independent survey may function to provide catch data for rare or infrequently encountered species as well as detailed capture information on key species of concern. Information about rare or species of concern provided by a fishery survey could be used to prioritize fishery dependent monitoring within the same spatial or temporal areas to better understand potential interactions of these particular species as bycatch in commercial fishery operations.

4.3 Fishing Vessel Trip Reports/Logbooks

4.3.1 Description

The vessel owner or operator of any vessel issued a valid Federal permit for any commercial or charter/party fishery except American lobster must maintain on board the vessel, and submit to NMFS, an accurate FVTR for each fishing trip. FVTRs must be submitted regardless of species caught or area fished. This requirement is fully described at 50 CFR 648.7(b) and has been in place since 1994. A listing of the data collected by the FVTR is provided in Table 31.

Vessel, crew, operator	**Gear**	**Commercial Catch**
Vessel name	Gear type	Pounds kept (by species)
USCG documentation number *or* State registration number	Quantity and size	Pounds discarded (by species)
Federal permit number	Mesh/ring size	Sea turtle incidental take
Number of crew		Skates by size category
Number of anglers (charter/party)	**Location**	
Vessel operator's name	Chart area (statistical area)	**Charter/Party Catch**
Signature of vessel operator	Average depth	Number kept (by species)
	Latitude/longitude *or* Loran station and bearings	Number discarded (by species)
Trip Information		**Sale/Landing**
Date/time sailed	**Effort**	Dealer permit number
Date/time landed	Number of hauls	Dealer name
Commercial *or* charter/party trip	Tow/soak time duration	Date sold
		Port and state landed

Table 31. Information collected on Greater Atlantic Region FVTRs, by data type.

Because the FVTR is a standardized form designed to capture data from numerous fisheries, the number of logbooks that must be maintained and submitted by a vessel owner or operator that participate in more than one fishery and utilizes more than one fishing permit is minimized. A new FVTR must be completed if the vessel changes gear type, mesh size, or statistical area during a fishing trip. The presence of an onboard observer during a trip does not relieve the vessel of the requirement to submit an FVTR.

FVTRs must be received or postmarked by the 15th of the month following the month in which the trip ended. Amendment 16 to the Northeast Multispecies FMP increased the reporting frequency to weekly for groundfish vessels. The Regional Administrator may authorize individuals to submit reports electronically, by using a VMS or other media. Submitted FVTRs are checked for completeness and then entered into a database. Incomplete, illegible, or inaccurate FVTRs are returned to the submitter for correction. Vessel owner/operators with missing, incomplete, illegible, or inaccurate

FVTRs may not be allowed to renew their Federal fishing permits until the problem(s) are corrected. Copies of FVTRs are required to be maintained onboard the vessel by the vessel owner/operator for one year and retained by the owner/operator for a total of three years.

All discards are required to be reported on Greater Atlantic Region FVTRs (NMFS 2004). Thus, given the mandatory reporting requirement applied to all federally permitted vessels (with the exception of vessels holding only a Greater Atlantic Region lobster permit), FVTR data represent a comprehensive source of information on total fishing effort, location, catch, and bycatch. In addition to the requirement to submit FVTRs, some FMPs require catch information to be reported also through an interactive voice response system or through a VMS.

Owners or operators of commercial groundfish vessels with federal permits now have the option to submit their FVTRs electronically (eVTR). Electronic reporting will make the collection of important data on fishing vessel activity more efficient, convenient, and timely for the fishing industry, fishery managers, and other data users. Vessels choosing to use eVTR must complete the report prior to landing and can either submit it immediately or upon landing. The option to use eVTR may be expanded to other fisheries in the Greater Atlantic Region.

4.3.2 Evaluation and Applicability

FVTRs provide an extensive set of data regarding fishing location, effort, catch, and bycatch. However, FVTR data are self-reported by the individual vessel operator and there are several challenges and limitations associated with the use of self-reported catch and discard data that have been well documented (NEFSC 1996; Walsh et al. 2002; NMFS 2004). The challenges and limitations include low compliance with mandatory reporting requirements, misidentification of species, errors in estimating the amount of catch in large volume fisheries (e.g., Atlantic mackerel and Atlantic herring), under-reporting (particularly of discards), and data entry errors on FVTR forms. It should be noted that FVTRs are not systematically inaccurate—a comparison of total groundfish landings from FVTR to dealer records for calendar years 2003 and 2004 shows close agreement between the two data sources (Rago et al. 2005). However, many fishermen have expressed concern about disclosing detailed information about primary fishing grounds for target species or providing information on discards in FVTRs for fear that the information may be used in a future management action that would negatively impact their operations.

With caution, the data provided in FVTRs can be utilized to provide the basis for stratum-specific expansion factors to raise the observed portion of the commercial fishing fleet's trips to the entire fleet. While FVTR data can be compared to other fishery dependent data sources such as dealer reports, vessel monitoring systems (VMS), and DAS to ensure the information provided is both complete and accurate, only observer data can be used to confirm the completeness and accuracy of FVTR bycatch and discard data. Additional information on the effective use of FVTRs as a bycatch and discard monitoring tool can be found in chapter 5.

New technologies such as electronic monitoring systems (described in section 4.10) could be used to verify FVTR logbook catch and discard data in hook and line fishery modes as is done with the comprehensive catch accounting system in British Columbia. It should be noted that a rigorous regulatory environment, requiring total retention of key species and documentation of all discards is in place to support British Columbia program. If a similar program were developed for the Greater Atlantic Region, a comprehensive regulatory structure, with considerable technological support and personnel, would need to be established.

4.4 Dealer Purchase Reports

4.4.1 Description

Since May 1, 2004, all federally permitted seafood dealers (excluding lobster only) have been required to submit electronic reports of all fish purchased on a weekly basis.[18] This requirement is fully described at 50 CFR 648.7. Dealer purchase reports are compiled and submitted to NMFS through one of two approved software packages specifically developed for this purpose or through a file upload process.

Dealer reports must include the following information for each purchase made from a fishing vessel: Dealer identification information; vessel identification information from which fish were purchased; a trip identifier; dates purchased; amount of species landed; price paid for each species; and disposition of the fish. Dealer reports are assumed to be the best source for comprehensive estimates of total landings and the resulting revenue generated. They can be used by the dealers for tax preparation purposes and as legal documentation of the purchase and sale of the landed catch.

4.4.2 Evaluation and Applicability

Federally permitted dealers are required to report all purchases of species governed by a Federal FMP. Dealers are not required to collect or report information on bycatch or discards. Dealer reports of landings may or may not specify the market category[19] which could, in turn, be used to categorize the general size of animals comprising the landed catch. Landings-related size information would not yield any specific application for quantifying bycatch or discards, even if discards of the same species landed were listed as discards on a FVTR. Dealer reports would not supply any

[18] May 1, 2004, was the effective date of a rule requiring all federally permitted seafood dealers in the Northeast except those handling lobster only to report fish purchases electronically via computer. Prior to this rule, all dealers were required to report all fish purchases on paper forms, submitted monthly, and dealers that purchase certain species were required to provide additional summary information on a weekly basis through an automated telephone call-in system. The May 1, 2004, rule consolidated the two reporting requirements, eliminated both the telephone call-in system and the paper reports, and implemented an on-line reporting program known as the Standard Atlantic Fisheries Information System (SAFIS).

[19] "Market category" is a term used to describe the various forms or sizes of fish products sold to dealers and for which different prices may be paid (for example, dealers will pay fishing vessels different prices per lb for "whale" cod, "market" cod, and "scrod" (small) cod).

information about species not brought to market. Therefore, dealer reports have limited applicability towards documenting discards.

Dealer reports are primarily used as a census of landings in a fishery. In turn, dealer data are important for expanding the catch and discard rates reported by at-sea observers to the entire fishing fleet. This information is used to optimize observer coverage and to developing estimates of total fishing effort and total discards (see Chapter 5 and Appendix A for more information).

4.5 At-Sea Observers

4.5.1 Description

At-sea fisheries observers are generally biologists trained to collect information onboard fishing vessels. Observers may be deployed for various reasons including monitoring interactions with protected species, measuring catch composition and disposition (including discards), validating or adjusting self-reported data, tracking in-season quotas (including bycatch quotas), or a variety of other reasons (NMFS 2004). In addition to the observer program that operates out of the NEFSC, several states employ observers either through a formal observer program or on an ad-hoc basis. In most cases, state observer programs are intended to provide information on fisheries not covered by the Federal observer program (such as the American lobster fishery).

4.5.1.1 Federal Observer Program

Bycatch in Greater Atlantic Region fisheries is monitored primarily through the NEFOP, which is coordinated through the NEFSC and has been in operation since 1989. The quality of observer information is ensured through several aspects of the program: Observers participate in a comprehensive training program that includes proficiency and testing standards; a standardized set of on-board data collection protocols are utilized in training and are available at-sea in written reference documents; and finally, significant auditing and quality assurance of the data collected occurs before it is used in stock assessment and management decisions (NMFS 2006a).

To allow extrapolation of the sample data to the fleet as a whole for the purposes of total bycatch estimation, the NEFOP employs a rigorous statistical sampling design. The procedure includes: Definition of a sampling frame across all relevant fisheries; and identification of sampling strata based on observable properties. A detailed discussion of the precision and accuracy of observer bycatch estimates is provided in chapter 5. Information on the data flow related to quality assurance and control for the NEFOP can be found in Appendix D.

Observers are trained to collect a variety of information, including the amount of all catch and bycatch, the disposition of the catch (i.e., kept or discarded), biological samples (i.e., for age and size distribution studies), effort data (e.g., number of tows, haul duration, vessel horsepower), gear characteristics, and economic information (NMFS 2006a). Observers record everything caught in the net (both living and non-living) and identify all organisms caught (including finfish, crustaceans, shellfish, corals, sponges, etc.) to the lowest taxonomic level possible (NMFS 2006a).

Current regulations require any vessel issued a Federal permit to carry an observer aboard a particular fishing trip, if requested to do so. Vessel owners or operators who refuse to carry an observer or that leave dock prior to the observer embarking are referred to the NMFS Office of Law Enforcement and may be prosecuted. Upon embarking, an observer will ensure the vessel has a current U.S. Coast Guard safety decal. Should the vessel not have an inspection decal or other unreasonable safety issues arise, the unsafe vessels will be observed at a later time. The NEFOP continues to work with non-compliant vessels to ensure compliance with safety and requirements (Amy Martins, pers. comm., NMFS).

The NEFOP allocates observer coverage ("sea days") to monitor bycatch (fish, invertebrates, and protected species) in the commercial fisheries in the Northeast. Available funding and the average cost of an observer sea day determine the number of potential sea days in the program for a given period of time. With the exception of some observer coverage funded through industry set-asides in the sea scallop fleet, the costs of observers in the Northeast fisheries are entirely borne by the Federal Government, using funds appropriated to NMFS by Congress. While NMFS requests funding for the NEFOP that it has determined necessary to meet the needs of the fishery and to comply with statutory mandates, the actual levels of future funding cannot be entirely predicted, and are uncertain until Congress approves the budget. Some of these annual funds are 'earmarked' to ensure that the required levels of sea days are available to satisfy mandated levels of coverage required for some fishery management plans or for fisheries that occur specific areas (e.g., funding directed to support observers and at-sea monitors in the Northeast multispecies catch share program). The remaining funds and subsequent sea days are divided amongst the remaining fisheries in the northeast. Within this remaining pool of sea days, it is necessary to maximize the utility of the available days to ensure that resulting bycatch estimates are accurate and precise for each fishery mode. Chapter 5 and Appendix A describe the detailed methods used to optimize available observer coverage throughout certain Greater Atlantic Region commercial fisheries prior to the 2007 SBRM Omnibus Amendment. A description of the methods currently used can be found in Wigley et al. 2012a.

4.5.1.2 State Observer Programs

State fisheries agencies often administer at-sea observer programs for fisheries that occur within their jurisdiction. State observer programs generally occur in fisheries that target species that are not federally managed or target federally managed species in state waters. All of the states within the Greater Atlantic Region have conducted some level of at-sea observations. Excluding lobster observation programs, North Carolina, Maryland, Rhode Island, and Massachusetts have formal programs for one or more areas and/or target species.

Standards for state observer programs are established by the Atlantic Coastal Cooperative Statistics Program (ACCSP) and NMFS. Therefore, much of the information previously described in section 4.5.1.1 also applies to the state administered observer programs.

4.5.1.3 At-Sea Monitors

The At-Sea Monitor Program was implemented starting in fishing year 2010 to support the Northeast multispecies sector management program, and collects data to verify fishing vessel catch (landings and discards), by species, gear type and area, for the purpose of monitoring sector catch of each stock for which a sector receives Annual Catch Entitlement. Although the programs function similarly, the NEFOP and At-Sea Monitor Program are each tailored to meet specific monitoring objectives. NEFOP observers collect the same fishing vessel catch information, but with an additional focus on biological sampling of catch, including any incidental take of a marine mammal, seabird, or sea turtle. The target coverage rates for at-sea monitors are determined through a separate process apart from NEFOP observer coverage rates. Although at-sea monitors are not specifically deployed as part of the SBRM, the catch and discard data they collect may be used to supplement SBRM data, for example when computing the precision of discard estimates. NEFOP observer coverage assigned under the SBRM for some fishing modes may fulfill a portion of the target coverage rate for at-sea monitors under the At-Sea Monitor Program. The potential effect of SBRM coverage on at-sea monitoring for a particular groundfish sector in a given year would depend on the mix of fishing modes within the sector, the SBRM target coverage, and the available SBRM funding among other factors.

4.5.2 Evaluation and Applicability

Observer-gathered discard information is generally considered the most accurate and objective in recording bycatch and discard information. Observer programs often collect detailed biological information on both catch and discards for all aspects of commercial catch; fish, invertebrates, marine mammals, birds, and protected species. Observers produce quantitative assessments of bycatch and discards. As such, it is often the primary source of bycatch and discard reporting and is the foundation for bycatch and discard estimation. Observer data are utilized extensively in both stock assessment and management actions.

Observer data are preferred over other data sources including FVTR data for a few reasons. Unlike fishermen, who may be performing or managing many fishing-related tasks at once so that reporting bycatch and discards becomes a lower priority than culling retainable catches or navigating their vessel, observers are solely focused on data collection while deployed at sea. In addition, observers are highly trained in their independent functions of data collection and are unlikely to be distracted by other priorities or influenced to misreport information. However, there are different sampling protocols for fishery resources and for marine mammals, and an observer assigned to a vessel primarily as a marine mammal observer may not conduct complete sampling of vessel catch and discards.

Managing an observer program requires dealing with numerous practical and fiscal constraints. Observers must be carefully trained, work under sometimes hazardous conditions, and deal with a variety of circumstances that can arise while at sea on a fishing vessel. Logistical issues, such as having an adequate number of observers available to cover a wide geographic area, numerous ports, and a variety of fisheries; and getting the observers aboard vessels within relatively short windows of time before they intend to sail further add to the complexity and costs of observer programs. Finally, safety issues must be considered in deploying observers. Observers are not deployed aboard vessels that present unsafe or unhealthy conditions. Vessels that may otherwise be safe may not have space or appropriate accommodations to carry observers. Even on a vessel that is determined to be safe and appropriate to accommodate an observer, weather, sea conditions, and the very nature of the commercial fishing business present some risk. As a result, recruitment and retention of observers is challenging.

While observer programs are one of the best ways to collect bycatch and discard information, they are also one of the most expensive means of doing so, due to the costs of rigorous training, recruitment of observers, salaries and benefits (including premium pay while at sea and on-call pay while waiting for a vessel to depart), contractor profit, travel costs, gear and equipment, and insurance (NMFS 2004). Indirect costs include salaries and benefits of NMFS employees that oversee the observer program, sampling design and analytical support, data entry, and database design and maintenance.

State observer programs may be used to provide the same types of discard and bycatch information provided by the Federal observer program. In many instances, the fisheries observed may not involve vessels with Federal fishing permits or may occur on vessels operating exclusively within the jurisdictional waters of a particular state. The data available from state programs may have value in providing information on non-FMP species or about locations not often sampled by the Federal program. Data collected by state programs are coordinated by the ACCSP and available to Federal stock assessment scientists through data sharing agreements.

4.6 Port Sampling (Commercial)

4.6.1 Description

Port agents are NMFS staff and contractors located in the major fishing ports in the Greater Atlantic Region. Port agents are responsible for collecting biological samples of landed catch to characterize commercial landings following standardized sampling protocols. Biological sampling data are linked with FVTR data to identify the statistical area the landed fish were harvested. Length and age samples are used to translate landed weight into numbers of fish landed at age. Landings-at-age data are then grouped with discard-at-age data to develop a total catch-at-age matrix used in analytical stock assessment models.

4.6.2 Evaluation and Applicability

Biological sampling conducted by port agents contributes to the assessment of total catch of species in the Northeast and provides important biological information on FMP species for use in stock assessment and management actions. Port agents do not collect specific information on bycatch or discards. They may receive anecdotal information occasionally during sampling or conversations with fishermen. The length and age data collected by port agents, along with other fishery dependent data sources, are a key component in estimating size and age of catch and, to some extent, are applicable to discard estimates by providing a size distribution for comparison against observer data.

Port agents also facilitate outreach with the fishing industry and dealers regarding reporting issues, new regulations, data quality concerns, and compliance with regulations. Port agents also work with industry to properly identify species through the use of outreach materials such as the skate and protected resources identification guides. Port agents assist in answering industry questions pertaining to data entry on FVTRs and dealer weigh-out reports. As outreach representatives of the agency, port agents help to increase the accuracy and reliability of the fishery-dependent data sources.

4.7 Recreational Fishery Sampling

4.7.1 Background

For many fish stocks, catch and discards associated with recreational angling are an increasingly important component of overall fishing mortality. NMFS estimates that in 2011 over 10 million anglers made more than 69 million fishing trips nationwide and caught more than 345 million fish, 60 percent of which were released alive (NMFS 2012). The total weight of recreational catch equates to about 2 percent of the total U.S. commercial harvest (in the states participating in MRIP), but because anglers tend to target relatively few species, the proportion of total catch attributed to recreational fishing on a stock-by-stock basis may be substantially higher. In Atlantic bluefish, for example, the total annual allocation and catch for recreational fishing exceeds the commercial allocation and catch. Accordingly, fishery managers need data on recreational fishing to ensure management actions are informed by estimates of the total impact of the recreational component.

Recreational angling presents NMFS with especially difficult data collection challenges. Angling may occur throughout the EEZ and coastal zone, including estuaries. Effort is broadly dispersed; anglers may work from bridges, piers, public and private beaches, other coastal properties, private docks and boats, and charter and head/party boats.[20] Also, recreational catch may not be sold, so aggregation points, such as dealers for commercial fisheries, are not available as data collection nodes.

[20]The terms "head boat" and "party boat" refer to same thing: boats that take large groups of anglers on a fishing trip. Generally, the anglers purchase individual tickets to fish, and the vessels may carry up to 100

To begin collecting data on recreational fishing activities, in 1979 NMFS initiated the Marine Recreational Fisheries Statistical Survey (MRFSS). Over the years, the MRFSS was expanded, refined, and supplemented by other surveys and methods. The overall effectiveness of the MRFSS has been evaluated many times (Witzig et al. 2006). Detailed information on the reviews that have been conducted since the inception of the MRFSS is available on the NMFS Office of Science and Technology web site.[21]

In September 2004, NMFS contracted with the National Research Council (NRC) of the National Academy of Sciences to conduct a critical review of the agency's recreational fishing surveys. The report of the review was delivered to NMFS in April 2006.[22] The report acknowledged the profound difficulty of collecting accurate and precise data on recreational fishing, listed a number of programmatic criticisms including possible sources of imprecision and bias, and included significant recommendations for redesigning the MRFSS.

General findings of the NRC include that:

- Much in recreational fisheries, from participation levels to management goals, changed since the design and implementation of the MRFSS and the survey did not keep pace with the changes;
- Funding and staff support was inadequate, and additional resources were needed to overhaul and maintain MRFSS;
- The Coastal Household Telephone Survey (CHTS) and access-intercept programs had serious design and implementation flaws and used inadequate analytical methods;
- For the purposes of data collection, the for-hire sector has more in common with commercial fishing than with private angling; and
- Concerns about the use of MRFSS to support fishery management decisions were well-justified.

To address issues cited in the report, the NRC recommended changes to the MRFSS and For-Hire Survey (FHS) that would improve the effectiveness of sampling procedures, enhance their applicability as relates to fishery management measures, and heighten the usefulness of the MRFSS social and economic analysis provided by the survey data. The NRC's many recommendations for improvement of the MRFSS and FHS also applied to the state-level recreational surveys designed to supplement the MRFSS data collection and analysis.

Specific to bycatch and discards, the NRC recommended several measures to enhance data quality, including mandatory logbooks in the for-hire sector (charter boats), greater use of onboard observers, and delineation of catch by target effort, catch effort, or

anglers. The duration of head boat trips is usually 4 to 12 hours. "Charter boat" refers to vessels that are hired—often for a full day—by a pre-formed group of 4 to 8 anglers (NRC 2006). Charter boats are often associated with large pelagic fisheries, but will often seek other species if the principal target is unavailable or if bag limits are met before the charter expires.

[21] For website, see www.st.nmfs.noaa.gov.

[22] Unless otherwise noted, all of the information in this subsection is drawn from NRC 2006.

directed effort, among other things. More background information regarding the NRC assessment and NMFS's efforts to improve recreational fishing data collection is provided in chapter 5.

Following the NRC report, NMFS conducted a major overhaul of the way recreational fishing information is collected and reported. The process involved the participation of state and Federal government, outside experts, recreational fishermen, charter boat captains, conservationists, and other stakeholders. The result of these efforts was the creation of a new program known as the Marine Recreational Information Program (MRIP), which is described in the sections that follow.

4.7.2 Description

The MRIP is the only federally coordinated source of fishery independent data available on bycatch for recreational fisheries in the marine waters of the United States, including estuarine areas. Data collected through the MRIP are used to produce estimates of recreational participation, fishing effort, catch, and discards/bycatch of finfish. Data on recreational shellfishing are not collected.

MRIP data are collected by three independent, but complementary, surveys:

- Access-Point Angler Intercept Survey (APAIS) – designed to collect data on catch per unit effort through interviews with individual anglers;
- Coastal Household Telephone Survey (CHTS) – designed to collect data used to estimate the total number of marine recreational trips taken by coastal residents; and
- For-Hire Survey - designed to assess charter and head boat fishing effort.

Intercept surveys are primarily pre-formatted interviews of anglers, conducted at fishing access sites such as docks, marinas, and along the shore. The APAIS has been completely re-designed by the MRIP program following the NRC report mentioned in section 5.7.1. Catch data are obtained from anglers intercepted by trained interviewers stationed at fishing access sites or patrolling the shoreline. Interviewers identify, count, weigh, and measure fish that are available for inspection. Fish not brought ashore (i.e., discarded bycatch) are categorized through the interview as released alive, eaten-plan to eat, used for bait, or discarded dead. In addition to the access-point intercept, surveyors will often ride aboard head/party boats to conduct the interviews with anglers and to collect data on angler practices and fish that are caught and discarded. All the intercept interviews—ashore and aboard party boats—are used to develop estimates of catch per unit effort, which in this case is the recreational fishing trip. Intercept data are not used as the basis for estimating total recreational fishing effort.

The CHTS obtains information on recreational fishing effort (Table 32). The effort information obtained via the telephone surveys can be used to scale estimates of overall recreational fishing effort with the catch-level information collected through the interview program. In combination, these two sources of information can be used to derive estimates of overall recreational fishing impacts, including discard estimates.

Intercept Survey	Telephone Household Survey
• Number, weights, and lengths of fish caught (by species)	• Presence of marine recreational anglers in household
• State and county of residence	• Number of anglers per household
• Avidity level (trips per year)	• Fishing trips in 2-month period
• Mode of fishing	• Mode of each trip
• Primary fishing area	• Location (county) of each trip

Table 32. Data collected by the complementary MRIP methods.

Under the CHTS and Access-Point Angler Intercept Survey, marine recreational fishing data on effort, participation, catch, and discards are collected for 2-month periods ("waves") by subregion, state, fishing mode, and primary fishing area. Not all Greater Atlantic Region states and survey modes are sampled in each wave. Total survey effort during a 1-year period usually involves more than 76,000 intercept interviews and over 265,000 telephone interviews (Witzig et al. 2006).

In 2003, the ACCSP launched a coastwide For-Hire Survey[23] (FHS), which was designed to collect catch and effort data from directory-based interviews with operators of charter and head/party boats. It also includes a "validation data" component that, through dockside observations of vessel activity, is used to validate the interviews and to correct any reporting errors. Catch per unit effort for the FHS relies on the access point intercept interviews noted above.

Unlike CHTS, which relies on random digit dialing to contact households in coastal counties, the FHS uses a telephone directory of known charter and party boat fishery participants. Sampling occurs weekly as vessel operators are contacted and asked about fishing effort in the prior week. The validation surveys are conducted through the same intercept survey method described above, but are targeted to correspond with vessels slated to be interviewed under the FHS at the week's end.

Another source of recreational fishing data is the FVTR. Charter and party boats in the Greater Atlantic Region are required to submit FVTRs per 50 CFR 648.7(b). Though not part of the MRIP, the FVTRs are important sources of recreational fishing data in the region and may be used to supplement MRIP data in the determination of impacts from recreational fisheries in the region.

Finally, over the years, several states have instituted activity- or fishery-specific recreational fishing surveys. Examples include state-level MRIP collections, angler reporting by catch-card, and vessel counts at certain marinas and harbor entrance channels. Such programs are well established on the Pacific, Gulf, and southeast coasts. In the Greater Atlantic Region, however, state-level programs are few and not focused on

[23] In some NMFS documents, the FHS is considered a component of the MRFSS. In others, it is presented as a supplement to the MRFSS. Such distinctions are merely semantic and have no relevance to the quality of the data and the degree to which the programs are integrated.

species under management of the Fishery Management Councils. The FHS began as a state program in Maine in 1995, before its methods were adopted coastwide. A catch-card program in North Carolina and Maryland requires reporting on bluefin tuna and marlin catches, and an FHS-type telephone survey, including access-point validation intercepts, is used to collect data on effort and catch of large pelagic species aboard charter boats and private boats with permits for highly-migratory species. None of the state-level programs are relevant to the fisheries considered in this document.

4.7.2.1 MRIP Access-Point Angler Intercept Survey Methods[24]

The intercept survey consists of interviews to gather catch and demographic data from marine recreational anglers who have just completed fishing in one of 3 fishing modes: Head/charter boat; private/rental boat; or shore based (e.g., man-made structures, beaches, and banks). As noted above, the intercept survey samples angler catches during the six 2-month sampling periods depending on the state. APAIS sampling is conducted in North Carolina in January/February; Massachusetts-Georgia in March/April; Maine to North Carolina in May/June, July/August, and September/October waves; and in Massachusetts to North Carolina in November/December. In January/February only shore, private or rental boat or charter boat angling is surveyed in North Carolina. During March/April (wave 2) head boats may be surveyed in New Hampshire. All modes are sampled in wave 2 in Massachusetts to North Carolina. All APAIS modes (shore, charter boat, head boat, and private/rental boat anglers) and all included states in the region are sampled in waves 3 through 5. In wave 6, all modes are surveyed in New York to North Carolina, and shore, private/rental boat, and charter boat modes are sampled from Massachusetts, Rhode Island, and Connecticut. The APAIS is not conducted in wave 6 in Maine and New Hampshire. Approximately 25,000 intercepts per year are allocated in the Greater Atlantic Region under MRIP (NMFS 2012SOW).

At the core of the APAIS plan is the Master Site Register (MSR), a complete coastwide list of access sites for marine recreational fishing. It was originally developed in 1979 and has been continuously updated. Sites are chosen for interviewing assignments by randomly selecting from among the MSR sites, as they are weighted by estimates of expected fishing activity. The intent of the weighting procedure is to sample in a manner such that each angler trip has an equal probability of inclusion in the sample.

The method used for assigning samplers to conduct interviews and collect data aboard a head/party boat is analogous to the MSR intercept assignment process. A directory of head/party boats is maintained and each entry is assigned a “pressure” reflective of the number of trips the vessel is expected to make in a week. Pressure is determined through field observations by MRIP staff and contractors, and the directory is updated regularly. Vessels annotated with a greater pressure value are likely to have samplers aboard more frequently than those vessels with a relatively low pressure. As with shore-based intercept sampling, the method for assigning samplers to ride aboard head/party boats helps to ensure each vessel trip has an equal probability of being

[24] Sections 4.7.2.14.7.2.1, MRFSS Intercept Survey, and 4.7.2.2, MRFSS Telephone Survey, are taken largely from Witzig et al. (2006).

sampled and minimize sampling bias and increase precision (Robert Andrews, pers. comm., NMFS).

A sampling "assignment" consists of a target mode, a time interval, a cluster of fishing sites with activity in that target mode, the order in which those sites are to be visited, and the date on which the cluster is to be visited. Designated time intervals in all states are 2am-8am, 8am-2pm, 2pm-8pm, and 8pm-2am. Site clusters are determined each wave based on the site pressures for the wave, among other criteria (e.g., proximity, staff constraints). In addition to angler interviews, samplers collect a count of all anglers and fishing boats that complete fishing during the assigned sampling period.

Anglers are intercepted, screened, and interviewed at assigned access sites upon completion of their fishing trips. In addition to conducting interviews with eligible anglers the APAIS includes counting all anglers, and fishing boats, that exit the site (i.e., complete fishing in the assigned mode) during the sampling period at each site. At sites with high activity interviewers may need to alternate between counting and conducting interviews. Anglers fishing along natural shorelines may have several points of entry or exit and may be difficult to intercept at the completion of their fishing trip. Therefore, after conducting normal sampling for most of the assigned time period, some interviews are conducted with beach/bank shore mode anglers who have not completed their trip.

Each interview consists of:

- An introduction to the survey and information on the Privacy Act of 1974;
- An oral interview concerning the fishing trip just completed;
- A thorough examination of the respondent's catch; and
- Measurement of lengths and weights from all of (or if necessary, a random sample) the fish of each species in the respondent's catch.

Interview procedures vary slightly among fishing modes:

- When assigned to head/charter boats, the interviewer occasionally rides on head boats to interview anglers and to examine their catches.
- Private/rental boat anglers are interviewed at boat ramps and hoists while they are recovering their boats or at dockside while they are cleaning their boats.
- Anglers fishing from natural shorelines often are widely distributed along beaches and banks with multiple access points, hence samplers often have to rove from angler to angler within the defined boundaries of the site to obtain interviews.
- Man-made structures often have a single egress point at which samplers can easily intercept departing anglers.

Interviewing procedures have been developed to allow separate recording of information on the following:

- Catch which is unavailable for identification;
- Available catch which cannot be easily subdivided among anglers; and

- Catch obtained during multiple-day boat trips.

For fish not available for the interviewers' examination, information is only recorded for individual anglers. For the fish available for inspection, grouped catch is allowed.

The procedure for interviewing anglers while aboard a head/party boat is roughly the same, except that parts of the interview may occur even before any fish are caught while the boat is heading out to sea (NMFS 2012SOW). Samplers do not attempt to interview all of the passengers, but randomly select passenger to be interviewed. As fish are brought aboard, the sampler will attempt to collect data on all catch (retained and discarded). Retained catch is weighed and measured (fork length). Discarded catch is measured, but is not weighed due to the concern of causing the fish further injury. The location fished may be obtained from the boat's captain after the trip. Otherwise, the vessel's crew are not interviewed.

4.7.2.2 MRIP Telephone Survey Methods

The CHTS is carried out in 2-week periods of interviewing starting the last week of each 2-month wave of fishing activity and continuing in the first week of the following month. For example, for the March/April wave, households are called during the last week of April and the first week of May. Respondents are asked to recall on a trip-by-trip basis all marine recreational fishing trips made within their state during the 60 days prior to the interview.

A summary of the methods used in the telephone survey are as follows:

- The telephone survey is only used to gather information on fishing effort, not on catch rate or species composition.
- The telephone interview sample quota for each wave varies with the amount of fishing activity expected. The allocation is based on historic MRIP data on fishing effort.
- Interview allocations for each county are proportional to the square root of the number of households within the county. This ensures a minimal level of sampling in coastal counties with small populations.
- The sampling units in the telephone survey are households with telephones in coastal counties. Households are contacted using a procedure called "random digit dialing." In this procedure, each telephone number (including unlisted numbers) within the county has an equal probability of selection.
- The household effort data obtained in each county is weighted by the number of households in the county for calculation of a state level estimate of the mean household fishing effort. In statistical terms, a stratified sampling estimator is used.
- This weighting procedure was started in 1993 and applied to all historical estimates. In earlier years, an improper weighting scheme (based on the number of households in the state) was used. States with large coastal

population centers (e.g., Boston, Baltimore) were the most affected by the change.
- Sampling is without replacement within strata (state/county/wave), as well as among strata within a year. Generally, no household telephone number is included in the sample more than once during a calendar year.
- Telephone interviews are conducted between 8:00 a.m. and 9:00 p.m. (respondent's local time) on weekdays and weekends, with at least one weekday attempt and three night or weekend attempts.
- At least five attempts are made to reach each household. Repeated attempts are made to complete the questionnaire with all eligible anglers residing in each contacted household.
- As necessary, interviews are conducted in Spanish.
- Information on marine recreational fishing activity is obtained from each angler in the household or from a responsible adult when appropriate.
- A procedure called "hot deck" imputation[25] is used to adjust for non-respondent anglers and households prior to estimation.

4.7.2.3 For-Hire Survey

The FHS is designed to collect data on fishing effort and catch per unit effort aboard charter and party boats. Effort data are collected through pre-formatted telephone interviews with vessel operators. A directory of active for-hire vessels is the source from which the sample frame is drawn. The directory is updated opportunistically and through information collected in the telephone surveys.

Sampling is stratified by state, mode (charter or party), week, and sampling wave. The sampling waves are the same as with MRIP. In each week of the survey, called a “sampling week,” approximately 10 percent of the for-hire fleet is selected to be queried. In areas where a 10 percent sample would result in fewer than three samples per stratum, additional samples are drawn. The vessels selected for the FHS are contacted by mail the week prior to the sampling week. A letter explains the program and the data that are needed, and the vessel operator is given a copy of the basic reporting form.

Vessel operators are contacted the week following their sampling week and interviewed in accordance with the FHS questionnaire and established protocols. The questions focus on the number of trips taken, the length of the trips, distance from shore, the number of anglers, and fishing method (trolling, jigging, etc.). The interviewer asks what species were targeted on the trip but does not ask the respondent to quantify or otherwise describe the catch and discards. Ditton *et al.* (2001) reports that, on average, 83 percent of the for-hire vessels in the survey are successfully contacted and about 80 percent respond to the survey. The FHS provides vessel operators with the alternative of

[25]The “hot deck” imputation method “replaces missing values in the data for a given household or angler with values randomly selected from complete, current observations obtained for households or anglers with similar characteristics. Hot-deck imputation leads to a complete data set that preserves the original variability of the sampled data better than ‘mean’ imputation. It is also usually preferred over ‘cold-deck’ imputation which replaces missing values in current data with values randomly selected from historical observations.” (Ditton *et al.* 2001)

self-reporting by submitting the completed reporting form to a toll-free fax number or through a PIN-protected secure website. About 5 percent of respondents use these alternative reporting modes.

The FHS includes dockside validation of self-reported trip data. During the designated sampling week, interviewers visit the marina/dock where the target for-hire vessel is moored. The interviewer notes the time and date and records the vessel status (moored, underway, hauled out, etc.) Ideally, interviewers will visit the dock several times during the sampling week. The presence/absence/activity data are compared to and used to correct errors in the self-reported FHS data. CPUE data are collected through access intercept surveys, conducted ashore at access points or afloat aboard party boats as described above.

4.7.2.4 FVTRs from Party and Charter Boats

Throughout the Greater Atlantic Region, party and charter boats are subject to the requirements at 50 CFR 648.7(b) for preparing and submitting FVTRs, just as are commercial vessels. An FVTR must be completed for each fishing trip. A new page must be started for each statistical area in which the vessel fishes. The FVTR logbook must be submitted by the 15th of the month following the month in which the trip ended. If a vessel holds a Federal permit for Northeast multispecies, Atlantic herring, Atlantic mackerel, longfin squid, *Illex* squid, or butterfish the FVTR logbooks must be submitted weekly, by the first Tuesday following the end of the reporting week. Charter and party boats are required to report the number of anglers fishing and the number (rather than the weight) and species of all fish kept and discarded.

A description and an evaluation of FVTRs are included in this document under section 4.3. The section is applicable to charter/party FVTRs with one exception. In commercial fisheries, the dealer report, documenting the species and pounds landed, provides an independent form of verification of the commercial FVTR. Catch from recreational fishing, however, may not be sold. Consequently, no dealer report is generated, and the party/charter FVTR cannot be verified in the same manner. Otherwise, the uses and limitations of the charter/party FVTR are the same as those addressed in section 4.3.

4.7.3 Evaluation and Applicability

In the Greater Atlantic Region, the species for which recreational angling is a significant source of fishing mortality include summer flounder, winter flounder, scup, bluefish, Atlantic cod, and striped bass. For each of these stocks, FVTRs, MRIP, and FHS data are primary sources of bycatch and discard information, used to document bycatch of these species, along with all others, in recreational fisheries. Data include landing and discard distributions by catch and size class by stock area and mode. Catch and discard per trip estimates are used in conjunction with effort data obtained by both surveys to estimate total recreational catch and bycatch for use in stock assessments.

Data on fish caught by recreational anglers are categorized as follows:

- Type A – Fish brought back to the dock and identified by MRIP interviewers.
- Type B1 – Fish that are released dead, used for bait, or filleted and identified only by the angler.
- Type B2 – Fish that are released alive and identified by the angler.

Types A and B1 are considered directly in the determination of total mortality from recreational fishing. Though type B2 data are reports of fish released alive, certainly some of the fish do not survive. Live-release mortality rates for the stocks listed above range from 8 to 50 percent. The estimations are based on empirical evidence, observations in commercial hand-gear fisheries, comparisons to similar species, and, in some cases, directed studies. Summer flounder, for example, were thought to die 25 percent of the time after release by a recreational angler, but studies in the 1990s determined the mortality rate to be approximately 10 percent. Taken together, types A, B1, and a percentage of B2 catch, form the basis for estimations of total mortality resulting from recreational fishing (Mark Terceiro, pers. comm., NMFS).

Fish age data are not collected under MRIP or the FHS. Age is derived from length-frequency data collected on landed fish (Type A) through intercepts. Length-frequency data on discards (Types B1 and B2) are collected by intercept samplers when they ride aboard party/head boats. Other sources of data for estimation of length-frequency of discards include intercept-observed sub-legal fish, at-sea sampling by state agencies, and self-reporting programs in Virginia, Maryland, New York, Connecticut, and Massachusetts. Catch-at-age, derived in this manner, is a component in the determination of stock size and total fishing mortality (Mark Terceiro, pers. comm., NMFS).

4.8 Industry-Based Surveys

4.8.1 Description

Industry-based surveys (IBS) are fishery-independent assessment studies that are conducted using commercial fishing vessels. IBS surveys often use gear designed to optimize the catch of the specific species being targeted by the survey. These IBS surveys are statistically designed and conducted under the oversight of scientists from academic institutions, State or Federal fishery agencies, or other marine research organizations (NMFS 2013c). Often, collaborations among these groups and NMFS occur with specific hypotheses to test as well as conducting stock monitoring programs. IBS surveys often use stratified random sampling designs as well as fishermen-selected stations. Fishermen-selected sample sites integrate the empirical ecological knowledge of fishermen to conduct surveys in areas where specific species are known to occur in either unusually high abundance or in areas outside the scope of the traditional NMFS surveys (Earl Meredith, pers. comm., NMFS). Survey designs that use fishermen-selected sample sites must be analyzed differently to control for inherent bias. Studies have shown that fishermen-selected sites do not necessarily improve the precision or accuracy of the survey abundance estimates.

The primary purpose of most IBS is to supplement existing estimates of relative abundance for a specific finfish or shellfish species or species assemblage obtained in NMFS surveys and to provide abundance data for areas and/or species poorly sampled by NOAA surveys (Table 33). These data may be utilized in conjunction with other data sources in performing stock assessments. The fishing methodology and gear utilized in industry-based surveys may be more similar to standard commercial fishing operations than fishery independent surveys, but may still differ substantially from typical fishing operations. Not all of the sampling protocols employed include detailed data collection on all captured species (Earl Meredith, pers. comm., NMFS).

Industry-Based Survey	Principal Investigator
ME/NH inshore trawl	ME Dept. of Marine Resources
Gulf of Maine Atlantic cod trawl	MA Division of Marine Fisheries
Yellowtail flounder trawl	RI Dept. of Environmental Management and University of Massachusetts-SMAST
Surf clam inventory	NJ Dept. of Environmental Protection
Sea scallop abundance	Virginia Institute of Marine Science, University of Delaware, ME Dept. of Marine Resources, Coonamesset Farm
Sea scallop photographic and video	University of Massachusetts, Arnie's Fisheries, and Woods Hole Oceanographic Institution (HABCAM)
Scup & black sea bass trap survey in non-trawlable areas	University of Rhode Island/Charles Borden
Northeast Area Monitoring and Assessment Program (NEAMAP)	Atlantic States Marine Fisheries Commission
Monkfish Trawl	NEFSC
Downeast Maine long line and jig surveys	Penobscot East Resource Center
Flat-fish trawl survey	NEFSC
Georges Bank longline survey	NEFSC

Table 33. Industry-based surveys in the Greater Atlantic Region.

4.8.2 Evaluation and Applicability

Industry based surveys may provide an alternate source of information on species distribution and the frequency of occurrence in fishing gear. However, because of their focused design, spatially and temporally limited orientation, and specialized fishing gears, IBS surveys are not suited to replace or supplement current data sources for bycatch information. The data generated through IBS surveys cannot be directly expanded to the commercial fishery. IBS surveys do not present a complete picture of all species encountered by commercial vessels, as the gears used, areas and seasons fished, and sampling schemes differ substantially from commercial fishing operations. The time series of industry-based survey data may be susceptible to lapses or compression pending research priorities and funding availability and therefore cannot be relied upon for future bycatch estimation.

4.9 Study Fleets

4.9.1 Description

In collaboration with the New England and Mid-Atlantic fishing fleets, NMFS established a study fleet to develop and implement state-of-the-art electronic data reporting devices for use aboard commercial fishing vessels (NMFS 2013d). The study fleet was designed to collect higher resolution and more timely fishing effort, harvest, discard, and oceanographic data. Electronic data systems were developed and field tested by commercial fishermen to enhance data accuracy and ease of submitting fishery dependent data to NEFSC. The study fleet data reflect activities that are truly commercial fishing and not scientifically designed fishing like the IBS described above.

There will soon be over one hundred commercial vessels reporting to the study fleet program. Vessels range in size from small day-boat otter trawlers to large off-shore trip boats. Study fleet vessels operate from ports in Southern Maine to Virginia. Otter trawl and scallop dredge fishing make up the majority of study fleet vessels.

Specialized equipment is necessary for data transmittal; currently the equipment is paid for by NMFS cooperative research program and a grant from the Pacific States Marine Fisheries Commission. Vessels participate on a voluntary basis and are currently compensated for their participation in the project (Earl Meredith, pers. comm., NMFS).

Data collected include an automated global positioning satellite (GPS) link for detailed catch location information. The reporting system can automatically capture water temperature throughout the water column, and depth information for use in profiling species abundance by depth or temperature. Oceanographic data are being correlated with bycatch information to model and predict areas where bycatch is high. This allows the opportunity to guide commercial fishing operations away from those areas with higher bycatch.

Once study fleet data are transmitted, the sender may perform a one-time correction to the submission via a web site interface. The data are then usable with little additional modification for analysis/management or submission to quota monitoring systems. The study fleet data provide a middle-level resolution between detailed tow/haul level observer and broad trip/area FVTR data and can be made available at or near real-time (Earl Meredith, pers. comm., NMFS).

4.9.2 Evaluation and Applicability

The NEFSC Study Fleet provides all of the self-reported data elements supplied in a FVTR, but the data are transmitted electronically and are provided on a tow-by-tow basis rather than at the sub-trip level (statistical area or change of fishing gear type). The study fleet can provide more detailed location data than is available on a FVTR including location information for each tow/set of the fishing gear. Additionally, the study fleet system has dynamic data fields that allow for the collection of additional information such as specific gear characteristics, length frequency of target species, or specialized information for other research needs.

Similar caveats and limitations apply to study fleet data and FVTRs (section 4.3.2). The electronic recording and transmittal of the study fleet data may minimize the transcription entry errors or recall bias associated with current filings of FVTRs, but may introduce new errors. The most functional current study fleet is a small subset of the groundfish trawl fishery mode. Because it is not necessarily a statistically valid allocation of the groundfish fleet, expanding the self-reported tow-by-tow bycatch and discard data to the entire fleet may not be representative of overall fishing practices. Soon, the number of study fleet vessels in the groundfish and squid fisheries may be sufficient to expand up to fishery-level estimates, but further review will be required.

The study fleet project has the capability to provide more detailed location and more precise effort data, such as tow distance, than is available from FVTRs. The improved location data may be beneficial in performing more precise expansions of observer-based bycatch estimates, particularly if the program is retooled to be a representative sample of the fleet or is expanded to encompass entire small fleet fisheries such as red crab or tilefish. The near real-time reporting capabilities of the study fleet could be useful in directing additional fishery dependent data collection efforts to specific areas to further investigate unusual bycatch events reported by the study fleet.

The study fleet project received a detailed evaluation and review in 2006. At present, the project has demonstrated that the hardware and software developed can be used to effectively collect and transmit tow by tow catch and discard information and provide detailed high resolution oceanographic data from commercial vessels conducting normal fishing operations. The study fleet will soon be investigating other technology to ensure verifiability and perhaps visual monitoring of commercial fishing operations.

4.10 Digital Video Cameras

4.10.1 Description

4.10.1.1 Electronic Monitoring Systems

The use of fixed placement, high resolution, and tamper resistant video cameras on-board fishing vessels that record digital video data to large capacity computer hard drives has been a relatively recent development in fisheries around the world (Ames 2005; McElderry 2003; McElderry et al. 2003; Tamee Mawani, pers. comm., DFO Pacific Region; Bob Stanley, pers. comm., AFMA). These systems are often referred to as electronic monitoring systems.

Electronic monitoring can be utilized to augment or replace onboard human observers in some data collection tasks. The majority of applications using electronic monitoring have been developed to monitor gear interactions with protected species and birds, to detect presence or absence of specific fish species occurring as bycatch, or to validate vessel landing and logbook information (e.g., as monitoring in full retention programs). Forays into bycatch quantification have yielded mixed results with success largely dependent on the type of gear being monitored and the electronic monitoring video quality (Mark Buckley, pers. comm., Digital Observers, Inc.). The technology supporting electronic monitoring has advanced significantly in a short time and issues of image quality that were once prevalent are virtually nonexistent when the cameras are properly placed. Electronic monitoring applications have been deployed successfully in fixed gear fisheries (i.e., longline, pot/trap, mechanical jig) and in trawl fisheries with relatively homogeneous catch composition.

Within the Greater Atlantic Region, a proof of concept project has been completed using electronic monitoring onboard small longline vessels operating off Cape Cod (McElderry et al. 2005). This project produced very similar data results as would be collected by an onboard observer in identifying and quantifying bycatch species, namely Atlantic cod occurring in sets targeting haddock (McElderry et al. 2005). A pilot program to test the applicability of electronic monitoring technology to collect catch and fishing effort data abroad commercial vessels was begun in 2010. Phase III of this project has recently been completed and a report of the results is pending. In addition, NMFS has recently approved a new policy document on electronic technologies and fishery-dependent data collection (NMFS 2013b).

4.10.1.2 Image Processing Systems

Also known as “digital observers,” this is an enhanced version of electronic monitoring systems described above. Digital video data are captured by fixed placement video equipment. The resulting video data are run through custom image recognition software that process the picture through a series of algorithms to identify fish species, provide length data and in some cases where a length/weight relationship has been established, weight data (Davis 2002). Video data are typically reviewed by technicians to visually confirm software identification findings and system performance.

4.10.2 Evaluation and Applicability

4.10.2.1 Electronic Monitoring Systems

Some initial successes using electronic monitoring have been demonstrated in several specific, limited programs worldwide (McElderry et al. 2005). In these programs, electronic monitoring technologies have been capable of providing visual catch data to answer specific questions about what is being caught, discarded, or interacting with fishing gear. Because of these successes, electronic monitoring is considered to have considerable potential for fishery applications and has been hailed by some as a replacement for onboard human observers. This may be true to a certain extent in fisheries where little previous at-sea data collection of any type has occurred. Considering the current limits of the technology and recent experience utilizing the technology, electronic monitoring is currently capable of acquiring only simple presence and absence data rather than the highly detailed data collected by at-sea observers such as those utilized in the Greater Atlantic Region.

Current successful electronic monitoring programs use video as a means to monitor retention or validate logbook data for retention and discards. In these programs, electronic monitoring uses visual data in an attempt to confirm logbook reports, and is only a part of the total monitoring program and does not do anything beyond confirming presence or absence of catch and discards. Such retention or logbook monitoring programs are supported by extensive regulatory environments that include some type of limited access privilege program and significant administrative support. These programs require extensive post-trip comparisons of video data to logbook and landings records. No such analogous program or regulatory environment currently exists in any Greater Atlantic Region fishery mode.

In the Greater Atlantic Region fishery modes, the at-sea observer programs are very complex in their sampling schemes and in regards to the data collected. Electronic monitoring technology is currently not capable of performing most of the detailed data collection tasks performed by human observers. Simple presence/absence characterization of catch would not lend itself to data expansion in any meaningful way in the models used in the Greater Atlantic Region unless additional parameters such as weight or length can be associated with the visual data. To obtain such data, vessel crews would have to handle catch and discards in a tightly prescribed manner at designated locations to ensure image capture. In contrast, electronic monitoring may be useful in documenting marine mammal or protected species interactions with commercial fishing operations in the absence of an at-sea observer, because in these cases, simple presence/absence data are usually sufficient. Deployment of electronic monitoring into fisheries with little to no at-sea observer coverage as a supplement to overall coverage levels would not yield data with much utility unless the deployments were tailored around answering very simple presence/absence questions.

The technology supporting the onboard video units has under gone significant development in recent years. So too has the number of programs testing the technology in applications worldwide. The potential for future uses of electronic monitoring remains high as continued refinement occurs. Many features of electronic monitoring are desirable. Electronic monitoring units can be deployed on small vessels that could not reasonably accommodate an onboard observer and may have a lower daily operational cost to industry when compared to onboard observers. There are some important electronic monitoring issues relating to the Freedom of Information Act (FOIA), privacy, data use, and chain of custody have not been widely discussed or resolved. In addition, significant program administrative support and costs are associated with large-scale electronic monitoring programs. Significant costs are involved with retrieving, reviewing, analyzing, and storing the electronic image data (Kinsolving 2006). Decisions would also need to be made regarding minimum performance standards and who would bear the costs of implementing an electronic monitoring program.

4.10.2.2 Image Processing Systems

This technology is still in pilot study development and has yet to demonstrate that it can replace human observers in field applications. Significant challenges have occurred during field testing in capturing quality images under sufficient lighting on an adequate background for the imaging software to perform at an acceptable standard for species identification (Mark Buckley, pers. comm., Digital Observer, Inc.). Additional challenges have occurred in configuring systems to provide length and weight data. Often, fish handling practices may require modification to ensure that optimal image captures occur. Discards must occur at a designated area and may also require special handling and lighting for image capture for the systems to function properly. Further testing of this technology needs to be performed to determine its potential utility for specific fishery applications.

4.11 Alternate Platforms

4.11.1 Description

Alternate platform programs are observer programs utilizing skiffs (i.e., other small marine vessels) to deploy human observers in proximity to operations of near-shore fixed gear operations to collect information on gear interactions with marine mammals or other protected species. Observations may not always occur in close enough proximity to the fishing operation to identify animals to the species level. Collection of biological data is often restricted to animals that have been killed as a result of gear interactions.

A program in Alaska utilized skiffs to monitor sea bird and marine mammal interactions with shore-based salmon gill nets (NMFS 2006b). In the Greater Atlantic Region, an alternate platform observation program is in use to monitor bycatch, primarily sea turtles, in the Chesapeake Bay pound net fishery (Ryan Silva, pers. comm., NMFS) and to monitor dolphin and turtle interactions with coastal gillnet fisheries in North Carolina and Virginia.

4.11.2 Evaluation and Applicability

Use of alternate platforms may allow observation of vessels that are too small to accommodate an onboard observer. Observers may be able to cover several vessels or gear locations in a short period of time. Observers may be able to set their own sampling agenda as they would not be dependent on a particular vessel hauling gear at a particular time, provided the vessels to be observed are in close proximity (NMFS 2006b). Use of alternate platforms requires the operation of the alternate vessel, either by the observer or by a vessel operator. Safety issues may arise with the operation of small vessels.

The type of data collected is not detailed; typically only presence/absence information and species identification are performed. Identification may be limited by factors affecting visibility of the catch, such as the distance between the observer and the fishing vessel, time of day, sea state, etc. Current alternative platform programs are focused on marine mammal and protected species interactions and do not currently collect any information on other species (e.g., fish).

4.12 Stranding Networks

4.12.1 Description

Stranding is a term used to describe an event when marine mammals or sea turtles become stuck, or 'beached', in shallow waters or on land. Stranded animals may be alive or dead. Formal networks of experts have been formed in coastal states to monitor and respond to the occurrence of and collect data on stranding events.

The Marine Mammal Health and Stranding Response Program was formalized by the 1992 amendment to the MMPA. The program has the following components: Stranding networks; responses/investigations of mortality events; biomonitoring; tissue/serum banking; and analytical quality assurance (NMFS 2006e). A similar program, the Sea Turtle Stranding and Salvage Network, coordinates responses to sea turtle stranding and mortality events (NMFS 2006e). NMFS has been designated as the lead agency to coordinate stranding network related activities for both programs.

Within both networks, initial information on strandings are provided by the public, mariners, educational institutions, and other interested parties by contacting a local stranding network member, which may be a university, non-profit organization, state fish and wildlife agency, or NMFS. Both stranding programs utilize an extensive group of qualified individuals from Florida to Maine to fully investigate any stranding that occurs. Investigators are well trained in species identification, animal handling, data and sample collection, necropsy, common injuries, and often rehabilitation. Data on both marine mammal and turtle strandings are maintained by NMFS databases.

4.12.2 Evaluation and Applicability

Stranding networks have only limited value in providing bycatch-related data. The data collected by stranding networks is useful to ascertain if human interaction was involved with the stranding or mortality event. In most instances, stranded animals are found on shore and any interaction with fishing gear may have occurred well before or some distance from the stranding location.

Strandings may be caused by a number of factors including, but not limited to, illness, predation, fisheries bycatch, vessel strikes, and ingestion of marine debris. During a stranding investigation, every effort is made to determine if human interaction contributed to the stranding or mortality event. Stranded animals may or may not have external evidence of human interaction. In either case, they are thoroughly examined and/or necropsied to determine whether human interaction contributed to the stranding or is an incidental finding. In some cases, a determination can be made that an interaction with commercial or recreational fishing gear contributed to or caused the stranding. When fishing gear is involved, it is often difficult to identify the specific fishery in which the gear was used. For example, vertical lines are used in many different pot/trap and gillnet fisheries. Understanding the characteristics of the gears and how they may impact an animal provides valuable information that can be used in addressing fisheries bycatch.

4.13 Vessel Monitoring Systems

4.13.1 Description

Vessel monitoring systems are electronic transceivers placed onboard commercial fishing vessels that transmit electronically location information captured from either the vessel's GPS receivers or by triangulating position from VHF radio transponders or mobile phone short message service (Trumble et al. 2004). Vessel location can be monitored remotely in either real time or retrospectively and the speed of the vessel can be derived by plotting the locations identified and the time at which the vessel occupied those locations. The activity of the vessel can be discerned by the speed at which the vessel is traveling—generally, slower speeds indicate fishing and higher speeds indicate transiting ("steaming").

GPS satellite-based VMS provides NMFS in the Greater Atlantic Region with accurate locations of fishing vessels that are either required to or voluntarily use VMS. Real-time location information can be used to monitor compliance with closed areas, special access programs, and validate FVTR data. Obtaining location information, known as polling, typically occurs on a specified schedule (frequency) according to the regulations of the fishery in which the vessel is participating. NMFS may poll VMS vessels at any time.

Most VMS units are capable of sending and receiving text messages or e-mail. Vessel operators may use the text message functionality of VMS to supply self-reported, real-time catch information, including the amount of fish kept and discarded. Several special access programs in the Greater Atlantic Region require reporting of this type (see below). DAS use can also be monitored by VMS. When a vessel crosses the demarcation line, DAS will begin to be utilized at whatever rate is specified for the fishery and/or area in which the vessel is participating.

VMS may also be used to provide notification of a vessel's return to port to facilitate dockside inspection of vessel landings by NMFS law enforcement or other officials. VMS is currently required in several Greater Atlantic Region fisheries or fishery programs (Table 34). As of September 24, 2013, there were 1,010 vessels using VMS in the Greater Atlantic Region. Several Council actions under development may increase the number of participants.

Permit Category	Number
Full-time and part-time sea scallop	331
General category sea scallop	573
Northeast multispecies (under DAS or in sector)	502
Limited access Atlantic herring	84
Atlantic Surfclam	618
Ocean Quahog	629

Table 34. Number of VMS users, by permit category (as of September 24, 2013).

Many of the fisheries listed in Table 34 have requirements to report bycatch via VMS. Atlantic sea scallop vessels are required to use VMS and are required to report catch of groundfish when operating in Sea Scallop Access Areas. Framework 42 to the Northeast Multispecies FMP requires all limited access DAS vessels participating in the Northeast multispecies fishery to use VMS. Monkfish fishing vessels are required to use VMS only when participating in special management programs.

4.13.2 Evaluation and Applicability

The applicability of VMS as a bycatch monitoring and reporting system is twofold. First, the systems provide the real-time position of each vessel tracked. The position data are used, for example, to ensure compliance with closed areas and monitor participation in special fishery access programs, many of which have specific bycatch quotas. Closed and special access areas may be designed to protect habitat, limit fishing mortality on spawning aggregations of fish, or to limit potential interactions with marine mammals, protected species, or other species of concern.

Second, vessels in some fisheries are required to supply self-reported discard data via VMS. In addition, vessels may use VMS to declare into specific fishery programs (e.g., the U.S./Canada management area, SAPs established under Amendment 13 to the Northeast Multispecies FMP, sea scallop access areas, and the monkfish offshore fishing area). By declaring into a specific fishery, program, or intent to fish in a particular mode, the amount of bycatch or the ability to discard legal-sized catch may be restricted. The submitted data are used in conjunction with observer data to monitor target and bycatch quotas, primarily in special access programs throughout the region.

VMS supplied data are validated using positional information, FVTRs, dealer reports, and observer data, and vice-versa. VMS may also help identify potential bias in regards to fishing location, effort, or trip length that may arise between observed and unobserved vessels.

It has been suggested that self-reported bycatch data and positional information supplied by VMS could be used for real-time bycatch avoidance (e.g., ‘hot-spot’ management) by providing the spatial and temporal characteristics of fishing activity as predictors for bycatch occurrence. At present, the Federal system is not structured to be responsive enough to enact dynamic management measures based on “hot spots,” such as avoiding bycatch in a small area. Significant regulatory changes and additional personnel, as well as changes in the administrative rulemaking process would be necessary to bring that type of management to fruition. Any bycatch "hot spot" management program would probably succeed far better if developed on a voluntary basis by the fishing industry.

4.14 Trawl Monitoring Devices

4.14.1 Description

Several marine electronic systems are available to monitor the performance of mobile fishing trawl gear (Trumble et al. 2004). These systems use wire or acoustic links to send information from sensors mounted on the trawl net to a receiver onboard the vessel. These devices can be used to measure the actual time and distance that the net is in contact with the bottom, when codends are filling or are full, and net opening height (i.e., net performance). Both commercial fishers and fishery researchers have made use of these technologies to better monitor their respective trawl nets as they operate.

4.14.2 Evaluation and Applicability

If tamper-resistant monitoring units were developed and made available for widespread use, they could be used as enforcement tools to ensure pelagic nets were not fished in contact with the bottom. At present, this type of monitoring is achieved through performance standards based on catch composition (e.g., if a percentage of benthic or demersal species are found in midwater trawl catch). Sensors could provide bottom contact information when used in conjunction with vessel location information, such as VMS, which could be useful in monitoring habitat impacts. In addition, these types of devices if employed in all trawl fisheries, could help reduce discards that result from "topping off" the catch when vessel holds are almost full.

4.15 Future Developments and New Technologies

The speed of development for electronics and technologies capable of operating in a marine environment to collect various data inputs is ever expanding. New technologies should be viewed with some degree of caution. Often regarded as the panacea for solving the monitoring or data needs of the day, new technologies should be developed and applied in fisheries with clearly developed goals for the end product of data generated. Rigorous development of new programs, testing, and performance standards must be developed as new technologies and data collecting methods are researched. Only through well planned proof-of-concept testing followed by beta-level field testing can new technologies be adequately assessed for suitability in any given fishery mode. In addition, thorough analysis of the costs and benefits must be considered relative to all parties involved; industry, government, and tax payers. Programs should focus on producing usable data that answer a specific question or set of questions, not just proving that the technology will work. Ideally, these types of tests and considerations will occur prior to full regulatory implementation of new technologies or replacement of current data collection sources are phased out.

Sampling Design and Estimation of Precision and Accuracy

5.1 Introduction

This chapter presents the results of analyses conducted in support of the SBRM developed for Greater Atlantic Region fisheries. These analyses include: (1) A comprehensive summarization of 2004 data collected by the NEFOP; (2) an estimation of discard precision for fish and protected species using three different estimation methods and two different discard ratio estimators; (3) an evaluation of these different methods; and (4) an estimation of the observer sea days that would be required to achieve a desired level of precision. Other analyses related to the SBRM can account for the overlapping nature of multiple species caught by a fishery, develop species-specific imputation methods, and expand the optimization tool used prior to the 2007 SBRM Amendment to allocate sea day coverage to account for all monitoring objectives. These secondary analyses are briefly described in this document and can be undertaken in the future, but are not the primary focus for this analysis. Based on the initial analyses, further work was undertaken to refine the importance filter and to integrate the sea days required to monitor sea turtles derived from model-based methods with the sea days required to monitor fish derived from design-based methods.

The methods used generally follow those recommended by the National Working Group on Bycatch (NWGB) (NMFS 2004) and further developed by Rago et al. (2005, Appendix A) and Fogarty and Gabriel (2005) for the Northeast multispecies fishery. These methods reflect a design-based rather than a model-based approach, and directly link the data collection monitoring program with the evaluation analyses. In Rago et al. (2005), 3 fishing modes and 12 species were examined; in this document, it was necessary to examine 45 fishing modes and 60 species/species groups to encompass all relevant federally managed species in the Greater Atlantic Region.

The NEFOP data are a key element of the SBRM. The SBRM should be viewed as the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the efficacy of the allocation of observer sea days to monitor discards associated with multiple fisheries targeting a large number of resource species while operating under 13 different FMPs. The SBRM Omnibus Amendment is not intended to be the definitive document on all possible bycatch estimation methods, nor is it a compendium of discard rates and totals. Instead, the SBRM is intended to support the application of multiple bycatch estimation methods used in specific stock assessments. The SBRM provides a general structure for defining fisheries into homogeneous groups and allocating appropriate levels of observer coverage based on prior information and the expected improvement in overall performance of the program. The general analytical structure helps identify gaps in existing observer coverage, similarities among fishing modes that allow for realistic imputation, and the tradeoffs associated with potential coverage levels for different target and discard species. The observer sea day allocation process, while guided by a concept of optimization, explicitly recognizes that many different factors affect the realized allocation of observer days to specific fisheries. Moreover, the optimization model allows for continuous improvement in observer allocation as new information on the results of the previous year's data is obtained.

None of the analyses associated with the SBRM are based on the potential mortality associated with unobserved encounters with fishing gear. The omission of these mortality sources does not confirm or deny their potential importance. Rather, it explicitly recognizes that such events cannot be observed even when an observer is present on a given trip and, therefore, there is no basis for extrapolation to unobserved sampling trips.

The analyses conducted in support of this amendment have occurred over a protracted time period (Wigley et al. 2007, Wigley et al. 2011, Wigley et al. 2012a, Murray 2012, and Wigley et al. 2012b). The initial analyses using 2004 data illustrated design-based methods; the methods are not specific to any given year. Therefore, it was not necessary to redo the analysis for this amendment. The analyses presented in this chapter are primarily presented in chronological order to help illustrate that more recent analysis builds upon the prior work done for the 2007 SBRM Omnibus Amendment.

5.2 Precision and Accuracy

It is important to understand that precision and accuracy are not the same thing and that they represent related, but different, aspects of a data collection program. Accuracy is defined as the closeness of a measured or estimated value to its actual value (for example, an estimate that there were 300 million people living in the United States during October 2006 can be considered reasonably accurate, but the actual number would have varied slightly with daily births, deaths, and immigration). Precision is defined as the degree of agreement of repeated measurements of the same quantity or object.

Precision is a measure of how closely repeated samples will agree to one another (i.e., the variability of the samples), and accuracy is an indication of how closely the estimate derived from the samples will agree with the true value. The precision of a sampling program can be measured because the data collected can be compared with one another using several basic statistical methods (to calculate the variance, standard error, standard deviation, etc.). However, the accuracy of the data rarely can be measured because the true value of the population feature being estimated is not known (which is why it is being estimated). As an example, consider a fish survey designed to generate an estimate of the total biomass of a fish species. The survey takes repeated samples (via tows of an otter trawl) of the population and those samples are used to estimate the total population. Because we can compare the samples (reported as kg/tow) to one another, we can calculate the variability and, hence, get a measure of the precision of the observations. However, because the actual biomass of the population cannot be known, we cannot compare the estimate to the true value. Therefore, there is no quantifiable measure of accuracy.

Data collected through a sampling program generally may be: Accurate but imprecise (substantial variability in the observations, but the observations coalesce to provide an estimate close to the true value); accurate and precise (low variability in the observations, which provide an estimate close to the true value); precise but inaccurate (low variability in the observations, but the estimate is not close to the true value); or neither precise nor accurate (high variability in the observations and an estimate that is not close to the true value). In a sampling program such as the at-sea observer program, the precision of the observations can be measured and controlled by calculating measures of variability and, if necessary, increasing the number of observations. While accuracy cannot be directly measured, it can be accounted for by reducing potential sources of bias in the data collection program. Bias is defined as a *systematic* difference between the expected value of a statistical estimate and the quantity it estimates. Thus, the case where the data were precise but inaccurate would most likely result from some source of bias in the data collection program. Absent bias, precision will lead to accuracy; thus, bias and accuracy are used interchangeably, but bias is generally associated with the design of sampling program. Eliminating potential sources of bias improves the accuracy of the results.

There are generally two primary potential sources of bias in a sampling program such as the at-sea observer program: Non-representative sampling; and the statistical properties of the consistency of the estimators (Rago et al. 2005). Non-representative sampling means that the targets of the sampling program (i.e., the vessels and trips on which an observer is present) are distinct and different from the overall population for which an estimate is desired. For example, if observers were placed only on small vessels fishing just offshore using a single gear type, these trips would not be representative of the variety of vessels, fishing gears, trip lengths, and fishing locations that comprise the wider fleet. The following section addresses the many ways in which the NEFOP strives to ensure that the observer program samples (observes) the Greater Atlantic Region fishing fleets in a representative manner. Later sections of this chapter address the statistical properties of the estimators, and provide evidence that there is very little bias associated with the data collected by the at-sea observers.

5.3 SBRM Design Considerations

5.3.1 Initial Design

5.3.1.1 Sampling Unit, Response Variables, and Precision Goals

Among the most important decisions in the preparation of the SBRM are associated with defining the sampling unit, determining the quantity to be measured for each sampling unit (in statistical terms this is known at the response variable), and establishing the desired level of precision for this value. The sampling unit is an object on which a measurement is taken (Cochran 1963; Mendenhall et al. 1971). The sampling unit for the SBRM is the vessel trip. For the purpose of the SBRM, the response variable for each trip is the total bycatch for a single species or a group of species. A bycatch ratio can be derived by dividing the total bycatch by some measure of fishing effort. If all trips have similar attributes (e.g., vessel power, fishing gear used, trip duration, etc.), then the average amount of bycatch per trip may be an acceptable ratio. Otherwise, the bycatch rate can be expressed as the ratio of total discards to vessel days absent from port, vessel days fished (i.e., the portion of the trip spent actually fishing), or the total kept weight of all species. Total kept weight of all species is, in this sense, a proxy for effective fishing power. For finfish and shellfish, the numerator of the bycatch ratio is defined as the total weight of the discards of the species or species group. The denominator of the bycatch ratio is either the total weight of all species kept (landed) or a measure of fishing effort. Owing to difficulties in interpreting quantitative measures of fishing effort found in the FVTRs, fishing effort is approximated by days absent.[26] For sea turtles, marine mammals, and sea birds, the numerator in the bycatch ratio is the total number of individuals discarded. Bycatch rates for these species are expressed as numbers per unit of fishing effort or numbers per species kept pounds.

The NWGB advocated evaluating bycatch programs on the basis of aggregated species, but this will not guarantee that programs will be adequate for individual species (NMFS 2004). To address this issue, the analyses conducted in support of the SBRM estimate not only bycatch ratios and the associated precision (relative standard error) for species complexes relevant to the FMPs (e.g., large-mesh multispecies, skates, etc.), but also bycatch ratios and precision for each individual species. Stock areas will not be considered in the analyses, although retrospective data on observed discards would be available at this scale. Conceptually, the problem of stock area is similar to that of estimating age-specific discard rates. The full variability of the estimates is the product of the uncertainty of the species-specific discard estimates and the sampling distribution of the age-length key, an issue of fine-scale detail that is beyond the scope of the broad SBRM. Parenthetically, the sampling design underlying the SBRM supports robust post-stratification, sufficient estimation of stock-area, and age-specific estimates of discards.

Although the Magnuson-Steven Act does not include marine mammals and sea birds in the definition of bycatch to be addressed by an SBRM, marine mammals and sea birds are included in these analyses to illustrate the comprehensive nature of the NEFOP and the SBRM. The aggregate species approach will illustrate the overall effectiveness of the SBRM. The individual species approach will show the tradeoffs for varying levels of precision. With respect to the precision targets, the NWGB determined that a 20-30 percent coefficient of variation (CV)[27] for the bycatch estimate is a useful goal:

> Protected species: For marine mammals and other protected species, including sea birds and sea turtles, the recommended precision goal is a 20-30 percent CV for estimates of bycatch for each species/stock taken by the a fishery.

[26] The discard-to-kept ratio is abbreviated as d/k, and the discard-to-days-absent ratio is abbreviated as d/da.

[27] A "CV" is a coefficient of variation and is a standard measure of precision, calculated as the ratio of the square root of the variance of the bycatch estimate (i.e., the standard error) to the bycatch estimate itself. The higher the CV, the larger the standard error is relative to the estimate. A lower CV reflects a smaller standard error relative to the estimate. A 0-percent CV means there is no variance in the sampling distribution. Alternatively, CVs of 100 percent or higher indicate that there is considerable variance in the estimate. Chapter 5 describes several ways in which the variances of the data and the estimates can be minimized, including stratifying the sampling frame and optimizing sampling effort.

> Fishery Resources: For fishery resources, excluding protected species, caught as bycatch in a fishery, the recommended precision goal is a 20-30 percent CV for estimates of total discards (aggregated over all species) for the fishery; or if total catch cannot be divided into discards and retained catch then the goal is a 20-30 percent CV for estimates of total catch (NMFS 2004).

As the NWGB pointed out, "Ideally, standards of precision would be based on the benefits and costs of increasing precision" (NMFS 2004) and noted that under some circumstances, attaining the precision goal alone would not be an efficient use of public resources. In the evaluation of precision of discard estimates, a CV of 30 percent was selected to derive the number of sea days that would be necessary to sufficiently monitor the bycatch of species groups within a fleet. Selection of the higher value is predicated upon stratification of species and fisheries at a finer level than the NWGB recommended. In this document, the term CV is defined as the ratio of the standard error of the estimate divided by the estimate. The estimate can be total discard or mean discard rate. Use of the term CV is equivalent to the term proportional standard error; for the sake of consistency with the NWGB (NMFS 2004), we use CV throughout this document. The NWGB recommended overall precision goals for a "fishery," but in the Northeast Region, a fishery may comprise several gear types; e.g., the groundfish fishery is composed of otter trawls, gillnets, and longlines. Thus, in order to define a fishery, gear type and mesh size are used as two key components in defining fishing modes within an overall fishery.

5.3.1.2 Definition of Strata—Fishery Identification

To monitor the diverse fisheries off the Northeast coast of the U.S. with at-sea observers, it is necessary to stratify the trips into fleet with similar characteristics. For the SBRM, fleets (fishing modes) are defined as strata within the overall survey design.

Commercial fishing trips are partitioned into fleets using six classification variables: Calendar quarter; geographical region; fishing gear type; mesh size; access area; and trip category. Some fleets were further stratified due to FMP requirements. These classification variables are selected because they are generally known before a trip occurs. Using these criteria, it is possible to generate a list of candidate vessels for each stratum, which simultaneously enables a random selection process and reduces the number of repeat trips on vessels. This is a critical aspect for both strata definition and sample selection. One cannot base a sampling design on the outcome of a sample observation. For example, in this exercise, it is not possible to select a sampling design that specifically improves the precision of cod discards, because that objective is dependent on the realization of the actual sample. However, it is possible to select samples that will improve the probability of obtaining improved discard estimates by estimating the expected proportion of trips that catch species groups of interest. These are important considerations to ensure that the observer allocations reflect a representative sample of active fishing vessels.

Calendar quarter was considered the most appropriate temporal unit to capture seasonal variations in fishing activity and bycatch rates over the full range of fisheries. Although some management regulations operate at a finer scale, once collected, quarterly data can be further subdivided if finer resolution is needed. Additionally, fishing trips are classified into two broad geographical regions, New England and Mid-Atlantic, based upon the port of departure: Ports located from Maine to Connecticut were grouped together to form the New England region and ports located in states from New York to North Carolina comprise the Mid-Atlantic region. While data from both FVTRs and NEFOP are summarized by port landed, allocation of sea day coverage is necessarily based upon port of departure because an observer must physically board the vessel before it departs. A review of the observer and FVTR databases for 2004 revealed few instances (less than 2 percent of trips) where a change of port of landing from port of departure resulted in a change in region (i.e., New England to Mid-Atlantic or vice versa). The basis for classifying trips is the region/port of departure because areas fished are not always predetermined. The majority (over 93 percent) of 2004 observer trips both originated and fished in the same region and exhibited the same general pattern observed in the FVTR data (see Table 35 and Table 36); however, the proportion of trips that do not do so can be accounted for in the sea day allocation.

	Area Fished	
Region/port of departure	New England	Mid-Atlantic
New England	72.4 percent	6.3 percent
Mid-Atlantic	0.2 percent	21.1 percent

Table 35. Percentage of 2004 observer trips that departed and fished in the New England and Mid-Atlantic regions.

	Area Fished	
Region/port of departure	New England	Mid-Atlantic
New England	60.1 percent	3.8 percent
Mid-Atlantic	0.8 percent	35.3 percent

Table 36. Percentage of 2004 FVTR records that departed and fished in the New England and Mid-Atlantic regions.

In these analyses, 14 general gear types were considered: Longline, otter trawl; scallop trawl; shrimp trawl; gillnets; scallop dredge; mid-water trawl (paired and single); fish pots/traps; purse seine; hand line; Scottish seine; clam dredge; crab pots; and lobster pots. Although the northern shrimp and the lobster fisheries are managed under the Atlantic Coastal Fisheries Cooperative Management Act (rather than the Magnuson-Stevens Act), these fisheries have bycatch of species managed by the New England and Mid-Atlantic Councils and, therefore, these gear types are included in the analysis to the extent possible.

Mesh size groups were used to further classify the otter trawl and gillnet gear types. For otter trawls, two mesh groups were used: Small mesh (less than 5.5 inches) and large mesh (5.5 inches and greater). For gillnets, three mesh groups were used: Small mesh (less than 5.5 inches); large mesh (from 5.5 to 7.99 inches); and extra-large mesh (8 inches and greater). Fishing trips that used either scallop trawls or scallop dredges were further classified into two access areas (open or closed) and well as two trip categories (general category or limited access). Trips using other gear types were not further classified beyond gear type and mesh size. Due to the mixture of species caught during a trip, it is not sufficient to classify trips with regard to target species because discard of target and non-target species may occur.

A total of 60 individual species or species groups are examined in these analyses. These species/species groups comprise the 13 FMPs of the New England and Mid-Atlantic Councils, an all species combined group, and five protected species groups. The fisheries encompassing these 60 species/species groups required 45 different fleets to account for all regional, gear type, mesh size, and quota-monitoring status combinations (Table 40).

5.3.2 Data Sources

The sampling unit used in these analyses is the fishing trip. Trip characteristics are recorded in both the NEFOP and FVTR datasets. Together, these databases are used to define the size of the sample and the size of the strata. Data from each source are retrieved and prepared separately before they are combined.

5.3.2.1 FVTR Data

Beginning in June 1994, the Northeast Region's data collection system was changed from a voluntary to a mandatory reporting system for fishermen and seafood dealers holding federal permits (with the exception of those vessels that hold only Federal lobster permits) issued under regulations implementing FMPs developed by the New England and/or the Mid-Atlantic Council. The mandatory reporting system consists of two primary components: (1) Dealer reporting and (2) vessel trip reporting. Each component contains information needed for fishery management and stock assessment analyses. The dealer reports contain total landings by market category, while the FVTRs contain information on area fished, kept and discarded portions of the catch, fishing effort, and the gear type and mesh size used. Ideally, these data collection systems would record equivalent total landings. In practice, a variety of problems, especially incomplete or delayed reporting of FVTR, generally results in a slight underestimation of landings. The FVTR data have been routinely used in management analyses and peer reviewed stock assessments. Details on example applications of the FVTR to stock assessments may be found in a large number of reports of the Stock Assessment Review Committee (SARC).[28]

In these analyses, the 2004 FVTR (commercial) data are used to: (1) Define the sampling frame of the commercial fishing trips; (2) expand bycatch rates to total discards; and (3) evaluate the accuracy of the observer data with respect to area fished, kept pounds, and trip length. The FVTR data are the only synoptic data source for vessel activity, area fished, and fishing effort for commercial fisheries. The VMS data and the

[28] Reports prepared since 2000 may be found at http://www.nefsc.noaa.gove/nefsc.saw. Earlier reports are available by email (contact: saw_reports@noaa.gov).

DAS data systems cover only portions of the fisheries and, therefore, their use is limited for this type of analysis.

The FVTR data can be used as a basis for defining the sampling frame, because all federally permitted vessels are required to file a FVTR for each fishing trip. These self-reported data constitute the basis of the fishing activity of the commercial fleets. FVTR trip data are collapsed into fleets as defined above. For each fleet, the number of trips, the average number of days absent per trip, and the kept weight of species are calculated.

The limitations of self-reported catch data, such as the data obtained through the FVTR, are well established (e.g., Walsh et al. 2002; NMFS 2004). Limitations of the initial FVTR datasets were described by the SARC in 1996 (NEFSC 1996). Since then, many of these limitations have been addressed. In particular, subsequent peer-reviews through numerous SARCs and a review by the National Research Council (1998) have identified the strengths, weaknesses, and appropriate uses of the FVTR data from the Northeast. Measures currently used to ensure the validity of the FVTR database include routine auditing procedures, standardized data entry protocols, and compliance reviews (Greg Power, pers. comm., NMFS).

In the analysis described below, the FVTR data are converted to round (live) weight using Commercial Fisheries Database System (CFDBS) conversion factors for each species. Days absent and total species kept on a trip are also calculated. The FVTR trips are collapsed into strata as defined above. For each fleet, the number of trips is calculated. Note that trips by vessels participating in the US-Canada access area, B DAS program, and other quota-monitored programs could not be identified in the FVTR data. These trips have been grouped by the other stratification variables and have not been partitioned separately.

The validity of using the FVTR data as a basis for developing a sampling frame is supported by comparisons with total landings data from dealer records. All federally permitted seafood dealers are required to report 100 percent of their purchases. These data are generally considered to represent a near complete census of total landings. A comparison of species landings from FVTR and dealer records for calendar year 2004 reveals some discrepancies, by species group, between these two sources (see Table 37). Overall, there is a 2.3 percent difference between landings reported in the dealer and FVTR databases; however, this low percentage difference is driven in part by a -10 percent difference for herring. If herring landings are removed from the total, the difference between the total kept weights in the two databases is 4.7 percent.

Species Group	FVTR Landings (mt, live)	Dealer Landings (mt, live)	Difference (mt, live)	Percent Difference
Atlantic Bluefish	2,357	3,423	1,067	31.2 %
Atlantic Herring	94,223	85,456	-8,766	-10.3 %
Atlantic Salmon	-	-	N/A	N/A
Deep-Sea Red crab	1,733	2,041	307	15.1 %
Mackerel/Squid/Butterfish	97,400	97,083	-317	-0.3 %
Monkfish	14,643	21,185	6,543	30.9 %
Large-mesh multispecies	35,101	41,414	6,313	15.2 %
Small-mesh multispecies	8,883	9,277	394	4.2 %
Sea Scallop	242,550	243,736	1,187	0.5 %
Skate complex (7 species)	13,054	16,073	3,020	18.8 %
Spiny Dogfish	600	983	382	38.9 %
Summer Flounder/Scup/Black Sea Bass	11,732	13,887	2,155	15.5 %
Tilefish	1,229	1,216	-13	-1.0 %
Total	523,505	535,774	12,269	2.29%
Total minus Atlantic Herring	429,282	450,318	21,036	4.67%

Table 37. The differences, in lb, in reported landings for 2004 between the FVTR and dealer databases (surfclam and ocean quahogs are not included in this table due to a different dealer reporting system for these species).

The apparent large percentage difference in the two databases for monkfish landings may be a result of misreporting monkfish product in the FVTR. If the incorrect product grade is reported (i.e., whole monkfish (“monk) are reported instead of monkfish tails (“monkt”)), then an underestimation of monkfish landings in the FVTR may result because the reported weight of monkfish tails would not be appropriately scaled up to the live weight equivalent. Large percentage differences for bluefish and spiny dogfish may be due to an inability to partition out the mandatory reporting landings (reflective of the FVTR data) from the state landings data, but this issue is unique to 2004 when mandatory electronic reporting for dealers was first implemented. Additionally, total landings of bluefish and spiny dogfish represent a small fraction of the total landings of all species and, overall, these differences are considered negligible. Ideally, it would be preferable to use total kept species weight and days absent from dealer data to expand bycatch rates and in the variance calculations of total discards; however, the FVTR data are currently the only source for information on gear type and mesh size—two key aspects of fishing operations used in stratifying trips and discard data. Thus, although they are considered to represent the complete landings, the dealer data do not present a complete picture of fishing activities.

Measures of fishing effort may be in terms of numbers of fishing trips, numbers of days absent, or numbers of days fished. Days fished is the finest level of effort, representing the time the gear is actually deployed in the water (e.g., trawl duration, soak time for fixed gears, etc.), while days absent represents a coarser level of effort, generally measuring the time a vessel is away from port. The lowest resolution of effort is the trip, which may encompass varying levels of days fished, days absent, and fishing power. The above comparisons of dealer and FVTR-based landings estimates suggest that some of the expansion factors for estimating total discards, and the weighting factors for d/k ratios will be underestimated slightly.

5.3.2.2 NEFOP Data

The NEFOP is a multi-purpose program that collects a broad range of data on all species that are encountered during a fishing trip, as well as data on gear characteristics, economic information, and biological samples. The NEFOP employs trained, sea-going observers to collect these data that also includes the weight, by species, and the disposition (retained and discarded), of the entire catch. Standard sampling protocols have been established and are utilized throughout the various fisheries.[29] For most gear types, observers use a complete sampling protocol that includes obtaining species weights for both kept and discarded portions of all species in the catch on every haul. In addition to the complete sampling protocol, there is a limited sampling protocol that is used on a portion of gillnet trips where specific information for marine mammals is collected. In a 'limited' sampling scenario, only kept species weights are obtained (no discard weights) because the observer must watch the gillnet gear during haul-back to observe if marine mammals roll out of the gear before the gear returns to the deck. Because there are two sampling protocols used for data collection, two datasets were formed using the 2004 NEFOP data: One dataset for fish observed on trips for which the complete sampling protocol was used; and another for turtles, marine mammals, and birds observed on trips for which either the complete or limited sampling protocols were utilized.

For the fish dataset, only observed hauls in which all discarded species were recorded are used. In the majority of trips, all hauls are observed. However, for some gear types, particularly the scallop dredge—where fishing activity occurs continuously and a single observer cannot observe all hauls—it was necessary to expand discard species weights by the ratio of the number of total hauls to the number of observed hauls to account for all hauls in the trip. The expanded discard weight was used in the subsequent discard-to-days-absent analysis (but not in the discard-to-kept analysis) because days absent is a trip level variable representing the entire trip, not just the observed portion of the trip. Fishing trips utilized for training observers were excluded from the fish dataset but were utilized for the protected species set because it was assumed that training trips were capturing protected species information even though all discarded fish information might not be collected. For the protected species dataset, all

[29] On-vessel sampling of large-volume fisheries can be difficult. Subsampling protocols were developed for the purse seine and mid-water pair trawl fisheries during 2004; thus the results for species groups from these fleets should be considered preliminary. Sampling protocols have since been established for these large volume fisheries; the standardized sampling protocols for all fisheries with observer coverage are provided in the Northeast Fisheries Observer Program Manual.

on-watch hauls are included in the dataset, regardless if discarded fish species were recorded. Because all hauls are used in this dataset, it was not necessary to adjust the discard weight to account for non-observed hauls.

Fishing trips observed under one of the regulatory quota-monitoring programs were included, by gear type, in the protected species dataset but were partitioned into separate strata for the fish dataset because the total allowable catch limits associated with these access area programs may result in different fishing patterns than non-quota-based trips. There were limitations associated with developing estimates of total discards for these strata because these trips are not identified in the FVTR data. Species hail weight can be reported in round or dressed weights;[30] if kept hail weights are reported as dressed, then the hail weight is converted to round weight using CFDBS conversion factors for the species. All discard hail weights are assumed to be round weight. Turtles, marine mammals, and sea birds are recorded as numbers of individuals, rather than by weight. The NEFOP trip data are collapsed into strata as defined above. For each fleet, the number of observed trips, number of observed hauls, average trip length (days), kept weight of all species in the trip, the discard weight of each species, and the discard weight of all species (combined) are calculated.

A summary of the number of 2004 observed trips and sea days and 2004 commercial FVTR trips and sea days by fleet and calendar quarter is presented in Table 40 and Table 41. There was a broad range of at-sea observer coverage by fishing gear type in 2004; 11 of the 14 gear types had observer coverage. The lobster pot, crab pot, and clam dredge gear types were not covered in 2004. Regionally sparse coverage occurred for longline, shrimp trawl, fish pots, and handline. Some gear types, such as Scottish seines and purse seines, have very low industry activity and/or strong seasonal activity patterns. For the fleets examined in the analyses, there were a total of 126,498 fishing trips in the FVTR database and, of these, a total of 3,587 trips were observed, resulting in approximately a 3 percent overall coverage rate. Finer scale coverage rates vary among fleet and quarter. The highest observer coverage rate (45 percent) occurred in the Mid-Atlantic closed-area scallop dredge fleet. It should be noted that percent coverage is only one measure for monitoring adequacy, and that precision of discard rates, along with overall discard magnitude relative to population size, are the preferred measures for monitoring the adequacy of observer coverage levels.

5.3.2.3 Recreational Fishing Data

5.3.2.3.1 The NRC Report

As noted in section 4.7.1, a committee of the NRC began a review of NMFS's recreational fishing data collection programs in 2004 and submitted a report of findings and recommendations in April 2006. Two parts of the NRC report are particularly relevant to the issues of bias in data collection and estimations of bycatch and discards in recreational fishing. This section introduces the findings and issues identified by the

[30] Hail weight is the amount of landings estimated by the fishing vessel on the FVTR; round weight is the weight of the whole, live fish; dressed weight is the weight of the fish carcass after the head, viscera, and fins are removed.

NRC as related to sampling and statistical estimation. For more detail on these issues, please refer directly to the report.[31]

The NRC report notes that a goal of the MRFSS was to minimize the bias and to maximize the precision of the estimators used to analyze recreational fishing activity. The difficulty is that data are not (cannot be) collected from all recreational anglers, and representative samples must be selected that allow for unbiased estimation of the catch. Unfortunately, due to the dispersed nature of recreational fishing (spatially, temporally, and in terms of angler practices)—and in light of limited resources—it is exceptionally difficult to design a survey that will adequately sample or represent all possible fishery modes at all times. Some of the modes and the challenges of sampling them are described below:

- Shore-based fishing: The full extent of publicly accessible shoreline from which fishing occurs is impossible to monitor completely. Some anglers fish from private-property and are inaccessible to interviewers.
- Boat ramps and docks: In many areas, public boat ramps are too numerous to be monitored adequately. Again, access to docks and ramps on private property is restricted and unobserved.
- Night fishing: Generally, samplers/interviewers do not work at night. Night fishing is common in some areas and is likely not to be sampled.

For each of these modes, if the catch per unit effort of the inaccessible fishing activity is not the same as it is at accessible sites, then bias is introduced to the data.

Another source of bias may be the MRFSS' use of the MSR for intercept assignments. The MSR cataloged the fishing access sites along the coast, weighted relative to expected angler activity at the sites. NRC found that the updating of the MSR and the methods for weighting the sites were not performed consistently across regions. Also, the practice of weighting the MSR sites, while likely to improve the chances of successful angler intercepts, did not account for potential site-to-site variation of CPUE, and, thus, may have introduced bias to the estimators. To address these problems, the NRC recommended that the access intercept program be redesigned. It should not depend on the assumption of an unvarying CPUE. It should provide for sampling at small and private access sites, for night fishing, and other poorly sampled modes. The NRC found that the methods of the CHTS may have introduced sampling errors. In 1979, no accommodation was necessary to account for the use of cellular phones. Today, residents in coastal counties may use cell phones with non-coastal area codes and vice versa. Removing cellular phone numbers from the sampling frame is not an acceptable solution, because many people are using cellular phones exclusively and they would be excluded from the survey.

In surveys such as the MRFSS, a basic rule of thumb is that precision can be improved by increasing the sample size. The CHTS had very low success rate at identifying households the residents of which participated in marine recreational fishing

[31] Unless otherwise noted, all of the information in this subsection is drawn from NRC 2006.

in the previous 2 months. Increased call efficiency would improve the sample size and could be realized if random digit dialing were replaced by directory-based dialing. The latter would require a universal registry of all marine anglers, but, at the time of the report, there was no requirement for anglers to register to fish in the EEZ. In the Greater Atlantic Region, only Virginia had a comprehensive registration requirement for anglers.

The main NRC recommendation that would address the shortcomings of the CHTS is that all saltwater anglers should be required to register, either through a Federal or state program. There should be no exceptions for age, gear, or locality. A requirement to have all anglers registered would reduce the telephone survey sampling frame from all coastal county residents to only marine recreational fishing registrants. Sampling from the set of more likely participants would greatly improve survey efficiency, and, with the same resources, many additional samples could be drawn and the precision of the survey would be improved. Registration would also address the CHTS problems associated with the widespread use of cell phones.

The fate of fish caught and released by recreational anglers was recorded by MRFSS; however, the survival rate of the discarded fish was not known. The NRC found that "the survey fails to provide a valid and reliable method of adequately accounting for fish caught and not brought to the dock." These unaccounted fish would include fish released alive or dead, used as bait, or given away before reaching the dock. The NRC noted that the lack of such a method may have introduced error to estimates of catch and discards. Also, incorrect fish species identification of catch and discards was another source of potential error cited by the NRC.

The statistical estimation methods used for analyzing recreational catch were also evaluated by the NRC. The NRC found that many program assumptions related to sampling design, only a few of which are noted above, were untested and the direction and amount of bias were undetermined. Therefore, the cumulative effect of bias on the final estimates could not be assessed. The NRC also found that the survey did not take advantage of the latest methods and current knowledge of finite population sampling theory. The NRC report states, "The current estimates are particularly deficient when applied to small areas because they do not use information in adjoining areas or time periods, nor do they consider relationships between species that occur together." The NRC determined that the resulting data were likely of lower precision than would have been possible if this information were used. To address these matters, the NRC recommended that NMFS convene a group of statisticians to examine program assumptions and evaluate inherent biases. Also, the NRC recommended that the group design new analyses based on recent developments in sampling theory.

The full NRC committee report on the MRFSS is available for download from the National Academies Press web site.[32] NMFS's efforts to overhaul the recreational data

[32] http://books.nap.edu/catalog.php?record_id=11616

collection programs are described in documents posted in Office of Science and Technology's website.[33]

5.3.2.3.2 Recreational Fishing Data Improvement and the Magnuson-Stevens Reauthorization Act

Upon receipt of the NRC's findings, NMFS initiated a national effort to respond quickly to the report's many recommendations and improve the agency's recreational fishing data collection programs. A senior-level steering committee guided the execution of a plan that included 60 programmatic changes needed to overhaul the MRFSS, FHS, and other recreational fishing data collection programs. Chief among the many improvements is an effort to collect angler registration information from all of the states.

In December 2006, Congress passed the Magnuson-Stevens Reauthorization Act, which, among many other things, included provisions requiring the Secretary of Commerce to "establish and implement a regionally based registry program for recreational fishermen in each of the eight fishery management regions" (§ 201). As noted above, the establishment of an angler directory will greatly enhance the effectiveness of the CHTS by improving call efficiency and markedly increasing the number of successful interviews. Thus, effort estimations are likely to be supported by substantially more interviews/samples than in the past.

In addition to calling on NMFS to require angler registration, the Magnuson-Stevens Reauthorization Act mandates an overall improvement to the MRFSS, taking into consideration the recommendations of the NRC. By January 12, 2009, NMFS, after consultation with representatives of the recreational fishing industry, expert statisticians, and others, was required to "establish a program to improve the quality and accuracy of information generated" by the MRFSS. The Magnuson-Stevens Reauthorization Act provision specifies the methodologies the program shall employ, including an "adequate number" of angler intercepts, use of angler directories as a basis for surveys, collection of FVTRs from for-hire vessels, development and application of a weather corrective factor for catch and effort estimates, and establishment of an expert review/advisory committee to scrutinize the data and methods by which it was collected.

Development of the MRIP as a replacement to the MRFSS began in 2006. MRIP is designed to evolve as a system of regional data collection programs adhering to national standards and protocols. Improvements such as new survey sampling designs are developed, piloted tested, and approved before undergoing a phased implementation to continually improve the program. In recent years significant improvements have been made to the collection, reporting, and management of recreational fishing catch and effort data. Additional improvements are being developed and will likely be implemented over the next few years.

The MRIP is an important source of data on discards by recreational anglers. Consistent with the ongoing agency-wide effort to improve recreational fishing data

[33] http://www.st.nmfs.noaa.gov/recreational-fisheries/index

collection programs, the alternatives considered under this SBRM Omnibus Amendment would effect no direct changes to existing recreational fishing survey programs. Instead, the proposed alternatives would fully incorporate the improved recreational survey programs that continue to result from the nationwide upgrade effort.

5.3.3 Additional Considerations

5.3.3.1 Unlikely Cells

In the matrix of fishing modes by species/species group, there are some combinations of species and gear modes that are considered infeasible or highly unlikely to occur (e.g., scallops in longline gear, surfclam in gillnet gear, etc.). With the assistance of the Councils' Plan Development Teams, Monitoring Committees, and Fishery Management Action Teams, some of these combinations have been identified as "unlikely" based on review of the previous 16 years of observer data, general knowledge of gear, fish distribution, and abundance patterns. Unlikely combinations of species and fishing modes are indicated in the matrix as gray-shaded cells (see Table 42). For some protected species, there was insufficient information with which to determine whether or not a combination was unlikely, so most combinations were assumed to be possible (see Table 43). When evaluating needed coverage levels, the unlikely cells would be removed from consideration to provide a more meaningful estimate. It is important to note that as fishing patterns, species abundance, and/or distributions change, these gray-shaded cells may be adjusted to reflect these changes.

The occurrence of trips with zero discards is summarized in Table 42 and Table 43 for fish and protected species, respectively. Generally, the unlikely gray-shaded cells correspond to trips where 100 percent of the trips had zero discards for the species. In August 2006, members of the two Councils' Science and Statistical Committees (SSCs) met to review the analytical work being done in support of this amendment. One aspect in particular that the SSC members addressed was the use of the unlikely cell process to help refine the cumulative observer coverage levels needed. The SSC members suggested that the process used to identify unlikely cells should serve as a first step in a more comprehensive "importance filter" process. The importance filter developed at the suggestion of the SSC members, and further refinements based upon operational use during 2009 through 2012 are described in chapter 6.

5.3.3.2 Missing Cells: Imputation and Pilot Coverage

The absence of at-sea observer coverage for some gear types/fishing modes during one or more quarters causes problems in two ways. First, if those quarters are ignored, the basis for comparing the average bycatch ratio will vary by fishery, species, and species group. In this situation, the inferences about the overall efficacy of an observer program are restricted to the set of quarters with observer data. Second, if the quarters are included, it is necessary to make some assumption about the mean and variance of the discard rate for these cells. This process is known as imputation, and it relies on information from the known part of the survey to attribute information to the unknown cells (quarters). Imputation of missing cells is routinely used in survey estimation, but it can be controversial because of the expert judgment required. Use of imputed values to compute an overall estimate of the CV of a bycatch rate will lead to a conditional estimate. "Conditional" in this context implies that the estimate depends on the set of rules/decisions used for imputation.

As part of the feedback process for improving the sampling design, it is necessary to use imputed values as a basis for allocating future at-sea observer coverage. Prior to the 2007 SBRM Amendment, imputation procedures were developed for Northeast multispecies (Rago et al. 2005) using a multi-tier imputation procedure for three gear types. Due to the diverse species and large geographic range of the comprehensive SBRM, a detailed imputation procedure is needed to account for the seasonal variability of all managed species over the full geographic range of the FMPs. Implementation of this amendment would continue to expand the imputation described in Rago et al. (2005) to provide appropriate means and variances by stratum for various species and species complexes and gear types.

Until the work to fully expand the formal imputation process is complete, a simple imputation approach was used in which data from adjoining strata were used. In this simple imputation, only the temporal stratification—calendar quarter—was relaxed (to half year or year) recognizing that seasonal variation can occur for some species (Table 40 and Table 41). In the case of shrimp trawl, given that the northern shrimp fishery is a seasonal fishery comprising only half the year, the quarterly data were applied annually. Data from adjoining cells were pooled to impute estimates for cells with zero or one trip. However, simple imputation could not be applied to fleets where observer coverage was low or missing throughout the year (i.e., there were too few data to support the simple imputation approach). In these cases, imputed values were not used, and the fleet was designated as a fleet in need of pilot observer coverage. If some data were available, then some estimates were derived; however, the sea days needed to achieve a 30 percent CV were estimated based on pilot coverage levels.

Pilot observer coverage is defined as a minimum level of at-sea observer coverage to acquire initial bycatch information with which to calculate variance estimates that in turn can be used to further define the level of sampling needed. Based on NMFS (2004), pilot coverage can range between 0.5 and 2 percent. In this analysis, pilot observer coverage was set based on the number of fishing trips needed to cover at least 2 percent of the annual FVTR trips for a fishing mode, with a minimum of 12 trips per year (3 trips per quarter) and a maximum of 400 trips per year (100 trips per quarter). The fishing modes that needed pilot coverage in 2004 are indicated in Table 40 and Table 41.

Based on 2004 observer coverage, four scenarios were developed to determine when to use imputation or pilot coverage: (1) If observer coverage exists in all 4 quarters with sufficient sample sizes to generate quarterly CVs, then no imputation or pilot coverage was used; (2) if observer coverage exists in 3 quarters with sufficient sample sizes to generate a CV, then the missing quarter was imputed using half-year estimates; (3) if observer coverage exists in 1 or 2 quarters with sufficient sample sizes to generate a CV and the other 2 or 3 quarters had zero or 1 trips, then there were insufficient data to apply simple imputation and pilot coverage was used instead for those quarters; or (4) if no observer coverage exists in all 4 quarters; then pilot coverage was used.

The need for pilot coverage originates from two different scenarios: (1) when there is insufficient observer data upon which to derive the sea days needed to achieve the precision standard; (2) when there is sufficient observer data but the sea days for all species groups are filtered out via the importance filter within a given fleet (Table 38). As described above, when there is insufficient observer data, pilot observer coverage was set based on the number of fishing trips needed to cover at least 2 percent of the annual FVTR trips for a fishing mode, with a minimum of 12 trips per year (3 trips per quarter) and a maximum of 400 trips per year (100 trips per quarter). However, when there is sufficient observer data yet all sea days are filtered out for a given fleet, a minimum pilot coverage of three trips per quarter would be used to maintain a minimal level of monitoring that would support a variance-based estimate of the sea days needed. The minimum pilot coverage of three trips per quarter is multiplied by the mean trip length within a quarter and summed over quarter to obtain the number of sea days for the given fleet.

If the minimum pilot coverage was applied to the 2012 sea days needed to monitor fish (see Table 5 in Wigley et al. 2012a), than a total of 18,641 sea days would be required rather than 18,822 sea days (Table 60) – a 181 day difference. Some fleets had no change in the number of sea days because the pilot coverage was already at the minimum; however, other fleets were reduced from the 2 percent pilot coverage to the minimum pilot coverage. Applying the minimum pilot coverage for fleets with sufficient observer coverage utilized the data (i.e., bycatch is known to be low for the fleet and hence the sea days are filtered out) yet maintaining some coverage to monitor the fleet in the upcoming year.

This represents an extension of the importance filter process and a refinement to the use of pilot coverage. The sea days derived from the minimum pilot coverage serve as a ‘floor’ in the prioritization alternatives to prevent the allocation of too few sea days to derive a variance-based estimate of the sea days needed for a given fleet. Use of minimum pilot coverage may result in the expansion of observer coverage to fleets that have not had coverage in recent years. It is expected that some transition period may be necessary for NEFOP to update sampling and deployment protocols and conduct any necessary training to effectively cover these fleets.

Row	Gear Type	Access Area	Trip Category	Region	Mesh	BLUE	HERR	SAL	RCRAB	SCAL	SBM	MONK	GFL	GFS	SKATE	DOG	FSB	SCOQ	TILE	Pilot days	2012 Sea Days Needed FISH	Pilot	2012 Sea Days Needed FISH
1	Longline	OPEN	all	MA	all	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	P	67
2	Longline	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	24	MPC	16
3	Hand Line	OPEN	all	MA	all	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	P	81
4	Hand Line	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	62	MPC	16
5	Otter Trawl	OPEN	all	MA	sm	0	0	0	3,231	0	364	0	497	545	397	325	513	0	0	160	3,231		3,231
6	Otter Trawl	OPEN	all	MA	lg	0	0	0	5,551	0	0	164	141	0	107	333	173	0	0	266	5,551		5,551
7	Otter Trawl	OPEN	all	NE	sm	0	0	0	0	0	411	0	461	451	531	1,151	489	0	0	168	1,151		1,151
8	Otter Trawl	OPEN	all	NE	lg	0	0	0	3,879	0	0	568	76	280	261	229	788	0	0	415	3,879		3,879
9	Scallop Trawl	AA	GEN	MA	all	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	P	21
10	Scallop Trawl	AA	LIM	MA	all	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	P	98
11	Scallop Trawl	OPEN	GEN	MA	all	0	0	0	0	0	0	0	0	0	32	0	0	0	0	25	32		32
12	Scallop Trawl	OPEN	LIM	MA	all	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	P	163
13 +	Otter Trawl, Ruhle	OPEN	all	MA	lg	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	P	9
14 +	Otter Trawl, Ruhle	OPEN	all	NE	sm	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	P	27
15	Otter Trawl, Ruhle	OPEN	all	NE	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	59	MPC	59
16 +	Otter Trawl, Haddock Separator	OPEN	all	MA	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8	MPC	8
17	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	0	0	0	0	0	0	0	0	0	257	567	0	0	0	100	567		567
18	Shrimp Trawl	OPEN	all	MA	all	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	P	131
19	Shrimp Trawl	OPEN	all	NE	all	0	0	0	0	0	0	0	0	34	0	0	0	0	0	65	34		34
20	Floating Trap	OPEN	all	MA	all	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	P	6
21	Floating Trap	OPEN	all	NE	all	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	P	6
22	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	MPC	13
23	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	43	MPC	13
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	0	0	0	0	0	0	70	0	0	83	0	0	0	0	61	83		83
25	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	P	41
26	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	0	0	0	0	0	0	0	0	0	0	97	0	0	0	134	97		97
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	0	0	0	0	0	0	132	0	0	118	171	0	0	0	94	171		171
28	Purse Seine	OPEN	all	MA	all	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	P	15
29	Purse Seine	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	23	MPC	23
30	Scallop Dredge	AA	GEN	MA	all	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	P	31
31	Scallop Dredge	AA	GEN	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	MPC	14
32	Scallop Dredge	AA	LIM	MA	all	0	0	0	0	0	0	282	0	0	0	0	0	0	0	102	282		282
33	Scallop Dredge	AA	LIM	NE	all	0	0	0	0	0	0	189	0	0	0	0	0	0	0	121	189		189
34	Scallop Dredge	OPEN	GEN	MA	all	0	0	0	0	0	0	0	0	0	50	0	0	0	0	95	50		50
35	Scallop Dredge	OPEN	GEN	NE	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87	87	MPC	17
36	Scallop Dredge	OPEN	LIM	MA	all	0	0	0	0	0	0	312	0	0	164	0	0	0	0	238	312		312
37	Scallop Dredge	OPEN	LIM	NE	all	0	0	0	0	500	0	234	107	0	163	505	607	0	0	277	607		607
38	Mid-water Paired & Single Trawl	OPEN	all	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17	MPC	17
39	Mid-water Paired & Single Trawl	OPEN	all	NE	all	0	0	0	0	0	0	0	0	0	0	571	0	0	0	43	571		571
40	Pots and Traps, Fish	OPEN	all	MA	all	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	P	25
41	Pots and Traps, Fish	OPEN	all	NE	all	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	P	15
42	Pots and Traps, Conch	OPEN	all	MA	all	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	P	27
43	Pots and Traps, Conch	OPEN	all	NE	all	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	P	26
44	Pots and Traps, Hagfish	OPEN	all	MA	all	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	P	3
45	Pots and Traps, Hagfish	OPEN	all	NE	all	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	P	74
46	Pots and Traps, Shrimp	OPEN	all	NE	all	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	P	6
47	Pots and Traps, Lobster	OPEN	all	MA	all	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	P	65
48	Pots and Traps, Lobster	OPEN	all	NE	all	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	429	P	429
49	Pots and Traps, Crab	OPEN	all	MA	all	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	P	12
50	Pots and Traps, Crab	OPEN	all	NE	all	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	P	67
51	Beam Trawl	OPEN	all	MA	all	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	P	31
52	Beam Trawl	OPEN	all	NE	all	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	P	16
53	Dredge, Other	OPEN	all	MA	all	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	P	41
54	Ocean Quahog/Surf Clam	OPEN	all	MA	all	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	P	67
55	Ocean Quahog/Surf Clam	OPEN	all	NE	all	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	P	38
					Totals	**1,638**	**1,638**	**1,638**	**14,299**	**2,138**	**2,413**	**3,589**	**2,920**	**2,948**	**3,801**	**5,587**	**4,208**	**1,638**	**1,638**	**4,379**	**18,822**		**18,641**

Table 38. The number of sea days needed to achieve a 30% CV of the discard estimate for each the 14 fish and invertebrate species groups, the number of pilot sea days, and the maximum number of sea days needed for each fleet (2012 Sea Days Needed) for fish and invertebrate species groups based on July 2010 through June 2011 data (red font indicates basis for fleet sea days; species group abbreviation are given in Wigley et al. 2012a). Fleets in need of pilot coverage are indicated with a 'P'; fleets in need of minimum pilot coverage are indicated with 'MPC' and blue font

5.4 Bycatch Rates and Total Discards

5.4.1 Estimation of Bycatch Rates

There are many different established methods for estimating bycatch rates in fisheries based on at-sea observer data. Design-based estimators are often used for finfish bycatch (e.g., Pikitch et al. 1998; Stratoudakis et al. 1999; Rochet et al. 2002), while model-based estimators are more commonly used for predicting less frequent bycatch events (e.g., Walsh et al. 2002; Perkins and Edwards 1996). Ratio estimators represent a simple form of model-based estimation within a sampling design. Studies that have compared the use of ratio estimators with other simple and proportional probability estimators have reported mixed results. Diamond (2003) found that ratio estimators overestimated discards compared to simple means-based estimators. However, Allen et al. (2001) found that ratio estimators performed better but that the appropriate covariate varied among species. Discard estimation is a very active area of fisheries and statistical research and the techniques and approaches used are undergoing continual development and refinement (e.g., Miller and Skalski 2006; Kaiser 2006). The sampling design proposed in this document is considered sufficiently robust to meet the needs of the Councils and NMFS.

For the purpose of the SBRM, a number of design-based approaches were examined that have been advocated in the literature and the assumptions of each were tested. Bycatch rates are expressed as: (1) The ratio of total weight of one or more species discarded to total weight of one or more species kept (d/k); (2) the ratio of total weight of one or more species discarded to days absent (d/da); and (3) discards per trip The basic difference between methods (2) and (3) is that “days absent” is assumed to contain more information about fishing effort than the sampling unit “trip.” For the ratio estimators (1) and (2), we examined the effects of pooling ratios over strata, using the “separate” and “combined” approaches given in Cochran (1963). Details of the separate and combined estimators follow a brief introduction to ratio estimators. Overall, we examined two different ratio estimators (discard/kept (d/k) vs. discard/days absent (d/da)) for two different pooling strategies (separate vs. combined). In addition, the discard per trip estimator (3) was applied individually to the datasets for d/k and d/da. The only differences between the two datasets were slight variations in the number of cases available in each stratum. Thus a total of six different estimators were applied to the set of 45 fleets and 60 species/species groups.

5.4.1.1 <u>Ratio Estimators</u>

Bycatch rates for each fleet, quarter, and species/species groups (stratum) were estimated using two ratios: Discard to all species kept (d/k) and discard to days absent (d/da) (equations 1a and 1b, respectively).

$$(1a)\quad \hat{R}_{jh} = \frac{\sum_{i=1}^{n_h} d_{ijh}}{\sum_{i=1}^{n_h} k_{ih}} \qquad \text{and} \quad (1b)\quad \hat{R}_{jh} = \frac{\sum_{i=1}^{n_h} d_{ijh}}{\sum_{i=1}^{n_h} da_{ih}}$$

where R_{jh} is the bycatch rate of species group j in stratum h; d_{ijh} is the discards (for fish, weight in pounds; for protected species, in numbers of animals) for species group j within trip i in stratum h; k_{ih} is the kept weight, in pounds, of all species within trip i in stratum h; and da_{ih} is the days absent of trip i in stratum h.

The approximate variance of the estimate of R_{jh} is obtained from a first order Taylor series expansion about the mean. The computational formula for these quantities can be expressed as:

$$(2a)\quad V\left(\hat{R}_{jh}\right) = \frac{1}{n_h \bar{k}_h^2} \left[\frac{\left(\sum_{i=1}^{n_h} d_{ijh}^2\right) + \hat{R}_{jh}^2 \left(\sum_{i=1}^{n_h} k_{ih}^2\right) - 2\hat{R}_{jh} \left(\sum_{i=1}^{n_h} d_{ijh} k_{ih}\right)}{(n_h - 1)} \right] \left[\frac{N_h - n_h}{N_h} \right]$$

and

$$(2b)\quad V\left(\hat{R}_{jh}\right) = \frac{1}{n_h \overline{da}_h^2} \left[\frac{\left(\sum_{i=1}^{n_h} d_{ijh}^2\right) + \hat{R}_{jh}^2 \left(\sum_{i=1}^{n_h} da_{ih}^2\right) - 2\hat{R}_{jh} \left(\sum_{i=1}^{n_h} d_{ijh} da_{ih}\right)}{(n_h - 1)} \right] \left[\frac{N_h - n_h}{N_h} \right]$$

where d_{ijh} is the total discard weight of species group j in trip i within stratum h; k_{ih} is the total kept weight of all species in trip i within stratum h; da_{ih} is the days absent of trip I in stratum h; n_h is the number of observed trips in stratum h; N_h is the number of FVTR trips in stratum h; k_h^{bar} is the mean kept landings of all species within the stratum, and da_h^{bar} is the mean days absent within stratum h.

The coefficient of variation for the bycatch ratio for species group j in stratum h is defined as:

$$(3)\quad CV(\hat{R}_{jh}) = \frac{\sqrt{V(\hat{R}_{jh})}}{\hat{R}_{jh}}$$

It should be noted that when only one stratum is considered, the CV of the total discards for species group j in stratum h is the same as the CV of the bycatch ration.

The number of trips necessary to achieve a 30 percent CV for species group j in stratum h is defined as:

$$(4)\quad \hat{T}_{jh} = \frac{N_h\left(\frac{n_h N_h}{N_h - n_h}\right)V(\hat{R}_{jh})}{(0.09)\hat{R}^2 N_h + \left(\frac{n_h N_h}{N_h - n_h}\right)V(\hat{R}_{jh})}$$

where n_h is the number of observed trips in stratum h; N_h is the number of FVTR trips in stratum h; R_{jh}^{hat} is the discard ratio of species group j in stratum h; and $V(R_{jh}^{hat})$ is the variance of the discard ratio of species group j in stratum h.

The number of sea days necessary to achieve a 30 percent CV for species group j in stratum h is defined as:

$$(5)\quad \hat{S}_{30jh} = \hat{T}_{jh} * \overline{DA_h}$$

where DA_h^{bar} is the average trip length of FVTR trips in stratum h.

The calculation of sea days uses the average FVTR trip length and not average observer trip length. Use of the FVTR data, which represent the entire industry, guards against sampling variability induced by small sample sizes. Sampling variability may be bi-directional with observers sampling trips that may be longer or shorter trips, on average, than industry is making overall.

Due to minor difficulties with fleet identification, including limitations in identifying FVTR trips with regard to access area, some sample size irregularities occur where $N_h < n_h$. This occurred in three fishing modes: (1) The New England limited access closed area scallop dredge mode in the first three quarters; (2) the Mid-Atlantic limited access closed area scallop dredge mode in the first three quarters; and (3) the Mid-Atlantic mid-water paired and single trawl mode in the first and fourth quarters (Table 40). To prevent negative sampling fractions in equations 2, 4, and 16, when $N_h < n_h$, N_h was assigned the value of $n_h + 1$.

5.4.1.2 Ratio Assumptions

Equations 2a and 2b are the computational formulas for a more general expression of the variance of a ratio (R=y/x) estimate that incorporates the covariance of the relationship between the numerator y and denominator x. The correlation (ρ) between the numerator and denominator is simply the covariance divided by the product of the standard errors of the numerator and denominator. The ratio estimator of a total Y can be written as the Y=(y/x)X where X is the total value of the covariate. The approximate variance of Y based on a ratio estimator can be written as:

$$(5.1)\quad V\left(\hat{Y}_R\right) = \frac{N^2(1-f)}{n}\left(S_y^2 + R^2 S_x^2 - 2R\rho S_y S_x\right)$$

where S_y and S_x are the standard errors of y and x. Note that increases in the correlation coefficient (ρ) will decrease the variance of the total. Increases in ρ imply a higher degree of association between the numerator and denominator and imply that the variance will decrease when the ratio model is appropriate. When ρ approaches zero the benefits of ratio estimation decrease and the variance may actually increase because the squared ratio estimate (the second term within the parentheses on the right hand side of equation 5.1) could increase the variance of the total.

In general, the ratio estimate has a bias of order 1/n (Cochran 1963). For moderate and large sample sizes, the bias is negligible. In this study, approximately three quarters of the strata have sample sizes of 30 or smaller. To evaluate the impact of bias in this study, the significance of correlation between sample size and ρ (the correlation of the ratio estimate, rho) was examined.

The correlation of the ratio estimate is defined as:

(6) $$L_{xy,j} = n_h \sum_{i=1}^{n_h} x_{i,j} y_{i,j} - \left(\sum_{i=1}^{n_h} x_{i,j} \right) \left(\sum_{i=1}^{n_h} y_{i,j} \right)$$

(7) $$L_{xx,j} = n_h \sum_{i=1}^{n_h} x_{i,j}^2 - \left(\sum_{i=1}^{n_h} x_{i,j} \right)^2$$

(8) $$L_{yy,j} = n_h \sum_{i=1}^{n_h} y_{i,j}^2 - \left(\sum_{i=1}^{n_h} y_{i,j} \right)^2$$

(9) $$\rho_j^{\,2} = \frac{L_{xy,j}^2}{L_{xx,j} L_{yy,j}}$$

where x_{ij} is days absent or kept pounds for species j in trip i; y_{ij} is discarded pounds of species j on trip i; n_h is number of observed trips in stratum h; and ρ^2 is squared correlation coefficient for species j.

The results of the correlation analyses are summarized in Table 44 and Table 45 for the ratio of discards by species group to total kept. Overall, the correlation coefficients were low but the exceptions are important and notable. Correlations exceeded 0.47 in the New England large-mesh trawl fishery for monkfish, and the large- and small-mesh multispecies fisheries. Associations for small-mesh otter trawls in New England were also strong for squid, mackerel, and butterfish and small-mesh multispecies. Correlations for skate discard rates were above 0.32 in the New England and Mid-Atlantic large-mesh trawl fisheries, above 0.48 in the New England and Mid-Atlantic extra-large-mesh gillnet fisheries, and above 0.2 in four of the six scallop dredge fisheries. A high correlation indicates a strong relationship between the two variables measured (in this case, the numerator and denominator of the discard ratio). The evidence indicates strong relationships for the three primary fisheries (large-mesh otter trawls, extra-large-mesh gillnets, and scallop dredges).

5.4.1.3 Linearity Assumptions

The ratio estimator assumes that a zero intercept regression is an appropriate model of the relationship between discard and kept (or days absent). The putative linear relationship between discarded and kept components of observed trips was examined by gear type and species group. For illustration purposes, two example plots of discard and kept are given using two different scales: Nominal scale and fourth root transformation.[34] These two illustrative plots (Figure 42 and Figure 43) reveal that the fourth root transformation facilitates the depiction of information and does not obscure the underlying pattern of increasing variance and a zero intercept. Thus, using a fourth root transformation, examples of the comparison between discard and kept (or days absent) are illustrated by thirteen fish species groups in otter trawl and gillnet gears by mesh sizes (presented in Appendix B, Figures B-1a to B-1xx) and by five protected species groups for longline, otter trawl, gillnet and scallop dredge (Appendix B, Figures B-2a to B-2j). Departures from linearity are often controlled by large numbers of trips with zero discards. When trips with zero discards are removed, improvement in linearity occurs. Examples of these are given for large-mesh groundfish discarded in the otter trawl and gillnet fleets (Appendix B, Figures B-3a to B-3d). Rho and sample size analyses (using power = 0.80, alpha = 0.10; alternative hypothesis = 'not equal' and null value = 0) indicated that a low percentage of fleets and species groups had linear relationships using a ratio estimator (d/k or d/da).

5.4.2 Estimation of Total Discards

Three methods were examined to estimate annual total discards, precision, and coverage necessary to achieve a 30 percent CV for fleets and species/species groups: (1) A separate ratio method; (2) a combined ratio method; and (3) a simple expansion method (mean discard per trip). Cochran (1963) discusses these three methods in greater detail. Each method utilized quarterly estimates of bycatch rates (d/k and d/da) and associated CV, and the number of sea days necessary to achieve a CV of 30 percent. In these analyses, stratum is defined as fleet and species group. Significant improvements in discard estimation may be possible through a variety of species-specific refinements. These might be accomplished via use of additional covariates, post stratification, or other model-based approaches.

In the notation that follows, we consider the definition of strata in general terms such that 'h' refers to a set of unique attributes. Recall that the observations are stratified by gear, access area, trip category, geographic region, mesh, and calendar quarter. These strata are nested, but not factorial. Totals can be computed over specific temporal, spatial, and 'type' strata by holding other strata values constant. In equations 10-15, we illustrate the mean and variances of the total discards, where the summation is over calendar quarter. Implicitly, the other strata values are held constant.

[34] The fourth root transformation approximates a natural logarithm transformation without the difficulty of adding a constant (Green 1979).

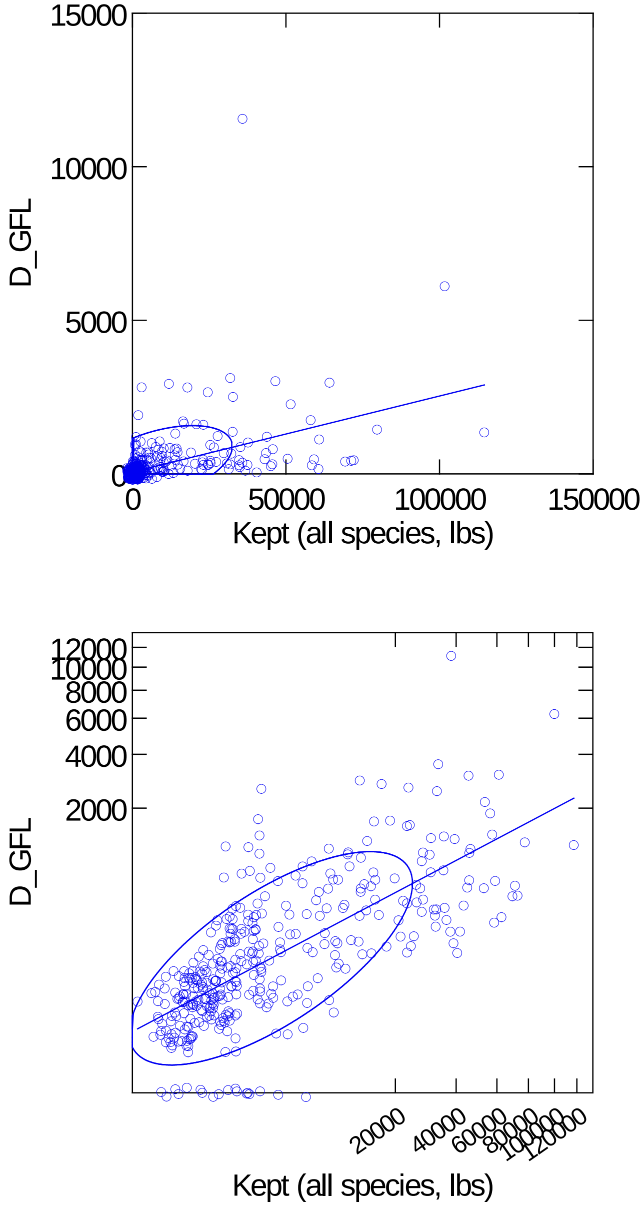

Figure 42. Comparison of nominal scale (top) and fourth root transformation (bottom) of Northeast multispecies (large-mesh) discards and kept weight of all species from 2004 observed large-mesh otter trawl trips in New England; each dot represents one fishing trip.

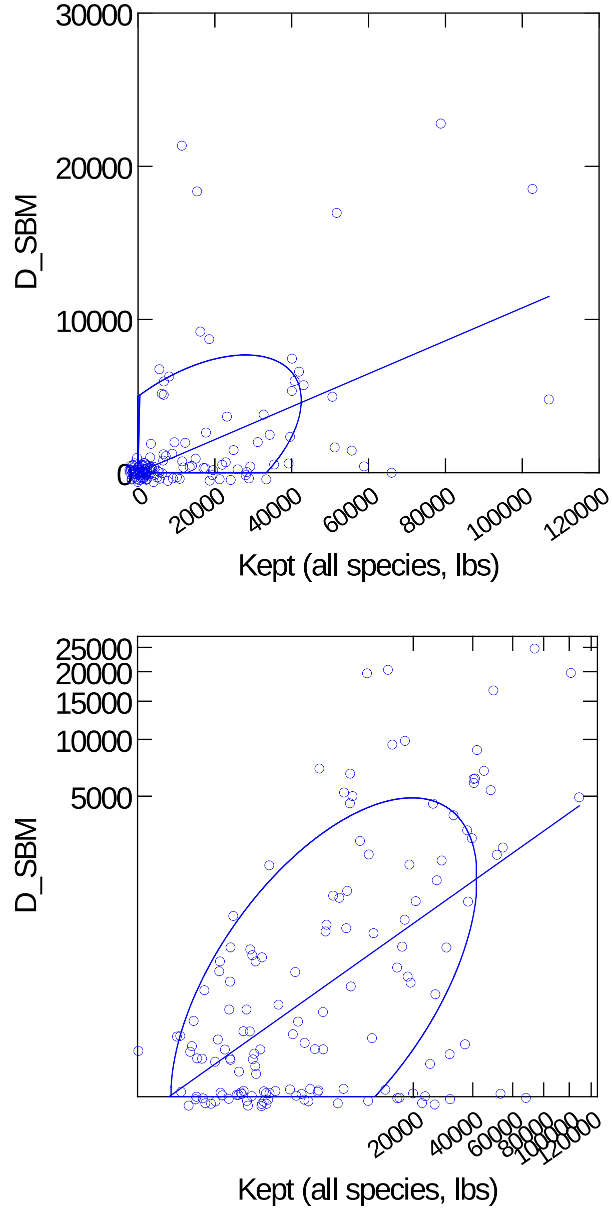

Figure 43. Comparison of nominal scale (top) and fourth root transformation (bottom) of squid, butterfish, and mackerel discards and kept weight of all species from 2004 observed small-mesh otter trawl trips in New England; each dot represents one fishing trip.

5.4.2.1 Separate Ratio Method (Method 1)

The total discarded pounds of species j using method 1 are defined as:

(10a) $\hat{D}_{1,j} = \sum_{h=1}^{L} K_h r_{s,jh}$ and (10b) $\hat{D}_{1,j} = \sum_{h=1}^{L} DA_h r'_{s,jh}$

where

(11a) $r_{s,jh} = \frac{\sum_{i=1}^{n_h} d_{jih}}{\sum_{i=1}^{n_h} k_{ih}}$ and (11b) $r'_{s,jh} = \frac{\sum_{i=1}^{n_h} d_{jih}}{\sum_{i=1}^{n_h} da_{ih}}$

where $D_{1,j}^{hat}$ is the total discarded pounds for species j; K_h is the FVTR total kept pounds in stratum h; DA_h is the FVTR total days absent in stratum h; $r_{s,jh}$ is the separate ratio for species j in stratum h; d_{jih} is discards of species j from trip i in stratum h; k_{ih} is kept pounds of all species on trip i in stratum h; and da_{ih} = days absent from trip i in stratum h.

The variance of $D_{1,j}^{hat}$ is defined as:

(12a) $$V(\hat{D}_{1,j}) = \sum_{h=1}^{L} K_h^2 \left(\frac{N_h - n_h}{n_h N_h} \right) \frac{1}{\left(\frac{\sum_{i=1}^{n_h} k_{ih}}{n_h} \right)^2} \left[\frac{\sum_{i=1}^{n_h} \left(d_{jih}^2 + \left(r_{s,jh} \right)^2 k_{ih}^2 - 2 r_{s,jh} d_{jih} k_{ih} \right)}{n_h - 1} \right]$$

and

(12b) $$V(\hat{D}_{1,j}) = \sum_{h=1}^{L} DA_h^2 \left(\frac{N_h - n_h}{n_h N_h} \right) \frac{1}{\left(\frac{\sum_{i=1}^{n_h} da_{ih}}{n_h} \right)^2} \left[\frac{\sum_{i=1}^{n_h} \left(d_{jih}^2 + \left(r'_{s,jh} \right)^2 da_{ih}^2 - 2 r'_{s,jh} d_{jih} da_{ih} \right)}{n_h - 1} \right]$$

where $D_{1,j}^{hat}$ is the total discarded pounds for species j; K_h is the FVTR total kept pounds in stratum h; DA_h is the FVTR total days absent in stratum h; $r_{s,jh}$ is the separate ratio for species j in stratum h; d_{jih} is discards of species j from trip i in stratum h; k_{ih} is kept pounds of all species on trip i in stratum h; da_{ih} = days absent from trip i in stratum h; N_h is the number of FVTR trips in stratum h; and n_h is the number of observed trips in stratum h.

The coefficient of variation of $D_{1,j}^{hat}$ is defined as:

(13) $$CV(\hat{D}_{1,j}) = \frac{\sqrt{V(\hat{D}_{1,j})}}{\hat{D}_{1,j}}$$

5.4.2.2 Combined Ratio Method (Method 2)

The combined ratio method is based on a ratio estimate pooled over all strata and trips within strata. The total discarded pounds for species j are given by:

$$\text{(14a)} \quad \hat{D}_{2,j} = \sum_{h=1}^{L} K_h r_{c,j} \quad \text{and} \quad \text{(14b)} \quad \hat{D}_{2,j} = \sum_{h=1}^{L} DA_h r'_{c,j}$$

where

$$\text{(15a)} \quad r_{c,j} = \frac{\sum_{h=1}^{L} N_h \sum_{i=1}^{n_h} \frac{d_{jih}}{n_h}}{\sum_{h=1}^{L} N_h \sum_{i=1}^{n_h} \frac{k_{ih}}{n_h}} \quad \text{and} \quad \text{(15b)} \quad r'_{c,j} = \frac{\sum_{h=1}^{L} N_h \sum_{i=1}^{n_h} \frac{d_{jih}}{n_h}}{\sum_{h=1}^{L} N_h \sum_{i=1}^{n_h} \frac{da_{ih}}{n_h}}$$

where $D_{2,j}^{hat}$ is total discarded pounds for species j; K_h is FVTR total kept pounds in stratum h; DA_h is FVTR total days absent in stratum h; $r_{c,j}$ is the combined ratio of species j; d_{jih} is discards of species j from trip i in stratum h; k_{ih} is kept pounds of all species on trip i in stratum h; da_{ih} is days absent from trip i in stratum h; N_h is the number of FVTR trips in stratum h; and n_h is the number of observed trips in stratum h. In equations 15a and 15b, the summation over strata h = 1 to L is over calendar quarters and the other strata values are held constant. Equations 16a and 16b require a more explicit definition of the stratum designation because the summation over quarter relies on an annual average ratio defined in equation 15.

The variance of $D_{2,j}^{hat}$ for species j is defined as:

$$\text{(16a)} \quad V(\hat{D}_{2,j}) = \sum_{q=1}^{4} K_{qh}^2 \left(\frac{N_{qh} - n_{qh}}{n_{qh} N_{qh}} \right) \frac{1}{\left(\frac{\sum_{i=1}^{n_h} k_{iqh}}{n_{qh}} \right)^2} \left[\frac{\sum_{i=1}^{n_{qh}} \left(d_{jiqh}^2 + (r_{c,j})^2 k_{iqh}^2 - 2 r_{c,j} \, d_{jiqh} k_{iqh} \right)}{n_{qh} - 1} \right]$$

and

$$\text{(16b)} \quad V(D_{2,j}) = \sum_{q=1}^{4} DA_{qh}^2 \left(\frac{N_{qh} - n_{qh}}{n_{qh} N_{qh}} \right) \frac{1}{\left(\frac{\sum_{i=1}^{n_h} da_{iqh}}{n_{qh}} \right)^2} \left[\frac{\sum_{i=1}^{n_{qh}} \left(d_{jiqh}^2 + (r'_{c,j})^2 da_{iqh}^2 - 2 r'_{c,j} \, d_{jiqh} da_{iqh} \right)}{n_{qh} - 1} \right]$$

where $D_{2,j}^{hat}$ is total discarded pounds for species j; K_{qh} is FVTR total kept pounds in quarter q and stratum h; DA_{qh} is FVTR total days absent in quarter q and stratum h; $r_{c,j}$ is the combined ratio of species j; d_{jiqh} is discards of species j from trip i in quarter q and stratum h; k_{iqh} is kept pounds of all species on trip i in quarter q and stratum h; da_{iqh} is days absent from trip i in quarter q and stratum h; N_{qh} is the number of FVTR trips in quarter q and stratum h; and n_{qh} is the number of observed trips in quarter q and stratum h.

The coefficient of variation of $D_{2,j}^{hat}$ is defined as:

$$(17)\quad CV(\hat{D}_{2,j}) = \frac{\sqrt{V(\hat{D}_{2,j})}}{\hat{D}_{2,j}}$$

5.4.2.3 Simple Expansion Method: mean discard per trip (Method 3)

The total discarded pounds for species j using method 3 is given by:

$$(18)\quad \hat{D}_{3,j} = \sum_{h=1}^{L} N_h \left(\frac{\sum_{i=1}^{n_h} d_{jih}}{n_h} \right)$$

where d_{jih} is discards of species j from trip i in stratum h; N_h is the number of FVTR trips in stratum h; and n_h is the number of observed trips in stratum h. Note that D_3^{hat} will differ between d/da and d/kl sets due to expansion of discards to account for non-observed hauls in the d/da set.

The variance of $D_{3,j}^{hat}$ for total discarded pounds using method 3 for species j is defined as:

$$(19)\quad V(\hat{D}_{3,j}) = \sum_{h=1}^{L} N_h^2 \left(\frac{N_h - n_h}{N_h} \right) \left[\frac{\sum_{i=1}^{n_h} d_{jih}^2 - \frac{\left(\sum_{i=1}^{n_h} d_{jih} \right)^2}{n_h}}{n(n_h - 1)} \right]$$

where $D_{3,j}^{hat}$ is total discarded pounds for species j; d_{jih} is discards of species j from trip i in stratum h; N_h is the number of FVTR trips in stratum h; and n_h is the number of observed trips in stratum h.

The coefficient of variation of $D_{3,j}^{hat}$ is defined as:

$$(20)\quad CV(\hat{D}_{3,j}) = \frac{\sqrt{V(\hat{D}_{3,j})}}{\hat{D}_{3,j}}.$$

5.5 Sample Size Analysis

A sample size analysis was conducted to estimate the number of trips and sea days needed to achieve a 30 percent CV for each species group and fishing mode. Two alternative methods are used: (1) The sample size based upon the variance of the quarterly bycatch ratio; and (2) the sample size based upon the variance of the composite annual total discard.

5.5.1 Sample Size Based Upon the Variance of the Quarterly Bycatch Ratio

The number of observer sea days (S_{30}) necessary to achieve a 30 percent CV for a fleet and species/species group is defined as:

(21) $$\hat{S}_{30,jh} = \sum_{q=1}^{4} \hat{S}_{30,jhq} .$$

If a quarterly sea day estimate was not available (due to no observer coverage or the CV could not be estimated due to a bycatch rate of zero), then the quarterly sea days were estimated by pilot coverage, as follows:

(22) $$\hat{S}_{30,jhq} = \hat{T}_{hq} * \overline{DA_{hq}}$$

where T^{hat} is 2 percent of the FVTR trips in stratum h and quarter q, and 3 <= T_{hq}^{hat} <= 100 trips, and DA_{hq}^{bar} is the average trip length of FVTR trips in stratum h and quarter q.

Equations 2–5 were applied to each quarter and the total number of trips and sea days for the year were obtained by summing over the quarterly estimates. In this approach, the number of sea days and trips necessary to achieve a 30 percent CV does not depend on any of the three methods used to estimate total discards. Instead, it depends on the estimated variance of the discard ratio within each quarter.

5.5.2 Sample Size Based Upon the Variance of the Composite Annual Total Discard

The number of sea days and trips needed to achieve a 30 percent CV were derived based on the variance of the composite annual total discards using the combined ratio method and the d/k bycatch ratio (equation 16a). From equation 16a, let:

(23) $$\hat{S}_{jqh}^{2} = \left[\frac{\sum_{i=1}^{n_{qh}} \left(d_{jiqh}^{2} + \left(r_{c,jh} \right)^{2} k_{iqh}^{2} - 2 r_{c,j} \ d_{jiqh} k_{iqh} \right)}{n_{qh} - 1} \right]$$ and

(24) $$\delta_{qh} = \frac{n_{qh}}{\sum_{q=1}^{4} n_{qh}}$$

where δ_{qh} is the fraction of the trips in quarter q in stratum h; $r_{c,jh}$ is the combined annual ratio of species j in stratum h; d_{jiqh} is discards of species j from trip i in stratum h in quarter q; k_{iqh} is kept pounds of all species on trip i in stratum h in quarter q; and n_{qh} is the number of observed trips in stratum h in quarter q. The $r_{c,jh}$ in equation 23 is defined in equation 15a where the summation is over quarters within a given strata defined by gear, region, access area, trip type, and so forth.

The number of trips necessary to achieve a 30 percent CV based on the variance of the composite annual total discards for species group j in stratum h is defined as:

$$(25) \quad \hat{T}D_{30jh} = \frac{\sum_{q=1}^{4}\left(\frac{K_{qh}^2}{\bar{k}_{qh}^2}\hat{S}_{jqh}^2\frac{1}{\delta_{qh}}\right)}{(0.09)D_{jh}^{\ 2} + \frac{\sum_{q=1}^{4}\frac{K_{qh}^2}{\bar{k}_{qh}^2}\hat{S}_{jqh}^2}{N_h}}$$

The number of sea days necessary to achieve a 30 percent CV based on the variance of the composite annual total discards for species group j in stratum h is defined as:

$$(26) \quad \hat{S}D_{30jh} = \hat{T}D_{30jh} * \overline{DA_h}$$

where $DA_h^{\ bar}$ is the weighted average trip length of FVTR trips in stratum h (weighted by the number of FVTR trips in each quarter).

When total discards could not be estimated due to little or no observer coverage (i.e., pilot coverage will be needed) or when total discards are zero (no variance), the sum of the quarterly trips and sum of the quarterly sea days are used (i.e., TD_{30} = sum of quarterly T_{30} and SD_{30} = sum of quarterly S_{30}).

Pilot coverage has been used when the bycatch ratio is zero or when variance of the bycatch ratio or the variance of the composite total discards is zero. It is recognized that pilot coverage may result in excessive coverage in cases where no observer coverage is needed for a cell. As new bycatch information is obtained, the unlikely (gray-shaded) cells should be re-evaluated and updated to prevent the overuse of unnecessary pilot coverage. As discussed later in section 6.2.3, when “importance filters” are applied, cells with pilot coverage may be excluded when cells have little or no discards due to other factors (e.g., discard amount is extremely low compared to total landings, etc.). It should be noted that pilot coverage plays an important role in determining coverage for protected species (species where bycatch may be a rare event) and only the unlikely (gray-shaded) filter is applied to protected species groups (other importance filters are not applied to protected species).

5.6 Additional Analyses

5.6.1 Meta-Analysis

A meta-analysis of the 60 species groups and 39 fishing modes (excluding the 5 quota-monitoring modes and the Scottish seine mode in the Mid-Atlantic) was conducted to compare estimates of total discards and the precision of the three methods and two bycatch ratio estimators (Wigley et al. 2007).

The total discards derived from each method and each ratio estimator were compared to each other by plotting all combinations within a single graph for each major gear type and region. The comparisons of total discard for four major gear types (longline, otter trawl, scallop dredge, and gillnet) and region are presented in Appendix B, Figures B-4a to B-4g. The comparisons of standard error (SE) of total discard and the CV of total discards for the four major gear types by region are presented in Appendix B, Figures B-5a to B-5n. For Figures B-4 and B-5 of Appendix B, the symbol within each subplot represents a species/species group and mesh size, the line represents a regression through the data points and the ellipse is the 68 percent confidence region.

Generally, there is a close relationship between all methods and ratio estimators for longline, otter trawl, and scallop dredge for total discards (Appendix B, Figures B-4a to B-4g). For longline and scallop dredge gear, the estimated total discards were strongly correlated among estimators (Appendix B, Figures B-4a,d,e). Differences between the "combined" and "separate" estimators of total discards in the trawl fisheries were negligible, but differences between d/k- and d/da-based estimates were more pronounced (Appendix B, Figures B-4b,c), especially for high values of discard.

There is some departure between methods and ratio estimators for gillnets in the Mid-Atlantic (Appendix B, Figure B-4f), but not in New England (Appendix B, Figure B-4g). This may be attributed to the use of days absent with a fixed gear fishery. Some vessels actively tend (stand by) their nets while the gear is in the water; thus, days absent is correlated with soak time—this may not be true for fleets who do not tend their gear (i.e., vessels that set their gillnets and return to port, returning to retrieve their nets at a later time or date).

For measures of uncertainty of the estimate, there was general agreement among the three methods and two ratio estimators (Appendix B, Figures B-5a to B-5g). Confidence ellipses for longline, gillnet, and scallop dredge were stronger than for otter trawl; however, although the otter trawl ellipses (measuring the strength of the associations) were wider than for gillnet and longline, they remain relatively narrow, indicating not much variability and a strong association. In general, results in Figures B-5h to B-5n of Appendix B suggested a greater degree of dispersion among methods 1 to 3 when days absent was used as a measure of fishing effort. Because days absent does not account for variations in steam time versus fishing time nor the effects of soak time for fixed gear, it was judged to be less useful than estimators based on a discard-to-kept ratio. In particular, estimators based on the separate ratio method were more variable than those based on the combined ratio method.

Closer examination of the comparison of precision from the combined ratio method and the simple expansion method are presented in Appendix B, Figures B-6a to B-6g, for four major gear types (longline, otter trawl, gillnet, and scallop dredge). In these figures, the identity line and a reference line representing a 30 percent CV are given; the symbol represents a species/species group and mesh size. There is general symmetry above and below the identity line, except for Mid-Atlantic otter trawl where coverage is low and precision estimates are higher, consequentially leading to higher coverage.

The meta-analyses indicate that generally there was little difference between the two bycatch ratios (d/da and d/k) for most species in most fleets, with the exception of gillnets where the d/da provided lower estimates of variation of total discards compared with d/k ratios. Generally, there was little difference between the three methods, but the ratio estimators tended to give higher CVs of the total than the simple expansion method. A relatively large fraction of the overall estimates for species, gear, and mesh size had CVs less than 30 percent, irrespective of which method was used.

The tables presenting precision (Table 46 and Table 47), ranking of total discards (Table 48, Table 49, Table 50, and Table 51), and the sea days and trips necessary to achieve a CV of 30 percent (Table 52-Table 57) are based upon the variance of the composite annual total discards using the combined ratio method (method 2).

The precision of the total discards by fleet and species is presented in Table 46 and Table 47 (see Appendix B, Table B-1 for individual species). Cells with adequate precision (at or below a CV of 30 percent) are identified with bold font. Note that when a CV is reported for a fishing mode where pilot coverage is needed, the CV is based upon the available, limited observer coverage.

For the 28 fishing modes for which a CV could be estimated, 19 (68 percent) had CVs less than or equal to 30 percent for all species combined (Table 46 and Table 47). For tilefish, three of the four fishing modes where discarded tilefish occurred had a CV above 30 percent. Of the 600 cells in the fleet by species matrix, 29 percent of the cells had a CV less than or equal to 30 percent. Caution should be used in evaluating the matrix in this manner, as this percentage does not include the cells where no discarding occurred (CV = null), nor does it incorporate the unlikely cells (gray-shaded cells). Additionally, the relative magnitude of the discard should also be considered when evaluating the precision. There are cases, such as encounters of large-mesh Northeast multispecies in mid-water trawls that are examples of where the magnitude of the total catch, rather than the precision of the estimate, is the most important factor.

Looking at the non-gray cells for which there was observer coverage, the majority (58 percent) had either no discards or CVs of 30 percent or less. By definition, those cells that had either no discards or CVs less than 30 percent were of sufficient quality to meet the performance standard proposed to be implemented through this amendment. Less than 25 percent of the non-gray cells for which there was observer coverage in 2004 had CVs in excess of 50 percent, while the remainder of cells (18 percent) had CVs between 30 percent and 50 percent. http://www.st.nmfs.gov/st4/nop/.

To provide insight into which species are discarded in each fleet, the total discard of each species group was ranked (highest in lb = 1, lowest in lb = n) within a fishing mode. The rank indicates the relative magnitude of the discarded species group within a fishing mode. Ranking of total discard weight within a fishing mode for fish species groups are presented in Table 48, and the ranking of total number of incidental takes of sea turtles, marine mammals, and sea birds within a fishing mode are presented in Table 49 (see Appendix B, Table B-2 for individual species). In the gillnet modes, spiny dogfish are discarded the most (rank = 1 for all gillnet modes), while in the scallop dredge modes, scallops and skates are the two species most heavily discarded. Although protected species are not often encountered, dolphins/porpoises are encountered more often in otter trawl modes than other protected species, while sea birds and sea turtles are encountered more frequently than other protected species in the gillnet and scallop dredge modes. Ranking of total discard weight for fish species and ranking of total numbers of incidental takes were also ranked within species group (Table 50 and Table 51, respectively; see Appendix B, Table B-3 for individual species). Compared to other fishing modes, the New England large-mesh otter trawl mode discards the most dogfish and Northeast multispecies. The open area, limited access scallop dredge modes discard the most scallops and monkfish. Sea turtles are taken most often in the Mid-Atlantic scallop trawl modes.

The sea days and trips needed to achieve a 30 percent CV based on the variance of the composite annual total discard for each species group and fishing mode are presented in Table 52 and Table 53 (sea days) and Table 54 and Table 55 (trips), respectively (see Appendix B, Tables B-4 and B-5 for individual species). Similar to the sea days and trips based on the variance of the quarterly bycatch ratio, the sea days and trips are additive across fishing modes within species groups (i.e., column sums); however, the sea days and trips are not additive across species groups within fishing modes (i.e., row sums). Fine-tuning of the unlikely (gray-shaded) cells may be necessary before making a final determination of the number of sea days and trips needed to monitor bycatch in the Greater Atlantic Region due to exceptions to the 30 percent CV standard and the relative magnitude of the discards. For example, the apparent need for 15,593 observer sea days to estimate surfclam discards in the New England large-mesh otter trawl fishery is driven by imprecise estimates of small amounts. Such an allocation of observer days would be wasteful with respect to surfclam discards and would over-sample by a factor of 145 the estimated days necessary to obtain a CV of 30 percent for large-mesh groundfish species (107 days).

To determine the number of sea days and trips needed to achieve a 30 percent CV within a fishing mode, the maximum number of sea days for all species groups in the study (i.e., the maximum number of days within a row) is used. This ensures that all other species groups will have a CV of 30 percent or less. Based on this approach, Table 56 and Table 57 present the number of sea days and trips needed for each fishing mode for: (1) All 20 species groups considered in the study; (2) 15 species groups required under the Magnuson-Stevens Act (all of the fish species groups plus sea turtles); (3) the 20 species groups, filtering out the unlikely (gray-shaded) cells; and (4) the 15 Magnuson-Stevens Act species groups filtering out the unlikely cells. In Table 56 and Table 57, the total number of sea days and trips needed to achieve a CV of 30 percent for each of these four scenarios is attained by summing each column. These totals range from 56,427 to 73,524 days; for comparative purposes, approximately 8,000 observer sea days were utilized by the NEFOP in 2004.

While the seasonal variation is captured more effectively in the variance of the quarterly bycatch ratio, the composite annual total discard captures the aggregated pattern of bycatch and its variability. Finer-scale variation of bycatch patterns at the quarterly level are not specifically addressed but implicitly assume that the estimates of total days at sea would be allocated in the same proportions as the original sample, i.e., δ_{qh}. Variation in the allocation factors, such as might be obtained via optimal allocation (Cochran 1963) or use of the optimization model (Rago et al. 2005) could further reduce the annual estimate.

Given the four-fold disparity between the projected number of sea days needed to meet the CV performance standard and the number of observer sea days generally available through the NEFOP, further refinements in the number of sea days may be necessary. This could be accomplished by applying a series of “importance filter” to the number of sea days (see section 6.2.3).

5.6.2 Accuracy Analyses

As noted above and elsewhere (Rago et al. 2005; Methot 2005), the most effective means to ensure the accuracy of a sampling program is to eliminate potential sources of bias that may be associated with the design of the sampling program.

Several analytical tests were conducted to evaluate the potential sources of bias in the 2004 observer data. We compared several measures of fishing performance for vessels with and without observers present. Bias can arise if the observed vessels and trips within a stratum are not representative of the unobserved vessels and trips within the stratum. Such bias could arise if the vessels with observers on board consistently catch more or less than unobserved vessels, if the average trip durations are different, or if observed vessels fish in different areas than the rest of the fleet. All federally permitted fishing vessels are required to report the total trip landings, the number of days absent from port, and the primary statistical area fished. This information provides a means to directly compare trips between observed and unobserved vessels.

Based on analysis that compared available FVTR data from unobserved vessels with data recorded by observers, average catches (kept pounds) by species groups for observed and total trips compare favorably (Appendix B, Figure B-7) and followed an expected linear relationship. If the observed and unobserved trips within a stratum measure the same underlying fishing processes, one would expect not to detect a significant statistical difference in the average catches (and the standard deviations) between the FVTR and observer datasets. An examination of the distribution of these differences (Appendix B, Figures B-8 and B-9), by species group, indicates no evidence of systematic bias and general symmetry in the pattern of positive and negative differences.[35]

The average difference in catch, by species, between the observed and unobserved trips was generally small as a proportion of total catch, and the average catch rates between the two datasets were not significantly different from zero in 12 of the 14 comparisons (Table 58). As well, a paired t-test of the stratum-specific standard deviations of pounds kept showed significant differences from six of the 14 comparisons. A strong correlation was detected in trip duration between observed and unobserved trips (Appendix B, Figure B-10), with observed trips averaging about a quarter-day longer (Table 58 and Appendix B, Figure B-11). However, the difference in stratum-specific standard deviations of trip length was significantly different from zero ($p = 0.002$). Some skewing of the differences in mean trip duration is evident, with observed trips being slightly longer.

These results suggest that average catch rates on observed trips were not significantly different from average catch rates reported on FVTRs, indicating no evidence of bias in the observer data based on the measure of average catch rate. Some differences were detected in the standard deviations indicating more variability in the FVTR data than in the observer data. The results also suggest that average trip durations were similar between the observed trips and the FVTR trips, indicating no evidence of bias in the observer data based on the measure of average trip length. There is evidence of small skewing of the data on a small scale, with observer trips being slightly longer by 0.25 day. The standard deviations of the average trip duration between the two datasets were different, indicating that the observer data were more variable than the FVTR data. Overall, these results indicate that observer trips are generally similar to FVTR trips and there are no bias issues evident.

Two measures of spatial coherence were also examined. Within stratum h (fleet and quarter) the expected number of observer trips by statistical area j (E_{jh}) as the product of the proportion of FVTR trips in statistical area j and stratum h (V_{jh}) and the number of observed trips in stratum n_h. Thus, $E_{jh} = V_{jh} * n_h$. These expectations can then be compared to the actual frequencies (O_{jh}) of observed trips by statistical area. Results of these analyses indicate that the spatial distribution of fishing effort for trips with observers on board closely matches the spatial distribution of trips for the stratum as a whole (Table 59). It was possible to compute chi-square statistics for 86 strata. The null hypothesis of observer proportions equal to FVTR proportions was rejected ($P<0.05$) in 38 of the 86 comparisons, which suggests that there are some spatial differences in the observed data compared with the FVTR data. This analysis included data collected on trips used for training observers, as well as quota-monitoring trips which have

[35] From mid-November 2004 through October 2005, regulations for the Northeast multispecies fishery included a pilot program that prohibited discards of legal-sized groundfish and required fishermen to take specific actions when the catch of these species exceeded very low limits. There is evidence that compliance with these regulations was influenced by the presence of an observer (NEFMC 2006). Investigation of whether this effect also influenced discards was not attempted in this analysis because the program was in effect for just over one month in 2004, a small number of vessels participated during this period, and the trips cannot be (directly) identified in the FVTR data for comparison.

disproportionate higher rate of observer coverage than other observed trips, and this may explain the significant differences observed for otter fleets. Murawski et al. (2005) compared the spatial distribution of 2003 otter trawl fishing effort for vessels with VMS with the distribution of fishing effort from 2003 observed trips. Qualitatively, the spatial distributions match very well with high concentrations of effort near the boundaries of existing closed areas on Georges Bank and within the Gulf of Maine. Moreover, the effort concentration profiles deduced from VMS data coincide almost exactly with the profiles derived from the observed trips. Overall, these comparisons suggested strong coherency between these two independent measures of fishing locations; therefore, there is no evidence of bias in the observer data.

Additional analyses of accuracy and potential bias in discard estimations have been conducted since the development of the 2007 SBRM Omnibus Amendment. The 3-year review of the SBRM process (Wigley et al. 2012b) found there was little evidence of systematic bias across all fleets. There are a few fleets where evidence suggests there may be differences between observed and unobserved vessels that could affect discard estimates. However, further investigation would be needed to determine if these differences could lead to inaccurate discard estimates. The New England Council's Northeast Multispecies Plan Development Team has conducted some preliminary analysis of potential observer effect on catch information in the groundfish fishery. However, to date, this work has not yielded any specific conclusions or recommendations.

Recent work to determine at-sea monitoring requirements for Northeast multispecies sectors included a discussion of discard accuracy (NMFS 2013a). This work included analysis by Dr. Paul Rago to approach the issue as a statistical control problem in which the question is--How much would the discard rate have to increase on unobserved trips in order to exceed a biological threshold? This was done by examining scenarios where there is a hypothetical increase in the rate of discards on unobserved trips. The results of this analysis suggest that, for the groundfish stocks examined, the bias in discard rates would have to be at least 5 to 10 times greater than presently observed in order to pose an appreciable risk of exceeding the ABC or OFL. The bias analyses conducted to date do not suggest behavioral differences of this magnitude.

This SBRM Omnibus Amendment does not preclude further analysis into accuracy and potential bias in discard estimations. The SBRM could be modified in the future to incorporate processes that are found to improve the accuracy of discard estimations.

5.6.3 Overlap Analyses

Within a given fishing mode, it is rare that fishing vessels would not catch species from more than one species group. Thus, an observer documenting discards of skates on an otter trawl trip may also document discards of spiny dogfish on the same trip. The degree of overlap among species groups has important implications for the efficacy of sampling within strata. Accounting for the magnitude of overlap can circumvent this potential inefficiency. The overlap approach developed and described by Rago et al.

(2005) for New England groundfish could be expanded and applied to all the species groups and fishing modes subject to the SBRM.

The attribution of discards to a fishery or permit type may be challenging given the number of fishing permits held by an individual fishing vessel. A provisional summary of the number of fishing permits held by individual vessels in 2010 indicate that in most fleets the majority of vessels within that fleet held more than one fishing permit (plan and category). For example, in the 2010 NE large mesh otter trawl fleet, approximately 68percent of the vessels in this fleet hold more than 10 fishing permits. Without a fishery declaration for every trip, it may not be possible to attribute discards of various species groups to one (or more) particular FMP. Additionally, the summary of discard reasons revealed that for many species, the discarding is not due to regulatory reasons, but rather economic (i.e. “No Market”) reasons (Wigley et al. 2012b).

5.6.4 Optimization Tool

The optimization model described by Rago et al. (2005) could be expanded to encompass more species groups and gear types. For the optimization model to be useful, it will take extensive analyses to ensure that the assumptions necessary to set up the model are appropriate across a wider range of species and fishing modes. Even then, the optimization model is simply a tool to help guide the allocation process and would not replace other means by which observer effort is allocated across the fisheries.

The most important aspect of using the optimization model is that it explicitly incorporates a regular feedback mechanism for continuously improving the performance of the bycatch monitoring. The optimization tool should be viewed as a set of quality assurance/quality control measures that provide a formal way of updating and improving the sampling design as new information is obtained. The optimization tool interacts with the formal sampling design by using updated estimates of variances and overall patterns of fishing effort to improve, via reallocation of observer coverage, the overall performance of the sampling program. The overall performance of the observer sampling program is measured as a composite of the precision of discard estimates. Developing a composite measure of performance requires developing weighting factors for each species group and fishery to account for differences in the scope and scale among the fishing modes. As the number of combinations of species and fishing modes is high, defining a complete set of weighting factors is challenging.

The optimization tool also explicitly incorporates external constraints that affect the allocation of observer effort, such as the annual budget available to the observer program. While the budget is ultimately the most important constraint, prescribed coverage levels for regulatory programs (e.g., US/Canada resource sharing areas, B DAS, and scallop vessels in closed areas), have substantial impacts on the overall performance of the program. The optimization tool provides at least one measure of the potential impacts of externally imposed constraints.

The use of observer data for single species stock assessments and the sea day allocation are presented in Figure 44. This overview illustrates the ‘feed-back’ loop and the use of observer data in the stock assessment process and in the sea day allocation process. The stock assessment analyses benefit from the sea day allocation process through improved monitoring of bycatch.

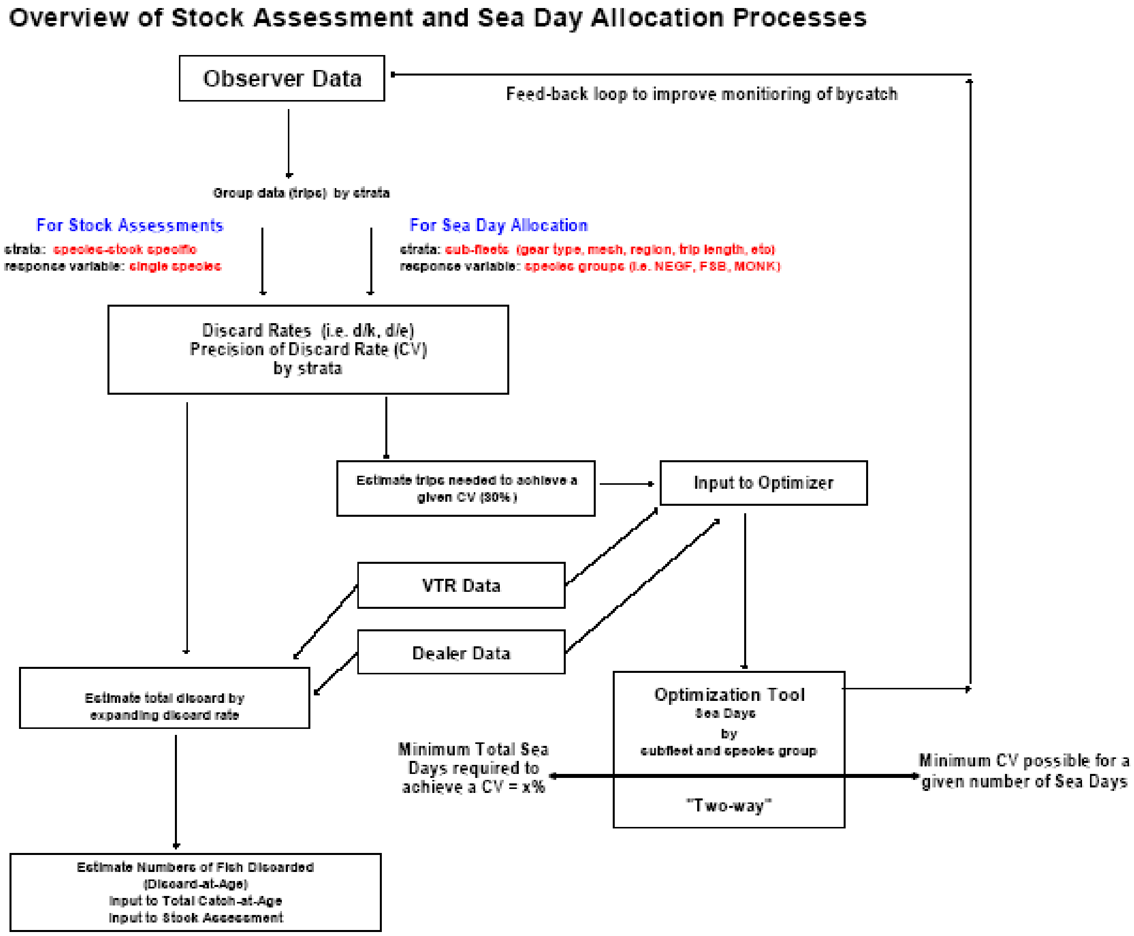

Figure 44. Overview of feedback loop used to improve bycatch monitoring in the Greater Atlantic Region(status quo).

5.7 Integration of Model-Based Methods for Sea Turtles

Since 2007, revised approaches have been considered for sea turtles due to the rare nature of turtle discard events. Total bycatch of turtles and the amount of sea days for monitoring are estimated independently from fish, and then monitoring needs for both fish and turtles are integrated together in the process described below.

5.7.1 Background on Bycatch Estimation Methods for Turtles

To date, the NEFSC has estimated interactions [where interactions are synonymous with the Endangered Species Act definitions of "takes"[36]] of loggerhead and

[36] The ESA (1973) defines takes as: "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct"

hard-shelled turtles with fishing gear in the Mid-Atlantic (i.e. see Murray 2011, Warden 2011a, and Murray 2009a). These estimates are subsequently allocated across fisheries, where a "fishery" is defined as a managed fish or invertebrate species landed, to provide information requested by Greater Atlantic Regional Fisheries Office (GARFO) for their Endangered Species Act Section 7 consultations (Warden 2011b, Murray 2009b). The model-based estimates pool several years of data, pool across multiple fishing fleets within the same gear type, and account for gear or environmental correlates with turtle discard rates over broad spatial regions. As such they tend to have lower variance than those generated from annual ratio estimators (Orphanides 2009), because of the larger sample sizes and inclusion of environmental covariates that significantly affect estimated discard rates.

The total number of interactions between loggerheads and commercial fishing gear has typically been estimated via Generalized Additive Models (GAMs), developed from NEFOP data. The response of the model is the expected turtle interaction rate, defined as the number of observed turtles per unit of fishing effort. The definition of fishing effort will vary between gear types, but typically reflects the amount of fishing time in the water (i.e. days fished or dredge hours). The form of the Generalized Additive Model (GAM) can be written as:

$$Log(E[y_j]) = \log(\text{fishing effort}_j) + \alpha + \sum_{i=1}^{n} f_i(x_{ij}) + \xi$$

where y_j is the number of hard-shelled turtles observed on the jth haul, α is a constant intercept term, f_j are a series of smoothing functions for each predictor variable, x_i describe environmental or fishing characteristics at each haul, and ξ is unexplained error (Hastie & Tibshirani 1990). The estimated interaction rates from the GAM model are then applied to commercial effort data (typically from FVTRs) to obtain the number of predicted loggerhead interactions on each fishing trip. Coefficients of variation (CVs) are determined from the distribution of predicted interactions that result from applying the GAM model to 1000 bootstrap replicates of the observer data.

5.7.2 Estimation of Sea Day Monitoring Needs

Projected amounts of observer sea days for vessels fishing gillnet, trawl (for fish and scallops), and dredge gear are derived from CVs around the total estimated loggerhead interactions in specific fisheries, where a fishery is defined within each gear type by the highest amount (by weight) of landed fish or invertebrate species on a trip (Murray 2012). The number of observed sea days needed to achieve a 30-percent CV, and other levels of precision, around an estimate of total loggerhead interactions is derived from:

$$n_{proj} = (CV_{obs} * \sqrt{n_{obs}}/CV_{proj})^2$$

where n_{proj}= the amount of projected effort required to achieve a given precision level (converted to sea days); CV_{obs} = the precision levels around estimated interactions levels as reported in Warden 2011b (trawl), Murray 2009b (gillnet), or Murray 2011 (dredge); n_{obs}= the observed effort as reported in the above publications; and CV_{proj} = the projected precision level to be achieved. Estimates of sea day needs for turtles are revised when new bycatch estimates are published for a particular gear type (approximately every five years). Sea day monitoring needs for non-loggerhead species are not currently estimated, but it may be possible in the future if there are sufficient data to estimate total interactions of non-loggerhead species.

5.7.3 Integrating Sea Day Monitoring Needs for Fish and Turtles

Estimated sea days to monitor loggerhead interactions are subsequently integrated with annual sea days estimated for fish. The following describes the steps used in 2012.

For fish/invertebrate species groups, the numbers of sea days needed to achieve a 30 percent CV of total discards of each species groups were estimated for 55 fleets using data collected during the June 2010 through July 2011(see Wigley et al. 2012a for details). An estimated 18,822 sea days are needed for the 14 fish and invertebrate species groups.

For loggerhead turtles, the numbers of sea days needed to achieve a 30 percent CV of turtle discards was estimated by fishery, defined as a managed fish or invertebrate species landed on vessels using bottom otter trawl, sink gillnet, or scallop dredge gear in the Mid-Atlantic region (see Murray 2012 for details). The maximum amount of projected coverage across all the fisheries was considered the desired level of sampling to monitor turtle discards for that gear type. Roughly 4,800 days are needed across bottom trawl fisheries. Roughly 1,400 days are needed across sink gillnet fisheries. Lastly, ~1,300 days are needed in the scallop dredge fishery, based on loggerhead bycatch precision levels after chain mats were implemented in the fishery.

The numbers of sea days needed to achieve a 30 percent CV associated with the Mid-Atlantic[37] turtle gear types and fish/invertebrate fleets are given in Table 60 and summarized below.

Turtle Gear Types and Fish Fleets	Sea Days	
	Loggerhead Turtles	Fish/Invertebrates Species Groups
MA Otter Trawl and Scallop Trawl Rows 5, 6, 9, 10, 11 and 12	4,838	9,096
MA Gillnet Rows 22, 23, and 24	1,440	109
MA Scallop Dredge	1,293	675

[37] In the sea turtle sample size analysis, Mid-Atlantic refers to areas fished west of 70°W. In the fish/invertebrate sample size analysis, Mid-Atlantic refers to region based on port of departure from Connecticut and southward. Although it is recognized that port of departure may differ from the area fished, an odds ratio analysis conducted to evaluate broad-scale spatial coherence indicated a strong relationship between area fished (statistical area) and port of departure (region). Based upon this analysis, the 'Mid-Atlantic' stratifications used in two analyses were considered similar.

Rows 30, 32, 34 and 36		

Table 39. Example number of observer sea days needed in select gear types to achieve a 30 percent CV for loggerhead turtles and fish/invertebrate species groups.

The number of sea days needed for the combined fish/invertebrates and turtle species groups are derived as followed:

- If the sum of the sea days needed for fish/invertebrates species groups of the corresponding fish fleets exceeds the sea days needed for the turtle gear type, then the sea days needed for fish/invertebrate sea day are used.
- If the number of sea days needed for turtles for the gear type exceeds the sum of the sea days needed for fish/invertebrates of the corresponding fish fleets, then the sea days needed for turtles are distributed according to the proportion of sea days needed for fish/invertebrates of the corresponding fish fleets.

A total of 20,590 sea days are needed for fish/invertebrates and loggerhead turtles (combined) during the April 2012 through March 2013 period (Table 60).

5.8 Sources of Uncertainty and General Discussion

The difficulties of discard estimation are well known and have been described extensively in the literature (e.g., Rochet et al. 2002; Diamond 2002; Rago et al. 2005; Kaiser 2006). In this analysis, a design-based approach was used to organize the basic concepts of inferring the behavior of a population from the properties of a sample. The design-based approach should be viewed as a first approximation of the overall efficacy of an observer sampling program. As additional information is obtained, more refined estimators of discards for individual or groups of species can be devised. The design approach does not preclude such development. Instead, it facilitates further development by ensuring that the sampling is sufficiently robust to address uncertainties associated with fishing operations. Allocation of observer effort to independent fishing modes, by quarter, protects against unforeseen changes in seasonal effort patterns, shifts to new fisheries (e.g., trawlers to general category scallopers), or the effects of closed areas. Moreover, the design-based approach can help smooth out the allocation process over time, thereby reducing potential problems associated with the logistics of running a large observer program (e.g., recruiting observers, training, ability to deploy observers, etc.). A design-based approach for biological sampling has proven to be an excellent technique for monitoring the biological attributes of landings. Extension of this approach to observer coverage allocation has similar advantages.

In spite of the many advantages associated with the current observer allocation approach, several areas of concern remain. These include:

1. How to appropriately address/minimize the influence of zero values (no discards) in the observer datasets;

2. How to appropriately address/minimize the influence of extremely high variation on measures of central tendency;

3. Developing alternative predictive variables;

4. Developing adequate measures of performance/efficacy for the observer program;

5. The influence over-stratification may have estimation (potential bias);

6. The lack of persistence in fishing behavior over years;

7. Addressing the influence of fishing regulations on fishing operations and vessel behavior;

8. The imprecise estimation of location reported on the FVTR;

9. The utility of using aggregate species measures of discards;

10. Improving the correspondence between FVTR and dealer data;

11. Incorporating more advanced statistical estimators that explicitly account for zero observations and over-dispersion; and

12. Developing appropriate criteria to filter the importance of fisheries and species combinations for the estimation of adequate sampling coverage.

The statistical theory applicable to the estimation of fisheries bycatch is evolving and significant advances are anticipated during the next few years. Several promising methods, recently published or now under development, are expected to advance the reliability of discard estimation; however, field testing these newer methods for multiple geographical regions and fisheries will take time. Meanwhile, the sampling design described in this chapter and, more importantly, the underlying data collected by NMFS should retain enough flexibility to accommodate/support using many of these newer methods.

Gear Type	Access Area (Open/ Closed)	Trip Category (General/ Limited)	Region	mesh groups	NUMBER OF TRIPS IN 2004 OBSERVER PROGRAM — FISH SET QTR 1	QTR 2	QTR 3	QTR 4	TOTAL	PROTECTED SPECIES SET QTR 1	QTR 2	QTR 3	QTR 4	TOTAL	NUMBER OF TRIPS IN 2004 VTR (commercial) — INDUSTRY ACTIVITY QTR1	QTR 2	QTR 3	QTR 4	VTR TOTAL	Comments
Longline	all	all	NE	all	5	1	3	3	12	8	1	8	102	119	470	63	277	424	1234	impute
Longline	all	all	MA	all	0	0	0	0	0	0	0	0	2	2	84	51	38	32	205	Pilot
Otter Trawl	all	all	NE	small	19	27	41	55	142	21	40	54	85	200	851	941	882	810	3484	
Otter Trawl	all	all	NE	large	75	69	119	123	386	81	99	176	183	539	2778	3714	5965	3699	16156	
Otter Trawl	all	all	MA	small	41	33	51	69	194	42	34	53	76	205	733	1517	1830	1142	5222	
Otter Trawl	all	all	MA	large	24	9	16	26	75	25	9	16	26	76	1406	3198	2579	1667	8850	
Scallop Trawl	open	limited	MA	all	0	0	0	1	1	0	0	2	1	3	23	62	68	45	198	Pilot
Scallop Trawl	open	general	MA	all	0	0	24	7	31	0	1	29	9	39	12	311	599	166	1088	Pilot
Shrimp Trawl	all	all	NE	all	12	0	0	0	12	12	0	0	0	12	1805	36	0	127	1968	impute
Shrimp Trawl	all	all	MA	all	0	0	2	0	2	0	0	2	0	2	1	45	214	74	334	Pilot
Sink, Anchor, Drift Gillnet	all	all	NE	small	0	1	0	0	1	0	1	0	0	1	5	3	18	16	42	Pilot
Sink, Anchor, Drift Gillnet	all	all	NE	large	84	90	232	171	577	157	119	277	219	772	1183	975	2004	1027	5189	
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	25	72	206	142	445	42	101	231	195	569	610	1245	1587	1270	4712	
Sink, Anchor, Drift Gillnet	all	all	MA	small	1	0	1	1	3	53	96	77	132	358	536	688	1115	585	2924	Pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	large	0	1	0	3	4	12	25	15	29	81	95	424	264	510	1293	Pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	1	0	0	26	27	21	52	3	66	142	546	1073	148	801	2568	Pilot for fish
Scallop Dredge	open	limited	NE	all	4	5	5	12	26	5	5	11	15	36	277	420	345	187	1229	
Scallop Dredge	open	limited	MA	all	7	8	31	23	69	7	14	33	24	78	359	584	560	319	1822	
Scallop Dredge	open	general	NE	all	1	0	1	7	9	1	0	2	17	20	620	1291	1166	489	3566	Pilot
Scallop Dredge	open	general	MA	all	0	5	13	4	22	0	6	22	11	39	228	1103	1343	759	3433	impute
Scallop Dredge	closed	limited	NE	all	8	23	20	35	86	8	23	20	35	86	2	4	3	283	292	
Scallop Dredge	closed	limited	MA	all	2	14	12	7	35	2	14	12	7	35	7	6	9	56	78	
Scallop Dredge	closed	general	NE	all	0	0	0	0	0	0	0	0	0	0	1	31	15	3	50	Pilot
Scallop Dredge	closed	general	MA	all	0	0	0	1	1	0	0	0	1	1	8	66	231	241	546	Pilot
Mid-water paired & single Trawl	all	all	NE	all	5	13	19	29	66	9	21	32	37	99	248	250	330	233	1061	
Mid-water paired & single Trawl	all	all	MA	all	5	0	6	2	13	5	0	7	2	14	103	9	8	1	121	impute
Fish Pots/ Traps	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	289	531	153	973	Pilot
Fish Pots/ Traps	all	all	MA	all	0	5	1	0	6	1	6	1	0	8	44	619	556	531	1750	Pilot
Purse Seine	all	all	NE	all	0	2	11	3	16	0	3	19	4	26	0	34	185	45	264	
Purse Seine	all	all	MA	all	0	0	0	0	0	0	2	0	0	2	0	31	21	24	76	Pilot
Hand Line	all	all	NE	all	0	0	4	2	6	0	0	6	3	9	251	709	1857	561	3378	Pilot
Hand Line	all	all	MA	all	0	0	0	0	0	0	2	1	0	3	141	1466	3122	1554	6283	Pilot
Scottish Seine	all	all	NE	all	0	3	1	1	5	0	4	2	2	8	3	40	39	11	93	Pilot
Scottish Seine	all	all	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	
Clam Quahog Dredge	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	700	1132	800	834	3466	Pilot
Clam Quahog Dredge	all	all	MA	all	0	0	0	0	0	0	0	0	0	0	763	1018	933	747	3461	Pilot
Crab Pots	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	10	17	37	39	103	Pilot
Crab Pots	all	all	MA	all	0	0	0	0	0	0	0	0	0	0	7	392	642	92	1133	Pilot
Lobster Pots	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	2638	6039	14487	10937	34101	Pilot
Lobster Pots	all	all	MA	all	0	0	0	0	0	0	0	1	2	3	165	1218	1718	649	3750	Pilot
Quota Monitored Longline	all	all	NE	all	0	0	0	96	96											
Quota Monitored Otter Trawl (U/C)	all	all	NE	large	0	24	43	25	92											
Quota Monitored Otter Trawl (U/C)	all	all	NE	small	0	1	4	2	7											
Quota Monitored Otter Trawl (B)	all	all	NE	large	0	0	0	20	20											
Quota Monitored Otter Trawl (B)	all	all	NE	small	0	0	0	1	1											
TOTAL									2488					3587	17713	31114	46526	31145	126498	

Table 40. Number of trips in the 2004 NEFOP and FVTRs, by fishing mode and quarter. The comments indicate where imputation and pilot coverage were used (shading indicates cells used in the imputation) in the fish and protected species datasets.

					NUMBER OF SEA DAYS IN 2004 OBSERVER PROGRAM										NUMBER OF SEA DAYS IN 2004 VTR (commercial)					
					FISH SET					PROTECTED SPECIES SET					INDUSTRY ACTIVITY					
Gear Type	Access Area (Open/ Closed)	Trip Category (General/ Limited)	Region	mesh groups	QTR 1	QTR 2	QTR 3	QTR 4	TOTAL	QTR 1	QTR 2	QTR 3	QTR 4	TOTAL	QTR1	QTR 2	QTR 3	QTR 4	VTR TOTAL	Comments
Longline	all	all	NE	all	5	1	3	3	12	8	1	8	116	133	654	132	319	474	1579	impute
Longline	all	all	MA	all	0	0	0	0	0	0	0	0	11	11	290	310	277	272	1149	Pilot
Otter Trawl	all	all	NE	small	84	100	79	186	449	86	128	118	245	577	3093	2608	2422	2442	10565	
Otter Trawl	all	all	NE	large	377	207	152	340	1076	390	389	484	684	1947	8231	9997	11445	8660	38333	
Otter Trawl	all	all	MA	small	162	56	100	153	471	165	57	102	175	499	2363	2539	2855	2047	9804	
Otter Trawl	all	all	MA	large	100	15	26	42	183	103	15	26	42	186	4935	4563	3791	3787	17076	
Scallop Trawl	open	limited	MA	all	0	0	0	11	11	0	0	11	11	22	154	591	593	305	1643	Pilot
Scallop Trawl	open	general	MA	all	0	0	48	8	56	0	3	58	10	71	27	633	1215	365	2240	Pilot
Shrimp Trawl	all	all	NE	all	12	0	0	0	12	12	0	0	0	12	1822	46	0	127	1995	impute
Shrimp Trawl	all	all	MA	all	0	0	2	0	2	0	0	2	0	2	6	276	1100	442	1824	Pilot
Sink, Anchor, Drift Gillnet	all	all	NE	small	0	1	0	0	1	0	1	0	0	1	5	3	18	17	43	Pilot
Sink, Anchor, Drift Gillnet	all	all	NE	large	84	98	276	199	657	169	138	322	247	876	1526	1602	2514	1388	7030	
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	54	92	232	155	533	80	152	258	211	701	1252	2327	2006	1611	7196	
Sink, Anchor, Drift Gillnet	all	all	MA	small	1	0	1	1	3	57	99	82	137	375	560	744	1172	605	3081	Pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	large	0	1	0	3	4	13	28	15	29	85	121	481	266	529	1397	Pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	1	0	0	29	30	23	54	3	72	152	787	1299	170	1164	3420	Pilot for fish
Scallop Dredge	open	limited	NE	all	52	78	53	161	344	61	78	123	195	457	3106	4628	3780	1915	13429	
Scallop Dredge	open	limited	MA	all	45	91	263	192	591	45	146	280	204	675	3220	5624	4779	2802	16425	
Scallop Dredge	open	general	NE	all	1	0	2	8	11	1	0	5	18	24	773	1562	1565	699	4599	Pilot
Scallop Dredge	open	general	MA	all	0	6	19	8	33	0	7	29	19	55	362	1487	1808	1133	4790	impute
Scallop Dredge	closed	limited	NE	all	90	214	200	301	805	90	214	200	301	805	24	41	25	2372	2462	
Scallop Dredge	closed	limited	MA	all	21	145	124	83	373	21	145	124	83	373	57	63	75	510	705	
Scallop Dredge	closed	general	NE	all	0	0	0	0	0	0	0	0	0	0	3	37	21	7	68	Pilot
Scallop Dredge	closed	general	MA	all	0	0	0	2	2	0	0	0	2	2	13	75	274	341	703	Pilot
Mid-water paired & single Trawl	all	all	NE	all	25	21	56	63	165	39	36	90	77	242	882	537	870	495	2784	
Mid-water paired & single Trawl	all	all	MA	all	14	0	19	6	39	14	0	22	6	42	364	40	22	1	427	impute
Fish Pots/ Traps	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	0	294	538	156	988	Pilot
Fish Pots/ Traps	all	all	MA	all	0	5	1	0	6	2	6	1	0	9	70	651	568	544	1833	Pilot
Purse Seine	all	all	NE	all	0	4	22	7	33	0	6	38	9	53	0	58	384	91	533	
Purse Seine	all	all	MA	all	0	0	0	0	0	0	2	0	0	2	0	36	21	24	81	Pilot
Hand Line	all	all	NE	all	0	0	4	2	6	0	0	15	3	18	273	743	1967	598	3581	Pilot
Hand Line	all	all	MA	all	0	0	0	0	0	0	2	9	0	11	152	1514	3350	1623	6639	Pilot
Scottish Seine	all	all	NE	all	0	3	1	1	5	0	4	2	2	8	3	40	39	11	93	Pilot
Scottish Seine	all	all	MA	all	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	
Clam Quahog Dredge	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	437	780	624	646	2487	Pilot
Clam Quahog Dredge	all	all	MA	all	0	0	0	0	0	0	0	0	0	0	862	1239	1115	963	4179	Pilot
Crab Pots	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	124	172	223	200	719	Pilot
Crab Pots	all	all	MA	all	0	0	0	0	0	0	0	0	0	0	7	412	647	102	1168	Pilot
Lobster Pots	all	all	NE	all	0	0	0	0	0	0	0	0	0	0	3699	7701	16980	13154	41534	Pilot
Lobster Pots	all	all	MA	all	0	0	0	0	0	0	0	1	2	3	193	1397	2034	835	4459	Pilot
Quota Monitored Longline	all	all	NE	all	0	0	0	110	110											
Quota Monitored Otter Trawl (U/C)	all	all	NE	large	0	175	318	201	694											
Quota Monitored Otter Trawl (U/C)	all	all	NE	small	0	10	30	19	59											
Quota Monitored Otter Trawl (B)	all	all	NE	large	0	0	0	126	126											
Quota Monitored Otter Trawl (B)	all	all	NE	small	0	0	0	6	6											
TOTAL									6908					8429	40450	57282	71872	53459	223063	

Table 41. Number of sea days in the 2004 NEFOP and FVTRs, by fishing mode and quarter. The comments indicate where imputation and pilot coverage were used (shading indicates the cells used in the imputation) in the fish and protected species datasets.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	Total Trips (FISH)	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE COMPLEX	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH	ALL SPECIES
Longline	all	all	NE	all	12	100%	100%	100%	100%	100%	100%	100%	0%	92%	25%	33%	100%	100%	100%	0%
Longline	all	all	MA	all	0															
Otter Trawl	all	all	NE	small	142	85%	74%	100%	90%	89%	35%	36%	4%	35%	14%	21%	41%	99%	87%	0%
Otter Trawl	all	all	NE	large	386	98%	90%	100%	82%	88%	70%	49%	5%	53%	6%	28%	72%	99%	99%	0%
Otter Trawl	all	all	MA	small	194	90%	96%	100%	99%	90%	55%	67%	44%	73%	23%	37%	28%	96%	99%	5%
Otter Trawl	all	all	MA	large	75	92%	96%	100%	100%	80%	59%	44%	35%	77%	5%	31%	20%	93%	100%	0%
Scallop Trawl	open	limited	MA	all	1	100%	100%	100%	100%	0%	0%	0%	0%	100%	0%	100%	0%	100%	100%	0%
Scallop Trawl	open	general	MA	all	31	97%	100%	100%	97%	35%	58%	29%	32%	77%	3%	77%	74%	100%	100%	0%
Shrimp Trawl	all	all	NE	all	12	100%	0%	100%	100%	92%	92%	17%	0%	50%	50%	92%	100%	100%	100%	0%
Shrimp Trawl	all	all	MA	all	2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%	0%	100%	100%	100%	0%
Sink, Anchor, Drift Gillnet	all	all	NE	large	577	93%	93%	100%	99%	99%	95%	81%	22%	81%	44%	28%	98%	100%	100%	2%
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	445	85%	96%	100%	100%	97%	95%	57%	48%	88%	30%	29%	92%	100%	98%	2%
Sink, Anchor, Drift Gillnet	all	all	MA	small	3	100%	100%	100%	100%	100%	67%	100%	100%	100%	100%	33%	67%	100%	100%	0%
Sink, Anchor, Drift Gillnet	all	all	MA	large	4	75%	100%	100%	100%	100%	100%	100%	75%	100%	50%	25%	100%	100%	100%	0%
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	27	56%	100%	100%	100%	81%	100%	37%	100%	100%	4%	11%	74%	100%	100%	0%
Scallop Dredge	open	limited	NE	all	26	100%	100%	100%	96%	19%	50%	8%	0%	38%	0%	46%	35%	62%	100%	0%
Scallop Dredge	open	limited	MA	all	69	100%	100%	100%	99%	26%	42%	1%	25%	57%	0%	62%	33%	81%	100%	0%
Scallop Dredge	open	general	NE	all	9	100%	100%	100%	100%	67%	89%	33%	0%	56%	11%	78%	89%	89%	100%	0%
Scallop Dredge	open	general	MA	all	22	100%	100%	100%	100%	41%	95%	18%	41%	77%	9%	86%	73%	95%	100%	5%
Scallop Dredge	closed	limited	NE	all	86	99%	97%	100%	98%	20%	43%	5%	1%	16%	0%	51%	26%	85%	100%	0%
Scallop Dredge	closed	limited	MA	all	35	97%	91%	100%	97%	17%	26%	0%	9%	23%	0%	46%	29%	91%	100%	0%
Scallop Dredge	closed	general	NE	all	0															
Scallop Dredge	closed	general	MA	all	1	100%	100%	100%	100%	0%	100%	0%	100%	100%	0%	100%	0%	100%	100%	0%
Mid-water paired & single Trawl	all	all	NE	all	66	89%	86%	100%	100%	98%	62%	85%	73%	79%	95%	30%	97%	100%	100%	9%
Mid-water paired & single Trawl	all	all	MA	all	13	92%	92%	100%	100%	100%	69%	77%	38%	77%	100%	54%	85%	100%	100%	0%
Fish Pots/ Traps	all	all	NE	all	0															
Fish Pots/ Traps	all	all	MA	all	6	100%	100%	100%	100%	100%	100%	83%	100%	100%	100%	100%	0%	100%	100%	0%
Purse Seine	all	all	NE	all	16	100%	88%	100%	100%	100%	88%	100%	94%	100%	100%	44%	100%	100%	100%	31%
Purse Seine	all	all	MA	all	0															
Hand Line	all	all	NE	all	6	100%	100%	100%	100%	100%	100%	100%	67%	100%	100%	100%	100%	100%	100%	67%
Hand Line	all	all	MA	all	0															
Scottish Seine	all	all	NE	all	5	100%	100%	100%	100%	100%	100%	100%	0%	80%	40%	100%	60%	100%	100%	0%
Scottish Seine	all	all	MA	all	0															
Clam Quahog Dredge	all	all	NE	all	0															
Clam Quahog Dredge	all	all	MA	all	0															
Crab Pots	all	all	NE	all	0															
Crab Pots	all	all	MA	all	0															
Lobster Pots	all	all	NE	all	0															
Lobster Pots	all	all	MA	all	0															
Quota Monitored Longline	all	all	NE	all	92	92%	63%	100%	71%	54%	26%	9%	0%	9%	0%	45%	47%	88%	100%	0%
Quota Monitored Otter Trawl (U/C)	all	all	NE	large	7	100%	71%	100%	86%	86%	43%	14%	0%	14%	0%	43%	86%	100%	100%	0%
Quota Monitored Otter Trawl (U/C)	all	all	NE	small	96	100%	100%	100%	100%	100%	100%	98%	3%	57%	11%	1%	100%	100%	100%	0%
Quota Monitored Otter Trawl (B)	all	all	NE	large	20	100%	80%	100%	70%	70%	80%	40%	0%	45%	0%	0%	70%	95%	100%	0%
Quota Monitored Otter Trawl (B)	all	all	NE	small	1	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	0%

Table 42. Number of observed trips in 2004 and the percent of observed trips with zero discard, by fishing mode, for fish species groups. Note: Gray-shade cells indicate unlikely species/gear combinations; U/C = US/Canada; B = B-DAS.

Gear Type	Access Area (Open-Closed)	Trip Category (General/Limited)	Region	mesh groups	Total Trips (PSPP)	TURTLES	SEALS	WHALES	DOLPHINS/-PORPOISE	SEA BIRDS (ALL)
Longline	all	all	NE	all	119	100.0%	100.0%	100.0%	100.0%	96.6%
Longline	all	all	MA	all	2	100.0%	100.0%	100.0%	100.0%	100.0%
Otter Trawl	all	all	NE	small	200	100.0%	100.0%	99.5%	97.5%	99.0%
Otter Trawl	all	all	NE	large	539	100.0%	100.0%	99.8%	98.5%	99.1%
Otter Trawl	all	all	MA	small	205	98.5%	100.0%	100.0%	98.5%	99.5%
Otter Trawl	all	all	MA	large	76	100.0%	100.0%	100.0%	100.0%	98.7%
Scallop Trawl	open	limited	MA	all	3	66.7%	100.0%	100.0%	100.0%	100.0%
Scallop Trawl	open	general	MA	all	39	100.0%	100.0%	100.0%	100.0%	100.0%
Shrimp Trawl	all	all	NE	all	12	100.0%	100.0%	100.0%	100.0%	100.0%
Shrimp Trawl	all	all	MA	all	2	100.0%	100.0%	100.0%	100.0%	100.0%
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	100.0%	100.0%	100.0%	100.0%	100.0%
Sink, Anchor, Drift Gillnet	all	all	NE	large	772	100.0%	96.6%	100.0%	99.1%	98.3%
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	569	100.0%	94.0%	100.0%	97.7%	99.5%
Sink, Anchor, Drift Gillnet	all	all	MA	small	358	99.4%	100.0%	100.0%	100.0%	98.9%
Sink, Anchor, Drift Gillnet	all	all	MA	large	81	97.5%	100.0%	100.0%	100.0%	97.5%
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	142	97.2%	98.6%	100.0%	99.3%	98.6%
Scallop Dredge	open	limited	NE	all	36	88.9%	100.0%	100.0%	100.0%	97.2%
Scallop Dredge	open	limited	MA	all	78	97.4%	100.0%	100.0%	100.0%	100.0%
Scallop Dredge	open	general	NE	all	20	100.0%	100.0%	100.0%	100.0%	100.0%
Scallop Dredge	open	general	MA	all	39	100.0%	100.0%	100.0%	100.0%	100.0%
Scallop Dredge	closed	limited	NE	all	86	98.8%	100.0%	100.0%	100.0%	98.8%
Scallop Dredge	closed	limited	MA	all	35	100.0%	100.0%	100.0%	100.0%	100.0%
Scallop Dredge	closed	general	NE	all	0					
Scallop Dredge	closed	general	MA	all	1	100.0%	100.0%	100.0%	100.0%	100.0%
Mid-water paired & single Trawl	all	all	NE	all	99	100.0%	100.0%	99.0%	99.0%	97.0%
Mid-water paired & single Trawl	all	all	MA	all	14	100.0%	100.0%	100.0%	100.0%	100.0%
Fish Pots/ Traps	all	all	NE	all	0					
Fish Pots/ Traps	all	all	MA	all	8	100.0%	100.0%	100.0%	100.0%	100.0%
Purse Seine	all	all	NE	all	26	100.0%	100.0%	100.0%	100.0%	100.0%
Purse Seine	all	all	MA	all	2	100.0%	100.0%	100.0%	100.0%	100.0%
Hand Line	all	all	NE	all	9	100.0%	100.0%	100.0%	100.0%	100.0%
Hand Line	all	all	MA	all	3	100.0%	100.0%	100.0%	100.0%	100.0%
Scottish Seine	all	all	NE	all	8	100.0%	100.0%	100.0%	100.0%	100.0%
Scottish Seine	all	all	MA	all	0					
Clam Quahog Dredge	all	all	NE	all	0					
Clam Quahog Dredge	all	all	MA	all	0					
Crab Pots	all	all	NE	all	0					
Crab Pots	all	all	MA	all	0					
Lobster Pots	all	all	NE	all	3	100.0%	100.0%	100.0%	100.0%	100.0%
Lobster Pots	all	all	MA	all	0					

Table 43. Number of observed trips in 2004 and the percent of observed trips with zero incidental takes, by fishing mode, for protected species groups.

Gear Type	Access Area (Open-Closed)	Trip Category (General/Limited)	Region	mesh groups	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH
Longline	all	all	NE	all								0.418	0.364	0.444	0.139			
Longline	all	all	MA	all														
Otter Trawl	all	all	NE	small	0.338	0.066		0.158	0.059	0.530	0.118	0.178	0.407	0.040	0.047	0.035	0.009	0.277
Otter Trawl	all	all	NE	large	0.116	0.107		0.437	0.069	0.059	0.650	0.479	0.511	0.353	0.312	0.024	0.020	0.016
Otter Trawl	all	all	MA	small	0.090	0.022		0.013	0.020	0.205	0.015	0.096	0.198	0.220	0.028	0.000	0.056	0.149
Otter Trawl	all	all	MA	large	0.080	0.084			0.418	0.420	0.468	0.010	0.239	0.319	0.111	0.185	0.135	
Scallop Trawl	open	limited	MA	all														
Scallop Trawl	open	general	MA	all	0.164			0.067	0.034	0.337	0.238	0.397	0.204	0.210	0.167	0.108		
Shrimp Trawl	all	all	NE	all		0.783			0.034	0.136	0.420	0.099	0.255	0.153	0.004			
Shrimp Trawl	all	all	MA	all														
Sink, Anchor, Drift Gillnet	all	all	NE	small														
Sink, Anchor, Drift Gillnet	all	all	NE	large	0.020	0.167		0.455	0.005	0.005	0.015	0.315	0.136	0.002	0.233	0.032		
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	0.303	0.048		0.013	0.174	0.029	0.362	0.086	0.038	0.481	0.055	0.244		0.162
Sink, Anchor, Drift Gillnet	all	all	MA	small						0.993					0.981	0.993		
Sink, Anchor, Drift Gillnet	all	all	MA	large	0.575							0.507		0.652	0.644			
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	0.381				0.071		0.251			0.199	0.078	0.130		
Scallop Dredge	open	limited	NE	all				0.199	0.537	0.055	0.452	0.016	0.177	0.228	0.194	0.225	0.278	
Scallop Dredge	open	limited	MA	all				0.078	0.097	0.144	0.262	0.185	0.056	0.275	0.309	0.206	0.004	
Scallop Dredge	open	general	NE	all					0.375	0.112	0.126	0.658	0.174	0.001	0.809	0.491	0.064	
Scallop Dredge	open	general	MA	all					0.295	0.168	0.555	0.332	0.032	0.439	0.103	0.155	0.417	
Scallop Dredge	closed	limited	NE	all	0.035	0.082		0.099	0.115	0.005	0.006	0.172	0.015	0.124	0.058	0.267	0.078	
Scallop Dredge	closed	limited	MA	all	0.022	0.155		0.105	0.429	0.122	0.205	0.064	0.085	0.211	0.239	0.144	0.093	
Scallop Dredge	closed	general	NE	all														
Scallop Dredge	closed	general	MA	all														
Mid-water paired & single Trawl	all	all	NE	all	0.157	0.142			0.133	0.383	0.152	0.148	0.008	0.140	0.030	0.387		
Mid-water paired & single Trawl	all	all	MA	all	0.243	0.214				0.234	0.465	0.437	0.244		0.854	0.371		
Fish Pots/ Traps	all	all	NE	all														
Fish Pots/ Traps	all	all	MA	all							0.377					0.658		
Purse Seine	all	all	NE	all		0.235				0.095		0.085			0.003			
Purse Seine	all	all	MA	all														
Hand Line	all	all	NE	all								0.521						
Hand Line	all	all	MA	all														
Scottish Seine	all	all	NE	all								0.007	0.859	0.083		0.734		
Clam Quahog Dredge	all	all	NE	all														
Clam Quahog Dredge	all	all	MA	all														
Crab Pots	all	all	NE	all														
Crab Pots	all	all	MA	all														
Lobster Pots	all	all	NE	all														
Lobster Pots	all	all	MA	all														

Table 44. Summary of correlation (rho) of the ratio estimate (discard to kept estimator), by fish species group and fishing mode.

Gear Type	Access Area (Open-Closed)	Trip Category (General/Limited)	Region	mesh groups	TURTLES	SEALS	WHALES	DOLPHINS/-PORPOISE	SEA BIRDS (ALL)	ALL SPECIES	PILOT coverage
Longline	all	all	NE	all					0.002	0.208	
Longline	all	all	MA	all							pilot
Otter Trawl	all	all	NE	small			0.102	0.255	0.080	0.411	
Otter Trawl	all	all	NE	large			0.042	0.210	0.111	0.470	
Otter Trawl	all	all	MA	small	0.044			0.110	0.108	0.099	
Otter Trawl	all	all	MA	large					0.064	0.415	
Scallop Trawl	open	limited	MA	all	0.981						pilot
Scallop Trawl	open	general	MA	all						0.266	pilot
Shrimp Trawl	all	all	NE	all						0.592	
Shrimp Trawl	all	all	MA	all						1.000	pilot
Sink, Anchor, Drift Gillnet	all	all	NE	small							pilot
Sink, Anchor, Drift Gillnet	all	all	NE	large		0.014		0.014	0.292	0.265	
Sink, Anchor, Drift Gillnet	all	all	NE	xlg		0.006		0.018	0.108	0.244	
Sink, Anchor, Drift Gillnet	all	all	MA	small	0.006				0.042	0.977	pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	large	0.090				0.073	0.636	pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	0.031	0.125		0.034	0.093	0.238	pilot for fish
Scallop Dredge	open	limited	NE	all	0.077				0.025	0.389	
Scallop Dredge	open	limited	MA	all	0.091					0.394	
Scallop Dredge	open	general	NE	all						0.452	pilot
Scallop Dredge	open	general	MA	all						0.353	
Scallop Dredge	closed	limited	NE	all	0.230				0.143	0.112	
Scallop Dredge	closed	limited	MA	all						0.446	
Scallop Dredge	closed	general	NE	all							pilot
Scallop Dredge	closed	general	MA	all							pilot
Mid-water paired & single Trawl	all	all	NE	all			0.003	0.139	0.182	0.272	
Mid-water paired & single Trawl	all	all	MA	all						0.203	
Fish Pots/ Traps	all	all	NE	all							pilot
Fish Pots/ Traps	all	all	MA	all						0.686	pilot
Purse Seine	all	all	NE	all						0.098	
Purse Seine	all	all	MA	all							pilot
Hand Line	all	all	NE	all						0.521	pilot
Hand Line	all	all	MA	all							pilot
Scottish Seine	all	all	NE	all						0.109	pilot
Clam Quahog Dredge	all	all	NE	all							pilot
Clam Quahog Dredge	all	all	MA	all							pilot
Crab Pots	all	all	NE	all							pilot
Crab Pots	all	all	MA	all							pilot
Lobster Pots	all	all	NE	all							pilot
Lobster Pots	all	all	MA	all							pilot

Table 45. Summary of correlation (rho) of the ratio estimate (discard to kept estimator), by protected species group and fishing mode.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB FISH TRIPS	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH	PILOT coverage
Longline	all	all	NE	all	12	*	*	*	*	*	*	*	0.335	0.910	0.614	0.654	*	*	*	
Longline	all	all	MA	all	0															pilot
Otter Trawl	all	all	NE	small	142	0.508	0.437	*	0.428	0.710	**0.227**	0.405	**0.233**	**0.235**	0.691	0.322	0.309	1.028	0.304	
Otter Trawl	all	all	NE	large	386	2.474	1.313	*	**0.280**	0.350	0.572	**0.088**	**0.101**	**0.182**	**0.175**	**0.245**	0.319	1.512	0.529	
Otter Trawl	all	all	MA	small	194	0.903	0.784	*	1.394	0.574	0.561	0.354	0.326	0.508	**0.222**	0.367	0.386	0.464	1.155	
Otter Trawl	all	all	MA	large	75	1.906	0.775	*	*	0.444	0.390	**0.295**	**0.251**	0.827	**0.209**	0.557	**0.246**	0.609	*	
Scallop Trawl	open	limited	MA	all	1	*	*	*	*	**0.000**	**0.000**	**0.000**	**0.000**	*	**0.000**	*	**0.000**	*	*	pilot
Scallop Trawl	open	general	MA	all	31	1.141	*	*	0.640	**0.224**	0.354	**0.194**	**0.170**	0.496	0.347	0.675	0.505	*	*	pilot
Shrimp Trawl	all	all	NE	all	12	*	0.479	*	*	0.965	0.981	**0.235**	**0.224**	0.557	0.799	0.960	*	*	*	
Shrimp Trawl	all	all	MA	all	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	pilot
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	*	*	*	*	*	**0.000**	*	*	*	*	**0.000**	*	*	*	pilot
Sink, Anchor, Drift Gillnet	all	all	NE	large	577	**0.220**	**0.229**	*	0.625	0.969	0.841	**0.210**	**0.092**	**0.183**	**0.228**	**0.106**	0.845	*	*	
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	445	**0.181**	0.378	*	0.998	0.421	0.498	**0.174**	**0.159**	0.624	**0.117**	**0.162**	**0.233**	*	**0.256**	
Sink, Anchor, Drift Gillnet	all	all	MA	small	3	*	*	*	*	*	**0.000**	*	*	*	*	**0.000**	**0.000**	*	*	pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	large	4	1.216	*	*	*	*	*	*	0.868	*	1.118	1.083	*	*	*	pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	27	0.304	*	*	*	0.587	*	**0.273**	*	*	**0.115**	**0.129**	0.303	*	*	pilot for fish
Scallop Dredge	open	limited	NE	all	26	*	*	*	0.842	**0.159**	0.689	0.319	0.480	0.414	**0.236**	0.515	0.458	0.391	*	
Scallop Dredge	open	limited	MA	all	69	*	*	*	1.304	**0.200**	0.305	**0.174**	**0.242**	0.758	**0.126**	**0.230**	**0.259**	0.771	*	
Scallop Dredge	open	general	NE	all	9	*	*	*	*	**0.094**	1.274	0.560	0.358	**0.104**	**0.177**	0.318	**0.092**	1.287	*	pilot
Scallop Dredge	open	general	MA	all	22	*	*	*	*	0.359	0.865	**0.202**	0.311	0.482	**0.202**	0.550	0.461	0.830	*	
Scallop Dredge	closed	limited	NE	all	86	1.077	**0.168**	*	0.482	**0.135**	0.421	**0.222**	**0.159**	0.396	**0.126**	0.326	**0.291**	**0.198**	*	
Scallop Dredge	closed	limited	MA	all	35	1.208	0.660	*	0.357	**0.198**	0.310	**0.280**	0.712	**0.268**	**0.142**	0.425	0.383	0.321	*	
Scallop Dredge	closed	general	NE	all	0															pilot
Scallop Dredge	closed	general	MA	all	1	*	*	*	*	**0.000**	*	**0.000**	*	*	**0.000**	*	**0.000**	*	*	pilot
Mid-water paired & single Trawl	all	all	NE	all	66	0.770	0.770	*	*	1.464	0.429	0.724	0.669	0.994	1.177	0.418	0.628	*	*	
Mid-water paired & single Trawl	all	all	MA	all	13	0.539	0.982	*	*	*	0.545	1.048	0.708	0.539	*	**0.246**	1.165	*	*	
Fish Pots/ Traps	all	all	NE	all	0															pilot
Fish Pots/ Traps	all	all	MA	all	6	*	*	*	*	*	*	0.408	*	*	*	*	**0.161**	*	*	pilot
Purse Seine	all	all	NE	all	16	*	0.981	*	*	*	0.935	*	0.973	*	*	0.972	*	*	*	
Purse Seine	all	all	MA	all	0															pilot
Hand Line	all	all	NE	all	6	*	*	*	*	*	*	*	4.030	*	*	*	*	*	*	pilot
Hand Line	all	all	MA	all	0															pilot
Scottish Seine	all	all	NE	all	5	*	*	*	*	*	*	*	**0.289**	**0.279**	0.319	*	**0.253**	*	*	pilot
Clam Quahog Dredge	all	all	NE	all	0															pilot
Clam Quahog Dredge	all	all	MA	all	0															pilot
Crab Pots	all	all	NE	all	0															pilot
Crab Pots	all	all	MA	all	0															pilot
Lobster Pots	all	all	NE	all	0															pilot
Lobster Pots	all	all	MA	all	0															pilot

Table 46. The coefficient of variation (CV) of composite annual total discards, by fleet and species group (bold font indicates CV is less or equal to 30 percent) derived from 2004 NEFOP data; see Appendix B, Table B-1 for all species. Note, when bycatch ratio = 0, CV = null(*); blank = no observer coverage.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB PSPP TRIPS	TURTLES	SEALS	WHALES	DOLPHINS/-PORPOISE	SEA BIRDS (ALL)	ALL SPECIES	PILOT coverage
Longline	all	all	NE	all	119	*	*	*	*	0.425	0.489	
Longline	all	all	MA	all	2	*	*	*	*	*		pilot
Otter Trawl	all	all	NE	small	200	*	*	0.931	0.650	0.548	**0.193**	
Otter Trawl	all	all	NE	large	539	*	*	1.089	0.389	0.489	**0.124**	
Otter Trawl	all	all	MA	small	205	0.573	*	*	0.557	0.706	**0.247**	
Otter Trawl	all	all	MA	large	76	*	*	*	*	0.672	**0.185**	
Scallop Trawl	open	limited	MA	all	3	0.381	*	*	*	*	**0.000**	pilot
Scallop Trawl	open	general	MA	all	39	*	*	*	*	*	**0.243**	pilot
Shrimp Trawl	all	all	NE	all	12	*	*	*	*	*	0.310	
Shrimp Trawl	all	all	MA	all	2	*	*	*	*	*	**0.052**	pilot
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	*	*	*	*	*	**0.000**	pilot
Sink, Anchor, Drift Gillnet	all	all	NE	large	772	*	**0.206**	*	0.359	0.342	**0.092**	
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	569	*	**0.215**	*	**0.288**	0.602	**0.085**	
Sink, Anchor, Drift Gillnet	all	all	MA	small	358	0.626	*	*	*	0.582	**0.000**	pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	large	81	1.052	*	*	*	0.618	1.078	pilot for fish
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	142	0.495	0.692	*	0.924	0.693	**0.052**	pilot for fish
Scallop Dredge	open	limited	NE	all	36	0.551	*	*	*	0.896	**0.197**	
Scallop Dredge	open	limited	MA	all	78	0.770	*	*	*	*	**0.112**	
Scallop Dredge	open	general	NE	all	20	*	*	*	*	*	0.325	pilot
Scallop Dredge	open	general	MA	all	39	*	*	*	*	*	**0.184**	
Scallop Dredge	closed	limited	NE	all	86	**0.165**	*	*	*	**0.163**	**0.119**	
Scallop Dredge	closed	limited	MA	all	35	*	*	*	*	*	**0.119**	
Scallop Dredge	closed	general	NE	all	0							pilot
Scallop Dredge	closed	general	MA	all	1	*	*	*	*	*	**0.000**	pilot
Mid-water paired & single Trawl	all	all	NE	all	99	*	*	1.114	0.786	0.554	0.317	
Mid-water paired & single Trawl	all	all	MA	all	14	*	*	*	*	*	0.408	
Fish Pots/ Traps	all	all	NE	all	0							pilot
Fish Pots/ Traps	all	all	MA	all	8	*	*	*	*	*	**0.137**	pilot
Purse Seine	all	all	NE	all	26	*	*	*	*	*	0.715	
Purse Seine	all	all	MA	all	2	*	*	*	*	*		pilot
Hand Line	all	all	NE	all	9	*	*	*	*	*	4.030	pilot
Hand Line	all	all	MA	all	3	*	*	*	*	*		pilot
Scottish Seine	all	all	NE	all	8	*	*	*	*	*	0.423	pilot
Clam Quahog Dredge	all	all	NE	all	0							pilot
Clam Quahog Dredge	all	all	MA	all	0							pilot
Crab Pots	all	all	NE	all	0							pilot
Crab Pots	all	all	MA	all	0							pilot
Lobster Pots	all	all	NE	all	3	*	*	*	*	*		pilot
Lobster Pots	all	all	MA	all	0							pilot

Table 47. The coefficient of variation (CV) of composite annual total discard, by fleet and species group (bold font indicates CV is less or equal to 30%) derived from 2004 NEFOP data; see Appendix B, Table B-1 for all species. Note, when bycatch ratio = 0, CV = null (*); blank = no observer coverage.

Gear Type	Access Area (Open-Closed)	Trip Category (General/Limited)	Region	mesh groups	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH
Longline	all	all	NE	all	5	5	*	5	5	5	5	2	4	3	1	5	5	5
Longline	all	all	MA	all														
Otter Trawl	all	all	NE	small	9	8	*	10	12	1	7	6	3	2	4	5	13	11
Otter Trawl	all	all	NE	large	9	10	*	6	8	11	4	3	7	1	2	5	13	12
Otter Trawl	all	all	MA	small	8	11	*	12	9	2	7	6	5	1	3	4	10	13
Otter Trawl	all	all	MA	large	10	11	*	12	5	7	6	4	8	1	2	3	9	12
Scallop Trawl	open	limited	MA	all	7	7	*	7	1	6	4	3	7	2	7	5	7	7
Scallop Trawl	open	general	MA	all	10	11	*	9	2	8	4	5	7	1	3	6	11	11
Shrimp Trawl	all	all	NE	all	9	1	*	9	6	8	5	2	3	4	7	9	9	9
Shrimp Trawl	all	all	MA	all	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sink, Anchor, Drift Gillnet	all	all	NE	small	3	3	*	3	3	2	3	3	3	3	1	3	3	3
Sink, Anchor, Drift Gillnet	all	all	NE	large	5	8	*	10	11	7	4	2	6	3	1	9	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	6	11	*	12	10	7	3	4	8	2	1	5	13	9
Sink, Anchor, Drift Gillnet	all	all	MA	small	4	4	*	4	4	2	4	4	4	4	1	3	4	4
Sink, Anchor, Drift Gillnet	all	all	MA	large	2	5	*	5	5	5	5	4	5	3	1	5	5	5
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	4	7	*	7	6	7	3	7	7	2	1	5	7	7
Scallop Dredge	open	limited	NE	all	11	11	*	10	1	9	3	5	7	2	8	4	6	11
Scallop Dredge	open	limited	MA	all	11	11	*	10	1	9	3	5	8	2	6	4	7	11
Scallop Dredge	open	general	NE	all	10	10	*	10	3	9	1	4	7	2	5	6	8	10
Scallop Dredge	open	general	MA	all	10	10	*	10	2	9	3	4	8	1	7	5	6	10
Scallop Dredge	closed	limited	NE	all	10	12	*	11	1	8	3	4	6	2	7	5	9	13
Scallop Dredge	closed	limited	MA	all	10	9	*	12	1	8	3	6	7	2	5	4	11	13
Scallop Dredge	closed	general	NE	all														
Scallop Dredge	closed	general	MA	all	5	5	*	5	1	5	3	5	5	2	5	4	5	5
Mid-water paired & single Trawl	all	all	NE	all	6	3	*	11	10	1	8	4	5	7	2	9	11	11
Mid-water paired & single Trawl	all	all	MA	all	8	6	*	9	9	2	3	7	5	9	1	4	9	9
Fish Pots/ Traps	all	all	NE	all														
Fish Pots/ Traps	all	all	MA	all	3	3	*	3	3	3	2	3	3	3	3	1	3	3
Purse Seine	all	all	NE	all	5	2	*	5	5	4	5	3	5	5	1	5	5	5
Purse Seine	all	all	MA	all														
Hand Line	all	all	NE	all	2	2	*	2	2	2	2	1	2	2	2	2	2	2
Hand Line	all	all	MA	all														
Scottish Seine	all	all	NE	all	5	5	*	5	5	5	5	2	3	4	5	1	5	5
Clam Quahog Dredge	all	all	NE	all														
Clam Quahog Dredge	all	all	MA	all														
Crab Pots	all	all	NE	all														
Crab Pots	all	all	MA	all														
Lobster Pots	all	all	NE	all														
Lobster Pots	all	all	MA	all														

Table 48. Rank of total discard weight within fleet for fish species groups derived from 2004 NEFOP data; see Appendix B, Table B-2 **for all species. Note, "*" indicates no discards of these species occurred.**

Gear Type	Access Area (Open-Closed)	Trip Category (General/Limited)	Region	mesh groups	TURTLES	SEALS	WHALES	DOLPHINS/-PORPOISE	SEA BIRDS (ALL)
Longline	all	all	NE	all	2	2	2	2	1
Longline	all	all	MA	all	*	*	*	*	*
Otter Trawl	all	all	NE	small	4	4	3	1	2
Otter Trawl	all	all	NE	large	4	4	3	1	2
Otter Trawl	all	all	MA	small	2	4	4	1	3
Otter Trawl	all	all	MA	large	2	2	2	2	1
Scallop Trawl	open	limited	MA	all	1	2	2	2	2
Scallop Trawl	open	general	MA	all	*	*	*	*	*
Shrimp Trawl	all	all	NE	all	*	*	*	*	*
Shrimp Trawl	all	all	MA	all	*	*	*	*	*
Sink, Anchor, Drift Gillnet	all	all	NE	small	*	*	*	*	*
Sink, Anchor, Drift Gillnet	all	all	NE	large	4	2	4	3	1
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	4	1	4	2	3
Sink, Anchor, Drift Gillnet	all	all	MA	small	2	3	3	3	1
Sink, Anchor, Drift Gillnet	all	all	MA	large	1	3	3	3	2
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	1	3	5	2	3
Scallop Dredge	open	limited	NE	all	1	3	3	3	2
Scallop Dredge	open	limited	MA	all	1	2	2	2	2
Scallop Dredge	open	general	NE	all	*	*	*	*	*
Scallop Dredge	open	general	MA	all	*	*	*	*	*
Scallop Dredge	closed	limited	NE	all	2	3	3	3	1
Scallop Dredge	closed	limited	MA	all	*	*	*	*	*
Scallop Dredge	closed	general	NE	all					
Scallop Dredge	closed	general	MA	all	*	*	*	*	*
Mid-water paired & single Trawl	all	all	NE	all	4	4	3	2	1
Mid-water paired & single Trawl	all	all	MA	all	*	*	*	*	*
Fish Pots/ Traps	all	all	NE	all					
Fish Pots/ Traps	all	all	MA	all	*	*	*	*	*
Purse Seine	all	all	NE	all	*	*	*	*	*
Purse Seine	all	all	MA	all	*	*	*	*	*
Hand Line	all	all	NE	all	*	*	*	*	*
Hand Line	all	all	MA	all	*	*	*	*	*
Scottish Seine	all	all	NE	all	*	*	*	*	*
Clam Quahog Dredge	all	all	NE	all					
Clam Quahog Dredge	all	all	MA	all					
Crab Pots	all	all	NE	all					
Crab Pots	all	all	MA	all					
Lobster Pots	all	all	NE	all	*	*	*	*	*
Lobster Pots	all	all	MA	all					

Table 49. Rank of total number of incidental takes within fleet for protected species groups derived from 2004 NEFOP data; see Appendix B, Table B-2 for all species. Note, "*" indicates no discards of these species occurred.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH	
Longline	all	all	NE	all	14	13	*	11	19	21	21	6	16	17	10	22	11	5	
Longline	all	all	MA	all															
Otter Trawl	all	all	NE	small	2	2	*	2	13	1	4	2	1	3	4	1	8	1	
Otter Trawl	all	all	NE	large	4	5	*	1	11	6	3	1	3	1	3	5	6	2	
Otter Trawl	all	all	MA	small	3	7	*	6	10	3	11	10	2	6	7	3	5	4	
Otter Trawl	all	all	MA	large	8	9	*	11	7	4	10	4	9	5	5	4	3	5	
Scallop Trawl	open	limited	MA	all	14	13	*	11	3	13	13	5	19	8	23	12	11	5	
Scallop Trawl	open	general	MA	all	11	13	*	3	8	15	14	18	13	10	13	17	11	5	
Shrimp Trawl	all	all	NE	all	14	3	*	11	16	20	19	12	5	18	22	22	11	5	
Shrimp Trawl	all	all	MA	all	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Sink, Anchor, Drift Gillnet	all	all	NE	small	14	13	*	11	19	12	21	23	19	22	20	22	11	5	
Sink, Anchor, Drift Gillnet	all	all	NE	large	7	6	*	4	17	11	15	3	10	15	2	18	11	5	
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	5	8	*	5	15	9	5	7	11	11	8	10	11	3	
Sink, Anchor, Drift Gillnet	all	all	MA	small	14	13	*	11	19	5	21	23	19	22	6	14	11	5	
Sink, Anchor, Drift Gillnet	all	all	MA	large	1	13	*	11	19	21	21	15	19	16	1	22	11	5	
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	6	13	*	11	14	21	12	23	19	14	12	16	11	5	
Scallop Dredge	open	limited	NE	all	14	13	*	7	2	7	1	8	4	2	16	6	1	5	
Scallop Dredge	open	limited	MA	all	14	13	*	8	1	10	2	11	7	4	14	7	2	5	
Scallop Dredge	open	general	NE	all	14	13	*	11	9	19	6	16	12	13	19	15	7	5	
Scallop Dredge	open	general	MA	all	14	13	*	11	6	18	9	14	15	7	21	11	4	5	
Scallop Dredge	closed	limited	NE	all	10	12	*	9	4	14	7	9	8	9	17	8	9	5	
Scallop Dredge	closed	limited	MA	all	13	11	*	10	5	16	8	19	17	12	18	9	10	5	
Scallop Dredge	closed	general	NE	all															
Scallop Dredge	closed	general	MA	all	14	13	*	11	12	21	16	23	19	19	23	19	11	5	
Mid-water paired & single Trawl	all	all	NE	all	9	1	*	11	18	2	17	13	6	20	9	21	11	5	
Mid-water paired & single Trawl	all	all	MA	all	12	10	*	11	19	8	18	22	18	22	15	20	11	5	
Fish Pots/ Traps	all	all	NE	all															
Fish Pots/ Traps	all	all	MA	all	14	13	*	11	19	21	20	23	19	22	23	2	11	5	
Purse Seine	all	all	NE	all	14	4	*	11	19	17	21	21	19	22	11	22	11	5	
Purse Seine	all	all	MA	all															
Hand Line	all	all	NE	all	14	13	*	11	19	21	21	17	19	22	23	22	11	5	
Hand Line	all	all	MA	all															
Scottish Seine	all	all	NE	all	14	13	*	11	19	21	21	20	14	21	23	13	11	5	
Clam Quahog Dredge	all	all	NE	all															
Clam Quahog Dredge	all	all	MA	all															
Crab Pots	all	all	NE	all															
Crab Pots	all	all	MA	all															
Lobster Pots	all	all	NE	all															
Lobster Pots	all	all	MA	all															

Table 50. Rank of total discard weight within species group for fish species groups derived from 2004 NEFOP data; see Appendix B, Table B-3 for all species. Note, "*" indicates no discards of these species occurred.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	TURTLES	SEALS	WHALES	DOLPHINS/-PORPOISE	SEA BIRDS (ALL)
Longline	all	all	NE	all	9	4	4	8	12
Longline	all	all	MA	all	*	*	*	*	*
Otter Trawl	all	all	NE	small	9	4	1	3	6
Otter Trawl	all	all	NE	large	9	4	2	2	5
Otter Trawl	all	all	MA	small	6	4	4	4	11
Otter Trawl	all	all	MA	large	9	4	4	8	3
Scallop Trawl	open	limited	MA	all	1	4	4	8	14
Scallop Trawl	open	general	MA	all	*	*	*	*	*
Shrimp Trawl	all	all	NE	all	*	*	*	*	*
Shrimp Trawl	all	all	MA	all	*	*	*	*	*
Sink, Anchor, Drift Gillnet	all	all	NE	small	*	*	*	*	*
Sink, Anchor, Drift Gillnet	all	all	NE	large	9	2	4	5	1
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	9	1	4	1	9
Sink, Anchor, Drift Gillnet	all	all	MA	small	7	4	4	8	8
Sink, Anchor, Drift Gillnet	all	all	MA	large	5	4	4	8	7
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	3	3	4	6	10
Scallop Dredge	open	limited	NE	all	2	4	4	8	4
Scallop Dredge	open	limited	MA	all	4	4	4	8	14
Scallop Dredge	open	general	NE	all	*	*	*	*	*
Scallop Dredge	open	general	MA	all	*	*	*	*	*
Scallop Dredge	closed	limited	NE	all	8	4	4	8	13
Scallop Dredge	closed	limited	MA	all	*	*	*	*	*
Scallop Dredge	closed	general	NE	all					
Scallop Dredge	closed	general	MA	all	*	*	*	*	*
Mid-water paired & single Trawl	all	all	NE	all	9	4	3	7	2
Mid-water paired & single Trawl	all	all	MA	all	*	*	*	*	*
Fish Pots/ Traps	all	all	NE	all					
Fish Pots/ Traps	all	all	MA	all	*	*	*	*	*
Purse Seine	all	all	NE	all	*	*	*	*	*
Purse Seine	all	all	MA	all	*	*	*	*	*
Hand Line	all	all	NE	all	*	*	*	*	*
Hand Line	all	all	MA	all	*	*	*	*	*
Scottish Seine	all	all	NE	all	*	*	*	*	*
Clam Quahog Dredge	all	all	NE	all					
Clam Quahog Dredge	all	all	MA	all					
Crab Pots	all	all	NE	all					
Crab Pots	all	all	MA	all					
Lobster Pots	all	all	NE	all	*	*	*	*	*
Lobster Pots	all	all	MA	all					

Table 51. Rank of total number of incidental takes within species group for protected species groups derived from 2004 NEFOP data; see Appendix B, Table B-3 for all species. Note, "*" indicates no discards of these species occurred.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB FISH sea days	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH
Longline	all	all	NE	all	12	35	35	35	35	35	35	35	27	185	89	99	35	35	35
Longline	all	all	MA	all	0	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Otter Trawl	all	all	NE	small	449	1103	882	211	848	1998	249	757	266	269	2024	492	455	3822	441
Otter Trawl	all	all	NE	large	1076	26644	12864	730	798	1233	3159	81	107	341	316	614	1034	15593	2692
Otter Trawl	all	all	MA	small	471	2231	1869	196	5417	1162	1125	497	429	944	202	532	584	836	3057
Otter Trawl	all	all	MA	large	183	3625	883	342	342	311	242	140	101	998	70	481	98	584	342
Scallop Trawl	open	limited	MA	all	11	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Scallop Trawl	open	general	MA	all	56	155	51	51	399	119	181	115	85	292	80	443	408	51	51
Shrimp Trawl	all	all	NE	all	12	42	92	42	42	353	364	22	20	123	247	349	42	42	42
Shrimp Trawl	all	all	MA	all	2	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	large	657	443	486	141	2592	4357	3758	408	83	313	482	109	3767	141	141
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	533	267	1004	144	3266	1255	1701	238	206	2059	109	214	417	144	502
Sink, Anchor, Drift Gillnet	all	all	MA	small	3	62	62	62	62	62	62	62	62	62	62	62	62	62	62
Sink, Anchor, Drift Gillnet	all	all	MA	large	4	105	29	29	29	29	29	29	19	29	99	96	29	29	29
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	30	131	68	68	68	301	68	104	68	68	55	58	120	68	68
Scallop Dredge	open	limited	NE	all	344	269	269	269	1596	80	1380	320	708	534	177	807	649	478	269
Scallop Dredge	open	limited	MA	all	591	329	329	329	8713	280	641	213	411	3080	114	371	465	2958	329
Scallop Dredge	open	general	NE	all	11	92	92	92	92	204	176	117	82	135	120	120	92	190	92
Scallop Dredge	open	general	MA	all	33	96	96	96	96	54	293	17	40	96	17	124	88	271	96
Scallop Dredge	closed	limited	NE	all	805	3861	344	139	1473	167	1301	429	227	1180	145	857	703	375	139
Scallop Dredge	closed	limited	MA	all	373	1777	772	108	341	157	337	283	1136	287	88	567	481	334	108
Scallop Dredge	closed	general	NE	all	0	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Scallop Dredge	closed	general	MA	all	2	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Mid-water paired & single Trawl	all	all	NE	all	165	699	747	56	56	1793	346	718	688	1218	1034	316	697	56	56
Mid-water paired & single Trawl	all	all	MA	all	39	182	453	35	35	35	167	492	281	182	35	43	557	35	35
Fish Pots/ Traps	all	all	NE	all	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Fish Pots/ Traps	all	all	MA	all	6	40	40	40	40	40	40	103	40	40	40	40	40	40	40
Purse Seine	all	all	NE	all	33	19	219	19	19	19	206	19	217	19	19	217	19	19	19
Purse Seine	all	all	MA	all	0	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Hand Line	all	all	NE	all	6	72	72	72	72	72	72	72	137	72	72	72	72	72	72
Hand Line	all	all	MA	all	0	133	133	133	133	133	133	133	133	133	133	133	133	133	133
Scottish Seine	all	all	NE	all	5	12	12	12	12	12	12	12	14	12	12	12	30	12	12
Clam Quahog Dredge	all	all	NE	all	0	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Clam Quahog Dredge	all	all	MA	all	0	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Crab Pots	all	all	NE	all	0	101	101	101	101	101	101	101	101	101	101	101	101	101	101
Crab Pots	all	all	MA	all	0	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Lobster Pots	all	all	NE	all	0	439	439	439	439	439	439	439	439	439	439	439	439	439	439
Lobster Pots	all	all	MA	all	0	89	89	89	89	89	89	89	89	89	89	89	89	89	89
Total Sea Days					5,913	43,547	23,025	4,573	27,698	15,384	17,200	6,541	6,712	13,792	6,965	8,351	12,200	27,502	9,984
Total Sea Days excluding shaded cells						35,867	19,828	0	5,547	6,049	15,522	5,528	6,450	12,562	4,901	6,943	9,850	133	6,703

Table 52. Number of sea days needed to achieve a 30 percent CV based on the composite annual total discards and the 2004 observed sea days for fish species, by fishing mode and species group; see Appendix B, Table B-4 for all species.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB PSPP sea days	TURTLES	SEALS	WHALES	DOLPHINS/-PORPOISE	SEA BIRDS (ALL)	ALL SPECIES
Longline	all	all	NE	all	133	35	35	35	35	267	57
Longline	all	all	MA	all	11	76	76	76	76	76	76
Otter Trawl	all	all	NE	small	577	211	211	3082	2265	1870	183
Otter Trawl	all	all	NE	large	1947	730	730	10526	2111	3237	159
Otter Trawl	all	all	MA	small	499	1229	196	196	1164	1880	250
Otter Trawl	all	all	MA	large	186	342	342	342	342	727	55
Scallop Trawl	open	limited	MA	all	22	95	95	95	95	95	95
Scallop Trawl	open	general	MA	all	71	51	51	51	51	51	38
Shrimp Trawl	all	all	NE	all	12	42	42	42	42	42	39
Shrimp Trawl	all	all	MA	all	2	76	76	76	76	76	55
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	12	12	12	12	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	large	876	141	531	141	1398	1306	82
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	701	144	470	144	806	2661	59
Sink, Anchor, Drift Gillnet	all	all	MA	small	375	1259	62	62	62	880	62
Sink, Anchor, Drift Gillnet	all	all	MA	large	85	653	29	29	29	311	95
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	152	468	804	68	1272	806	51
Scallop Dredge	open	limited	NE	all	457	1261	269	269	269	3194	123
Scallop Dredge	open	limited	MA	all	675	3956	329	329	329	329	89
Scallop Dredge	open	general	NE	all	24	92	92	92	92	92	88
Scallop Dredge	open	general	MA	all	55	96	96	96	96	96	14
Scallop Dredge	closed	limited	NE	all	805	414	139	139	139	407	130
Scallop Dredge	closed	limited	MA	all	373	108	108	108	108	108	61
Scallop Dredge	closed	general	NE	all	0	24	24	24	24	24	24
Scallop Dredge	closed	general	MA	all	2	21	21	21	21	21	21
Mid-water paired & single Trawl	all	all	NE	all	242	56	56	1606	1464	808	193
Mid-water paired & single Trawl	all	all	MA	all	42	35	35	35	35	35	111
Fish Pots/ Traps	all	all	NE	all	0	20	20	20	20	20	20
Fish Pots/ Traps	all	all	MA	all	9	40	40	40	40	40	37
Purse Seine	all	all	NE	all	53	19	19	19	19	19	143
Purse Seine	all	all	MA	all	2	9	9	9	9	9	9
Hand Line	all	all	NE	all	18	72	72	72	72	72	137
Hand Line	all	all	MA	all	11	133	133	133	133	133	133
Scottish Seine	all	all	NE	all	8	12	12	12	12	12	20
Clam Quahog Dredge	all	all	NE	all	0	50	50	50	50	50	50
Clam Quahog Dredge	all	all	MA	all	0	84	84	84	84	84	84
Crab Pots	all	all	NE	all	0	101	101	101	101	101	101
Crab Pots	all	all	MA	all	0	28	28	28	28	28	28
Lobster Pots	all	all	NE	all	3	439	439	439	439	439	439
Lobster Pots	all	all	MA	all	0	89	89	89	89	89	89
Total Sea Days					8,429	12,721	6,025	18,791	13,507	20,503	3,513
Total Sea Days excluding shaded cells						12,721	4,742	17,714	13,507	20,503	3,513

Table 53. Number of sea days needed to achieve a 30 percent CV based on the composite annual total discards and the 2004 observed sea days for protected species, by fishing mode and species group; see Appendix B, Table B-4 for all species.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB FISH TRIPS	BLUEFISH	HERRING	SALMON	RED CRAB	SCALLOP	MACK-/SQUID-/BUTTERFISH	MONKFISH	NE MULTI-SPP (LARGE-MESH)	NE MULTI-SPP (SMALL-MESH)	SKATE	DOGFISH	FLUKE/-SCUP/-BLK SEA BASS	SURF CLAM/-OCEAN QUAHOG	TILEFISH
Longline	all	all	NE	all	12	26	26	26	26	26	26	26	21	144	69	78	26	26	26
Longline	all	all	MA	all	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Otter Trawl	all	all	NE	small	142	364	291	70	280	659	82	250	88	89	668	162	150	1260	146
Otter Trawl	all	all	NE	large	386	11227	5420	304	336	520	1331	34	45	143	133	259	436	6570	1134
Otter Trawl	all	all	MA	small	194	1189	995	104	2885	619	599	265	229	503	108	283	311	445	1628
Otter Trawl	all	all	MA	large	75	1879	458	177	177	161	125	72	52	517	36	249	51	303	177
Scallop Trawl	open	limited	MA	all	1	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Scallop Trawl	open	general	MA	all	31	72	25	25	196	56	85	54	41	142	39	216	200	25	25
Shrimp Trawl	all	all	NE	all	12	42	91	42	42	350	361	22	20	122	245	346	42	42	42
Shrimp Trawl	all	all	MA	all	2	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	large	577	327	359	104	1913	3216	2774	301	61	231	356	81	2780	104	104
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	445	175	657	94	2139	822	1114	156	135	1348	71	140	273	94	329
Sink, Anchor, Drift Gillnet	all	all	MA	small	3	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Sink, Anchor, Drift Gillnet	all	all	MA	large	4	100	27	27	27	27	27	27	17	27	95	91	27	27	27
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	27	94	51	51	51	211	51	76	51	51	42	44	87	51	51
Scallop Dredge	open	limited	NE	all	26	25	25	25	146	7	126	29	65	49	16	74	59	44	25
Scallop Dredge	open	limited	MA	all	69	36	36	36	966	31	71	24	46	342	13	41	52	328	36
Scallop Dredge	open	general	NE	all	9	71	71	71	71	149	130	89	64	102	91	91	71	140	71
Scallop Dredge	open	general	MA	all	22	69	69	69	69	39	210	12	29	69	12	89	63	194	69
Scallop Dredge	closed	limited	NE	all	86	449	40	15	171	19	151	50	26	137	17	100	82	44	15
Scallop Dredge	closed	limited	MA	all	35	194	84	12	37	17	37	31	124	31	10	62	53	37	12
Scallop Dredge	closed	general	NE	all	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Scallop Dredge	closed	general	MA	all	1	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mid-water paired & single Trawl	all	all	NE	all	66	266	285	21	21	683	132	274	262	464	394	121	266	21	21
Mid-water paired & single Trawl	all	all	MA	all	13	52	130	12	12	12	48	141	81	52	12	12	160	12	12
Fish Pots/ Traps	all	all	NE	all	0	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Fish Pots/ Traps	all	all	MA	all	6	37	37	37	37	37	37	97	37	37	37	37	37	37	37
Purse Seine	all	all	NE	all	16	10	108	10	10	10	102	10	107	10	10	107	10	10	10
Purse Seine	all	all	MA	all	0	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Hand Line	all	all	NE	all	6	68	68	68	68	68	68	68	129	68	68	68	68	68	68
Hand Line	all	all	MA	all	0	126	126	126	126	126	126	126	126	126	126	126	126	126	126
Scottish Seine	all	all	NE	all	5	12	12	12	12	12	12	12	14	12	12	12	30	12	12
Clam Quahog Dredge	all	all	NE	all	0	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Clam Quahog Dredge	all	all	MA	all	0	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Crab Pots	all	all	NE	all	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Crab Pots	all	all	MA	all	0	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Lobster Pots	all	all	NE	all	0	353	353	353	353	353	353	353	353	353	353	353	353	353	353
Lobster Pots	all	all	MA	all	0	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Total Trips					2,272	17,678	10,260	2,306	10,588	8,647	8,594	3,015	2,641	5,584	3,447	3,658	6,227	10,788	4,971
Total Trips excluding shaded cells						15,925	9,034	0	1,539	2,468	7,333	2,219	2,464	4,637	2,243	2,511	4,981	139	3,180

Table 54. Number of trips needed to achieve a 30 percent CV based on composite annual total discards and the 2004 observed trips of fish species, by fishing mode and species group; see Appendix B, Table B-5 for all species.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB PSPP TRIPS	TURTLES	SEALS	WHALES	DOLPHINS/ PORPOISE	SEA BIRDS (ALL)	ALL SPECIES
Longline	all	all	NE	all	119	26	26	26	26	208	44
Longline	all	all	MA	all	2	12	12	12	12	12	12
Otter Trawl	all	all	NE	small	200	70	70	1016	747	617	60
Otter Trawl	all	all	NE	large	539	304	304	4435	890	1364	67
Otter Trawl	all	all	MA	small	205	654	104	104	620	1001	133
Otter Trawl	all	all	MA	large	76	177	177	177	177	377	29
Scallop Trawl	open	limited	MA	all	3	12	12	12	12	12	12
Scallop Trawl	open	general	MA	all	39	25	25	25	25	25	18
Shrimp Trawl	all	all	NE	all	12	42	42	42	42	42	38
Shrimp Trawl	all	all	MA	all	2	13	13	13	13	13	9
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	12	12	12	12	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	large	772	104	392	104	1032	964	61
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	569	94	308	94	528	1742	38
Sink, Anchor, Drift Gillnet	all	all	MA	small	358	1195	58	58	58	835	58
Sink, Anchor, Drift Gillnet	all	all	MA	large	81	604	27	27	27	288	91
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	142	351	604	51	955	605	39
Scallop Dredge	open	limited	NE	all	36	115	25	25	25	292	11
Scallop Dredge	open	limited	MA	all	78	439	36	36	36	36	10
Scallop Dredge	open	general	NE	all	20	71	71	71	71	71	69
Scallop Dredge	open	general	MA	all	39	69	69	69	69	69	10
Scallop Dredge	closed	limited	NE	all	86	48	15	15	15	47	15
Scallop Dredge	closed	limited	MA	all	35	12	12	12	12	12	7
Scallop Dredge	closed	general	NE	all	0	12	12	12	12	12	12
Scallop Dredge	closed	general	MA	all	1	15	15	15	15	15	15
Mid-water paired & single Trawl	all	all	NE	all	99	21	21	612	558	308	73
Mid-water paired & single Trawl	all	all	MA	all	14	12	12	12	12	12	32
Fish Pots/ Traps	all	all	NE	all	0	19	19	19	19	19	19
Fish Pots/ Traps	all	all	MA	all	8	37	37	37	37	37	34
Purse Seine	all	all	NE	all	26	10	10	10	10	10	71
Purse Seine	all	all	MA	all	2	9	9	9	9	9	9
Hand Line	all	all	NE	all	9	68	68	68	68	68	129
Hand Line	all	all	MA	all	3	126	126	126	126	126	126
Scottish Seine	all	all	NE	all	8	12	12	12	12	12	20
Clam Quahog Dredge	all	all	NE	all	0	69	69	69	69	69	69
Clam Quahog Dredge	all	all	MA	all	0	69	69	69	69	69	69
Crab Pots	all	all	NE	all	0	12	12	12	12	12	12
Crab Pots	all	all	MA	all	0	27	27	27	27	27	27
Lobster Pots	all	all	NE	all	3	353	353	353	353	353	353
Lobster Pots	all	all	MA	all	0	75	75	75	75	75	75
Total Trips					3,587	5,397	3,360	7,975	6,887	9,877	1,992
Total Trips excluding shaded cells						5,397	3,023	7,720	6,887	9,877	1,992

Table 55. Number of fishing trips needed to achieve a 30 percent CV based on composite annual total discards and the 2004 observed trips for protected species, by fishing mode and species group; see Appendix B, Table B-5 for all species.

Gear Type	Access Area (Open-Closed)	Trip Category (General/Limited)	Region	mesh groups	2004 OB FISH sea days	2004 OB PSPP sea days	BASELINE: Sea days needed for 20 species groups by fleet	BASELINE: Sea days needed for 15 species groups by fleet	FILTER APPLIED: Sea days needed for 20 species groups by fleet	FILTER APPLIED: Sea days needed for 15 species groups by fleet
Longline	all	all	NE	all	12	133	267	185	267	185
Longline	all	all	MA	all	0	11	76	76	76	76
Otter Trawl	all	all	NE	small	449	577	3822	3822	3082	2024
Otter Trawl	all	all	NE	large	1076	1947	26644	26644	26644	26644
Otter Trawl	all	all	MA	small	471	499	5417	5417	3057	3057
Otter Trawl	all	all	MA	large	183	186	3625	3625	3625	3625
Scallop Trawl	open	limited	MA	all	11	22	95	95	95	95
Scallop Trawl	open	general	MA	all	56	71	443	443	443	443
Shrimp Trawl	all	all	NE	all	12	12	364	364	364	364
Shrimp Trawl	all	all	MA	all	2	2	76	76	76	76
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	1	12	12	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	large	657	876	4357	4357	3767	3767
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	533	701	3266	3266	2661	2059
Sink, Anchor, Drift Gillnet	all	all	MA	small	3	375	1259	1259	1259	1259
Sink, Anchor, Drift Gillnet	all	all	MA	large	4	85	653	653	653	653
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	30	152	1272	468	1272	468
Scallop Dredge	open	limited	NE	all	344	457	3194	1596	3194	1596
Scallop Dredge	open	limited	MA	all	591	675	8713	8713	3956	3956
Scallop Dredge	open	general	NE	all	11	24	204	204	204	204
Scallop Dredge	open	general	MA	all	33	55	293	293	124	124
Scallop Dredge	closed	limited	NE	all	805	805	3861	3861	1473	1473
Scallop Dredge	closed	limited	MA	all	373	373	1777	1777	1136	1136
Scallop Dredge	closed	general	NE	all	0	0	24	24	24	24
Scallop Dredge	closed	general	MA	all	2	2	21	21	21	21
Mid-water paired & single Trawl	all	all	NE	all	165	242	1793	1793	1606	1218
Mid-water paired & single Trawl	all	all	MA	all	39	42	557	557	492	492
Fish Pots/ Traps	all	all	NE	all	0	0	20	20	20	20
Fish Pots/ Traps	all	all	MA	all	6	9	103	103	40	40
Purse Seine	all	all	NE	all	33	53	219	219	219	219
Purse Seine	all	all	MA	all	0	2	9	9	9	9
Hand Line	all	all	NE	all	6	18	137	137	137	137
Hand Line	all	all	MA	all	0	11	133	133	133	133
Scottish Seine	all	all	NE	all	5	8	30	30	30	30
Clam Quahog Dredge	all	all	NE	all	0	0	50	50	50	50
Clam Quahog Dredge	all	all	MA	all	0	0	84	84	84	84
Crab Pots	all	all	NE	all	0	0	101	101	101	101
Crab Pots	all	all	MA	all	0	0	28	28	28	28
Lobster Pots	all	all	NE	all	0	3	439	439	439	439
Lobster Pots	all	all	MA	all	0	0	89	89	89	89
Total Sea Days					5,913	8,429	73,524	71,041	60,959	56,427

Table 56. The maximum number of sea days (baseline and filtered) needed to achieve a 30 percent CV based on the composite annual total discards for any of the species groups (20 species groups) and for any of the fish and turtle species groups (15 species groups), by fishing mode. Filtered values exclude gray-shaded cells within a fishing mode. The 2004 observed sea days for fish species and protected species are presented for comparison.

Gear Type	Access Area (Open-Closed)	Trip Category (General/ Limited)	Region	mesh groups	2004 OB FISH TRIPS	2004 OB PSPP TRIPS	BASELINE: Trips needed for 20 species groups by fleet	BASELINE: Trips needed for 15 species groups by fleet	FILTER APPLIED: Trips needed for 20 species groups by fleet	FILTER APPLIED: Trips needed for 15 species groups by fleet
Longline	all	all	NE	all	12	119	208	144	208	144
Longline	all	all	MA	all	0	2	12	12	12	12
Otter Trawl	all	all	NE	small	142	200	1260	1260	1016	668
Otter Trawl	all	all	NE	large	386	539	11227	11227	11227	11227
Otter Trawl	all	all	MA	small	194	205	2885	2885	1628	1628
Otter Trawl	all	all	MA	large	75	76	1879	1879	1879	1879
Scallop Trawl	open	limited	MA	all	1	3	12	12	12	12
Scallop Trawl	open	general	MA	all	31	39	216	216	216	216
Shrimp Trawl	all	all	NE	all	12	12	361	361	361	361
Shrimp Trawl	all	all	MA	all	2	2	13	13	13	13
Sink, Anchor, Drift Gillnet	all	all	NE	small	1	1	12	12	12	12
Sink, Anchor, Drift Gillnet	all	all	NE	large	577	772	3216	3216	2780	2780
Sink, Anchor, Drift Gillnet	all	all	NE	xlg	445	569	2139	2139	1742	1348
Sink, Anchor, Drift Gillnet	all	all	MA	small	3	358	1195	1195	1195	1195
Sink, Anchor, Drift Gillnet	all	all	MA	large	4	81	604	604	604	604
Sink, Anchor, Drift Gillnet	all	all	MA	xlg	27	142	955	351	955	351
Scallop Dredge	open	limited	NE	all	26	36	292	146	292	146
Scallop Dredge	open	limited	MA	all	69	78	966	966	439	439
Scallop Dredge	open	general	NE	all	9	20	149	149	149	149
Scallop Dredge	open	general	MA	all	22	39	210	210	89	89
Scallop Dredge	closed	limited	NE	all	86	86	449	449	171	171
Scallop Dredge	closed	limited	MA	all	35	35	194	194	124	124
Scallop Dredge	closed	general	NE	all	0	0	12	12	12	12
Scallop Dredge	closed	general	MA	all	1	1	15	15	15	15
Mid-water paired & single Trawl	all	all	NE	all	66	99	683	683	612	464
Mid-water paired & single Trawl	all	all	MA	all	13	14	160	160	141	141
Fish Pots/ Traps	all	all	NE	all	0	0	19	19	19	19
Fish Pots/ Traps	all	all	MA	all	6	8	97	97	37	37
Purse Seine	all	all	NE	all	16	26	108	108	108	108
Purse Seine	all	all	MA	all	0	2	9	9	9	9
Hand Line	all	all	NE	all	6	9	129	129	129	129
Hand Line	all	all	MA	all	0	3	126	126	126	126
Scottish Seine	all	all	NE	all	5	8	30	30	30	30
Clam Quahog Dredge	all	all	NE	all	0	0	69	69	69	69
Clam Quahog Dredge	all	all	MA	all	0	0	69	69	69	69
Crab Pots	all	all	NE	all	0	0	12	12	12	12
Crab Pots	all	all	MA	all	0	0	27	27	27	27
Lobster Pots	all	all	NE	all	0	3	353	353	353	353
Lobster Pots	all	all	MA	all	0	0	75	75	75	75
Total Trips					2,272	3,587	30,450	29,636	26,971	25,266

Table 57. The maximum number of trips (baseline and filtered) needed to achieve a 30 percent CV based on composite annual total discards for any of the species groups (20 species groups) and for any of the fish and turtle species groups (15 species groups). Filtered values exclude gray-shaded cells within a fishing mode. The 2004 observed sea days for fish species and protected species are presented for comparison.

Species	VTR - OB Avg Kept	N	SE	t-value	Pr >|t|		VTR-OB SD Kept	N	SE	t-value	Pr >|t|
Bluefish	192.04	89	127.171	1.51	0.135		324.19	79	157.262	2.06	**0.043**
Dogfish	-15.70	89	17.962	-0.87	0.385		30.65	79	14.318	2.14	**0.035**
Fluke-Scup-Blk Sea Bass	-51.04	89	54.436	-0.94	0.351		157.76	79	76.790	2.05	**0.043**
NE Multi-species Large mesh	-357.86	89	134.004	-2.67	**0.009**		-476.10	79	220.113	-2.16	**0.034**
NE Multi-species Small mesh	157.08	89	64.444	2.44	**0.017**		508.04	79	153.252	3.32	**0.001**
Herring	-2317.45	89	1722.540	-1.35	0.182		-629.71	79	1485.460	-0.42	0.673
Monkfish	-152.02	89	79.585	-1.91	0.059		-231.12	79	167.885	-1.38	0.173
Red crab	0.00	89	0.006	0.31	0.754		0.08	79	0.093	0.86	0.395
Mackerel-Squid-Butterfish	-11705.74	89	8118.610	-1.44	0.153		860.00	79	4483.930	0.19	0.848
Scallop	-608.13	89	1730.680	-0.35	0.726		5098.35	79	1631.770	3.12	**0.003**
Surf Clam/Ocean Quahog	0.00	89	0.007	-0.73	0.466		0.00	79	0.060	-0.02	0.986
Skate Complex	-47.31	89	33.559	-1.41	0.162		26.24	79	82.646	0.32	0.752
Tilefish	97.62	89	89.291	1.09	0.277		90.44	79	57.857	1.56	0.122
All species	-16787.50	89	8372.200	-2.01	**0.048**		1864.35	79	4740.290	0.39	0.695

VTR - OB Avg Trip Duration	N	SE	t-value	Pr >|t|		VTR-OB SD Trip Duration	N	SE	t-value	Pr >|t|
-0.2133396	89.000	0.15309	-1.390	0.167		0.2989122	79.000	0.094976	3.150	**0.002**

Table 58. Summary of statistical comparisons of differences in average kept pounds, standard error of average kept pounds (SE), average trip duration, and standard deviation of average trip duration between 2004 FVTR and observer (OB) trips.

Quarter	Gear	Acces Area	Region	Mesh	Trip Duration	df	Chi Sqr Test Statistic	Chi Sqr Crit Value	Signif Level
4	Longline	N/A	MA	all	all	3	0.215	7.815	0.9751
1	Longline	N/A	NE	all	all	7	2.844	14.067	0.8991
2	Longline	N/A	NE	all	all	4	2.500	9.488	0.6446
3	Longline	N/A	NE	all	all	10	5.291	18.307	0.8709
4	Longline	N/A	NE	all	all	10	40.599	18.307	0.0000
2	Handline	N/A	MA	all	all	18	92.581	28.869	0.0000
3	Handline	N/A	NE	all	all	21	5.024	32.671	0.9999
4	Handline	N/A	NE	all	all	13	2.267	22.362	0.9995
1	Otter Trawl	N/A	MA	lg	all	25	44.504	37.652	0.0095
1	Otter Trawl	N/A	MA	sm	all	19	63.025	30.144	0.0000
2	Otter Trawl	N/A	MA	lg	all	20	37.788	31.410	0.0094
2	Otter Trawl	N/A	MA	sm	all	22	228.933	33.924	0.0000
3	Otter Trawl	N/A	MA	lg	all	17	120.121	27.587	0.0000
3	Otter Trawl	N/A	MA	sm	all	22	271.477	33.924	0.0000
4	Otter Trawl	N/A	MA	lg	all	21	16.469	32.671	0.7427
4	Otter Trawl	N/A	MA	sm	all	19	88.007	30.144	0.0000
1	Otter Trawl	N/A	NE	lg	all	23	242.863	35.172	0.0000
1	Otter Trawl	N/A	NE	sm	all	24	181.785	36.415	0.0000
2	Otter Trawl	N/A	NE	lg	all	24	155.561	36.415	0.0000
2	Otter Trawl	N/A	NE	sm	all	25	133.612	37.652	0.0000
3	Otter Trawl	N/A	NE	lg	all	23	302.233	35.172	0.0000
3	Otter Trawl	N/A	NE	sm	all	26	42.856	38.885	0.0200
4	Otter Trawl	N/A	NE	lg	all	26	250.108	38.885	0.0000
4	Otter Trawl	N/A	NE	sm	all	26	152.285	38.885	0.0000
2	Scallop Trawl	OPEN	MA	all	GEN	11	310.000	19.675	0.0000
3	Scallop Trawl	OPEN	MA	all	GEN	10	4.431	18.307	0.9258
4	Scallop Trawl	OPEN	MA	all	GEN	10	120.884	18.307	0.0000
1	Shrimp Trawl	N/A	NE	all	all	7	33.307	14.067	0.0000
1	Gillnets	N/A	MA	lg	all	6	2.278	12.592	0.8925
1	Gillnets	N/A	MA	sm	all	12	10.915	21.026	0.5362
1	Gillnets	N/A	MA	xlg	all	12	76.243	21.026	0.0000
2	Gillnets	N/A	MA	lg	all	12	45.891	21.026	0.0000
2	Gillnets	N/A	MA	sm	all	13	358.693	22.362	0.0000
2	Gillnets	N/A	MA	xlg	all	16	36.796	26.296	0.0022
3	Gillnets	N/A	MA	lg	all	8	46.832	15.507	0.0000
3	Gillnets	N/A	MA	sm	all	16	55.543	26.296	0.0000
3	Gillnets	N/A	MA	xlg	all	9	4.674	16.919	0.8617
4	Gillnets	N/A	MA	lg	all	16	37.909	26.296	0.0016
4	Gillnets	N/A	MA	sm	all	14	28.583	23.685	0.0119
4	Gillnets	N/A	MA	xlg	all	12	8.187	21.026	0.7704
1	Gillnets	N/A	NE	lg	all	9	9.442	16.919	0.3975
1	Gillnets	N/A	NE	xlg	all	11	14.015	19.675	0.2322
2	Gillnets	N/A	NE	lg	all	13	85.201	22.362	0.0000
2	Gillnets	N/A	NE	xlg	all	19	54.954	30.144	0.0000
3	Gillnets	N/A	NE	lg	all	16	228.757	26.296	0.0000
3	Gillnets	N/A	NE	xlg	all	16	108.983	26.296	0.0000
4	Gillnets	N/A	NE	lg	all	15	102.635	24.996	0.0000
4	Gillnets	N/A	NE	xlg	all	15	83.781	24.996	0.0000

Quarter	Gear	Acces Area	Region	Mesh	Trip Duration	df	Chi Sqr Test Statistic	Chi Sqr Crit Value	Signif Level
2	Purse Seine	N/A	NE	all	all	1	0.048	3.841	0.8257
3	Purse Seine	N/A	NE	all	all	3	1.673	7.815	0.6429
4	Purse Seine	N/A	NE	all	all	3	4.540	7.815	0.2087
1	Scallop Dredge	CLOSE	MA	all	LIM	1	6.722	3.841	0.0095
2	Scallop Dredge	CLOSE	MA	all	LIM	1	0.727	3.841	0.3938
3	Scallop Dredge	CLOSE	MA	all	LIM	1	5.009	3.841	0.0252
4	Scallop Dredge	CLOSE	MA	all	GEN	1	19.083	3.841	0.0000
4	Scallop Dredge	CLOSE	MA	all	LIM	3	14.834	7.815	0.0020
1	Scallop Dredge	CLOSE	NE	all	LIM	1	8.000	3.841	0.0047
2	Scallop Dredge	CLOSE	NE	all	LIM	1	11.701	3.841	0.0006
3	Scallop Dredge	CLOSE	NE	all	LIM	1	10.000	3.841	0.0016
4	Scallop Dredge	CLOSE	NE	all	LIM	3	412.873	7.815	0.0000
1	Scallop Dredge	OPEN	MA	all	LIM	9	2.266	16.919	0.9865
2	Scallop Dredge	OPEN	MA	all	GEN	15	2.931	24.996	0.9997
2	Scallop Dredge	OPEN	MA	all	LIM	14	37.021	23.685	0.0007
3	Scallop Dredge	OPEN	MA	all	GEN	14	20.087	23.685	0.1274
3	Scallop Dredge	OPEN	MA	all	LIM	15	18.187	24.996	0.2530
4	Scallop Dredge	OPEN	MA	all	GEN	12	10.077	21.026	0.6092
4	Scallop Dredge	OPEN	MA	all	LIM	15	6.035	24.996	0.9792
1	Scallop Dredge	OPEN	NE	all	GEN	12	1.175	21.026	1.0000
1	Scallop Dredge	OPEN	NE	all	LIM	15	28.176	24.996	0.0205
2	Scallop Dredge	OPEN	NE	all	LIM	17	15.682	27.587	0.5464
3	Scallop Dredge	OPEN	NE	all	GEN	17	75.386	27.587	0.0000
3	Scallop Dredge	OPEN	NE	all	LIM	15	34.112	24.996	0.0033
4	Scallop Dredge	OPEN	NE	all	GEN	15	30.304	24.996	0.0109
4	Scallop Dredge	OPEN	NE	all	LIM	14	20.032	23.685	0.1291
1	Mid-water Trawls	N/A	MA	all	all	9	3.455	16.919	0.9435
1	Mid-water Trawls	N/A	NE	all	all	13	12.966	22.362	0.4505
2	Mid-water Trawls	N/A	NE	all	all	12	6.588	21.026	0.8836
3	Mid-water Trawls	N/A	NE	all	all	10	10.498	18.307	0.3979
4	Mid-water Trawls	N/A	NE	all	all	11	8.442	19.675	0.6732
2	Fish Pots/Traps	N/A	MA	all	all	13	34.188	22.362	0.0011
3	Fish Pots/Traps	N/A	MA	all	all	11	14.444	19.675	0.2094
3	Lobster Pots	N/A	NE	all	all	28	3.031	41.337	1.0000
4	Lobster Pots	N/A	NE	all	all	25	4.020	37.652	1.0000
2	Scottish Seine	N/A	NE	all	all	2	1.476	5.991	0.4780
3	Scottish Seine	N/A	NE	all	all	2	0.238	5.991	0.8880
4	Scottish Seine	N/A	NE	all	all	1	0.750	3.841	0.3865

Table 59. Summary of contingency table analyses of spatial distribution of 2004 FVTR and observed trips. Expected value of observed trips is based of proportions of FVTR trips by Statistical Areas. Critical value of Chi-Square statistics is based on alpha level of 0.05. Degrees of freedom as based on number of Statistical Areas reported in the FVTR database. Shading indicates p-value greater than 0.05.

Row	Gear Type	Access Area	Trip Category	Region	Mesh	2012 Sea Days for Min Pilot Coverage (MPC)	2012 Sea Days Needed for FISH	2012 Sea Days Needed for TURS	2012 Sea Days Needed COMBINED
1	Longline	OPEN	all	MA	all	67	67		67
2	Longline	OPEN	all	NE	all	16	16		16
3	Hand Line	OPEN	all	MA	all	13	81		81
4	Hand Line	OPEN	all	NE	all	16	16		16
5	Otter Trawl	OPEN	all	MA	sm	30	3,231	4,838	3,231
6	Otter Trawl	OPEN	all	MA	lg	27	5,551		5,551
7	Otter Trawl	OPEN	all	NE	sm	29	1,151		1,151
8	Otter Trawl	OPEN	all	NE	lg	35	3,879		3,879
9	Scallop Trawl	AA	GEN	MA	all	21	21		21
10	Scallop Trawl	AA	LIM	MA	all	98	98		98
11	Scallop Trawl	OPEN	GEN	MA	all	22	32		32
12	Scallop Trawl	OPEN	LIM	MA	all	163	163		163
13 +	Otter Trawl, Ruhle	OPEN	all	MA	lg	9	9		9
14 +	Otter Trawl, Ruhle	OPEN	all	NE	sm	27	27		27
15	Otter Trawl, Ruhle	OPEN	all	NE	lg	59	59		59
16 +	Otter Trawl, Haddock Separator	OPEN	all	MA	lg	8	8		8
17	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	100	567		567
18	Shrimp Trawl	OPEN	all	MA	all	120	131		131
19	Shrimp Trawl	OPEN	all	NE	all	13	34		34
20	Floating Trap	OPEN	all	MA	all	6	6		6
21	Floating Trap	OPEN	all	NE	all	6	6		6
22	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	13	13		172
23	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	13	13	1,440	172
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	15	83		1,096
25	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	41	41		41
26	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	14	97		97
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	19	171		171
28	Purse Seine	OPEN	all	MA	all	15	15		15
29	Purse Seine	OPEN	all	NE	all	23	23		23
30	Scallop Dredge	AA	GEN	MA	all	31	31		59
31	Scallop Dredge	AA	GEN	NE	all	14	14		14
32	Scallop Dredge	AA	LIM	MA	all	102	282	1,293	540
33	Scallop Dredge	AA	LIM	NE	all	121	189		189
34	Scallop Dredge	OPEN	GEN	MA	all	17	50		96
35	Scallop Dredge	OPEN	GEN	NE	all	17	17		17
36	Scallop Dredge	OPEN	LIM	MA	all	109	312		598
37	Scallop Dredge	OPEN	LIM	NE	all	124	607		607
38	Mid-water Paired & Single Trawl	OPEN	all	MA	all	17	17		17
39	Mid-water Paired & Single Trawl	OPEN	all	NE	all	43	571		571
40	Pots and Traps, Fish	OPEN	all	MA	all	13	25		25
41	Pots and Traps, Fish	OPEN	all	NE	all	9	15		15
42	Pots and Traps, Conch	OPEN	all	MA	all	12	27		27
43	Pots and Traps, Conch	OPEN	all	NE	all	18	26		26
44	Pots and Traps, Hagfish	OPEN	all	MA	all	3	3		3
45	Pots and Traps, Hagfish	OPEN	all	NE	all	74	74		74
46	Pots and Traps, Shrimp	OPEN	all	NE	all	6	6		6
47	Pots and Traps, Lobster	OPEN	all	MA	all	16	65		65
48	Pots and Traps, Lobster	OPEN	all	NE	all	17	429		429
49	Pots and Traps, Crab	OPEN	all	MA	all	12	12		12
50	Pots and Traps, Crab	OPEN	all	NE	all	67	67		67
51	Beam Trawl	OPEN	all	MA	all	31	31		31
52	Beam Trawl	OPEN	all	NE	all	16	16		16
53	Dredge, Other	OPEN	all	MA	all	41	41		41
54	Ocean Quahog/Surf Clam Dredge	OPEN	all	MA	all	24	67		67
55	Ocean Quahog/Surf Clam Dredge	OPEN	all	NE	all	16	38		38
					Total	2,008	**18,641**		**20,590**

Table 60. The number of sea days needed to monitor fish/invertebrates (FISH) and loggerhead turtles (TURS), and combined species groups (COMBINED) by fleet for the April 2012 through March 2013 time period.

Chapter 6
Proposed Action and Other Alternatives Considered

This chapter presents the alternatives for the SBRM for Greater Atlantic Region FMP fisheries, including those preferred alternatives identified as the proposed action, considered during the development of this amendment. Following the public review of the process, the Councils selected preferred alternatives. This chapter has been revised to reflect the final preferred alternatives (i.e., the proposed action).

According to NMFS (2004), an SBRM is the "combination of data collection and analyses that [is] used to estimate bycatch in a fishery." However, it is important to distinguish between analytical techniques and procedures used to determine the precision of estimates of total discards and the appropriate observer sea day allocation levels from those analytical techniques and procedures used to incorporate discard data into and conduct stock assessments. Different analytical tools and models are used for these purposes, and the techniques and models used for stock assessments vary by species and stocks assessed.[38]

For the purposes of this amendment, the SBRM to be established for the FMPs of the Greater Atlantic Region would specify how the relevant data are to be collected and how those data, once collected, would be analyzed to develop estimates of the precision associated with discard estimates and to determine the appropriate allocation of observer coverage. Further, the amendment would establish standards for the SBRM, per the Court findings in *Oceana* v. *Evans I, Oceana* v. *Evans II*, and *Oceana* v. *Locke*. Therefore, based on NMFS's definition and Court findings, there are three principal components of the SBRM for which alternatives are presented: (1) The suite of reporting and monitoring mechanisms used to collect bycatch-related data; (2) the analytical techniques or procedures used to develop estimates of the precision associated with bycatch data; and (3) the performance measure (standard) used to determine the adequacy of the data collected. Per the Court findings in *Oceana* v. *Locke,* the amendment would provide details of a prioritization process that identifies how funding for at-sea observers is evaluated and limits the discretion of NMFS in setting observer coverage levels. The SBRM Omnibus Amendment includes additional supporting elements regarding a process by which bycatch data collected under the SBRM will be evaluated and reported, framework adjustment procedures, and provisions for industry-funded observer programs.

[38] The analytical techniques, procedures, and models employed in stock assessments vary by stock assessment and are reviewed as part of each stock assessment (the NEFSC SAW/SARC process). These techniques, procedures, and models are updated with each stock assessment as new data are incorporated into the stock assessment process and as new techniques, procedures, and models are developed and refined. It would be neither practicable nor appropriate to attempt to identify or prescribe the analytical tools to be used in future stock assessments.

The presentation of alternatives in this chapter is structured around the seven components identified above. For each component, or element, two to four alternatives are presented: The status quo alternative, which reflects the current bycatch monitoring and reporting program; and an action(s) that could be taken to modify, supplement, or replace the relevant component of the current bycatch monitoring and reporting program. In some cases, there are options available for consideration within an alternative. In addition to the alternatives presented for each of the seven components identified above, there is a brief description and discussion of the alternatives that were considered but rejected from formal consideration during the development of this amendment.

In many fishery management actions, the "no action alternative" represents the outcome if the Councils and NMFS take no action to address the relevant issue (no FMP, amendment, framework adjustment, or annual specifications are prepared). In some cases, the current regulations would continue; but in other cases, the current regulations would expire or no longer be relevant.[39] In cases where current regulations or specifications would expire or no longer be relevant, the no action alternative can be distinguished from the status quo, which would represent a continuation of regulations or specifications from one year to the next. In cases where the current regulations would continue without interruption, and no other changes would occur, the no action alternative and the status quo would not be distinguished.

In this amendment, the "no action alternative" is considered to be an outcome in which the Councils and NMFS fail to develop, submit, approve, and implement an SBRM Omnibus Amendment that documents and establishes those components of a bycatch reporting program required under the law. However, because the Magnuson-Stevens Act requires that an SBRM be established for each FMP, and because the Court, in rulings regarding *Oceana* v. *Evans I*, *Oceana* v. *Evans II*, and *Oceana* v. *Locke* remanded to the Secretary of Commerce Amendment 13 to the Northeast Multispecies FMP, Amendment 10 to the Sea Scallop FMP, and the 2007 SBRM Omnibus Amendment pending development or revision of said SBRM, such an outcome would be contrary to both law and the standing Court orders. Thus, the "no action alternative" is not a reasonable alternative for this action and will not be formally considered or analyzed in this document. However, for each element of the SBRM, the "status quo" is presented and analyzed.

Bycatch data are currently being collected by a variety of mechanisms on a variety of Greater Atlantic Region fisheries. These data are currently being utilized in stock assessments and are currently available to managers. Absent this amendment, these data would continue to be collected and utilized by managers and in stock assessments. Therefore, for the purposes of this amendment, the "status quo" is considered to represent the currently utilized data collection mechanisms or analytical procedures that provide data and information on bycatch in the Greater Atlantic Region. Furthermore, the status

[39] For example, some frameworks or annual adjustments set an annual quota or allocate DAS to a fleet. Absent the action, zero DAS may be allocated (no fishing), or no quota may be established (unlimited fishing). Thus, the implications of the no action alternative may be very different depending on the type of management system in place. In these cases, the status quo would continue a set of regulations that would provide for some level of controlled fishing activity.

quo alternatives will provide the baseline against which alternatives are compared and analyzed. This amendment would formally specify the data collection and analytical mechanisms currently in use, considers changes or additions to these mechanisms, discusses how these data are used and what constitutes standards of acceptability for these data, and would formally implement the resulting SBRM as an explicit element of each subject FMP.

The unique history of the SBRM Omnibus Amendment creates an unusual situation with regard to "status quo" alternatives. The Court in *Oceana* v. *Locke* only found fault with one of the seven largely independent elements of the 2007 SBRM Omnibus Amendment -- the prioritization process, but vacated the entire amendment. Thus all elements of the SBRM process must be reconsidered and readopted by the Councils. Both Councils expressed their intention to focus revisions on the prioritization process and to retain as much of the rest of the 2007 SBRM Omnibus Amendment as possible without change. During the development of the 2007 Amendment, scientific advances were made in how bycatch was monitored in the Greater Atlantic Region; including the adoption of a CV-based SBRM standard and use of an integrated allocation approach with importance filters for assigning observer sea days to fishing modes. When the 2007 SBRM Omnibus Amendment was vacated, these improvements to the bycatch monitoring process were largely retained by the scientists collecting and using bycatch data, even though these elements were not formally documented in an FMP, and therefore have become the "status quo" for purposes of this new amendment document.

The status quo is not limited to the methods by which at-sea observer trips and days are currently allocated. The status quo is the totality of all the ways in which data and information related to discards are currently collected, monitored, analyzed, and reported. Because all of the currently used data collection mechanisms are valid and contribute, at least in some way, to our understanding of discard rates in Greater Atlantic Region fisheries, all of the alternatives considered below represent modifications to the status quo. Thus, alternatives described below that would affirmatively and formally establish a current mechanism, procedure, or practice as a component of the SBRM are called the "status quo" alternatives. Alternatives that would modify, supplement, or replace the current program are named for their most distinguishing characteristic.

As fully described in each of the following subsections, the proposed action comprises the following preferred alternatives:

- Element 1: Alternative 1.1 – Status quo
- Element 2: Alternative 2.3 – Integrated allocation approach with importance filter (Option C)
- Element 3: Alternative 3.2 – Establish a CV SBRM standard
- Element 4: Alternative 4.2 – Specify an SBRM review process (Option D); and Alternative 4.3 – Require periodic discard reports (Option B)

- Element 5: Alternative 5.4 – Modify the framework adjustment and annual adjustment/specification procedures, allowing changes to fishing modes without formal Council action.
- Element 6: Alternative 6.1.2 – Identify specific SBRM funding sources; Alternative 6.2.3 – Adjust observer coverage using the penultimate cell approach; and Alternative 6.3.3 – Adjust for less than minimum pilot coverage by removing fleets with the highest ratio of minimum pilot coverage to days absent.
- Element 7: Alternative 7.2 – Authorize observer service provider approval and certification; and Alternative 7.3 – Addition of industry-funded observer and observer set-aside provisions as a measures that can be implemented through framework adjustments to the FMPs

6.1 Element 1: Bycatch Reporting and Monitoring Mechanisms

6.1.1 Alternative 1.1 – Status Quo (*Preferred Alternative*)

Under this alternative, the bycatch reporting and monitoring mechanisms currently utilized for the fisheries subject to this amendment would continue to be utilized. The data collection mechanisms are tiered based on the relevance of the data. The primary mechanisms (Tier 1) used to provide direct information on fishery discards would include:

- At-sea fishery observers;[40]
- Marine Recreational Information Program (MRIP);
- Vessel monitoring systems (VMS); and
- FVTRs (limited utility for discards).

These information collection and reporting mechanisms, as well as the mechanisms identified below, are fully described in Chapter 4. There are several information collection mechanisms that are currently in use, and would remain in use, that serve as primary sources of fishery-related information (Tier 2) but do not directly provide information on fishery discards (including information used in conjunction with discard information to complete stock assessments). These include:

[40] Note that nothing in this alternative, or in this amendment, requires the *establishment* of a fisheries observer program. The NEFOP is a long-standing, well-established at-sea fisheries observer program that has been in place for over 20 years. The NEFOP observer program manual (NMFS 2005a), biological sampling manual (NMFS 2006a), training manuals, data handling procedures (see Appendix D), and formal training facility and training program serve as a model for other observer programs around the country and around the world. The focus of the amendment is on how the NEFOP is *utilized* to provide adequate data on discards occurring in fisheries.

- Fishery independent surveys (state and Federal);
- Dealer purchase reports;
- FVTRs; and
- Port sampling.

In addition, three sources of information currently contribute to the universe of fishery data that are used by scientists and managers in the Northeast to understand and address bycatch-related issues (Tier 3). Although these mechanisms are much more limited in scope and applicability than those identified above, they have been used and may continue to be used in the future as one among many sources of fishery-related information. These include:

- Industry-based surveys;
- Study fleets; and
- Alternate platforms.

Although not currently in use, other potential reporting and monitoring mechanisms may be developed and/or become sufficiently mature and cost-effective to be used to collect relevant data at some future time (Tier 4). These potential mechanisms include electronic monitoring and image processing systems. In addition, "specialized" bycatch monitoring to address specific issues that arise in particular fisheries may be developed and requested by a Council or implemented as part of a future FMP action. While these technologies or monitoring programs are not presently proposed to be implemented as a discrete part of the SBRM, this alternative would not preclude adoption and implementation of one or more of these technologies in the future.

As summarized in Table 61, the status quo alternative proposes four tiers of information collection and monitoring as part of the SBRM for use by fishery scientists and managers to better understand and address the scope and nature of bycatch in Greater Atlantic Region fisheries.

Tier 1: Primary Sources of Fishery Discard Information • At-sea fishery observers • Marine Recreational Information Program) • Vessel monitoring system reports • FVTRs (limited)	**Tier 2: Primary Sources of Fishery-Related Information** • Fishery-independent surveys • Seafood dealer purchase reports • Port Agent sampling • FVTRs
Tier 3: Supplemental Sources of Discard and Fishery-Related Information • Industry-based surveys • Study fleets • Alternate platforms	**Tier 4: Potential Future Sources of Discard and Fishery-Related Information** • Electronic monitoring • Image capture and processing • Specialized monitoring programs

Table 61. Status quo alternative fishery information collection and monitoring in the SBRM.

6.1.2 Alternative 1.2 – Implement Electronic Monitoring to Collect Bycatch Information

As described in chapter 4, there are a variety of mechanisms by which information on discards can be collected. Many of these mechanisms are already employed in the Greater Atlantic Region, and these would continue to be employed under the status quo alternative described above. However, this alternative would require that one additional bycatch information collection mechanism be implemented as part of the SBRM—electronic monitoring. This alternative does not propose *replacing* any status quo mechanism, but rather would reflect an *expanded* suite of data collection mechanisms to include some form of this developing technology.

For each electronic monitoring development and deployment within the Greater Atlantic Region, the type of data, system specifications, and the planned application of the data must be clearly established for an effective program to be administered. Should this alternative be selected, further refinement would be required. For example, in a hook and line fishery, an electronic monitoring program utilizing the off-the-shelf technology that currently exists could be developed and deployed to collect a wide array of data elements. Some examples of data that could be collected under the existing regulatory environment include:

- Detailed gear setting and retrieval information;
- Estimates of total effort through hook counts per set;
- Visual confirmation of seabird, marine mammal, and protected species interactions, incidental takes, and possibly mortality events;
- Species identification of discards that occur at the hauling station or as ‘drop offs’ before catch is brought onboard. Identification may be limited to species of concern, general species groups, or only performed for a subset of all hooks observed.

Additional data elements that may be possible with additional regulatory requirements that specify how retained catch and discards must be handled may include:

- Identification of retained and discarded catch. Identification may be limited to species of concern, general species groups, or only performed for a subset of all fishing time observed.
- Size estimates of catch and discards. May be limited to market category or general size groups (e.g., small, medium, large, extra-large) pending type of visual reference available to cameras for scaling.
- Logbook verification of vessel operator catch and discard information.

Development of electronic monitoring into a tool that is usable for bycatch and discard monitoring may well be possible but will take additional development effort, starting with the decision of what data electronic monitoring could provide and where electronic monitoring collection data could be most useful. NMFS has recently established a formal policy on Electronic Technologies and Fishery-Dependent Data Collection (NMFS 2013b). Consideration of any future electronic monitoring program should be consistent with this policy.

Within the Greater Atlantic Region, an electronic monitoring pilot study has been conducted on hook and line vessels. A longer-term study across multiple gear types in the groundfish fishery is currently underway. Other fisheries may also be suitable for electronic monitoring development and deployments depending on the type(s) of data to be collected. Table 62 categorizes the degree of complexity considering the typical vessel size, gear type, and diversity of catch. The scale ranges from one to five, with one being the least complex and five being the most complex.

Electronic monitoring could, in theory, be developed to collect specific data elements in any fishery mode. There are limitations on how detailed the visual data can be and electronic monitoring is not capable of collecting biological data such as age or sex. Electronic monitoring may be well suited for applications such as monitoring discards in pelagic trawl fishery modes or for monitoring turtle interactions with fishery modes operating in the Mid-Atlantic area. Clear establishment of data needs and project goals would be essential in moving any concept forward into a formal component of the SBRM.

Gear Type	Complexity Tier
Demersal Longline	2
Otter Trawl	5
Scallop Trawl	5
Scallop Dredge	5
Mid-water Trawl	5
Fish Pots/Traps	1
Crab Pots	1
Lobster Pots	1
Clam/Quahog Dredge	Unknown
Purse Seine	4
Hand Line	2
Gillnet (sink, anchor, or drift)	4

Table 62. Evaluation of fishery modes complexity for Greater Atlantic Region electronic monitoring programs (complexity scale: 1-low to 5-high). The complexity tiers were assigned based on a review of the available information and consideration of the appropriateness of the technology to each type of fishing gear.

6.2 Element 2: Analytical Techniques and Allocation of Observers

6.2.1 Alternative 2.1 – Pre-2007 SBRM Omnibus Amendment Process

This alternative was the status quo in the 2007 SBRM Omnibus Amendment. In the time since the implementation of that amendment, the analytical techniques employed to estimate the precision of discard estimates and allocate at-sea fishery observer effort have evolved and improved. This alternative has been preserved in this action to comply with the request from both Councils to maintain as much of the 2007 amendment as possible. However, returning to the pre-2007 SBRM Omnibus Amendment process may no longer meet the purpose and need of this action.

Under this alternative, the analytical techniques employed to estimate the precision of discard estimates and allocate at-sea fishery observer effort for the fisheries subject to this amendment would revert to those in use prior to the adoption of the 2007 SBRM Omnibus Amendment. These analytical techniques and procedures are fully described in Rago et al. 2005 and address such issues as sampling units, response variables, definitions of appropriate strata, data sources, imputation, and tests for sources of bias. The procedures and analyses described in Rago et al. 2005 would be applied to three species groups (large-mesh multispecies; summer flounder, scup, and black sea bass; and monkfish) and three gear types (otter trawls, gillnets, and longlines). These are the only species and gear types for which this methodology would be applied in a formal manner. Observer coverage for other gear types and species would be allocated on an ad hoc basis, or as requested by the Councils, if funding is available.

In addition to the analytical techniques described in Rago et al. 2005, this alternative addresses the mechanisms by which observer coverage would be determined for the species and gear types addressed by these procedures. Under the pre-2007 SBRM Omnibus Amendment process approach, observers would be allocated using, among other means, the optimization tool described in Rago et al. 2005 (see Figure 44). As noted above, the optimization tool was initially designed for the large-mesh otter trawl, gillnet, and longline fisheries, but could be expanded to encompass all fishing modes subject to the SBRM. Under this alternative, available observer sea days would first be allocated to programs with prescribed observer coverage levels (e.g., Northeast multispecies fishery, sectors, SAPs and B-Regular DAS program). Remaining available observer sea days would then be allocated to the three fishing gear types noted above based on the optimization tool. Other factors, such as special requests of a Council (for example, the hagfish fishery information collection program) or an unforeseen circumstance or problem that arises in a fishery (such as increased monitoring of protected resources interactions), would be used to assign observer coverage to other fisheries on an ad hoc basis.

As the primary source of bycatch data in commercial fisheries, at-sea observer coverage applies to all commercial fishing modes affected by the SBRM Omnibus Amendment. Data on recreational fishing would be obtained through the MRIP program. These data would serve the same function for recreational fisheries as at-sea observer data serve for commercial fisheries.

Regarding the use of at-sea fisheries observers, in the Greater Atlantic Region existing regulations require that, as a condition of all Federal fishing vessel permits issued in the Region, fishing vessels carry an observer anytime they are requested to do so. The regulations at § 648.11(a) stipulate that "The Regional Administrator may request any vessel holding a permit for Atlantic sea scallops, [Northeast] multispecies, monkfish, skates, Atlantic mackerel, squid, butterfish, scup, black sea bass, bluefish, spiny dogfish, Atlantic herring, tilefish, or Atlantic deep-sea red crab; or a moratorium permit for summer flounder; to carry a NMFS-certified fisheries observer." A change in April 2007 extended this requirement to "any vessel . . . that fishes for, catches or lands hagfish, or intends to fish for, catch, or land hagfish in or from the [EEZ]." This requirement is reinforced in the "prohibitions" section of the regulations, which state at § 648.14(e)(2) that it is unlawful for a person to "refuse to carry an observer or sea sampler if requested to do so by the Regional Administrator."

6.2.2 Alternative 2.2 – Integrated Allocation Approach

Building on the techniques and procedures described in Rago et al. 2005 and utilized under the pre-2007 SBRM Omnibus Amendment alternative, this alternative would refine and expand the aforementioned methodology to apply to 56 separate fishing modes across 14 gear types and 15 species/species groups (including sea turtles). The refined and expanded methodology proposed under this alternative is described in detail in chapter 5. In addition to being expanded to include all relevant gear types and applicable species, the bycatch variance assignment method also differs from the pre-2007 SBRM Omnibus Amendment by the inclusion of the gray-cell filter (as described in section 5.3.3).

Under this alternative, there are two ways in which the observer coverage may be determined for any combination of fishing gear type and species: The math-driven approach, which calculates the number of observer sea days necessary to attain the CV-based performance standard, based on the results of analysis using data from prior years; or the pilot coverage approach, which estimates a baseline level of pilot coverage expected to provide sufficient data to use the math-driven approach in the future. Wherever possible, the math-driven approach is used. The pilot coverage approach is used when prior sampling levels were too low to provide sufficient data with which to use the math-driven approach (see section 5.3.3).

Because the math-driven approach requires data collected by at-sea fisheries observers as input—in order to calculate a CV and then project the number of observed sea days are required to attain the CV-based performance standard—if there were no observed trips of a fishing mode, there would be no data available to serve as input to the math-driven approach. Pilot coverage allocates an initial level of observer coverage equivalent to 2 percent of the trips that occurred in the year on which the analysis is based. For example, if, in 2004, there were an average of 300 3-day long fishing trips per quarter for a fishing mode that had no observer coverage in 2004, in order to begin to collect data on this fishing mode, pilot coverage equivalent to 2 percent of these trips, or 72 sea days, would be allocated to this fishing mode. The pilot coverage level of 2 percent was selected based on the most conservative recommendation of the National

Working Group on Bycatch, which suggested that pilot coverage, where needed, be based on a range of 0.5-2 percent of trips, with a minimum of 3 trips per quarter and a maximum of 100 trips per quarter (NMFS 2004).

Under this alternative, the target observer coverage allocation for each fishing mode would be the highest projected number of observer sea days needed to achieve the CV-based performance standard for each species or species group after the application of the gray-cell filter. The gray-cell filter is designed to eliminate combinations of fishing gear types and species under two scenarios: (1) The discards of a species in a gear type does not occur, either due to the area fished or to the design of the gear type (e.g., Atlantic salmon in Mid-Atlantic crab pots, sea scallops in longline gear, surfclams in mid-water trawls, etc.); or (2) the discards are extremely unlikely to occur, due to the nature of the gear and/or the nature/distribution of the species (e.g., deep-sea red crabs in New England large-mesh gillnets, surfclams in otter trawls, etc.). Either of these scenarios may be due to the nature/distribution of the species or its lack of interaction with a gear type, or may be due to specific regulations that have been implemented to reduce bycatch. The premise behind the gray-cell filter is to recognize that there are certain combinations of species and fishing gear types for which bycatch is infeasible or occurs so infrequently that it would be imprudent to derive observer coverage levels for these gear types based on these species.

As the primary source of bycatch data in commercial fisheries, at-sea observer coverage applies to all commercial fishing modes affected by the SBRM Omnibus Amendment. Data on recreational fishing would be obtained through the MRIP data collection program that resulted from the NRC-suggested and Congressionally-mandated changes to the MRFSS program. These data would serve the same function for recreational fisheries as at-sea observer data serve for commercial fisheries.

6.2.3 Alternative 2.3 – Integrated Allocation Approach with Importance Filter (Status Quo) (*Preferred Alternative*)

This alternative would function the same as the previous alternative for determining the appropriate allocation of observer effort, but with the substantial addition of an "importance filter" beyond the gray-cell filter to further refine the appropriate target allocation of observer effort within each fishing mode.[41] Under the previous alternative, the necessary observer coverage allocation for each fishing mode would be the highest projected number of observer sea days to achieve the CV-based performance standard for each species or species group after the application of the gray-cell filter. However, one of the limitations of this method is that it does not account for the relevance of the discards of each species within each fishing mode. The intent is to distinguish between species for which the imprecision of the discard estimate may have the potential to affect a stock assessment, and those species for which it would not. The importance filter is

[41] At a meeting on August 22, 2006, members of the Science and Statistical Committees of the New England and Mid-Atlantic Councils met to conduct a peer-review of the analytical components of this amendment. During the review and discussion, the SSC members agreed and recommended that the SBRM Amendment include an "importance filter" as a means to most effectively determine the appropriate target observer coverage levels for the various fishing modes.

intended to serve as a tool to illuminate that distinction, and to aid in establishing observer sea day allocations that are more meaningful and efficient at achieving the overall objectives of the SBRM and the at-sea observer program.

An importance filter, in this context, is a criteria-based tool applied to the projected observer sea days needed to achieve the CV-based performance standard. It is specifically designed to "weed out" particular combinations of fishing gear and bycatch species where the infrequency and variable amounts of discards would result in high observer sea day coverage levels, in spite of the fact that the actual magnitude and frequency of discards may be low and of small consequence to the discarded species in the larger context of all Greater Atlantic Region fisheries. For example, based on the initial calculations of observer coverage levels needed to achieve the objective of a CV of no more than 30 percent, 12,864 observer sea days would be required to monitor Atlantic herring bycatch in the New England large-mesh otter trawl fishery (see page 25 in Appendix C). However, in 2004 a *total* of 563 lb of herring were observed to be discarded in this fishery (a fishery in which over 1,000 fishing sea days were observed) and 90 percent of observed trips had zero discards of herring. Specifically, out of 386 observed trips within this fishing mode, 38 had discards of herring, and the sum of the discards on those 38 trips was 563 lb (< 15 lb per trip). This 563 lb represents roughly 0.0003 percent of the 2004 commercial landings in the herring fishery, and 0.000085 percent of the 2004 allowable biological catch. Without the application of an importance filter, the target observer sea day coverage level in this fishing mode would be 12,864 days, which is more than one-third the total number of days actually fished in the New England large-mesh otter trawl fishery in 2004. As such, allocating this level of coverage, based solely on the observed discards of Atlantic herring, would be an inefficient use of observer coverage resources.

The use of an importance filter is intended to eliminate these cases from the final calculation of target observer sea days for each fishing mode, so the bycatch species driving the target coverage level are ones for which the implications of the discards in the fishery are not negligible. Within this alternative, three options are presented for the final form of the importance filter: Option A, which reflects the importance filter alternative originally presented in the public hearing draft of the 2007 SBRM Omnibus Amendment; Option B, the current status quo, which eliminates the CV-met filter and incorporates revisions to the third-level and fourth-level filters to address comments received during the public review and comment process; and Option C, which includes the revisions in Option B, while removing the gray-cell filter based on updated analysis of its utility. Option A is retained primarily to illustrate the differences between what was initially proposed in the public hearing draft of the 2007 SBRM Omnibus Amendment and the revised importance filter process in Option B.

Regardless of the option selected as the preferred alternative, there are several important issues that may require clarification. The options listed below function on three levels: As with the previous alternative, the gray-cell filter is designed to eliminate combinations of fishing gear types and species that either do not occur or occur so infrequently, due to the nature of the interaction between the gear and the species or due to regulations that have been implemented to reduce or eliminate the bycatch of certain species, that it would be imprudent to derive observer coverage levels based on these species; the second is to eliminate combinations of fishing gear types and species where the contribution of that gear type to the total discards of that species is negligible; and the third is to eliminate combinations where the magnitude of discards of a species relative to the overall landings or total fishing mortality (landings plus discards) of that species is negligible. While the proposed gray-cell filter addresses both fish species and sea turtles, the consideration of total discards and total landings/mortality in Option A, Option B, and Option C focus solely on filtering observer coverage levels for commercially targeted fish species. The discards and landings/mortality based filters proposed in these options are not used to filter sea turtles as the basis for establishing the necessary observer coverage level in a fishing mode. This is explained further in each option below.

All three options presented below are designed to be used on an annual basis to determine the observer coverage levels necessary to achieve the CV-based performance standard annually. Prior to the start of each calendar year, scientists at the Center would utilize observer and landings data from the four most recent quarters for which data are available as input to the processes described in this amendment. These data would provide the basis to determine the number of sea days needed for each cell of the species-gear type matrix. The importance filter selected as the preferred alternative would then be applied to refine the total number of observer sea days needed in each fishing mode. This information would then be used by the Center and the NEFOP to allocate observer coverage levels across all fishing modes for the coming year.

As the primary source of bycatch data in commercial fisheries, at-sea observer coverage applies to all commercial fishing modes affected by the SBRM Omnibus Amendment. Data on recreational fishing would be obtained through the data collection program(s) that result from the NRC-suggested and Congressionally-mandated changes to the MRFSS program. These data would serve the same function for recreational fisheries as at-sea observer data serve for commercial fisheries.

6.2.3.1 Importance Filter Option A

The first option for an importance filter is the original importance filter alternative described in the public hearing draft of the 2007 SBRM Omnibus Amendment. This option focuses on the encounter rate (the proportion of trips in which the species was encountered and discarded), the relative proportion of discards of that particular species compared to discards of other species within the fishing mode, the magnitude of the observed discards, and the proportion of the discards of the species within the fishing mode to the total landings of the species among all fisheries. Under this option, sea turtles are filtered only at the initial gray-cell filter (level 1) or the CV-met filter (level 2). The third and fourth level filters would not reduce the observer sea days in any fishing mode below the number necessary to achieve the performance standard for sea turtles.

An example of how this importance filter could be applied is demonstrated with the bycatch of Atlantic herring in the New England small-mesh otter trawl fishing mode (see page 23 in Appendix C): In 2004, 142 trips out of 3,484 were observed. On 74 percent of the observed trips (105 trips), there were no discards of herring; but on the remaining 37 trips, herring totaling 13,687 lb were observed to be discarded. Relative to the 563 lb of discarded herring in the large-mesh otter trawl example above, this amount of discarded herring may appear to be substantial. However, even this amount of discarded herring only represents 1.24 percent of the total observed discards within the observed fishing mode, and is still less than 0.01 percent of the commercial landings of herring in 2004. Even though the 142 observed trips only represent 4 percent of all fishing trips in this mode in 2004, the total amount of herring discarded by this mode is estimated to be less than 0.3 percent of the commercial landings (which were only 28 percent of the total allowable biological catch for the year). So, the importance filter provides a way to identify that the 882 observer sea days calculated to be necessary to achieve a CV of 30 percent should not necessarily be used to determine the target observer coverage level for this fishing mode.

For each fishing gear mode, and for each of the 15 relevant species and species groups, a series of hierarchical filters would be applied to eliminate from consideration the species/species groups that fall below established thresholds for each relevant factor, and would function as follows (see Table 63):

(1) The first-level filter would be the gray-cell filter described in chapter 5 and in the previous alternative, which eliminates combinations of species and gear types in which encounters are infeasible or extremely unlikely;

(2) The second-level filter would eliminate species when the realized CV, based on the dataset analyzed to calculate the CV, is 30 percent or less (i.e., successfully achieved the performance standard), but the projected observer sea days exceeds the number of days actually observed in the year(s) in which the performance standard was achieved;

(3) The third-level filter would eliminate species when the discards of that species in a mode are less than a certain minimum percentage of the total discards for that mode (with the exception of protected species, for which none of the filters beyond the gray-cell filter would be applied); and

(4) The fourth-level filter would eliminate species when the total discards of that species in a mode are less than a certain minimum percentage of the total landings (commercial and recreational) of that species in all fisheries combined.

A potential fifth filter, which is not proposed at this time, would eliminate species when the total discards of that species in a mode are less than a certain minimum percentage of the total allowable catch, or, depending on the information available at the time, the total biomass, of the species.[42]

[42] This last filter, described here as a placeholder for possible future action, is intended to address species, such as Atlantic herring or mackerel, for which the total landings of that species could be markedly less than the total allowable catch and, therefore, may be an incomplete measure of the implications of the bycatch amount in the subject fishing mode.

So, for example, in the Mid-Atlantic small-mesh otter trawl fishing mode (see page 23 in Appendix C), after eliminating the gray-celled salmon, red crab, and surfclam and ocean quahog, the importance filter could be used to eliminate sea scallops (with a total of 6,303 lb of observed discards, 0.81 percent of all discards in this fishing mode), and then to eliminate the mackerel, squid, and butterfish complex (while the percent of all discards in the fishing mode may exceed the threshold for this filter, with total discards at less than 0.90 percent of total landings of herring, it would likely fall below the threshold established for the fourth-level filter). Eliminating bluefish, herring, and tilefish for similar reasons would reduce the target observer sea days for this fishing mode from 5,417 to no more than 944. Given that the cost of each observer sea day is roughly $1,150, the reduction in the necessary coverage represents over $5.1 million.

The two most important aspects of the design and application of this importance filter option are the criteria selected as the filters (i.e., the discards of the species relative to the total discards in the fishing mode, and the discards of the species relative to the total landings of that species in all fisheries), and the threshold levels established within each filter. The thresholds considered ranged from 0.5 percent to 3.0 percent, and a final threshold would be selected in the final version of the SBRM Omnibus Amendment, after review by all appropriate technical groups and the two Councils, should this option be selected as the preferred alternative.

	Total Sea Days Required for All 15 Species Groups (including sea turtles)		
	Example 1 0.5%	**Example 2** 1.0%	**Example 3** 3.0%
Baseline	71,043	71,043	71,043
1. Gray-cell filter	55,554	55,554	55,554
2. CV-met filter	55,452	55,452	55,452
3. Discard ratio filter	14,516	13,151	12,065
4. Landings ratio filter	11,868	11,253	10,704
5. Discard % of TAC/B filter (*potential future upgrade*)	N/A	N/A	N/A

Table 63. Summary of the number of observer sea days needed to achieve a CV of 30 percent, based on the sequential application of the Option A importance filters at a variety of threshold levels.

It is important to understand that without the importance filter, as in the previous alternative, there would be no established protocol to refine the total target observer sea days to levels commensurate with the importance of the discard species within the overall fisheries observer program or within the context of the overall Greater Atlantic Region fisheries (see "baseline" row in Table 63). Again, consider red crab: Without any filter, including the gray-cell process, for red crab alone the total number of sea days needed to observe the fishing modes in which red crabs are discarded (to achieve the target CV of 30 percent) would be 27,698 days. With the gray-cell filter, but without an importance filter, the number decreases to 5,547 days. The cost to implement this level of observer coverage, however, far exceeds the total value of the red crab fishery (the cost to observe 27,698 days would be $31.8 million and the cost to observe 5,547 days would be $6.4 million, while the ex-vessel value of all red crab landings average less than $4 million annually). From a cost-benefit perspective, it does not appear appropriate to expend more than one and a half times the value of a fishery to monitor potential discards of the target species in other fisheries. To maximize the value and benefit of the observer program, the importance filter would provide a tool to limit the projected observer sea days needed to more reasonable and effective levels, commensurate with the relative importance of the potential bycatch events.

6.2.3.2 Importance Filter Option B (Status Quo)

The second option for an importance filter is a modification of the original importance filter alternative described in the public hearing draft of the 2007 SBRM Omnibus Amendment, based on comments received during the comment period on the original 2007 amendment. The differences between this and Option A are: (1) The CV-met filter is eliminated as unnecessary following the full incorporation of the finite population correction factor (see chapter 5); (2) the third-level filter is now based on the discards of a species in a fishing mode relative to the total discards of that species; and (3) the fourth-level filter is now based on the discards of a species in a fishing mode relative to the total known fishing mortality of that species (commercial landings, recreational landings, and discards). Under this option, sea turtles are filtered only at the initial gray-cell filter (level 1).

As noted above, the most significant differences between the revised filters in Option B and the original filters in Option A are the mechanisms by which the non-gray-cell filters are applied. Under Option A, the discard-to-discard (third level) filter was applied within a fishing mode; i.e., the filter operated on the proportion of discards of a species relative to the other species discarded by that fishing mode. In this way, if a species comprised a minor component of the discards of a fishing mode, it may have been filtered out, regardless of the proportion of the total discards of that species contributed by the subject fishing mode. Under Option B, there is still a comparison of discards to total discards, but instead of within a fishing mode and across species, it is within a species and across fishing modes. In this way, a species/fishing mode combination would only be filtered out at this stage if it contributed a minor amount of the total discards of that species.

The discards-to-landings filter in Option A operated by comparing the discards of a species in a fishing mode to the total landings (recreational and commercial) of that species. In this way, if the discards of a species were relatively minor in proportion to the landings of that species, it may have been filtered out. Under Option B, this filter expands the denominator of this function by adding discards so that the comparison is of the discards of a species relative to the total known fishing mortality on that species. In this way, when the discards of a species in a fishing mode contribute a relatively minor amount to the total fishing mortality on that species, it may be filtered out.

The other significant change from the Option A filter and the revised filters is the basis for selecting an appropriate threshold level for the filters to operate. Under Option A, the filter thresholds operated independently of the cumulative effect of the discards or mortality contributed by the various fishing modes. This created the impression (based on the comments received on the draft 2007 SBRM Omnibus Amendment) that the threshold levels could be selected on an arbitrary basis because there was no apparent relationship between the thresholds considered and the implications of these threshold levels to the fishery or the stock. Instead, under Option B, the threshold levels are set based on the cumulative effect of all the subject fishing modes. Thus, under Option A, a threshold of 10 percent for the discards to discards filter would mean that any species that individually comprised less than 10 percent of the total discards within a fishing mode would be filtered out. If all but one species each contributed less than 10 percent of total discards within that fishing mode, then all but that one species would be filtered out. Conversely, with Option B, a threshold of 90 percent for the discards to discards filter means that the species would only be filtered for those fishing modes that contribute, on a cumulative basis, less than 10 percent of the total discards of that species.

As an example of the functional difference between these approaches, see Table 64. Under Option A, individual species are filtered out for each fishing mode based on the individual contribution of discards associated with that fishing mode. Using a threshold of 5 percent for illustration, all species but Species A and Species B would be filtered out as contributing less than 5 percent of total discards, even though cumulatively these species combine for 25 percent of the total discards. In contrast, under Option B, fishing modes are filtered out for each species based on the cumulative discards each fishing mode contributes for that species. Thus, at a threshold of 5 percent, all fishing modes but the two that together contribute less than 5 percent of total discards are retained and only these two are filtered.

Option A			Option B		
Within Fishing Mode X			Within Species X		
	Individual % of discards	Cumulative % of discards		Individual % of discards	Cumulative % of discards
Species A	50%	50%	Mode 1	50%	50%
Species B	25%	75%	Mode 2	25%	75%
Species C	**4%**	79%	Mode 3	4%	79%
Species D	**4%**	83%	Mode 4	4%	83%
Species E	**4%**	87%	Mode 5	4%	87%
Species F	**3%**	90%	Mode 6	3%	90%
Species G	**3%**	93%	Mode 7	3%	93%
Species H	**3%**	96%	Mode 8	3%	96%
Species I	**2%**	98%	Mode 9	2%	**98%**
Species J	**2%**	100%	Mode 10	2%	**100%**

Table 64. Example of the functional differences between the discard ratio importance filters proposed in Option A and Option B. The shaded rows represent the species/fishing modes that would be filtered under each option using a filter threshold of 5 percent.

An example of how this importance filter could be applied is demonstrated with the bycatch of mackerel, squid, and butterfish in the New England large-mesh gillnet mode. Almost all discards of these species come from three fishing modes (New England small-mesh otter trawl, New England mid-water trawls, and Mid-Atlantic small-mesh otter trawls), which together account for 98.75 percent of the total discards. On the other hand, New England large-mesh gillnets contribute only 0.03 percent of the total discards of these species, yet the observer sea days for these species in this fishing mode were calculated to be 3,758 days. The importance filter under Option B would be a way to identify that the 3,758 observer sea days calculated to be necessary to achieve a CV of 30 percent should not necessarily be used to determine the target observer coverage level for this fishing mode.

For each fishing gear mode, and for each of the 15 relevant species and species groups, a combination of filters would be applied to eliminate from consideration the species/species groups that fall below established thresholds for each relevant factor, and would function as follows (see Table 65):

(1) The first-level filter would be the gray-cell filter described in chapter 5 and in the previous alternative, which eliminates combinations of species and gear types in which encounters are infeasible or extremely unlikely;

(2) The second-level filter is no longer applicable;

(3) The third-level filter would eliminate fishing modes for a species that together contribute less than a threshold level of the cumulative discards of that species in all fisheries combined; and

(4) The fourth-level filter would eliminate fishing modes for a species when the total discards of that species in a mode are less than a threshold level of the cumulative fishing mortality (commercial and recreational landings plus known discards) of that species in all fisheries combined.

The potential fifth filter, which is described in Option A, is not proposed under this option as a potential future filter. Because the fourth filter under Option B is calculated as a mortality ratio, rather than just landings, it would not be appropriate to incorporate the TAC into the importance evaluation.

So, for example, in the Mid-Atlantic small-mesh otter trawl mode, the baseline observer sea days would be 5,417 days (to achieve a 30 percent CV for red crab). The gray-cell filter reduces this amount to 3,057 days (to achieve the CV for tilefish), by eliminating red crabs, surfclams, and Atlantic salmon from further consideration. Applying the discard ratio filter (third level) at a threshold of 95 percent further reduces this amount to 2,231 (for bluefish). At this threshold level, tilefish are filtered because Mid-Atlantic small-mesh otter trawls contribute only 0.25 percent of the total discards of tilefish. Atlantic herring (1,869 observer sea days, but only 0.12 percent of total herring discards) are also filtered from further consideration at this stage. Applying the mortality ratio filter (fourth level) at a threshold of 98 percent reduces the observer sea days necessary for this fishing mode to 1,229 days, which is the target level for sea turtles. Bluefish (2,231 sea days) is filtered at this stage as the discards of bluefish associated with this fishing mode contribute only 0.16 percent of the total fishing mortality on bluefish (including all commercial and recreational landings plus discards). The observer coverage level of 1,229 days is projected to achieve a CV of at least 30 percent for sea turtles; sea scallops; mackerel, squid, and butterfish; small-mesh multispecies; summer flounder, scup, and black sea bass; spiny dogfish; monkfish; large-mesh multispecies; and skates. Thus, the application of the Option B importance filters served to reduce the necessary sea day coverage level for this fishing mode from 5,417 days to 1,229 days.

The two most important aspects of the design and application of this importance filter option are the criteria selected as the filters (i.e., the discards of a species within a fishing mode relative to the total discards of that species across all 39 fishing modes, and the contribution to total fishing mortality represented by the discards of a species in the fishing mode), and the threshold levels established within each filter. The thresholds considered ranged from a cumulative percentage of 90 percent to 99 percent.

	Total Sea Days Required for All 15 Species Groups (including sea turtles)		
	Example 1 99%	**Example 2** 95%	**Example 3** 90%
Baseline	71,043	71,043	71,043
1. Gray-cell filter	55,554	55,554	55,554
2. CV-met filter	N/A	N/A	N/A
3. Discard ratio filter	42,995	38,749	14,208
4. Mortality ratio filter	10,400	9,726	9,395

Table 65. Summary of the number of observer sea days needed to achieve a CV of 30 percent, based on the sequential application of the Option B importance filters at a variety of threshold levels.

As indicated in Table 65, application of the Option B importance filters at the range of thresholds considered has the potential to reduce the total observer sea day requirements from a baseline level of 71,043 days to as low as 9,395 days. The threshold levels for the SBRM are as follows: Filter 3 – 95 percent of total discards; and Filter 4 – 98 percent of total mortality. At a discard ratio threshold of 95 percent and a mortality ratio threshold of 98 percent, and based on data from 2004, a total of 9,874 observer sea days would be needed. This set of importance filters provides a mechanism to account for the individual contributions of each fishing mode relative to the cumulative discards of each species across all fishing modes and the total fishing mortality of each species, filtering out those species (as the driving force behind setting the overall observer coverage levels for each fishing mode) for which the fishing mode contributes a relatively insignificant portion of the total discards of that species, the total fishing mortality of that species, or both.

At a discard ratio threshold of 95 percent and a mortality ratio threshold of 98 percent, a total of 9,874 observer sea days would be needed to be allocated across all 39 fishing modes (for the detailed allocation at these threshold levels, see Appendix C). Note that while this *threshold level* is intended to be implemented as a component of the SBRM, the specific level and allocation of observer coverage is not. The projected 9,874 observer sea days is the amount calculated based on implementation of the proposed SBRM using 2004 observer data as input values. Full and continued implementation of the SBRM would require annual updates using the most recent 4 quarters of data from the observer program. As new data are utilized in the SBRM following implementation, the overall number of projected observer days, as well as the fishing mode allocations, will change. This is analogous to establishing a survey index-based biological reference point that utilizes a 3-year moving average of the NEFSC survey weight per tow of the subject species. As new data are input into the calculation, the calculated reference point changes up or down to reflect the status of the stock. So, too, in the case of the SBRM, will the calculated number of observer sea days change as new, updated information is input in the methodology.

6.2.3.3 Importance Filter Option C (*Preferred Option*)

The third option for an importance filter is a modification of the current status quo importance filter (Option B). The difference between Option B (status quo) and Option C is that Option C would not use the gray-cell (tier 1 or "unlikely") filter, based on analysis done as part of the 3-year evaluation of the 2007 SBRM Omnibus Amendment (Wigley et al. 2012b).

The initial determination of which cells would be considered unlikely was made by FMATs and Plan Development Teams (PDT) and was based on a review of the previous 16 years of observer data, general knowledge of gear, fish distribution, and abundance patterns. It was recognized during the development of the filters that the fishing patterns or species abundance and/or distribution may shift and the intent was that the unlikely filter would be evaluated as more data were collected.

The 3-year evaluation of the 2007 SBRM Omnibus Amendment was the first evaluation of the use of the gray-cell filter for all species since it was established. Since 2009, the gray-cell filter has been set to a default of "likely" for all new fishing modes and new species. For pilot fleets, the gray-cell filter has no impact on the final determination of SBRM standard sea days at the fishing mode level. In non-pilot fleets, the gray-cell filter influences the species group with the maximum number of sea days within a fishing mode, which will determine the SBRM standard sea days at the fishing mode level. Cases where the gray-cell filter indicates bycatch to be unlikely, but the discard ratio filter (tier 3) or the mortality ratio filter (tier 4) indicate that the fishing mode contributes a relatively significant portion of the total discards of that species, the total fishing mortality of that species, or both, should not occur and results could be screened to prevent this from happening.

Based on a review of analyses conducted on data collected during June 2007 through July 2011, no changes to the final determination of the SBRM standard sea days for these three years would have occurred if the gray-cell filter had been removed from the importance filter.

The refinement to the importance filter applies only to fish and invertebrate species, the species groups where design-based methods are used to estimate the number of sea days needed. The model-based methods adopted for turtles do not explicitly define or use a gray-cell filter – interactions between turtles and gillnet, dredge, and trawl gear in the Mid-Atlantic are considered likely. Sea day monitoring needs are not estimated for other gear types or in other regions (i.e. New England) because to date we have not had sufficient levels of observed turtle bycatch to estimate total bycatch in these gears or regions using model-based methods.

6.2.4 Alternative 2.4 – Minimum Percentage Observer Coverage

This alternative would establish a minimum percentage observer coverage level for each fishery. One method to reduce bias in observer estimates of bycatch suggested in Babcock et al. (2003) is to establish sufficiently high coverage levels. Babcock et al. (2003) suggest that observer programs adopt coverage levels of at least 20 percent for common species and 50 percent for rare species. Under this alternative, the current observer sea day allocation procedure (including the optimization tool, among other means, to minimize the overall CV) would be replaced by a process whereby fisheries for which the bycatch species are all considered "common" would have a target observer coverage rate of 20 percent of all trips, and fisheries for which the bycatch species include "rare" species would have a target observer coverage rate of 50 percent of all trips.

To implement this alternative, one of the first steps would be to determine appropriate definitions of rarity of the bycatch species. Babcock et al. (2003) distinguish rare species as those for which the weight of the discards is 0.1 percent or less of the total catch (landings plus discards) in the fishery. In some ways, this approach is counter-intuitive: In a relatively clean fishery with very low discards, each species that may occasionally be encountered would be considered rare and, therefore, the observer coverage level would be quite high (even if the magnitude of the discards is negligible). Other approaches to determine rarity could be: To look at the discards of each species proportional to the total discards of all species; to consider any species afforded protection under the Marine Mammal Protection Act and/or Endangered Species Act to be rare regardless of actual encounter rates; to set an upper and lower bound for non-protected species, such as 0.5 to 1.0 percent of total discards; or to develop an algorithm that incorporates both the frequency of encounter with the magnitude of potential encounters relative to stock size or landings of that species. Implementation of this alternative would require further consideration of the most appropriate way in which to define rare versus common species.

Under this alternative, the discards estimation analyses would continue to use the techniques and procedures described in chapter 5 and Appendix A that comprise the other alternatives. As the primary source of bycatch data in commercial fisheries, at-sea observer coverage applies to all commercial fishing modes affected by the SBRM Omnibus Amendment. Data on recreational fishing would be obtained through the data collection program(s) that result from the MRIP. These data would serve the same function for recreational fisheries as at-sea observer data serve for commercial fisheries.

6.3 Element 3: SBRM Standard

6.3.1 Alternative 3.1 – No SBRM Standard

Under this alternative, the SBRM Omnibus Amendment would not specify a target CV as a performance measure or standard against which to judge the adequacy of the bycatch monitoring program described in the amendment. This alternative would not preclude the establishment of CV standards at some time in the future. While there would be no requirement or expectation in this amendment that a standard be established, at any time target CVs could be established for all relevant fisheries, or could be established on an FMP-by-FMP basis in future management actions. This alternative represents the condition of the monitoring program before approval and implementation of the 2007 SBRM Omnibus Amendment.

6.3.2 Alternative 3.2 – Establish a CV SBRM Standard (Status Quo) (*Preferred Alternative*)

This alternative for the SBRM would establish a performance standard to ensure that the bycatch-related data collected under the SBRM and utilized in stock assessments and management is adequate for those tasks. In order to ensure that the SBRM is performing to the expected level, this alternative would establish a process to periodically review the adequacy of the SBRM, with consideration of how and when changes to the SBRM should be made.

The guidance provided in NMFS (2004) recommends establishing precision goals for a fishery as part of an SBRM. The recommended precision goals, as stated in the document (NMFS 2004) are as follows:

> For fishery resources, excluding protected species, caught as bycatch in a fishery, the recommended precision goal is a 20-30% CV for estimates of total discards (aggregated over all species) for the fishery; or if total catch cannot be divided into discards and retained catch then the goal is a 20-30% CV for estimates of total catch.
>
> For marine mammals and other protected species, including seabirds and sea turtles, the recommended precision goal is a 20-30% CV for estimates of bycatch for each species/stock taken in a fishery.

This alternative would establish, as a performance measure of the SBRM, a standard that the SBRM be sufficient to attain a CV of no more than 30 percent for each applicable fishing mode. The 30-percent CV standard would apply, at least initially, to all applicable fishing modes for each species group (see Table 46 and Table 47). This SBRM standard addresses the precision of the estimates, not the accuracy of the estimates. For a full analysis and discussion of precision and accuracy, including a discussion of the ways in which accuracy can be improved, see Chapter 5 and Appendix A.

Although the proposed 30-percent CV standard is based on the recommendation in NMFS (2004), the proposed application of this standard differs in several important ways. First, the precision goal is recommended to apply to “a fishery,” but in the proposed SBRM, the CV standard would apply at the level of the fishing mode. The Magnuson-Stevens Act defines “fishery” as “(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks.” Thus, under the Magnuson-Stevens Act definition, the monkfish fishery, for example, would be treated as a single fishery inclusive of all gillnet fishing, otter trawl fishing, scallop dredge fishing, and all other fishing regardless of gear type used and/or area fished, that catches monkfish. Employing the precision goal at the level of the fishery, then, could be inferred to mean that the precision of the estimate of monkfish discards across all types of fishing activities that catch monkfish should be between 20 and 30 percent.

In contrast, under this alternative the SBRM CV standard would apply not at the level of the fishery, but at the finer scale of the individual fishing modes (described in Chapter 3). In the monkfish example, there would be 6 primary fishing modes associated with the monkfish fishery within a total of over 25 fishing modes for which the SBRM CV standard of 30 percent would separately apply. For the purposes of defining the SBRM, this amendment classifies the relevant fishing activity into 56 fishing modes (as explained in Chapter 3 and Chapter 5).

Another way in which the proposed application of the SBRM standard differs from the NMFS (2004) guidance is that while the guidance document indicates that the precision goal of 20-30 percent should apply to total discards "aggregated over *all* species" [emphasis added], this preferred alternative proposes disaggregating all species to the level of individual species or groups of related species. Continuing the example of the monkfish fishery, among the gear types that catch monkfish, there are more than 29 other FMP species caught in those gears (along with many other non-FMP species). The guidance in NMFS (2004), therefore, recommends that the precision of the estimate of total discards of all 30+ species across all applicable fishing gears would be sufficient if the single estimate had a CV between 20 and 30 percent. The SBRM proposed under the preferred alternative would separately track the precision of the discard estimates for each individual species, except for a few limited cases where a species complex is more appropriate, managed under a Greater Atlantic Region FMP. Thus, rather than tracking a single discard estimate for the monkfish fishery across 30+ species, the proposed SBRM would separately track discard estimates for 15 individual species or species groups.

In total, the proposed SBRM would separately track and report the precision associated with the discard estimates of 14 individual fishery resource species or species groups and one protected species group across 56 separate fishing gear modes (see Table B-1 in Appendix B). In sum, this means that rather than trying to achieve a precision of 20-30 percent for a single estimate of total discards in each of 15 major fisheries (15 separate estimates), under this proposed SBRM, the Councils and NMFS will strive to achieve a precision of no more than 30 percent in each of up to 840 unique fishing gear mode and species combinations (see Table 46 and Table 47).

The proposed CV-based performance standard for the SBRM applies only to data collected by at-sea fisheries observers. Observer data are the primary sources of bycatch information in the commercial fisheries subject to an affected FMP. It is the intent of the agency to ensure that all future recreational fishing data collection programs minimize bias and maximize precision to the extent practicable, and to take all necessary steps, as suggested by the NRC and mandated by Congress, to develop and maintain a statistically valid and reliable recreational fishing data collection program.

6.4 Element 4: SBRM Review/Reporting Process

More than one alternative to the status quo could be selected from this section.

6.4.1 Alternative 4.1 – No Review or Reporting Requirements (Status Quo)

Under this alternative, the SBRM Omnibus Amendment would neither include any specific process or requirement to conduct periodic reviews of the effectiveness of the SBRM, nor would it specify or suggest any particular process to be used by the Councils and/or NMFS to determine whether a CV standard should be changed, or whether additional steps are necessary to improve the SBRM.

6.4.2 Alternative 4.2 – Specify an SBRM Review Process (*Preferred Alternative*)

This alternative would establish a periodic review and reporting process through which the Councils and NMFS would consider the effectiveness of the SBRM and, if necessary, take appropriate steps to improve the SBRM. The periodic review process established for the SBRM would specify how and when the Councils and NMFS would review information regarding the effectiveness of the SBRM relative to the CV standard. Note that the report specified under this alternative would be separate from the discard reporting process described in alternative 4.3. The SBRM Review Report is intended to provide the information necessary to evaluate whether the SBRM has been effective at meeting its objectives. The discard report (alternative 4.3) is intended to present the most recent information on discards occurring in the relevant fisheries.

The cornerstone of the review process would be a report (SBRM Review Report), prepared by an SBRM Review FMAT formed for this purpose, that would provide the following information: (1) A review of the recent levels of observer coverage in each applicable fishing mode; (2) a review of recent observed encounters with each species in each fishery (or by gear type for turtles), and a summary of observed discards by weight; (3) a review of the CV of the discard information collected for each fishery; (4) a review of recent estimates of the total amount of discards associated with each fishing mode (these estimates may differ from estimates generated and used in stock assessments, as different methods and stratification may be used in each case); (5) an evaluation of the effectiveness of the SBRM at meeting the performance standard for each fishery; (6) a description of the methods used to calculate the reported CVs and to determine observer coverage levels, if the methods used are different from those described and evaluated in this amendment; (7) an updated assessment of potential sources of bias in the sampling program and analyses of accuracy; and (8) an evaluation of the implications of the discard information collected under the SBRM. This last item would apply in cases where the evaluation performed for item 5 indicates that the performance standard is not met for certain combinations of fishing modes and species groups. In these cases, the report would evaluate the implications of not meeting the performance standard. It is expected that the evaluation would focus on whether the data remain sufficiently precise to conduct sound stock assessments and manage ACLs, whether the magnitude of the discards is such that the effect of less precise data is negligible, or whether the less precise data may actually compromise the stock assessment or management processes.

The information to be provided in the report for the purpose of determining the effectiveness of the SBRM in meeting the CV standards should not be confused with the level of information a Council may want or need to address specific management issues. More detailed discard-related information, structured in a way and at a scale meaningful for the particular management issue, can always be provided by the various PDTs and FMATs at the Councils' request. For example, the data collection programs within the SBRM could summarize bycatch data annually, by quarter, by month, for a region or by statistical area, by species groups or individual species, or other parameters requested by fisheries managers. Please note that the term "fishery" in the context of the SBRM Review Report maintains the usage indicated in this amendment, i.e., the fishing modes identified in chapter 3 based on the observable a priori attributes of a fishing trip. However, information requested by the Councils regarding discards occurring in specific fisheries, for the purpose of a fishery management action, may be organized based on primary species caught/targeted, area fished, trip length, or other feature of a fishing trip that would not be known until the trip is complete.

This alternative would also specify the frequency of the SBRM review process. There are four options relative to the frequency with which the review process is conducted:[43]

Option A – Annually. Under this option, the Councils would be presented with an annual SBRM Review Report that would address all fisheries for which the SBRM applies, including any new fisheries added to Council management since the last SBRM Review Report.

Option B – Every 5 years. Under this option, the Councils would be presented with an SBRM Review Report once every 5 years that would address all fisheries for which the SBRM applies, including any new fisheries added to Council management since the last SBRM Review Report. The structure of this review would be similar to the 5-year review of Council EFH designations, with NMFS providing the information needed by the Councils and the Councils each incorporating that information into their management process either in an omnibus SBRM Omnibus Amendment (as the New England Council is doing with an omnibus EFH amendment) or on a case-by-case basis in conjunction with each new management action (as the Mid-Atlantic Council is doing for EFH with all upcoming amendments).

Option C – SAFE Report schedule. Instead of a single SBRM Review Report generated for all applicable fisheries, information relevant to the effectiveness of the SBRM for a fishery would be presented in separate reports for each fishery, at a time interval appropriate for that fishery. This option could capitalize on review processes and timeframes already established for each FMP. For example, under the Red Crab FMP, there is a Stock Assessment and Fishery Evaluation (SAFE)

[43] In the draft 2007 SBRM Omnibus Amendment, three options were presented: Annually; every 5 years; and according to the SAFE reporting schedule. Based upon further consideration and review, a fourth option was added to the final draft of the 2007 SBRM Omnibus Amendment to provide a comprehensive SBRM Review Report every 3 years.

report prepared every 3 years, but the Skate FMP requires a SAFE report every 2 years and an annual report in the intervening years. Under this option, the SBRM Report for the red crab fishery could be incorporated into the Red Crab SAFE report and presented every 3 years, while the SBRM Report for the skate fisheries could be presented either annually or every 2 years.

Option D – Every 3 years. (*Preferred Option*) Under this option, the Councils would be presented with an SBRM Review Report once every 3 years that would address all fisheries for which the SBRM applies, including any new fisheries added to Council management since the last SBRM Review Report. This comprehensive report would address all items required of the report (see earlier paragraph) for all fisheries of both Councils.

The information provided to the Councils in the SBRM Review Report would indicate when and where any lack of precision around a bycatch estimate is different from the CV standard and whether this difference may be problematic for stock assessments or management decisions, including the monitoring of ACLs. With this information in hand, the Councils could initiate an action to change the appropriate SBRM standard and/or recommend additional management action(s) to address the problem. Under this alternative, the SBRM Review Report would identify pertinent issues to the Councils, and the Councils would choose whether and how to most effectively address the issues raised. The SBRM Review Report may warrant peer review, particularly if there have been substantial changes or updates to the models and analytical methods used to calculate the reported CVs and to determine observer coverage levels (as provided in item 6 of the report). The peer review may take the form of an independent external peer review such as for a formal stock assessment, or through the Councils' Scientific and Statistical Committees (SSCs), as was done for the 2007 SBRM Omnibus Amendment.

6.4.3 Alternative 4.3 – Require Periodic Discard Reports (*Preferred Alternative*)

This alternative would require, a periodic discard report prepared by the NEFSC on discards occurring in Council-managed fisheries. This report would be separate from any periodic report on effectiveness of the SBRM (considered under Alternative 4.2). This discard report would utilize information obtained from the NEFOP. The report would be presented to the Councils and would include catch and estimated discard based on data from all observed trips during a specified time period. Additional catch and effort data from other sources would be included as needed.

The discard reports would include summaries of the trips observed, fishing modes in the relevant time period, funding issues and other related issues and developments, and projections of coverage across fisheries for upcoming time period. More detailed information would be provided in tables and figures that addressed: The number of observer trips and sea days scheduled that were accomplished for each fishing mode and quarter, as well as the number of trips and sea days of industry activity; the kept weight from unobserved quarters and statistical areas summarized by fishing mode; the amount kept and estimated discards of each species by fishing mode; and the relationship between sample size and precision for relevant fishing modes.

Examples as to how discard data could be summarized by fishery and presented to the Councils are illustrated in NEFSC Reference Document 12-17 (Wigley et al., 2012a) for 15 species groups of fish and NEFSC reference Document 12-26 (Murray 2012) for turtles. Turtle estimates are currently updated for each gear type on a 5-year schedule to utilize a longer time series of data for these rare bycatch events. There are two options regarding the frequency with which the reports would be prepared:

> *Option A – Semi-annually.* Under this option, the Councils would be presented with an SBRM Discard Report every 6 months. The report would address all fisheries for which the SBRM applies.

> *Option B – Annually.* (*Preferred Option*) Under this option, the Councils would be presented with an SBRM Discard Report once every year. The report would address all fisheries for which the SBRM applies.

Under each option for turtles, the most recent average annual estimate of total bycatch would be reported until new estimates are generated.

6.5 Element 5: Changes to the Framework Adjustment and/or Annual Adjustment Provisions

6.5.1 Alternative 5.1 – Status Quo

Under the status quo, and notwithstanding the current framework adjustment provisions of any FMP, changes to the provisions of the SBRM implemented by this amendment could only be made through an amendment to the FMPs subject to this action. The SBRM Omnibus Amendment would <u>not</u> modify the current framework adjustment or annual adjustment/specification provisions of the subject FMPs to explicitly include any of the new SBRM provisions as items that may be modified through either a framework adjustment or an annual adjustment/specification.

6.5.2 Alternative 5.2 – Modify the Framework Adjustment Provisions

Under this alternative, certain provisions of the SBRM implemented under this amendment could be changed by the Councils through a framework adjustment to an affected FMP. Subject to the framework adjustment provisions established in each FMP, the following management measures or provisions of the SBRM may be implemented and/or modified through a framework adjustment to the applicable FMP:

- The CV-based performance standard. This includes changes to the CV level established as the SBRM performance standard for a particular fishery, fishing mode, or combination of species and fishing mode(s). The intent of this provision is to provide an efficient means for a Council to change the performance standard in certain circumstances when a higher level of precision (i.e., reducing the CV to less than 30 percent) is desired for a particular fishery or management program (e.g., a Special Access Program (SAP) under the Northeast Multispecies FMP).

- The means by which discard data are collected/obtained in a fishery. This includes implementation of new data collection technologies or procedures and/or changing current data collection technologies or procedures. The intent of this provision is to provide an efficient means for a Council to implement new collection protocols, to the extent that such implementation would require changes to fishing regulations. Changes implemented through this provision could include electronic video monitoring or electronic catch reporting, in one or more fisheries when and if the technologies become sufficiently mature for such use and there is an appropriate need in the subject fishery.

- Fishery stratification for the SBRM. This includes adding to or removing from the list of fishing modes that comprise the analytical framework for the SBRM. The intent is to provide an efficient mechanism for a Council to modify the basis by which SBRM-related analyses are conducted and by which observer effort is allocated across all fisheries. These changes are necessary as management measures create, eliminate, or modify fishery programs identified as independent fishing modes for the purposes of applying the SBRM.

- SBRM reporting. This includes changes to the requirements for periodic reports of discards occurring in New England and/or Mid-Atlantic fisheries, as well as changes to the requirements for periodic reports on the effectiveness of the SBRM. The intent is to provide an efficient mechanism for a Council to change the frequency at which they receive SBRM-related reports, as well as to change the minimum required contents of all such SBRM-related reports.

- Industry-funded observers and/or observer set-aside programs. This change authorizes the establishment of an industry-funded observer program and observer set-aside provisions. For more information, see section 6.7.3.

6.5.3 Alternative 5.3 – Modify the Framework Adjustment and Annual Adjustment/Specification Procedures

Under this alternative, certain provisions of the SBRM implemented under this amendment could be changed by the Councils through a framework adjustment to an affected FMP or through the annual adjustment or annual or multi-year specification process established by an FMP. Subject to the appropriate framework adjustment, annual adjustment, annual specifications, and/or multi-year specifications provisions established in each FMP, the following management measures or provisions of the SBRM may be implemented and/or modified through one of these mechanisms of the applicable FMP:

- The CV-based performance standard. This includes changes to the CV level established as the SBRM performance standard for a particular fishery, fishing mode, or combination of species and fishing mode(s). The intent of this provision is to provide an efficient means for a Council to change the performance standard in certain circumstances when a higher level of precision (i.e., reducing the CV to less than 30 percent) is desired for a particular fishery or management program (e.g., a Special Access Program (SAP) under the Northeast Multispecies FMP).

- The means by which discard data are collected/obtained in a fishery. This includes implementation of new data collection technologies or procedures and/or changing current data collection technologies or procedures. The intent of this provision is to provide an efficient means for a Council to implement new collection protocols, to the extent that such implementation would require changes to fishing regulations. Changes implemented through this provision could include electronic video monitoring or electronic catch reporting, in one or more fisheries when and if the technologies become sufficiently mature for such use and there is an appropriate need in the subject fishery.

- Fishery stratification for the SBRM. This includes adding to or removing from the list of fishing modes that comprise the analytical framework for the SBRM. The intent is to provide an efficient mechanism for a Council to modify the basis by which SBRM-related analyses are conducted and by which observer effort is allocated across all fisheries. These changes are necessary as management measures create, eliminate, or modify fishery programs identified as independent fishing modes for the purposes of applying the SBRM.

- SBRM reporting. This includes changes to the requirements for periodic reports of discards occurring in New England and/or Mid-Atlantic fisheries, as well as changes to the requirements for periodic reports on the effectiveness of the SBRM. The intent is to provide an efficient mechanism for a Council to change the frequency at which they receive SBRM-related reports, as well as to change the minimum required contents of all such SBRM-related reports.

- Industry-funded observers and/or observer set-aside programs. This change would only be made to the framework adjustment provisions of relevant FMPs, and authorizes the establishment of an industry-funded observer program and observer set-aside provisions. For more information, see section 6.7.3.

6.5.4 Alternative 5.4 – Modify the Framework Adjustment and Annual Adjustment/Specification Procedures, Allowing Changes to Fishing Modes Without Formal Council Action (*Preferred Alternative*)

Under this alternative, certain provisions of the SBRM implemented under this amendment could be changed by the Councils through a framework adjustment to an affected FMP or through the annual adjustment or annual or multi-year specification process established by an FMP. However, unlike the provisions listed above under Alternative 5.3, adding to or removing from the list of fishing modes that comprise the analytical framework for the SBRM could be done annually without specific action by the Councils. The Councils would be informed each year if a specific fishing mode(s) is added or removed from the SBRM, and would have the opportunity to provide comment on the appropriateness of the change. The Councils could suggest specific fishing modes be considered for addition or removal from the SBRM. The intent is to provide an efficient mechanism to modify the basis by which SBRM-related analyses are conducted and by which observer effort is allocated across all fisheries. These changes are necessary as management measures or innovations by the fishing industry create, eliminate, or modify fishing operations identified as independent fishing modes for the purposes of applying the SBRM.

Subject to the appropriate framework adjustment, annual adjustment, annual specifications, and/or multi-year specifications provisions established in each FMP, the following management measures or provisions of the SBRM may be implemented and/or modified through one of these mechanisms of the applicable FMP:

- The CV-based performance standard. This includes changes to the CV level established as the SBRM performance standard for a particular fishery, fishing mode, or combination of species and fishing mode(s). The intent of this provision is to provide an efficient means for a Council to change the performance standard in certain circumstances when a higher level of precision (i.e., reducing the CV to less than 30 percent) is desired for a particular fishery or management program (e.g., a Special Access Program (SAP) under the Northeast Multispecies FMP).

- The means by which discard data are collected/obtained in a fishery. This includes implementation of new data collection technologies or procedures and/or changing current data collection technologies or procedures. The intent of this provision is to provide an efficient means for a Council to implement new collection protocols, to the extent that such implementation would require changes to fishing regulations. Changes implemented through this provision could include electronic video monitoring or electronic catch reporting, in one or more fisheries when and if the technologies become sufficiently mature for such use and there is an appropriate need in the subject fishery.

- SBRM reporting. This includes changes to the requirements for periodic reports of discards occurring in New England and/or Mid-Atlantic fisheries, as well as changes to the requirements for periodic reports on the effectiveness of the SBRM. The intent is to provide an efficient mechanism for a Council to change the frequency at which they receive SBRM-related reports, as well as to change the minimum required contents of all such SBRM-related reports.

- Industry-funded observers and/or observer set-aside programs. This change would only be made to the framework adjustment provisions of relevant FMPs, and authorizes the establishment of an industry-funded observer program and observer set-aside provisions. For more information, see section 6.7.3.

6.6 Element 6: Prioritization Process for SBRM Observer Allocations

The Court order in *Oceana* v. *Locke* which vacated the 2007 SBRM Omnibus Amendment found fault with the prioritization process adopted in that action on two fronts. The Court found that NMFS had too much discretion in determining whether there were sufficient resources available to fully implement the estimated number of sea days needed to achieve the CV performance standard. In addition, the Court found that NMFS had too much discretion in how observer sea days were redistributed under the prioritization process. To address these two aspects of the court order, the alternatives in this section are divided into two groups. The first group of alternatives (6.1.1 and 6.1.2) proposes “funding triggers” that could be used to determine what resources are available and whether those resources are sufficient to fully implement the SBRM coverage in a given year. The second group of alternatives (6.2.1, 6.2.2, and 6.2.3) proposes alternative methods for redistributing the available observer sea days if resources are limiting. If there are sufficient funds to fully implement the SBRM in a given year, then the trigger would not be met and no redistribution of observer coverage would be necessary.

A third set of alternatives (6.3.1, 6.3.2, and 6.3.3) is presented to address the unlikely event that Federal observer funding is so restricted in a given year that there are not enough observer sea days to achieve the minimum pilot coverage in each fleet.

6.6.1 Funding Trigger Alternatives

6.6.1.1 Alternative 6.1.1 – Status Quo Funding Trigger

Observer sea days in the Greater Atlantic Region are funded from a number of funding lines. Some funding sources are dedicated to observers for specific species (e.g., sea turtles under the Endangered Species Act or marine mammals under the MMPA) or for bycatch in specific fisheries (e.g., mid-water trawls or groundfish sectors). Some national funding sources have more flexibility and can be targeted to Regions or fisheries that have a particular need or priority. When determining if sufficient funding is available to fully implement the target observer coverage levels, NMFS currently takes into account the range of available funds and the various restrictions and limitations on each source.

6.6.1.2 Alternative 6.1.2 – Identify Specific SBRM Funding Sources (*Preferred Alternative*)

Under this trigger alternative, the SBRM Omnibus Amendment would identify specific funding sources to be used to fund observer coverage under the SBRM each year. If this funding in a given year is sufficient to fully implement the observer coverage levels estimated to achieve the target performance standard, then no further prioritization would be necessary that year. If the funding available through these specified sources is not sufficient to fully implement the estimated observer coverage levels in a given year, then an additional prioritization process would be used to determine how the available observer sea days would be allocated across the fisheries.

Funding Line	**Average Proportion to the Region (2010-2012)**
Northeast Observers	98 percent
Atlantic Coast Observers	43 percent
National Observer Program	43 percent
Reducing Bycatch - Observers	13 percent

Table 66. Example of recent average funding for Greater Atlantic Region observer coverage

Table 66 illustrates the levels of these funding sources that have been allocated to the Greater Atlantic Region for observer coverage in recent years. Future allocations to the Greater Atlantic Region may vary. The SBRM would form the foundation of observer coverage in the region. As such, the NEFOP would use funds allocated to the Region from these funding program lines to support SBRM consistent with historic practice. Funding for Atlantic Coast Observers is divided between the Greater Atlantic Region, Southeast Region, and NMFS Headquarters. In recent years the proportion that has been allocated to the Greater Atlantic Region to fund SBRM coverage has been 43 percent, on average. The National Observer Program funding line is divided among all of the NMFS regions and NMFS Headquarters. In recent years, the Greater Atlantic Region has received the largest portion of this funding, averaging 43 percent. Funding under the Reducing Bycatch-Observers line is directed to NMFS to fund a variety of bycatch observer-related work among all of the Regions and NMFS Headquarters. In recent years, an average of 13 percent of this funding has been allocated to SBRM coverage in the Greater Atlantic Region.

Under this alternative, the total available funds allocated to the Greater Atlantic Region from the Congressional appropriation funding lines listed in Table 66, would be used to support SBRM consistent with historic practice and thereby determine if there were sufficient funds available to fully implement the SBRM in a given year. These funding sources could be adjusted if Congress directs the use of these funds for other purposes; as such a directive would be binding on NMFS. If additional funds for observer sea days were available from another funding source, not listed here, those observer sea days could be allocated according to other priorities and would not necessarily be allocated according to the SBRM process. Such other funding sources could include funding for observers dedicated to monitoring at-sea interactions under the MMPA or the Endangered Species Act, or funding dedicated for management purposes, such as monitoring catch share programs. In case final Congressional appropriations are not available at the time observer coverage rates are determined, it may be necessary to use an estimate of the funds that will ultimately be available. Subsequently adjusting coverage levels to match the final budget allocations may not be feasible.

6.6.2 Observer Sea Day Prioritization Alternatives

6.6.2.1 Alternative 6.2.1 – Council Consultation of Proposed SBRM Observer Allocations

Under this alternative, the Regional Administrator and Science and Research Director would be required to develop a proposed prioritization of how the available resources should be allocated across the fisheries should any external operational constraint exist. The Regional Administer and Science and Research Director would provide the Councils, at the earliest practicable opportunity: (1) The at-sea observer coverage levels required to attain the SBRM performance standard in each applicable fishery; (2) the coverage levels that would be available if the resource shortfall were allocated proportionately across all applicable fisheries; (3) the coverage levels that incorporate the recommended prioritization; and (4) the rationale for the recommended prioritization. The recommendation of the Regional Administrator and Science and Research Director should be based on: Meeting the immediate and anticipated data needs for upcoming stock assessments; legal mandates of the agency under other applicable laws, such as the Endangered Species Act or MMPA; meeting the data needs of upcoming fishery management actions, taking into account the status of each fishery resource; improving the quality of discard data across all fishing modes; and/or any other criteria identified by NMFS and/or the Councils. The Councils would consider the recommendations of the Regional Administrator and Science and Research Director at a public meeting, and may choose to recommend revisions or additional considerations to be considered by the Regional Administrator and Science and Research Director.

This alternative represents the alternative implemented by the 2007 SBRM Omnibus Amendment. This approach to prioritizing at-sea observer coverage was found to be legally deficient by the Court in Oceana v. Locke and was the basis for the decision to vacate the 2007 SBRM Omnibus Amendment. Therefore, this alternative would not meet the Court's directive to address this deficiency.

6.6.2.2 Alternative 6.2.2 –Adjust Observer Coverage Proportionally Across All Fishing Modes

Under this alternative, the number of observer sea days for each agency-funded fishing mode would be reduced by the same percentage as the funding shortfall, after the number of sea days needed for minimum pilot coverage has been deducted. It was recognized that in the process of proportionally reducing sea days to match available funds some fishing modes might result in coverage below a level that would be expected to produce meaningful discard information. The minimum pilot coverage has been incorporated into this formulaic approach to provide a minimum threshold for all fishing modes. The minimum pilot coverage level as described in 5.3.3.

To account for the minimum pilot coverage, total minimum pilot coverage sea days are subtracted from the total number of funded observer sea days and from the number of sea days needed to achieve the CV performance standard. Next, a ratio would be calculated by dividing the adjusted total number of funded observer sea days by the adjusted number of sea days needed to achieve the CV performance standard. This ratio would be applied to all of the fishing modes subject to the funding shortfall.

In the following example, the allocation process determined that 15,000 sea days were needed to achieve the CV performance standard and 2,000 sea days were needed for minimum pilot coverage, but funding was only available for 12,000 sea days. The 2,000 minimum pilot coverage sea days would be subtracted from the sea days needed to achieve the CV performance standard (15,000 – 2,000), yielding 13,000 sea day needed. Similarly 2,000 minimum pilot coverage sea days would be subtracted from the 12,000 funded days, yielding 10,000 funded. Therefore, there would be a 3,000 day shortfall. These 10,000 funded sea days would be proportionally allocated to each fishing mode based on the ratio of 0.77 (10,000 funded days / 13,000 needed days). Within each agency-funded fishing mode, the proportionally allocated sea days would be added to the minimum pilot coverage sea days. Fleets with industry funded observer coverage, which is not specifically tied to SBRM coverage levels, would be excluded from these calculations. Therefore, the coverage levels in the scallop fishery would not necessarily be included in the calculation of the funding shortfall nor would coverage levels in the scallop fleet be reduced by the percent shortfall.

This alternative prioritization approach is applicable when the total agency-funded sea days are greater than the total minimum pilot sea days needed. An illustrative example of this alternative is provided in Appendix H. All fleets will have some observer coverage.

6.6.2.3 Alternative 6.2.3 - Adjust Observer Coverage Using the Penultimate Cell Approach (*Preferred Alternative*)

Under this alternative, the available number of observer sea days would be prioritized across the various agency-funded fishing modes such that the fewest number of fishing mode and species group combinations have a CV that is higher than the CV-based performance standard. As described in 6.2.2, the necessary observer coverage for each fishing mode would be the highest projected number of observer sea days needed to achieve the CV-based performance standard for each species or species group after the application of the importance filters. In order to prioritize the available sea days, using this alternative, the species group sea days needed would be organized in descending ordered within each fishing mode for all modes, and the highest difference in needed sea days between adjacent species groups within the fishing modes would be identified. The sea days associated with the species group that represents the highest number of observer sea days from that fishing mode would be removed, with the constraint that the differences are taken in order within a fleet. Therefore, that fishing mode would then use the second highest (penultimate) projected number of observer sea days. This process of eliminating the highest difference in projected number of observer sea days within a fleet would be repeated, as necessary, across all fishing modes until the total number of observer sea days needed is within that year's funding limit.

Table 67 shows an example of how the sea days needed are derived. In this example, the projected number of observer sea days needed to achieve the CV performance standard is determined for each fishing mode and species group combination. Several of the cells are filtered out by the importance filters as described under section 6.2.3, and are shown as zero sea days in the table. Of the cells that remain, the highest value in each fishing mode is used as observer coverage needed in that fishing mode to achieve the CV-based performance standard across all species groups. In this example, after the importance filter, 18,301 observer sea days would be needed to fully implement the SBRM.

In the penultimate approach, if the available funding resources could not fund this number of days, the fishing mode with the highest difference in the number of observer sea days between species groups within a fishing mode would be adjusted. Here, the highest difference between species groups occurs within the small mesh groundfish in the Mid-Atlantic large-mesh otter trawl fishery (Row 6). This fishing mode needs 5,551 observer sea days to achieve the CV performance standard and the next highest (penultimate) sea days needed is 2,952 for sea turtles, a difference of 3,091 days. If the small mesh groundfish cell is eliminated from consideration, then that fishing mode would then use 2,952 observer sea days based on the number needed for the sea turtle species group. This would drop the number of needed observer sea days from 18,301 to 15,210. If additional reductions were necessary, the process would be repeated, each time using the difference in sea days between the highest value cell and the second-highest value cell (penultimate cell) for each fishing mode, and comparing that difference across all fishing modes.

In this alternative the minimum pilot coverage is incorporated, and the sea days within a fishing mode would not be reduced below this number of sea days. The minimum pilot coverage level is described in 5.3.3. This alternative prioritization approach is applicable when the total agency funded sea days are greater than the total minimum pilot sea days needed. An illustrative example of this alternative is provided in Appendix H. All fishing modes would have some observer coverage.

Row	Gear Type	Region	Mesh Group	RCRAB	SBM	MONK	GFL	GFS	SKATE	DOG	FSB	TURS	Pilot days	Min Pilot Days	2012 Sea Days Needed COMBINED
5	Otter Trawl	MA	sm	3,231	364	0	497	545	397	325	513	1,719	160	30	3,231
6	Otter Trawl	MA	lg	5,551	0	164	141	0	107	333	173	2,952	266	27	5,551
7	Otter Trawl	NE	sm	0	411	0	461	451	531	1,151	489	-	168	29	1,151
8	Otter Trawl	NE	lg	3,879	0	568	76	280	261	229	788	-	415	35	3,879
17	Otter Trawl, Haddock Separator	NE	lg	0	0	0	0	0	257	567	0	-	100	100	567
22	Sink, Anchor, Drift Gillnet	MA	sm	0	0	0	0	0	0	0	0	172	40	13	172
23	Sink, Anchor, Drift Gillnet	MA	lg	0	0	0	0	0	0	0	0	172	43	13	172
24	Sink, Anchor, Drift Gillnet	MA	xlg	0	0	70	0	0	83	0	0	1,096	61	15	1,096
26	Sink, Anchor, Drift Gillnet	NE	lg	0	0	0	0	0	0	97	0	-	134	14	97
36	Scallop Dredge	MA	all	0	0	312	0	0	164	0	0	598	238	109	598
39	Mid-water Paired & Single Trawl	NE	all	0	0	0	0	0	0	571	0	-	43	43	571
48	Pots and Traps, Lobster	NE	all	429	429	429	429	429	429	429	429	-	429	17	429
⋮	⋮			⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮

Agency-funded fleets	**18,301**
Industry-funded fleets	**2,289**
Total	**20,590**

Table 67. Example of projected number of observer sea days; purple shading indicates an industry funded fleet.

6.6.3 Insufficient Funding for Minimum Pilot Coverage Alternatives

The use of minimum pilot coverage as described in section 5.3.3 ensures that a fleet is not allocated too few observer sea days such that meaningful discard estimations could not be generated. If the total of agency funded sea days is greater than the total minimum pilot coverage, then one of the prioritization alternatives in 6.6.2 would be appropriate. If the funded days exactly equals the total minimum pilot coverage sea days then the sea days would be assigned to fishing modes according to the minimum pilot coverage. However, it is theoretically possible that the available funding for SBRM observers in a given year could be so restricted that the minimum pilot coverage for each fleet could not be achieved. In such a case, it would be necessary to determine which fleets would get enough observer coverage to reach the minimum pilot coverage and which would not. Three alternatives have been developed to ensure some meaningful discard estimations if SBRM funding is ever so restricted. To address all potential funding situations, one alternative from section 6.6.2 and one alternative from this section would be selected. Which of those two alternatives would apply in a given year would depend on the specific funding level.

It should be noted that an FMP may require a level of observer coverage to address management considerations other than SBRM, which is funded outside of the SBRM funding sources discussed in section 6.6.1. Current examples are the industry funded observer program in the scallop fishery, or the at-sea monitors in the NE multispecies sector program. Although these observers may not be specifically deployed for SBRM, the data they collect may be used to supplement SBRM data or to generate discard estimations in the absence of SBRM-funded observers.

6.6.3.1 Alternative 6.3.1 – Assign Coverage Ad-Hoc

Under this alternative the Regional Administrator and Science and Research Director would provide the Councils a proposal that provides details of the funding shortfall and recommends which fishing modes would receive minimum pilot coverage and which would not receive any coverage. The proposal should include the basis for these recommendations, including any legal mandates, management priorities, or data needs that were considered. The Councils would consider the proposal at a public meeting, and may choose to recommend revisions or additional considerations.

This alternative prioritization approach is applicable only when the agency-funded sea days are less than the minimum pilot sea days needed. Under this alternative some fleets will necessarily not have observer coverage.

6.6.3.2 Alternative 6.3.2 – Assign Coverage Based on Minimum Pilot Coverage

Under this alternative, the number of agency-funded sea days would be assigned to each fishing mode by sequentially eliminating coverage in fleets that have the highest minimum pilot coverage days until the shortfall in minimum pilot coverage sea days is removed. Here, the MA shrimp trawl fleet (Row 36) requires the most minimum pilot sea days (120 days), thus this fleet would be assigned zero sea days. If necessary, the fishing mode with the next highest minimum sea days (Row 17 with 100 days) would be assigned zero sea days. This process would continue until the shortfall in minimum pilot coverage sea days is removed. Any remaining days would then be proportionally allocated among fleets with sea days assigned.

This alternative prioritization approach is applicable only when the agency-funded sea days are less than the minimum pilot sea days needed. An illustrative example of this alternative (also referred to as the "Penultimate MPC Approach") is provided in Appendix H. Under this alternative some fleets will necessarily not have observer coverage.

6.6.3.3 Alternative 6.3.3 – Assign Coverage Based on Minimum Pilot Coverage Ratio *(Preferred Alternative)*

Under this alternative, the number of agency-funded sea days would be assigned to each fishing mode by sequentially eliminating coverage in fleets that had the highest ratio of minimum pilot coverage days to actual days absent from port, as reported by FVTRs from the previous year, until the shortfall in minimum pilot coverage days is removed. This process would continue until the shortfall in minimum pilot coverage sea days is removed. Any remaining days would then be proportionally allocated among fleets with sea days assigned.

This alternative prioritization approach is applicable only when the agency-funded sea days are less than the minimum pilot sea days needed. An illustrative example of this alternative (also referred to as the "Penultimate MPC Ratio Approach") is provided in Appendix H. Under this alternative some fleets will necessarily not have observer coverage.

6.7 Element 7: Industry-Funded Observer Program Provisions

6.7.1 Alternative 7.1 – Status Quo

The only Greater Atlantic Region FMP currently with an industry-funded observer program is the Sea Scallop FMP. Beginning in 1999, a percentage of the TAC in scallop access areas has been set aside from the amount available to the fishery in order to generate funding for vessels required to carry an observer on a fishing trip. The scallop TAC set-aside was then allocated to scallop vessels in the form of increased trip limits on trips for which an observer is required. The increased trip limits are intended to offset the cost of carrying and paying for an observer. Amendment 10 to the Scallop FMP extended the set-aside program to include a DAS set-aside for fishing trips in the open areas. The scallop DAS set-aside was provided to scallop vessels in the form of a reduced DAS charge on fishing trips for which an observer is required. In either case, scallop vessels are required to carry and pay for observers when asked, regardless of the availability of either TAC set-aside or DAS set-aside; i.e., vessels are compensated for carrying an observer only to the extent that the set-asides are available, and once the set-asides are exhausted, fishing vessels required to carry observers bear the entire cost.

Under the status quo alternative, similar provisions would not be created for any other FMP under the Councils' jurisdiction. Should a Council decide, at any point in the future, to require permitted fishing vessels to pay for at-sea observers and to develop an observer set-aside program to offset the costs to the vessels of carrying and paying said observers, a full amendment to the subject FMP would be required.

Under the status quo alternative, no changes would be made to the sea scallop observer set-aside program, which would continue to operate as established under Framework Adjustments 16 and 18 and Amendments 10 and 13 to the FMP.

6.7.2 Alternative 7.2 – Authorize Observer Service Provider Approval and Certification (*Preferred Alternative*)

Under this alternative, the sea scallop industry-funded observer regulations at 50 CFR 648.11(h) and (i) implemented via emergency rule would be modified and broadened to apply to all Council FMPs. This action would authorize observer service provider approval and certification for all applicable fisheries, should a Council develop and implement a requirement or option for an industry-funded observer program in other fisheries besides sea scallops. It would not, in itself, implement or obligate the Councils to develop an industry-funded observer program, but would create the process by which observer service providers can be approved and certified. This alternative should be considered a parallel to developing a Vessel Monitoring System (VMS) type approval process that applies to all fisheries implementing a VMS provision. The VMS type approval process requirements at § 648.9 were established across all fisheries, but a separate action is required under each FMP to implement VMS provisions for each fishery. Similarly, only though a follow-on action for each FMP (either an amendment or framework adjustment, see alternative 7.3) could an industry-funded observer program, along with any observer set-aside provisions, be developed and implemented.

The June 13, 2007, final rule that implemented Amendment 13 to the Sea Scallop FMP made permanent the industry-funded observer regulations that were first implemented on December 28, 2006, via emergency rule. This action would not expand or modify the regulations at § 648(g), which include the specific requirements for sea scallop vessels to obtain, carry, and pay for observers.

The intent of the current regulations at § 648.11(h) that would be expanded through this action is to allow any entity to become an observer service provider, provided it meets the established approval process and all the responsibilities stipulated. An application would be required to contain detailed information such as contact information; description of past experience with placing individuals in remote field and/or marine environments; evidence of adequate insurance to cover injury, liability, and accidental death for observers during employment; and proof of compensation for observers while employed that meet or exceed U.S. Department of Labor guidelines. NMFS would review and evaluate each application and, if approved, the observer service provider's name would be added to the list of approved observer service providers. An approved observer service provider would be required to maintain at least eight certified observers that have passed the NMFS NEFOP Fisheries Observer Training course. The observer service provider would be responsible for all necessary transportation, lodging expenses, and necessary equipment for the observer. An observer service provider would be required to be available for access by the fishing industry 24 hours per day, 7 days per week. Specific reporting requirements would apply, including the timing of reports to be provided to NMFS. Additional requirements are detailed in Appendix H to this amendment.

This action would include specific standards set by NMFS that an observer service provider would be required to meet in order to be certified, including that employees of observer service providers meet the NMFS National Minimum Eligibility Standards;[44] and the observers would be required to pass the NMFS training course, be physically and mentally capable of carrying out the responsibilities of an observer, and hold a current CPR/first aid certification. NMFS would retain the authority to review observer certifications and issue observer certification probation and/or decertification if warranted. Additional requirements are detailed in Appendix H to this amendment.

6.7.3 Alternative 7.3 – Addition of Industry-Funded Observer and Observer Set-Aside Provisions as a Measure That Can Be Implemented Through Framework Adjustment to the FMPs (*Preferred Alternative*)

Under this alternative, the development of and/or modifications to an industry-funded observer program, including observer set-aside provisions, could be implemented through a framework adjustment to the relevant FMP. Absent this action, a full FMP amendment would be required for all fisheries, with the exception of the sea scallop fishery. This measure would include general language in the regulations of each FMP that would allow an industry-funded observer program and observer set-aside provisions to be implemented by framework adjustment.

[44] Available at www.nmfs.noaa.gov/op/pds/documents/04/109/04-109-01.pdf/.

Development of an industry-funded observer program, an observer set-aside program, or changes to either could be implemented by framework adjustment and could include measures such as the level of observer coverage required in the fishery, the basis for an observer set-aside program and the amount of the set-aside (e.g., quota, DAS, etc.), how the set-aside is allocated to vessels required to carry an observer (e.g., an increased trip limit, differential DAS counting, additional trips, an allocation of quota, etc.), the process for vessel notification, how funds are collected and administered from the industry to cover the costs of observer coverage, revisions to the observer service provider program (if adopted in this action), along with any other measures necessary to develop and implement either an industry-funded observer program or an observer set-aside program.

6.8 Alternatives Considered but Rejected

Alternatives that were considered initially or during the development of this amendment but were rejected from further analysis do not meet the purpose and need of the SBRM Omnibus Amendment (section 1.4) for one or more reasons. The rationale for rejecting these alternatives is discussed in this section.

6.8.1 Incorporating Non-Managed Species into the SBRM

Much of the focus of the SBRM has been on two groups of species: Those subject to a Mid-Atlantic or New England Council FMP; and those afforded protection under the Marine Mammal Protection Act or the Endangered Species Act. During the development of this amendment, there was consideration of whether the SBRM needed to explicitly account for non-managed species (those that are neither subject to an FMP nor protected as above). A review of discard observations from 2012 provided insight into this issue. In 2012, observers reported discards of 255 unique species.[45] Of these, 39 are managed under a Council FMP subject to this amendment. Another 43 species are subject to an FMP of the ASMFC or NMFS's Atlantic Highly Migratory Species Management Division. The remaining 173 species are either unmanaged or managed only at the level of the individual state.

An analysis of these data indicates that the 39 Council FMP species comprised 78.9 percent, by weight, of the observed discards in 2012. The addition of the Atlantic Highly Migratory Species and ASMFC species, to total 82 species, equaled 82.8 percent of the observed discards. Of the remaining 173 species that accounted for 17.2 percent of the observed discards, the top 15 non-managed species accounted for 16 percent of total discards, leaving 158 species that together comprised only 1 percent of the observed discards, by weight. Looking at the data another way, of the 255 recorded species, 97 species (roughly one-third of the reported species) accounted for 99 percent of the

[45] In this case, "unique" is meant to reflect the species codes reported by observers. There is some degree of overlap among the reported species. For example, while all relevant flounder species are recorded separately, there is also a "flounder, NK" category for flounders that cannot be clearly identified to the species. There are also several types of marine fauna that are not identified to the species level, such as starfish, sponges, and sea cucumbers, but are instead identified at this level.

discards by weight. Of these 97 species, 39 are managed under a Council FMP and 43 are managed under an ASMFC or Atlantic Highly Migratory Species FMP. Table 68 shows the top 15 non-managed discard species in the 2012 observer database.

Species	Percent of total observed discards
Sand dollar	6.5 %
Fish, species not known	2.8 %
Sponge	1.7 %
Starfish	1.4 %
Sea raven	0.6 %
Spotted hake	0.6 %
Northern sea robin	0.6 %
Jonah crab	0.5 %
Fourspot flounder	0.5 %
Herring, species not known	0.4 %
Longhorn sculpin	0.3 %
Striped sea robin	0.3 %
Rock crab	0.2 %
Sea robin, species not known	0.1 %
Seaweed	0.1 %

Table 68. Top non-FMP species, by weight, of observed discards in 2012, and the percent of each relative to the total observed discards of all species.

Together, the species identified in Table 68 and the species managed under an FMP account for 99 percent of all discards in 2012. This indicates that the majority of discards (99 percent of observed discards) are comprised of relatively few species (38 percent of observed discard species).

More important than the relative proportion of discards of various species is that this analysis demonstrates that at-sea observers record information on all species encountered by the fishing vessel. Observers are trained and expected to record information regarding 670 species (this includes differentiating some species by market code), and observers do so for both discards and landed catch (NEFSC 2013a). For the purposes of designing an SBRM from which data can be extracted to serve a variety of information and analytical needs, the most important factor is to ensure that as wide an array as possible of data are being collected. This analysis confirmed that all possible discard species are being reported by the at-sea observers. This information is available for use by NMFS, Council, ASMFC, and/or state fishery biologists and managers.

Because the explicit inclusion of additional, non-FMP managed species (other than those required under the law), is not necessary to ensure that data on the discards of these species is collected and available for review and/or use in stock assessments, and is beyond the scope required for the SBRM Omnibus Amendment, the need to explicitly consider non-managed species in the design and development of the SBRM was eliminated from further consideration, other than to continue to ensure that all species (managed and non-managed) encountered by observed fishing vessels are reported either as landings or discards.

6.8.2 Use Additional Mechanisms to Collect Bycatch Information

Expanded use of Industry-Based Surveys for bycatch purposes.

Expanded use of industry-based surveys as a bycatch monitoring mechanism was considered but rejected from further analysis and consideration. Because of their focused design, compressed seasonality, and specialized fishing gears, industry-based surveys are poorly suited to formally replace or supplement current data sources for bycatch information in any fishery mode of the Greater Atlantic Region, except in an ad hoc or opportunistic way. The industry-based surveys are conducted in a manner that is different than commercial fishing practices, and so the data collected by these surveys cannot be used in a meaningful way to supplement, replace, or improve data collected from other sources. Industry-based surveys are not a means to directly collect bycatch and discard data, nor are industry-based surveys data suitable to use as imputed values for missing commercial fisheries bycatch data. The time series of industry-based surveys data may be susceptible to lapses or compression pending research priorities and funding availability within the Greater Atlantic Region.

Information from the industry-based surveys may be most valuable in providing insight to unique or unusual situations that may need further investigation though other means, similar to how fishery independent survey data may be used. For example, if an industry-based survey found that an unusually high concentration of a given species was seen in the survey area during a specified time but fishery dependent data from the same time and area did not, it may be desirable to increase observer coverage within that time and area. Alternatively, a pilot program for a new technology such as electronic monitoring could be used in fishing modes within the area to confirm the presence of the anomaly. Such a pilot program would need significant regulatory development as well as technological and personnel support from within the Greater Atlantic Region.

Using industry-based surveys as an indicator for areas of study for fishery dependent resources should be left to the discretion of groups that assess and monitor specific FMPs and need not be a formalized process laid out in this amendment. The groups that may choose to periodically review industry-based survey data for bycatch related information include the Plan Development Teams, Monitoring Committees, and assessment working groups. Otherwise, industry-based surveys have no specific utility as a bycatch monitoring mechanism for any of the Greater Atlantic Region fishery modes.

Expanded use of Study Fleets for bycatch purposes.

Expanded use of study fleets to monitor bycatch information was considered but rejected from further analysis and consideration primarily because the study fleet program is not fully matured and the long-term design of the program has yet to be determined (John Hoey, pers. comm., NMFS). Many of the technical issues related to the study fleet have only recently been resolved (John Hoey, pers. comm., NMFS); the program has only just passed beyond the proof of concept phase and it is a data collection in its infancy. Additionally, the current study fleet participants are volunteers who are compensated for their participation in the program and these volunteers may not truly represent their fleet. A more representative fleet that is not potentially biased by compensation would be needed to ensure that the data are representative of the fleet as a whole. Only then could study fleet data be used for bycatch monitoring, in-season fisheries management, or as estimates to be expanded to an entire fishery mode.

Study fleet data are currently converted from tow-by-tow to trip level data for use in the various Northeast Regional data analyses. Thus, the study fleet information is the same as the data provided by the FVTR data collection. The increased resolution of tow data and improved location data may yield future utility, but for many of the reasons listed above, use of these data is currently limited.

The study fleet project is currently undergoing a detailed evaluation by NMFS and the Northeast Regional Research Steering Committee. It is, at this time, more appropriate that the Steering Committee make recommendations and changes to the study fleet program to further its utility as a regional data source, including bycatch and discard data, rather than implementing changes through this amendment. If revisions to the study fleet program yield usable data, they can be incorporated into updates of individual fishery mode SBRMs, as needed.

Expanded use of Alternative Platforms for bycatch purposes.

Expansion of the alternative platform program was considered but rejected from further analysis and consideration because no additional fisheries or fishery modes in the region were suitable for this type of data collection. Several alternative platform programs already exist in most of the fisheries or fishery modes for which they are suited in the Greater Atlantic Region. These include near-shore, fixed gear fisheries such as the Chesapeake Bay pound net and the internal waters gillnet fisheries in North Carolina and Virginia. These programs enable observers to obtain visual sampling data from small vessels or static gear that would otherwise be unobservable.

Because an independently operated vessel is needed to deploy an observer and the data collected are limited in most cases to what can be confirmed visually (i.e., presence/absence information), alternative platform programs would be suitable only for expansion to open ocean fishery modes if the desired data were observations of marine mammal and protected species interactions. It remains more effective to continue to monitor open ocean fisheries for these types of interactions through the placement of onboard observers and by requiring such interactions to be reported in FVTRs for unobserved vessels. Therefore, there are currently no additional fisheries or fishery modes where the alternative platform program could be expanded to provide additional bycatch data.

Implementation of Image Capture and Processing.

The implementation of image capture and processing or ‘digital observer’ systems was considered but rejected from further analysis and consideration because the technology has yet to be perfected in worldwide development and deployment (Mark

Buckley, pers. comm., Digital Observer, Inc.). To date, successes in using this technology have been limited to trials in laboratory settings (Davis 2002). The systems are not yet capable of performing to an acceptable standard in the field, even when lighting is enhanced and catch and discards are handled in a prescribed manner at designated locations. It remains more effective for human observers to perform the data collection tasks these systems would provide or to use electronic image capture paired with human analysis of the raw image data. Given the current capabilities of these types of systems, they are not yet suitable for collecting bycatch or discard information in any Greater Atlantic Region fishery mode.

Implementation of trawl monitoring devices.

The use of trawl monitoring devices was considered but rejected from further analysis and consideration because other means are more effective at providing the limited bycatch-related data that such systems would supply. Trawl monitoring devices have no direct applicability to collecting bycatch information. Their potential as a tool that assists in monitoring or as a means to reduce potential bycatch is also limited. This technology is primarily designed to assist fishermen in ascertaining how their gear is performing and when their nets are full. Fishery researchers have also made use of the technology to monitor performance parameters of trawl gear. The technology is often costly, may require complex installations and continual maintenance to ensure proper monitoring, and may require substantial electronic support onboard the deploying vessel (e.g., personal computer, GPS, fathometer, third wire, etc.).

Such devices may be most applicable to large-volume trawl fisheries such as the herring, squid, and mackerel trawl fishing modes, but would not be appropriate for collecting information on discards. Vessel operators, in an effort to maximize their operating efficiency, may capture and bring onboard more fish in their last set than the vessel can hold. Though this ensures that the vessel's hold will be filled to capacity before returning to port, it may result in discards. The extent to which 'topping off' occurs within the Greater Atlantic Region is not well understood, but is well documented in such fisheries as the Alaska walleye pollock and west coast hake fisheries (Carrie Nordeen, pers. comm., NMFS). The deployment of devices that signal when a codend is filling or full may be of use in helping vessel operators reduce any guess work related with trying to fill vessel holds to capacity.

If a program were designed that required the use of trawl monitors as a means to reduce potential for topping off, the devices would have to be rigorously tested for durability, failure rates, recording capabilities, tamper resistance, and performance standards. A significant regulatory environment would also need to be in place to support such a program. At this time, other approaches to reducing topping off discards are more practical. These may include such things as trip limits, limited access privilege programs, or observer coverage sufficient to characterize discards that do occur. In the scup fishery, for example, a transfer-at-sea provision was implemented to allow vessels with more scup in their net than the trip limit would allow to transfer the surplus to another fishing vessel, reducing the amount of scup that are discarded.

Other potential uses of trawl monitoring devices are limited. Though the technology is capable of monitoring such parameters as bottom contact, headrope height, and net spread, bycatch-related performance measures are better monitored as a function of observed and retained catch. For example, the correct use of a haddock separator trawl could be monitored by trawl devices. A more cost effective, practical way of monitoring separator trawls could be achieved by monitoring the catch of species such as cod or benthic organisms through onboard observers, FVTRs, and landing data.

6.8.3 Quarterly Discard Reports

The Councils considered requiring quarterly bycatch reports instead of semi-annual or annual reports (described in section 6.4.3). This information, however, would only be useful if the Councils could take action on the same frequency to modify fishing regulations on a quarterly basis. Most Council FMPs provide for an annual or biennial adjustment or measures set on a 3-year basis. Although all Council FMPs allow for mid-season changes to management measures through a framework adjustment, frameworks require at least two meetings of a Council to be approved, which generally means that framework adjustments take 4-6 months (or longer) to develop. Thus, it is not possible for a Council to make changes to management measures on a quarterly basis. Because the Councils generally operate on an annual basis, or less frequently, the potential value of quarterly reports is extremely limited. Quarterly reports would, however, require a significant investment of staff time and resources. Given the high cost staff time and resources, and the limited utility for directing Council action, this option was rejected from full consideration.

6.8.4 Alternative CV Levels

The Councils considered alternatives to the proposed CV of 30 percent applied to all combinations of fishing modes and species. In particular, the Councils considered an approach that would have attempted to establish a separate and distinct CV level for each particular combination of fishing mode and species (e.g., one CV level established for monkfish in New England small-mesh gillnets, a different CV level established for bluefish in Mid-Atlantic large-mesh otter trawls, etc.). The Councils also considered the basis for selecting 30 percent as the most appropriate CV level, and whether an alternative percentage (15 percent, 20 percent, 40 percent, etc.) should be selected instead. There are several reasons why these approaches were not pursued.

The primary reason for not considering a wide range of CV values is the lack of scientific justification for CV values outside the range recommended by the National Working Group on Bycatch. In NMFS (2004), a range of 20-30 percent was recommended for use in developing SBRMs. Even within this range, there is little scientific justification for choosing one CV level (e.g., 28 percent) over any other specific CV level (e.g., 27 percent). Given the lack of a scientific basis to select any one specific level over any other, the Councils focused on the extremes of this range (i.e., 20 percent and 30 percent). The reasons for utilizing the 30 percent CV level instead of the 20 percent CV level are explained in section 6.3.2.

Although briefly considered by the Councils early in the process to develop this amendment, establishing separate and distinct CV levels for each particular combination of fishing mode and species was not pursued further. As mentioned above, there was no scientific justification for choosing a CV level outside the range of 20-30 percent recommended in NMFS (2004). In addition, this approach was not pursued further due to a lack of information necessary to make informed decisions regarding the cell-by-cell CVs. In other words, the information that would be necessary to determine, for example, that monkfish in New England small-mesh gillnets should have a different CV level than that for bluefish in Mid-Atlantic large-mesh otter trawls, and whether that CV level should be higher or lower, is not available at this time.

Recognizing that as this information becomes available, the Councils may wish to establish different CV levels for certain combinations of fishing mode and species, this amendment provides the flexibility to the Councils to enable such changes to the CV level (see section 6.5.3). The global CV of 30 percent functions, in this case, as a baseline level of precision expected for all relevant fishing modes and species in the SBRM. If new information, or new management measures, indicate a need for improved precision for certain fishing modes and/or species, the Councils may change the CV levels to address these needs.

6.8.5 Alternative Prioritization Process

An alternative method of reallocating observer sea days by adjusting the filter cut points was considered but rejected. The Councils examined an alternative that would change the cut-point for the total discards (tier 3) and discard mortality (tier 4) filters discussed in alternative 2.3. The increased number of fishing modes that are filtered out would then be assigned pilot coverage levels instead of observer sea days based on the CV performance standard. The FMAT conducted analysis of this alternative, which showed that it would produce undesirable results, including eliminating coverage to some fishing modes where observer coverage was considered important for management. The reductions in observer sea days under this alternative occurred in discreet blocks of sea days. If an iteration of the adjustment required more observer sea days than could be funded, the next iteration could drop the number needed significantly below the available funds making adjusting the process to meet a given number of available observer sea days difficult. Given the limitations of this alternative and the availability of other alternatives that did not have this limitation, this alternative was rejected from further consideration.

6.8.6 Exclude protected species from the prioritization process

An alternative to exclude the estimated observer coverage needed to achieve the performance standard for protected species, including sea turtles, from the prioritization process was considered but rejected. The FMAT analyzed the potential impact of excluding sea turtles from the prioritization process. This analysis indicated that, under recent funding constraints, all available observer sea days would have been allocated to just a few fishing modes. This could result in no observer-collected discard information being collected in all other fishing modes. This would not meet the stated purpose and objective of this amendment. As a result, this alternative was rejected from further consideration.

6.9 Evaluation of Alternatives

This section will evaluate the alternatives presented in the above sections. This technical evaluation will focus solely on the ability of each alternative to effectively achieve the primary purpose and objectives of this amendment. Chapter 5 provides a technical assessment of the status quo process to allocate observer effort. An evaluation of the environmental consequences of the alternatives is presented in chapter 7 to comply with the requirements of the National Environmental Policy Act, the guidelines of the Council of Environmental Quality (CEQ), and NOAA Administrative Order 216-6.

6.9.1 Item 1: Bycatch Reporting and Monitoring Mechanisms

For this item, two alternatives are considered: (1) The status quo; and (2) implementing electronic monitoring to collect bycatch information. Although detailed information about the bycatch reporting and monitoring mechanisms currently utilized in the Greater Atlantic Region is available (see chapters 4 and 5, and Appendix A,), less is known about the implications of electronic monitoring as a potential bycatch reporting and monitoring tool for Greater Atlantic Region fisheries.

Currently, NMFS is reviewing available information to determine whether electronic monitoring applications may be best developed on a national basis rather than through various uncoordinated regional approaches (e.g., this SBRM). Electronic monitoring technology has been determined to be able to function reliably in the marine environment to identify fishing events (e.g., gear set and retrieval times and locations), obtain images of catch as it is brought aboard, and to determine when discards are occurring. Several programs world-wide have demonstrated some of the capabilities of electronic monitoring in hook and line fisheries (e.g., demersal longline) and trawl fisheries with relatively homogeneous catches, but the overall degree of success for electronic monitoring programs has been variable. Electronic monitoring technology is only moderately capable of providing data to estimate the species composition and number of fish retained and discarded in hook and line catch, quantify the amount of discards on trawl vessels, and detect and identify protected species and bird bycatch. Some highly specialized programs with complex regulatory requirements that stipulate how retained catch and discards must be handled have yielded more detailed bycatch and discard related data. In general, the larger the vessel, complexity of the fishing gear and its operation, diversity of the catch, and the level of detail in the data collection, the higher the degree of complexity to the type of electronic monitoring system that must be designed and deployed.

While electronic monitoring is a promising tool for bycatch monitoring, it remains very much a work in progress. The technology and systems available cannot currently perform the same complex data collection supplied by onboard human observers. Its utility as a tool to supplement existing data collection programs depends largely on designing a system within the constraints of the known electronic monitoring capabilities and ensuring the information collected is able to meet defined data needs. Smaller fishing vessels also present particular challenges to fitting and powering the required hardware, and to ensuring sufficient crew available to support the monitoring protocols.

To date, electronic monitoring has been demonstrated as most successful in providing presence/absence data or providing simple visual data (e.g., a marine mammal interacting with fishing gear). These types of data are of limited utility in the Greater Atlantic Region as most stock assessments require detailed biological data such as length-at-age develop estimates of total catch and discard. This does not mean that electronic monitoring could not be utilized effectively as a bycatch monitoring tool in the Greater Atlantic Region; however, it does mean that new ways of incorporating the type of data electronic monitoring could provide would first have to be designed and tested before an electronic monitoring program is implemented.

Some significant issues related to electronic monitoring program development have been very well characterized in a discussion paper on implementing electronic monitoring programs (Kinsolving 2006). In this paper, Kinsolving (2006) outlines the four primary regulatory scenarios that could be utilized in a large-scale electronic monitoring program:

- Full ownership by NMFS wherein the electronic monitoring equipment is purchased, owned, installed, maintained, and the data analyzed by the agency;
- Use of approved contractors that have been deemed to satisfy the regulatory requirements to administer some or all aspects of the electronic monitoring program;
- Type approval which would be similar to the current VMS operation model where certain types of electronic monitoring units are approved for installation and operation and /or contractors are approved to handle such things as installation and data analysis; and
- Performance standards where there are specifications of what an electronic monitoring system must do, but not how it must do it.

Within each of these scenarios, there are many additional issues that require consideration. Costs to all parties involved, data review and analysis, adaptation to technological advances, oversight on installation and operation, and enforceability could all be slightly different for each option and would require resolution before the development of an electronic monitoring program for the Greater Atlantic Region. Issues of data ownership, privacy, data error checking, and record storage are all equally significant and would also require detailed planning and solution for an electronic monitoring program. Interestingly, Kinsolving (2006) points out that the total costs of an electronic monitoring program currently may equal or surpass the cost of an onboard observer program—particularly in light of the startup costs associated with a new program.

6.9.2 Item 2: Analytical Techniques and Allocation of Observers

For this item, four alternatives are considered: A return to pre-2007 SBRM Omnibus Amendment approach; the integrated allocation approach; the integrated allocation approach with importance filters (the status quo); and establishing a minimum percentage observer coverage level. The data sources, fishery stratification, and analytical techniques described in detail in chapter 5 and Appendix A apply to the pre-2007 SBRM Omnibus Amendment approach and the integrated allocation approach alternatives. The primary difference between the pre-2007 SBRM Omnibus Amendment approach method and the baseline integrated allocation approach is that the methodology described in chapter 5 is applied across all fisheries in a prescribed uniform manner under the integrated allocation approaches, while under the pre-2007 SBRM Omnibus Amendment approach it is applied consistently only to the trawl, gillnet, and longline gear types generally engaged in the Northeast multispecies, monkfish, and summer flounder, as described in Appendix A.

The benefits, concerns, and limitations associated with the pre-2007 SBRM Omnibus Amendment approach and two integrated allocation approach alternatives are well described in chapter 5 and Appendix A and so will not be repeated here. The sole difference between the two integrated allocation approaches is the addition of the “importance filter” described in section 6.2.3. As noted above, the importance filter functions to refine the observer sea days needed to achieve the SBRM performance standard by eliminating cases (cells) where the effect of the discards of a species in a fishing mode is likely to be minimal. Thus, the third alternative carries forward most of the same benefits, concerns, and limitations of the second alternative, with the additional benefit of being more selective as to the fishing mode-species combinations that drive the target level of observer sea days.

The primary benefit of the alternative with the importance filter is to ensure that the observer program can be applied to the subject fisheries in as cost effective a manner as possible. By eliminating combinations of fishing modes and species where (1) it is infeasible or exceedingly rare that the species would be encountered in the gear (Options A and B only), (2) the CV-based performance standard has been achieved for fewer days than projected (Option A only), or (3) the likely impact of the discards of the species in the gear is negligible, observer sea days would be more efficiently allocated across all fisheries. There is an element of cost-benefit to this exercise, however, as by “eliminating” species as the basis for determining the observer coverage level, the result would be to accept that the performance standard may not be met for the species filtered out. It is important to understand that the importance filter is designed to function without reference to annual budgets or available observer resources. The importance filter would be used to establish meaningful observer coverage allocations for each fishing mode. Budgets can, and often do, shift as a result of national priorities, and in any given year, the available resources may not support full implementation of the established targets.

The threshold levels determine the degree of filtering that occurs for the discard ratio filter (filter 3) and the mortality ratio filter (filter 4). Higher thresholds (95 percent and up) reflect a more conservative approach that "accounts" for more of the total discards and mortality. Lower thresholds (less than 95 percent) reflect a less conservative approach. In order to most effectively utilize the SBRM proposed in this amendment, reasonable thresholds are necessary to focus observer resources in a meaningful way without sacrificing information on important fishery/discard interaction. The proposed thresholds of 95 percent of the discard ratio (filter 3) and 98 percent of the total mortality ratio (filter 4) provide a reasonable level of filtering that retains observer coverage for the fishing modes associated with nearly all of the discards and mortality of each species. This level of filtering is intended to eliminate the insignificant contributors of discards and mortality, while ensuring a robust and effective observer coverage allocation.

The fourth alternative considered for this item, establishing a minimum percentage observer coverage level of 20 percent of trips for common species and 50 percent of trips for rare species, is described in Babcock et al. (2003) and addressed in chapter 5 and Appendix A. This alternative is intended to address concerns regarding the potential for bias in the bycatch data and to ensure sufficient sampling levels to provide more precise and accurate bycatch data (Babcock et al. 2003). However, several concerns regarding this approach have been identified (Methot 2005; Rago et al. 2005). One specific criticism of the approach proposed in Babcock et al. (2003) is that the particular recommendation for a default level of coverage is not linked to any particular management need, performance evaluation, or set of funding or logistical constraints. The expectations for precision vary by the use of the data and realizations of precision vary by species.

Babcock et al. (2003) point to default observer coverage levels as a tool to address or minimize bias in the observer sampling. However, this presumes that there is a substantial bias in the data, and that the bias is not a direct result of the presence of the observer on the vessel but rather is of the type that may be mitigated by increases in sampling size. Analyses presented in chapter 5 and in Appendix A discuss the potential for bias in the observer data and conclude that any such bias is minimal. Also, if any such bias is actually due to the presence of the observer on the vessel, then neither improved randomization nor increased sample size (higher observer coverage levels) would remove the bias. In the extreme, a very high level of observer coverage could simultaneously change the behavior of the entire fleet while providing a measurement of the bycatch of the fleet, but provide little insight into the level of bycatch prior to the increased sampling levels (or after, if they were to abate). There is a strong concern that the use of default minimum percent observer coverage levels may mask the great diversity of requirements and logistical constraints faced by fisheries observer programs, and fails to recognize the great cost of achieving high levels of coverage.

Regardless of the approach selected, the at-sea observer program implemented in this amendment is designed to optimize the accounting and estimation of discards occurring in fisheries managed under the Greater Atlantic Region FMPs. If observers assigned to fishing vessels under the SBRM are utilized for other purposes, such as real-time quota monitoring, monitoring of marine mammal interactions, monitoring fishing gear operations, etc., these activities and competing priorities may degrade the sampling design developed and implemented through this amendment.

6.9.3 Item 3: Establish an SBRM CV Standard

For this item, two alternatives are considered: No SBRM standard and establishing an SBRM CV standard of 30 percent. While the first alternative represents the pre-2007 SBRM Omnibus Amendment process for optimizing the observer sea day allocation across fisheries for several fishing gear types (otter trawl, gillnet, and longline) using a CV of 30 percent as its target, this feature is neither explicitly specified nor considered a formal component of the SBRM. Under alternative 2, the CV standard would be explicitly specified for all relevant combinations of gear type and species or species group as a formal component of the SBRM. In evaluating these two alternatives, the primary consideration is the recognition by the Court, in *Oceana* v. *Evans I*, that Amendment 13 to the Northeast Multispecies FMP did not contain any standards as part of an SBRM. Therefore, only the second alternative would be consistent with the intent of the Court order in response to both *Oceana* v. *Evans I* and *II* and meet the purpose of this amendment.

6.9.4 Item 4: SBRM Review/Reporting Process

For this item, three alternatives were considered: (1) No SBRM review or reporting requirements (status quo/no action); (2) establishing an SBRM review process; and (3) requiring periodic discard reports. Under the first alternative, there is no requirement to prepare formal reports that evaluate the effectiveness of the SBRM at achieving its goals and objectives, or to prepare periodic reports that provide information on discards occurring in the fisheries. This information would be available upon request by a Council or NMFS, but there would be no standards for the type or level of information to be provided in response to any such request. It would be difficult to plan for and budget resources in advance for the preparation of any report requested in an ad-hoc manner by a Council.

With the second alternative, the frequency of the preparation of an SBRM Review Report would be specified, allowing for adequate planning and resource allocation, and the minimum expected contents of the review reports would be specified, providing for consistency of information and comparison across reports and across time. The second alternative would contribute to meeting the intent of the Court in *Oceana* v. *Evans I* and *II* in which the Court identified a "mandated" SBRM as a requirement of the Magnuson-Stevens Act. By mandating periodic reports evaluating the effectiveness of the SBRM implemented under this amendment, as well as the contents of such reports, a required element of the SBRM would become a reporting and evaluation feedback mechanism to determine whether modifications to the SBRM are required.

Within the second alternative to specify an SBRM review process, four options are presented for the periodicity of such review reports: Annually; every 3 years; every 5 years; and as part of an existing required reporting schedule (e.g., SAFE reports). Under the first three options, a single comprehensive report would present the required information for all species and fishing modes to allow both Councils and NMFS to evaluate the overall effectiveness of the SBRM. The primary concern with this approach (a single, all-encompassing report) is the significant staff time and resources required in order to conduct such a review. In particular, the option for an annual review report does not reflect an effective use of available resources. In addition, there is concern that under any of the first three options, the SBRM review report may be presented out of sync with either the stock assessments utilizing the information, such that the information in the report would not represent the current status of how the information is being used in stock assessments, or the consideration of management measures for which the information may be useful. Lastly, the first three options add an additional reporting requirement, which may be perceived as redundant with other reports prepared for Greater Atlantic Region fisheries (including stock assessment reports, SAFE reports, annual reports, etc.)

The fourth option attempts to address these concerns by linking the presentation of the SBRM information to the development of reports already called for in the FMPs for the relevant fisheries. This could distribute the reporting requirement so that the analytical burden in any one year would be limited and more manageable, and incorporates the reporting requirement into an existing reporting requirement that is in sync with schedules for anticipated management actions (for example, the preparation and presentation of a SAFE report to a Council typically includes recommendations for changes to management measures to address any noted issues related to stock status, rebuilding, or changes in the affected fisheries). However, because there are so many interrelationships and overlaps among fisheries, this option may result in redundant reporting and additional analytical burden. For example, the Mid-Atlantic large-mesh otter trawl fleet encompasses the Northeast large-mesh multispecies, monkfish, and summer flounder fisheries; evaluating the effectiveness of the SBRM relative to this fishing mode (as a single example from among many) separately for each of the controlling relevant FMPs (which may be on independent reporting schedules) would require the NEFSC staff to perform the same analysis three separate times. Due to other priorities and limited resources, SAFE reports may not be developed as frequently as called for in the FMPs. This could result in no discard information being analyzed for a particular fishery until the next SAFE report.

Information collected through the NEFOP is the primary source of data for the Council's SBRM. As such, it is important that the Councils receive this information on a regular basis and in a consistent format, so that trends can be monitored, and potential problems and issues can be identified as they arise. A periodic report that provides detailed information for all observed trips in the Greater Atlantic Region, as proposed in alternative 4.3, would keep the Councils updated on the collection of discard information and may help to identify bycatch problems in a more timely manner. This should allow the Councils to respond more expeditiously and address problems before they worsen and potentially compromise stock rebuilding. Ultimately, reviewing these data regularly will improve fisheries management in the Region and help the Councils to better comply with the requirements of the Magnuson-Stevens Act.

It is possible, but not necessary, to adopt both alternative 4.2 and alternative 4.3, or to adopt either alone. Alternative 4.3 would provide for a periodic report of discards occurring in Council fisheries, while alternative 4.2 would provide for reporting on the efficacy of the SBRM. The most robust reporting procedures would include both, but neither alternative depends upon the other.

Alternative 4.3 includes two options: A semi-annual discard report or an annual discard report. There are several potential benefits of requiring either a semi-annual or annual discard report. The discard report would highlight the on-going data collection program of the NEFOP, and would formalize a process to provide an ongoing summary of estimated discards by fishing modes or gear type for turtles. This information is not currently provided in one location at this level of detail across fisheries and species groups, although some stock assessment documents show discard rates by gear and quarter. A requirement for monitoring annual catch limits and attendant accountability measures may require more frequent discard estimates; however, the data collection programs within the SBRM can support the monitoring needs of annual catch limits. Currently, discard estimates are provided by NEFSC in stock assessments and by the GARFO Analysis and Program Support Division in quota monitoring reports. Some PDTs and monitoring committees review discard and discard rate information more frequently on an ad hoc basis. The discard report may help to identify discard issues at a temporal scale that is shorter than the assessment cycle or to identify emerging discarding event/issues if reporting is sufficiently timely.

Under current data collection, processing, and reporting requirement time frames, the time between an observed fishing trip and the date when the data from that trip would be available for inclusion in a semi-annual discard report could take months. Such a long time lag diminishes the usefulness of such a report if there is an expectation that the information presented would be more current than is possible. By the time the information is presented, any apparent discard problem or event may no longer be occurring. A discard report such as what has been proposed may invite attempts to micro-manage fisheries based on incomplete data. Requiring such a detailed discard report on a semi-annual basis would divert resources to prepare a report with limited utility from other tasks such as stock assessments and supporting the development of management actions. An annual reporting cycle mitigates some of the timing concerns associated with the proposed discard report, but cannot overcome the larger issues identified above. A semi-annual report would create more of an administrative burden than an annual report, and would seem to be more frequent than necessary given that it is unlikely the management system could respond quickly to any issues that may be identified in a semi-annual report.

Alternative 1/status quo would be expected to result in a less effective SBRM program when compared to Alternative 2 because there would be no formalized, planned review of the program's performance. With this alternative, it is less likely that deficiencies would be periodically identified, brought to the attention of managers, and addressed through changes to the SBRM. Alternative 1 would also limit the information presented to managers when compared to Alternative 3. This would diminish the effectiveness for the program, because the data collected would not be routinely reported in a way that could lead to measures to address discard issues. Alternatives 2 and 3 are not directly comparable as they address separate issues, but the combined adoption the two alternatives would lead to a better program than if only one or the other was adopted

6.9.5 Item 5: Changes to the Framework Adjustment and/or Annual Adjustment Provisions

For this item, four alternatives are considered: (1) The status quo (no action); (2) authorizing changes to certain provisions of the SBRM through framework adjustments to the FMPs; (3) authorizing changes to certain provisions of the SBRM through framework adjustments, annual adjustments, and/or annual or multi-year specifications; and (4) authorizing changes to certain provisions of the SBRM through framework adjustments, annual adjustments, and/or annual or multi-year specifications, while authorizing fishing modes to be added or removed from the SBRM as needed to best characterize the fishery. None of these alternatives would affect the procedures already stipulated in each FMP regarding framework adjustments, annual adjustments, and/or annual or multi-year specifications. The only changes considered under this item relate to supplementing the lists of management measures that may be modified through one of these types of actions.

Under the status quo, any changes to the provisions of the SBRM would require another amendment to an affected FMP. Neither Council would be able to employ a more streamlined process, such as for framework adjustments, annual adjustments, or annual or multi-year specifications, to make changes to the provisions of the SBRM. This may create problems with the implementation and operation of future management programs that are developed and implemented through one of the more efficient processes, but which would rely upon concurrent changes to the SBRM to be effective.

With the second alternative, certain aspects of the SBRM could be modified via a framework adjustment to the affected FMP, including: (1) The CV-based performance standard; (2) the means by which discard data are collected/obtained in a fishery; (3) fishery stratification; (4) SBRM reporting; and (5) industry-funded observers and/or observer set-aside programs. The intent of this alternative is to ensure that as the Councils modify management measures through framework adjustments to adapt to changing conditions in the fisheries, that they retain the flexibility to make the needed changes to the SBRM to ensure adequate data on discards.

For example, under Amendment 13 to the Northeast Multispecies FMP, the New England Council may utilize the framework adjustment process to develop and implement new SAPs and/or new sector allocations. Under this alternative, the Council could use the framework developed for a new SAP to also modify the SBRM to ensure sufficient data are collected on the discards occurring in the SAP. Without this alternative, the Council could implement a new SAP through a framework, but would have to use the full amendment process to address the SBRM provisions associated with the SAP. This would create a substantial inconsistency in the process and a delay in the timeliness of implementing necessary management measures.

With the third alternative, all the changes proposed in the second alternative, with one notable exception, would also be authorized to be made through an annual adjustment or annual/multi-year specifications. This alternative would provide the Councils with more flexibility to update and/or modify the provisions of the SBRM as conditions in the fisheries or management programs change. For FMPs that utilize an annual adjustment or specifications process (annual or multi-year), these actions may be a more appropriate vehicle to implement necessary changes to the SBRM. For example, the Mid-Atlantic Council often modifies the provisions of the scup gear restricted areas through the summer flounder, scup, and black sea bass specifications. This alternative would allow the Council to also incorporate appropriate changes to the SBRM to support the scup gear restricted area modifications in the subject action, without the need for a separate framework adjustment or amendment to modify the SBRM. The exception noted above is the industry-funded observers and/or observer set-aside programs, which would require a framework adjustment regardless of the alternative selected.

The fourth alternative is similar to the third alternative mentioned above: Select elements of the SBRM could be modified through an annual adjustment or annual/multi-year specifications, and changes to industry funded observers and/or observer set-aside programs would require a framework adjustment. However, the list of aspects of the SBRM that could be modified has one notable change from those specified in the second alternative. With the fourth alternative, the aspects of the SBRM that could be modified via a framework adjustment to the affected FMP or through an annual/multi-year specification would include: (1) The CV-based performance standard; (2) the means by which discard data are collected/obtained in a fishery; (3) SBRM reporting; and (4) industry-funded observers and/or observer set-aside programs. Under this alternative changes to "fishery stratification" (i.e., adding or removing fishing modes) could be done annually without specific action by the Councils, although the Councils would be notified of any changes. The intent of this alternative is to provide the Councils with the most flexibility to keep the SBRM updated as conditions in the fisheries or management programs change. By allowing fishing modes included in the SBRM to be adjusted without formal Council action, the SBRM process can include new fishing modes as soon as they are identified in the fishery without waiting an additional year or two to be included in a framework adjustment or specification action.

6.9.6 Item 6: Prioritization Process for SBRM Observer Allocation

For this item, eight alternatives within three groups were considered. Two alternatives address a funding "trigger" for determining when prioritization would be necessary: (1.1) The status quo (no action); and (1.2) specifying specific SBRM funding sources.

While the SBRM clearly identifies the methodologies to be used to calculate observer coverage levels needed to achieve the CV-based SBRM performance standard on an annual basis, these coverage levels can only be implemented if all necessary resources (budget, trained observers, etc.) are sufficient for NMFS to allocate the necessary coverage. The methodologies were established and are intended to function independently from any decisions regarding available budgets or other resources; however, the SBRM Omnibus Amendment would be remiss if it did not address the contingency of insufficient resources that impose external operational constraints on the GARFO and NEFSC.

Under the status quo funding trigger alternative, the GARFO and NEFSC would use available sources of funding for observer sea days, within the restrictions on certain funding sources, to determine if there were an external operational constraint that prohibited fully implementing the coverage levels needed to achieve the CV-based performance standard. This approach could be interpreted as insufficient under the Court order in *Oceana* v. *Locke*, which found the prioritization process in the 2007 SBRM Omnibus Amendment gave too much discretion to NMFS in determine when an external operational constraint prevents fully implementing the SBRM.

The second alternative addresses the Court's concern over how a funding constraint is defined by presenting a specific formula based on established budgetary funding lines that are available for observer sea days. Changes to the funding provided to the Agency through these budget items would have a direct effect on the number of observer sea days that are available to meet the coverage levels needed to achieve the CV-based SBRM performance standard.

Three alternatives were presented to address how observer sea day coverage would be adjusted if funds were insufficient to fully implement the SBRM to the performance standard: (Alternative 2.1) specifying a consultation process to provide the Councils the opportunity to review and comment on the priority observer sea day coverage allocations proposed by the Regional Administrator and Science and Research Director; (Alternative 2.2) automatically adjusting observer sea day coverage on all fishing modes by the amount of funding shortfall; and (Alternative 2.3) automatically adjusting observer sea day coverage by removing fishing mode/species group combinations that require the highest number of sea days to achieve the CV performance standard. The alternative selected under this item will be most important in years in which the available budget or other resources are insufficient to fully provide the observer coverage levels calculated through the SBRM.

Under the Council consultation alternative (Alternative 2.1), the SBRM Omnibus Amendment would establish a formal consultation process to provide the Councils and the public with the opportunity to review, and provide comment on, the proposed prioritization recommended by the Regional Administrator and the Science and Research Director. This approach recognizes the need for the agency to develop an initial prioritization based on the needs of stock assessments and other legal mandates requiring fisheries monitoring and reporting, but includes the Councils in the process to develop the observer coverage allocations that adjust for any external operational constraints. This approach could be interpreted as insufficient under the Court order resulting from *Oceana* v. *Locke*, which found that the 2007 SBRM Omnibus Amendment gave too much discretion to NMFS in how observer coverage was redistributed.

Alternative 2.2 would determine the percentage by which available funding falls short of the funding needed to fully implement the SBRM and would then reduce the observer coverage in each fishing mode by this same percentage. This would avoid the Agency discretion that the Court found fault with, but could have unintended effects on coverage. Some fishing modes are assigned high observer coverage rates to achieve the CV-based performance standard based on relatively rare bycatch of specific species. If all fishing modes are reduced by the same percentage, these fleets would still have high coverage rates relative to other fishing modes. This may result in higher coverage for species and fleets of little concern to managers and unacceptably low coverage rates on fishing modes that are considered more important.

Alternative 2.3 would use a new method, referred to as the "penultimate approach" to reduce the number of observer sea days to meet a funding constraint, while resulting in the fewest cells with a CV above the performance standard. By using a defined formula to reduce the total number of needed observer sea days to meet funding constraints, this alternative would remove the Agency's discretion in adjusting observer coverage, which the Court found faulty in *Oceana* v. *Locke*. In addition, by maintaining the CV-based performance standard for as many fishing mode/species group combinations as possible, this alternative could minimize the impact of a funding shortfall on overall discard estimations.

For all of these proposed alternatives, if the adjustment to observer sea days for a particular fishing mode would result in too few sea days to provide useful discard information, the alternative minimum pilot coverage rates described in 5.3.3 would apply.

In the unlikely event that Federal funding for SBRM observers is so restricted in a given year that there are not enough observer sea days to achieve the minimum pilot coverage in each fleet, an additional level of prioritization would be necessary. Three alternatives were considered for how to decide which fishing modes would not get coverage in this situation of extremely limited Federal observer funding. Alternative 3.1 would direct the Regional Administrator and the Science Research Director to develop an ad-hoc proposal for which fleets would not get coverage based on any applicable legal mandates, management priorities, or data needs and to present this proposal to the Councils for their consideration and recommendations. Alternative 3.2 would adjust for the funding shortfall by sequentially eliminating coverage in fleets which have the highest minimum pilot coverage days. This alternative would have the greatest impact on fleets with the longest average trip length, and would impact the fewest fleets overall. Finally, Alternative 3.3 would eliminate the shortfall by sequentially eliminating coverage in fleets that had the highest ratio of minimum pilot coverage to days absent from port based on FVTRs from the previous year. This alternative would eliminate coverage from fleets with low numbers of days absent from port.

6.9.7 Item 7: Industry-Funded Observer Program

For this item, three alternatives are considered: (1) The status quo (no action); (2) authorizing an observer service provider approval and certification process; and (3) adding industry-funded observer and observer set-aside provisions as measures that can be implemented through framework adjustments. It is possible, but not necessary, to adopt both alternative 7.2 and alternative 7.3 under this item. Alternatives 7.2 and 7.3 are somewhat independent of one another, such that if alternative 7.2 were implemented, but alternative 7.3 was not, then the observer service provider approval and certification procedures and requirements would be established, but each FMP would continue to require an amendment to establish a requirement to utilize these procedures and requirements for an industry-funded observer program and/or observer set-aside program. This could be done to ensure consistent procedures and requirements across all fisheries for approving and certifying observer service providers, even if FMP-specific amendments would be required to establish the industry-funded observer program.

If, however, alternative 7.2 is not implemented, there is likely little benefit to alternative 7.3, as an amendment to each FMP would remain required to create the observer service provider approval and certification procedures and requirements necessary to implement an industry-funded observer requirement. This would be analogous to Amendment 13 to the Sea Scallop FMP: An amendment was required to establish the observer service provider approval and certification provisions even though the industry-funded observer requirements and observer set-aside provisions were adopted in earlier actions (Framework Adjustments 16 and 18 and Amendment 10 to the Sea Scallop FMP).

The most benefit would be derived if both alternatives 7.2 and 7.3 are adopted in this action. This would establish the observer service provider approval and certification procedures and requirements across all fisheries, and allow development and implementation of an industry-funded observer program, with or without observer set-aside provisions, through a framework adjustment for each fishery.

One example in particular of why it would be prudent to adopt alternatives 7.2 and 7.3 in this action is to facilitate the development of new sector programs or special access programs (SAPs) under the Northeast Multispecies FMP. Amendment 13 to the FMP authorized the development and implementation of both sectors and SAPs through the framework adjustment process. Amendment 16 to the FMP significantly expanded the use of sectors. However, should the New England Council choose to require specialized levels of observer coverage, at industry expense (with or without an observer set-aside program to offset costs), as part of either the sector or the SAP, currently an amendment to the FMP would be required. Adoption of alternatives 7.2 and 7.3 would allow these provisions to be included in the framework adjustment to implement the sector or SAP. The New England Council has considered other actions that would similarly allow new sectors to be established under other FMPs through a framework adjustment, but adoption of alternatives 7.2 and 7.3 would be necessary for the Council to include in such a framework the provisions for an industry-funded observer program and observer set-aside. For the Mid-Atlantic Council, recent attempts to include industry-funded observer requirements on vessels fishing for squid, in return for access to the scup gear restricted areas, provide an example where these measures would have simplified the process to develop and implement the scup gear restricted area access program.

6.10 Rationale for Selecting the Preferred Alternatives

Fisheries management is a dynamic, responsive process, adapting to changing environmental, socio-economic, and legal conditions. The management measures implemented with the intention to rebuild an overfished stock may be completely inappropriate for that fishery once the stock is rebuilt. Similarly, as new information becomes available, management measures change to reflect this new information.

Similarly, because fisheries management itself is so dynamic, the techniques and mechanisms used to collect information to monitor fisheries and fishing activities cannot be static. Any SBRM established for the fisheries of the Greater Atlantic Region must be able to be modified as conditions in the fisheries and the management systems require. Thus, one cannot expect that the SBRM established through this amendment will be able to fulfill all *potential* information and monitoring needs into the future without some degree of adjustment.

The SBRM established through this amendment is intended to adequately and efficiently provide sufficient information collection and monitoring to comply with the *existing* requirements and management systems. The notion that this amendment should predict various possible future fisheries management systems and measures (e.g., ITQs in the monkfish fishery or a new FMP for the whelk fishery, etc.) and establish an SBRM that can reliably provide information and monitoring under these changed circumstances is neither realistic nor practicable. For one, because the Councils and NMFS cannot predict with any expected accuracy either how unforeseen future environmental changes may affect fish stocks (and how these changes may affect the relevant fisheries) or how future changes to fishery management law may affect our legal obligations, we cannot accurately predict what types of management actions may be necessary in the future. Second, the information collection and monitoring program should be tailored to the specific types of information collection and monitoring that are required, and these requirements cannot be known until the program needs are identified.

However, this does not mean that the SBRM necessarily needs to be changed every time there is a change in management. The SBRM established through this amendment is designed to be flexible and adapt to future changes as conditions in fisheries and fisheries management change. The most effective way to monitor discards in a fishery managed under a DAS system may not be the most effective way to monitor discards in a fishery with bycatch quotas. The SBRM implemented with this amendment will need to adapt as management strategies change in order to ensure that the appropriate information is being collected as effectively as possible.

As noted in chapter 5, statistical theory applicable to the estimation of fisheries bycatch is evolving and significant advances in techniques and methods are expected to improve the reliability of discard estimation. Much like stock assessments, which adapt to use the most effective and appropriate analytical techniques and models available at the time the assessment is conducted, the analytical underpinnings of the SBRM would and should change as more effective and appropriate methods are developed.

Thus, the preferred alternatives selected by the New England and Mid-Atlantic Councils would establish an SBRM that defines the primary data collection and monitoring mechanisms to be used for bycatch reporting, defines the analytical framework for estimating bycatch and allocating at-sea observer effort, establishes a performance standard for the SBRM program (a CV of no more than 30 percent), dictates a periodic review, evaluation, and reporting process, establishes framework adjustment provisions to enable changes to the SBRM to be made efficiently, establishes a process for annually determining the funds available for the SBRM and to subsequently prioritize at-sea observer coverage allocations within the available funding, and establishes provisions to support the development of industry-funded observer programs. Table 69 identifies, for each element of the SBRM, the alternatives under consideration and highlights the preferred alternatives of the Councils.

SBRM Element	Alternatives Under Consideration			
1. Bycatch Reporting and Monitoring Mechanisms	Status quo		Implement electronic video monitoring	
2. Analytical Techniques and Allocation of Observers	Pre-2007 SBRM Amendment	Integrated allocation approach	Integrated allocation approach w/ importance filter	Minimum percent observer coverage
3. SBRM Performance Standard	No performance standard		Establish a CV standard	
4. SBRM Review/ Reporting Process	Status quo		Specify an SBRM review process	Require periodic discard reports
5. Framework Adjustment Provisions	Status quo	Framework adjustment	Frameworks and annual adjustments	Frameworks and annual adjustments excluding fishing modes
6. Prioritization Process				
6.1 Funding trigger	Status quo		Identify specific SBRM funding sources	
6.2 Reallocation	Council consultation		Proportional adjustment	Penultimate Cell Approach
6.3 Less than Minimum Pilot Coverage	Ad hoc prioritization		Remove fleets with high MPC	Remove fleets with high MPC to days absent ratio
7. Industry-Funded Observer Programs	Status quo		Observer provider approval	Framework provisions

Table 69 Summary of alternatives under consideration for the SBRM Omnibus Amendment (Councils' preferred alternatives are shaded).

The specific rationale for the preferred alternatives can be summarized as follows:

- Bycatch Reporting and Monitoring Mechanisms – The Councils' preferred alternative is the status quo, which represented all bycatch reporting and monitoring mechanisms currently employed in the Greater Atlantic Region. These mechanisms have been used successfully for several years and together they form a comprehensive and mature data collection program. Although the Councils considered implementing electronic video monitoring to supplement at-sea observer coverage, this technology, while it appears promising, is not considered to be sufficiently mature for widespread implementation at this time.

- Analytical Techniques and Allocation of Observers – The Councils' preferred alternative is the integrated allocation approach with the addition of the importance filters. The pre-2007 SBRM Omnibus Amendment procedures were used successfully in the Greater Atlantic Region for several years and were considered to provide an efficient and effective means to allocate observer effort. The integrated allocation approach represented an expansion and refinement of the pre-2007 SBRM Omnibus Amendment approach to address all applicable species groups and fishing gear modes. The addition of the importance filters incorporates the recommendation of the technical review by members of the two Council SSCs and this approach has been successfully used since the adoption of the 2007 SBRM Omnibus Amendment. Although the Councils initially considered a different approach to allocate observer coverage based on minimum percent levels, this approach was not considered to be sufficiently robust to effectively account for the many differences among the various Greater Atlantic Region fishing modes, nor does it directly employ the type of feedback mechanism that the preferred approach does. There was concern that the minimum percent observer coverage approach would lead to oversampling of some fishing modes, could lead to undersampling of other fishing modes, and would not ensure an efficient and effective allocation of resources. The Councils recommend that the importance filters be applied at the level of 95 percent of total discards and 98 percent of total mortality. These filter levels have been used since the 2007 SBRM Omnibus Amendment was first implemented. These levels are considered sufficiently conservative to retain observer coverage over the fishing modes responsible for nearly all of the discards and mortality of each species while providing a meaningful filter to address the intent of the SSC review. This level of filtering is intended to eliminate the insignificant contributors of discards and mortality, while ensuring a robust and effective observer coverage allocation. Removing the gray-cell (tier 1 or "unlikely") filter represents a refinement of the suite of importance filters that were initially developed for the 2007 SBRM Omnibus Amendment. Analysis conducted as part of the 3-year review of the SBRM found for 2009 through 2011, no changes to the final determination of the SBRM standard sea days would have occurred if the gray-cell filter had been removed from the importance filter (Wigley et al. 2012b).

- SBRM Standard – The Councils' preferred alternative is to establish a performance standard for the SBRM based on the CV of the discard estimate for each appropriate combination of fishing mode and species or species group. Implementation of the SBRM established with this amendment would require allocation of at-sea observer effort such that the resulting CV equals no more than 30 percent. The Councils consider this alternative to be the only one under consideration that is consistent with the intent of the Court orders in the *Oceana* v. *Evans I* and *II* decisions.

- SBRM Review and Reporting Process – The Councils' preferred alternative is to specify a periodic SBRM review and reporting process in order to provide a means for the Councils to periodically evaluate the performance and effectiveness of the SBRM established with this amendment. This alternative is considered more appropriate than the status quo given the desire of the Councils to be able to ensure that the bycatch information being collected under this SBRM continued to meet the needs of the fishery scientists and managers. The Councils recommend that the proposed SBRM Review Report be required to be prepared once every 3 years. This interval is considered to represent a reasonable balance of the workload required to prepare such a report and the value and timeliness of the information to be provided. In addition, the Councils recommend that a report on the discards occurring in all Greater Atlantic Region fisheries be prepared annually and provided to the Councils by the NEFSC. These are two separate reports intended to provide different information on the implementation of the SBRM.

- Changes to the Framework Adjustment and/or Annual Adjustment Provisions – The preferred alternative of the Councils is to add provisions to the framework adjustment and annual adjustment regulations, as appropriate, for each subject FMP in order to enable changes to the SBRM to be made on an FMP-by-FMP basis, as needed. The preferred alternative also allows changes to the list of fishing modes without formal Council action. This approach was considered preferable to the status quo alternative, which would require all future modifications to the SBRM to be done only through amendments to the FMPs. Using the framework adjustment and/or annual adjustment processes provides a timely, efficient, and effective tool to address future issues and management needs. Allowing changes to fishing modes on an annual basis provides the most efficient mechanism to adjust this aspect of the SBRM to developments in fishing gear technology.

- Prioritization Process for SBRM Observer Allocation – The Councils' preferred alternative for the funding trigger is to specify observer funding lines dedicated for SBRM. This approach was considered preferable to the status quo alternative, which would have left NMFS with some discretion in determining when funding was insufficient because it more completely addresses the Court's concern about Agency discretion in *Oceana* v. *Locke*.

  The preferred alternative for prioritization of observer sea day coverage is the penultimate-cell approach. This alternative is considered preferable to the proportional reduction method because it would affect the CV of fewer cells (fishing mode/species or species group combinations), and therefore potentially allow more cells to achieve the CV-based performance standard. The penultimate-cell approach is also considered preferable to the Council consultation alternative. The Council consultation approach would allow for a similar level of discretion on the part of the Agency as the prioritization process that was found deficient by the Court in *Oceana* v. *Locke*.

The Councils' preferred alternative for adjusting coverage levels below minimum pilot coverage would eliminate the funding shortfall by sequentially removing coverage in fleets that had the highest ratio of minimum pilot coverage to days absent from port based on FVTR reports in the previous year. Because the number of days absent from port is typically much larger than the minimum pilot coverage for a fishing mode, this alternative would maintain at-sea observer coverage on the most active fishing modes. Under the non-preferred ad-hoc alternative, in the event of extremely limited funding the NMFS would, in consultation with the Councils, develop a proposal for which fishing modes would receive observer coverage. This alternative is considered non-preferred by the Councils because it would allow a level of discretion on the part of NMFS that might run counter to the Court's ruling in *Oceana* v. *Locke*. The other non-preferred alternative would assign coverage based on the minimum pilot coverage, and thereby maximize the number of fishing modes that receive a useful level of bycatch monitoring under an extremely limited budget scenario. However, because minimum pilot coverage is based on the average length of a fishing trip, fishing modes with the longest average trip length, often very active and important fishing modes from a management perspective, would not receive at-sea observer coverage to monitor bycatch.

- Industry-Funded Observer Program – The preferred alternatives of the Councils would establish uniform observer service provider approval and certification procedures and requirements across all fisheries, and allowed the development and implementation of an industry-funded observer program on an FMP-by-FMP basis, with or without observer set-aside provisions, through a framework adjustment for each fishery. Under the non-preferred status quo alternative for this element, a full FMP amendment would have been required in each case in which a Council proposed either an industry-funded observer program or an observer set-aside program, with the exception of the sea scallop fishery. The preferred alternatives would streamline the development of such a program should a Council elect to propose one, and provide a uniform mechanism to retain observer service providers to support all such new programs.

Environmental Consequences of the Alternatives Under Consideration

7.1 Description of the Affected Environment

This amendment examines the analytical procedures and information reporting and data collection mechanisms that are currently used to assess the types and quantities of bycatch occurring in the Greater Atlantic Region. This amendment documents how those procedures and mechanisms apply to the variety of fisheries prosecuted by federally permitted fishing vessels operating under one or more of the FMPs developed by the Mid-Atlantic and/or New England Councils. The objective of this amendment is to ensure that the analytical procedures and information reporting and data collection mechanisms, which together comprise the current SBRM for the applicable fisheries, comply with the SBRM requirements of the Magnuson-Stevens Act. This amendment also considers alternatives to the current approach for collecting, monitoring, and analyzing information regarding bycatch to determine whether the current approach should be replaced, modified, and/or supplemented.

Earlier chapters of this document provide specific information on the FMPs subject to this amendment (see Chapter 2), on the fishing modes covered by the SBRM (see Chapter 3), and on the types of monitoring and information collections mechanisms addressed in this amendment (see Chapter 4). This chapter will diverge from these previous discussions that examined each FMP or fishing mode on a case-by-case basis, and summarize the relevant environmental features at a broader scale that crosses all subject FMPs and their constituent fisheries.

Because this amendment is wholly concerned with the procedures and mechanisms by which data and information on the types and rates of bycatch are obtained and utilized by scientists and fishery managers, the scope of the "environment" affected by this amendment is atypical for an FMP amendment. Most FMP amendments (and related actions) focus on changes to fishing regulations, which have a direct impact on fishing vessel operations (by modifying where, when, and/or how fishing may take place). These impacts on fishing vessel operations almost always affect the ways in which these fishing activities directly or indirectly interact with living marine resources, marine habitat, and the socio-economic constructs of the human environment. Thus, generally, for a fishery management action or an amendment of this type, the "Affected Environment" section would include specific, detailed information on the particular fishery and non-fishery species, the habitats of these species, and the fishing businesses and communities expected to be directly or indirectly affected by the proposed action.

However, as the focus of this amendment is on the methodology by which bycatch information is obtained, analyzed, and utilized, the impacts of the preferred alternatives are wholly procedural in nature. Therefore, a detailed description of the environmental components including the biological resources, physical environment, and socio-economic structure that could be affected by the alternatives under consideration is not necessary. Instead, this section of the amendment will include a brief overview of the areas in which the fishing activities affected by the subject FMPs occur, a brief overview of the primary ports engaged in the subject fishing activities, and a brief overview of the fishery and non-fishery living marine resources most frequently encountered by the subject fishing activities. This section will also include references for more detailed information on these topics, should any reader wish to become more familiar with the features of the environment in which the subject fisheries occur.

7.1.1 Physical Environment

The fishing activities affected by the FMPs subject to this amendment occur off the Atlantic coast of the U.S., primarily from Cape Hatteras, NC, to the U.S./Canada border. This area of the Northwest Atlantic Ocean is also known as the Northeast U.S. Continental Shelf Large Marine Ecosystem (Sherman et al., 1996) and includes the subsystems known as the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight. For more information about the physical characteristics of the environment described below, reference NEFMC (2004a); NEFMC (2004b); Sherman et al. (1996); and Stevenson et al. (2004). See Figure 45 for a map of the Greater Atlantic Region with the three major subsystems identified.

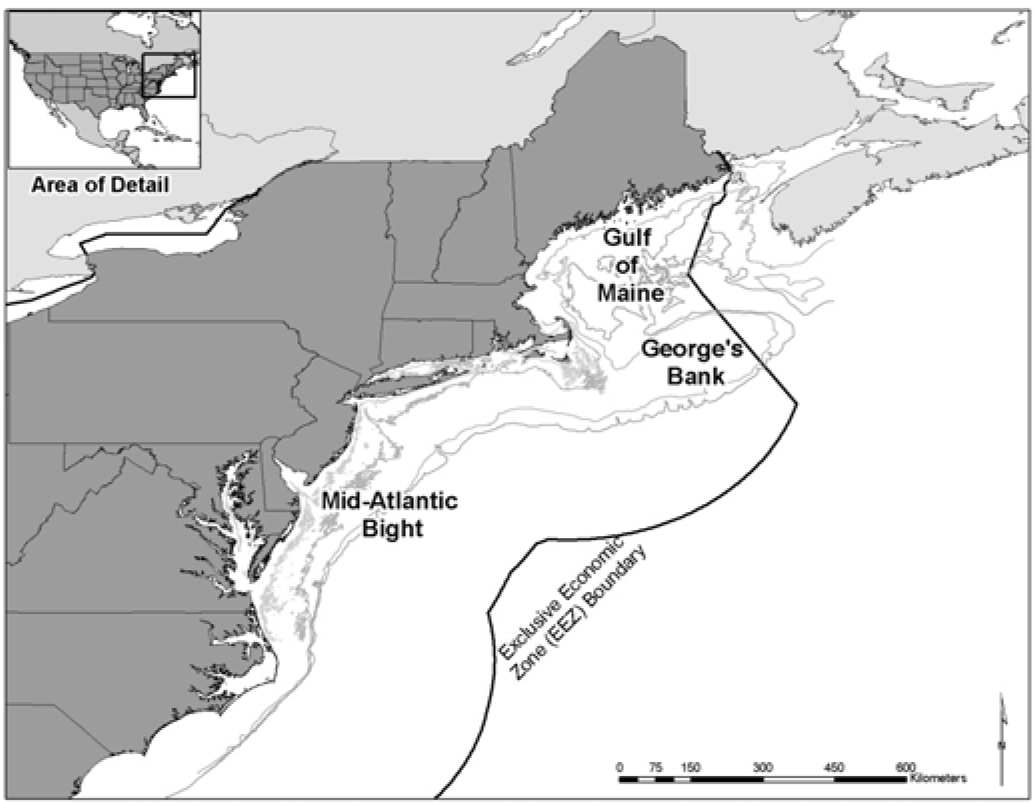

Figure 45. Map of the Gulf of Maine, Georges Bank, and Mid-Atlantic Bight.

7.1.1.1 Gulf of Maine

The Gulf of Maine is an enclosed coastal sea characterized by relatively cold waters and deep basins. The Gulf of Maine is bounded on the east by Browns Bank, on the north by Maine and Nova Scotia, on the west by Maine, New Hampshire, and Massachusetts, and on the south by Cape Cod and Georges Bank. Retreating glaciers (18,000-14,000 years ago) formed a complex system of deep basins, moraines, and rocky protrusions, leaving behind a variety of sediment types including silt, sand, clay, gravel, and boulders. These sediments are patchily distributed throughout the Gulf of Maine, and are largely related to the topography of the bottom.

Water patterns in the Gulf of Maine exhibit a general counterclockwise current, influenced primarily by cold water masses moving in from the Scotian Shelf and offshore. Although large-scale water patterns are generally counterclockwise around the Gulf, many small gyres and minor currents do occur. Freshwater runoff from the many rivers along the coast of the Gulf of Maine influences coastal circulation, as well. These water movements feed into and affect the circulation patterns on Georges Bank and in Southern New England, both of which are discussed below.

7.1.1.2 Georges Bank

Georges Bank is a shallow, elongate extension of the northeastern U.S. continental shelf, and it is characterized by a steep slope on its northern edge and a broad, flat, and gently sloping southern flank. The Gulf of Maine lies to the north of Georges Bank, the Northeast Channel (between Georges Bank and Browns Bank) is to the east, the continental slope lies to the south, and the Great South Channel separates Georges Bank and Southern New England to the west. Although the top of Georges Bank is predominantly sandy sediment, glacial retreat during the late Pleistocene era resulted in deposits of gravel along the northern edge of the Bank, and some patches of silt and clay can be found.

The most dominant oceanographic features of Georges Bank include a weak but persistent clockwise gyre that circulates over the whole of the Bank, strong tidal flows (predominantly northwest and southeast), and strong but intermittent storm-induced currents. The strong tidal currents result in waters over the Bank that are well-mixed vertically. The clockwise Georges Bank gyre is in part driven by the southwestern flow of shelf and slope water that forms a countervailing current to the Gulf Stream.

7.1.1.3 Mid-Atlantic Bight and Southern New England

The Mid-Atlantic Bight includes the continental shelf and slope waters from Georges Bank to Cape Hatteras, North Carolina. Occasionally discussed separately, most texts consider Southern New England a subregion within the Mid-Atlantic Bight.[46] The basic morphology and sediments of the Mid-Atlantic Bight were shaped during the retreat of the last ice sheet. The continental shelf south of New England is broad and flat, dominated by fine grained sediments (sand and silt). Patches of gravel can be found in places, such as on the western flank of the Great South Channel.

[46] Southern New England is generally considered to be the area of the continental shelf off the coasts of Massachusetts, Rhode Island, and Long Island, New York, from the Great South Channel to Hudson Canyon.

The shelf slopes gently away from the shore out to 100-200 km offshore, where it transforms into the continental slope at the shelf break (at water depths of 100-200 m). Along the shelf break, numerous deep-water canyons incise the slope and into the shelf. The sediments and topography of the canyons are much more heterogeneous than the predominantly sandy top of the shelf, with steep walls and outcroppings of bedrock and deposits of clay.

The southwestern flow of cold shelf water feeding out of the Gulf of Maine and off Georges Bank dominates the circulatory patterns in this area. The countervailing Gulf Stream provides a source of warmer water along the coast as warm-core rings and meanders break off from the Gulf Stream and move shoreward, mixing with the colder shelf and slope water. As the shelf plain narrows to the south (the extent of the continental shelf is narrowest at Cape Hatteras), the warmer Gulf Stream waters run closer to shore.

7.1.2 Biological Resources

The biological resources of the Northeast Shelf Ecosystem can be categorized into three basic groups: Fishery resources; protected resources; and other non-fishery resources. Fishery resources are distinguished as those species both caught and landed for commercial sale or for recreational use; primarily the managed species identified in Table 1 and Table 70.[47] Protected resources include whales and other marine mammals afforded protection under the Marine Mammal Protection Act and species afforded protection under the Endangered Species Act, including sea turtles, Atlantic salmon, two species of sturgeon, and Endangered Species Act-listed cetaceans. Other non-fishery resources include the vast majority of marine flora and fauna living in this environment, but which are neither landed for commercial or recreational purposes nor afforded any special protections under law. This section will provide summary descriptions of these biological resources, but additional, more detailed, information may be found in a variety of sources, including: Collette and Klein-MacPhee (2002); Stevenson et al. (2004); and Sherman et al. (1996).

7.1.2.1 Fishery Resources

The fishery resources of the Greater Atlantic Region include a variety of managed and non-managed species that are caught and landed by commercial and recreational fishermen operating in the region (see Table 70). These fishery resources include many species of both demersal and pelagic finfish, several species of crustaceans, mollusks, and other invertebrates. These species occupy broad ranges within the Greater Atlantic Region (see Table 70) and a wide variety of habitats from the pelagic waters of the open ocean to sand, mud, gravel, and rock beds in coastal waters.

In 2011, over 157 species were recorded in FVTRs as being landed. Of the 39 species that comprised the top 99 percent, by weight, of the reported landings, all but 4

[47] Some fishery resources, such as hagfish and cusk, are landed for sale commercially but are not the subject of an FMP. For some of these, such as hagfish, an FMP is expected within the next several years, but there are some fishery resources for which no FMP is planned.

are the subject of an FMP by the Mid-Atlantic Council, the New England Council, or the ASMFC. Of the four non-FMP species in this group, two are managed by at least one state (channeled whelk, and knobbed whelk), one is likely to be subject to a forthcoming Council FMP (Atlantic hagfish), and one may be considered for future Council FMPs (Jonah crabs).

The 40 species managed under the FMPs subject to this amendment comprised 81 percent, by weight, of the species reported as landed in the 2011 FVTR data. Additional information regarding these species, and the management programs established under the subject FMPs, can be found in chapter 2 of this document. An additional 17 percent, by weight, of all landed species incorporates the 15 species managed solely under ASMFC FMPs, and the federally managed Atlantic highly migratory species represent another 0.1 percent of total reported landings by vessels submitting FVTRs. In sum, 97.5 percent, by weight, of all reported landings in 2011 were comprised by species subject to either Federal or ASMFC FMPs.[48]

7.1.2.2 Protected Resources

There are many protected species inhabiting the Northeast Continental Shelf Large Marine Ecosystem. These include Atlantic salmon, two species of listed sturgeon, several species of endangered and threatened sea turtles, and several species of whales, small cetaceans, and pinnipeds. Although there may be many species that occur in this area, this section will focus on those protected species that may be caught in or otherwise interact with one or more of the fishing gears utilized in a fishery addressed in this amendment. For a complete list of protected species that occur in the Greater Atlantic Region, see Table 70. More detailed information on the range-wide status of marine mammal and sea turtle species that occur in the area can be found in a number of published documents. These include sea turtle status reviews and biological reports (Conant et al. 2009; NMFS and USFWS 1995, 2007a, 2007b, 2007c, 2007d; Hirth 1997; Turtle Expert Working Group (TEWG) 1998, 2000, 2007, 2009), recovery plans for Endangered Species Act-listed sea turtles and marine mammals (NMFS 1991; NMFS and USFWS 1991a, 1991b, 2008; NMFS et al. 2011; USFWS and NMFS 1992; NMFS 2005b), the marine mammal stock assessment reports (e.g., Waring et al. 2011), and other publications (e.g., Clapham et al. 1999; Perry et al. 1999; Wynne and Schwartz 1999; Best et al. 2001; Perrin et al. 2002). Additional background information on the Gulf of Maine Distinct Population Segment of Atlantic salmon and the five distinct population segments of Atlantic sturgeon can be found in the respective status reviews (Fay et al. 2006; ASSRT 2007) and listing determinations for Atlantic salmon (74 FR 29344; June 19, 2009) and Atlantic sturgeon (77 FR 5880 and 77 FR 5914; February 3, 2012)

The wild populations of Atlantic salmon whose freshwater range covers the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, including the Penobscot and Kennebec rivers, are listed as endangered under the

[48] For additional information regarding species managed by the ASMFC, see the ASMFC's web page at www.asmfc.org/managedSpecies.htm. For additional information regarding species managed under the Atlantic highly migratory species FMPs, see the NMFS Highly Migratory Species Division web page at www.nmfs.noaa.gov/sfa/hms/.

Endangered Species Act (74 FR 29344, June 19, 2009). This status also applies wherever these fish occur in these rivers' estuaries and the marine environment. Atlantic salmon are highly migratory, undertaking long marine migrations from the mouths of U.S. rivers into the northwest Atlantic Ocean, where they are distributed seasonally over much of the region (Reddin 1985, Sheehan et al. 2012). Most of the salmon originating from the Gulf of Maine Distinct Population Segment spend two winters in the ocean before returning to streams for spawning (Fay et al. 2006).

Loggerhead, leatherback, Kemp's ridley, and green sea turtles occur seasonally in continental shelf waters north of Cape Hatteras. In general, turtles move up the coast from southern wintering areas as water temperatures warm in the spring (James et al. 2005; Morreale and Standora 2005; Braun-McNeill and Epperly 2004; Morreale and Standora 1998; Musick and Limpus 1997; Shoop and Kenney 1992; Keinath et al. 1987). The trend is reversed in the fall as water temperatures cool. By December, turtles have passed Cape Hatteras, returning to more southern waters for the winter (James et al. 2005; Morreale and Standora 2005; Braun-McNeill and Epperly 2004; Morreale and Standora 1998; Musick and Limpus 1997; Shoop and Kenney 1992; Keinath et al. 1987). Hard-shelled sea turtles are more commonly observed south of Cape Cod, but may occur in the Gulf of Maine. The more cold-tolerant leatherbacks range farther north than other sea turtles, feeding as far north as Canadian waters.

The western North Atlantic baleen whale species (North Atlantic right, humpback, fin, sei, and minke) follow a general annual pattern of migration from high latitude summer foraging grounds, including the Gulf and Maine and Georges Bank, and low latitude winter calving grounds (Perry et al. 1999; Waring et al. 2011). However, this is an oversimplification of species movements, and the complete winter distribution of most species is unclear (Perry et al. 1999; Waring et al. 2011). Studies of some of the large baleen whales (right, humpback, and fin) have demonstrated the presence of each species in higher latitude waters even in the winter (Swingle et al. 1993; Wiley et al. 1995; Perry et al. 1999; Brown et al. 2002).

Waring et al. (2011) report that, in comparison to the baleen whales, sperm whale distribution occurs more on the continental shelf edge, over the continental slope, and into mid-ocean regions. However, sperm whales distribution in EEZ waters also occurs in a distinct seasonal cycle. Typically, sperm whale distribution is concentrated east-northeast of Cape Hatteras in winter and shifts northward in spring when whales are found throughout the Mid-Atlantic Bight. Distribution extends further northward to areas north of Georges Bank and the Northeast Channel region in summer and then south of New England in fall, back to the Mid-Atlantic Bight.

Numerous small cetacean species (dolphins, pilot whales, harbor porpoise) occur within the area from Cape Hatteras through the Gulf of Maine. Seasonal abundance and distribution of each species in Mid-Atlantic, Georges Bank, and/or Gulf of Maine waters varies with respect to life history characteristics. Some species primarily occupy continental shelf waters (e.g., white sided dolphins, bottlenose dolphin, harbor porpoise), while others are found primarily in continental shelf edge and slope waters (e.g., Risso's dolphin), and still others occupy all three habitats (e.g., common dolphin, pilot whale).

Information on the western North Atlantic stocks of each species is summarized in Waring et al. (2005).

Of the four species of seals expected to occur in the area, harbor seals have the most extensive distribution with sightings occurring as far south as 30° N (Katona et al. 1993). Gray seals are the second most common seal species in EEZ waters of the United States, occurring primarily in New England (Katona et al. 1993; Waring et al. 2011). Pupping colonies for both species are also present in New England, although the majority of pupping occurs in Canada. Harp and hooded seals are less commonly observed in EEZ waters. Both species form aggregations for pupping and breeding off of eastern Canada in the late winter/early spring, and then travel to more northern latitudes for molting and summer feeding (Waring et al. 2011). However, individuals of both species are also known to travel south into EEZ waters and sightings as well as strandings of each species have been recorded for both New England and Mid-Atlantic waters (Waring et al. 2011).

Atlantic sturgeons belonging to the five distinct population segments use different rivers for spawning and exhibit differences in certain characteristics (e.g., age at maturity and timing of spawning) (Scott and Crossman 1973; Murawski and Pacheco 1977; Smith et al. 1982; Smith 1985; Bain 1997; Smith and Clugston 1997; Young et al. 1998; Caron et al. 2002). However, once the young have become sufficiently salt tolerant, they leave the natal estuary and undertake a migratory existence, ranging from Hamilton Inlet, Labrador, Canada to Cape Canaveral, Florida, USA (Scott and Scott, 1988; ASSRT, 2007). Numerous publications support the conclusion that Atlantic sturgeon of all five distinct population segments occur primarily in marine waters less than 60m, aggregate in certain areas, and exhibit seasonal northerly and southerly coastal movement to and from coastal estuaries (Vladykov and Greeley 1963; Murawski and Pacheco 1977; Dovel and Berggren 1983; Smith 1985; Collins and Smith 1997; Welsh et al. 2002; Savoy and Pacileo 2003; Stein et al. 2004; USFWS 2004; Laney et al. 2007; Dunton et al. 2010; Erickson et al. 2011; Wirgin et al. 2012; Waldman et al. 2013). The final listing rules provide additional information on the distribution of Atlantic sturgeon (77 FR 5880 and 77 FR 5914; February 6, 2012).

Shortnose sturgeons are listed as endangered under the Endangered Species Act. The species is listed as one unit throughout its range, with populations occurring from the Saint John River, New Brunswick, Canada, to the St. Johns River, Florida. Coastal migrations of shortnose sturgeon do occur, particularly in the Gulf of Maine and Southeast where shortnose sturgeon operate as metapopulations (Shortnose Sturgeon Status Review Team 2010).

There are no seabird species in the Greater Atlantic Region that would be subject to interactions with fishing gear from one or more of the relevant fisheries listed as either endangered or threatened under the Endangered Species Act.

Candidate species are those petitioned species that NMFS is actively considering for listing as endangered or threatened under the ESA. Candidate species also include those species for which NMFS has initiated an ESA status review through an announcement in the Federal Register.

Candidate species receive no substantive or procedural protection under the ESA; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed project. NMFS has initiated review of recent stock assessments, bycatch information, and other information for these candidate/proposed species. The results of those efforts are needed to accurately characterize recent interactions between fisheries and the candidate/proposed species in the context of stock sizes. Any conservation measures deemed appropriate for these species will follow the information reviews. Please note that once a species is proposed for listing the conference provisions of the ESA apply (see 50 CFR 402.10).

Cusk (*Brosme brosme*) are NMFS "species of concern," as well as a "candidate species" under the ESA as NMFS is currently conducting a review of the species. NMFS initiated a status review due to concerns over the status of and threats to cusk, particularly bycatch. NMFS is involved in various proactive conservation initiatives to obtain more information on this data poor species to assess its status and further conservation efforts. These initiatives involve cooperative efforts with industry, scientists, and other partners to learn more about cusk. NMFS is especially interested in the investigation and identification of methods to reduce bycatch or discard mortality of cusk, and, in particular, studies of how to alleviate barotrauma effects in released cusk are of high interest. In the Northeastern U.S., cusk are predominantly caught in the Gulf of Maine in commercial bottom trawl, bottom longline, gillnet, lobster trap, and handline/rod and reel gears, as well recreational handline gear (O'Brien, 2010; GMRI, 2012). Additional information on cusk and some conservation efforts can be found at www.greateratlantic.fisheries.noaa.gov/protected/pcp/soc/cusk.html.

7.1.2.3 <u>Other Non-Fishery Resources</u>

In addition to the fishery resources caught and landed by commercial and recreational fishermen, and the protected resources subject to various levels of interactions with commercial and recreational fishing activities, there are a wide variety of other non-fishery resources that may be subject to interactions with fishing gear or operations. Although there may be other non-fishery resources that occur in the Northeast Continental Shelf Large Marine Ecosystem, the focus of this review remains on those species or taxa most likely to be encountered by one or more fishing gears utilized in a fishery addressed in this amendment. Table 70 lists examples of non-fishery resources known to be subject to interactions with fishing gear or operations. The non-fishery resources most likely subject to interactions with fishing activities represent many diverse taxa of invertebrates, finfish, and algae that occupy a broad range of habitats throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight.

Based on the results of extensive benthic studies by Theroux and Wigley (1981 and 1998), the biomass and density of non-fishery resources in the Greater Atlantic Region tends to be dominated by five groups: Amphipods; annelids; arthropods;

echinoderms; and mollusks. In the Gulf of Maine and on Georges Bank, echinoderms and mollusks dominate the biomass, while mollusks dominate in the Mid-Atlantic Bight. In terms of density of individuals, annelids and mollusks dominate in the Gulf of Maine, while crustaceans and annelids dominate on Georges Bank and arthropods, mollusks, and annelids dominate in the Mid-Atlantic Bight. These groups vary by sediment type, as well, with amphipods dominating numerically in sand, gravel, and sand-gravel habitats in all three areas. Mollusks dominate the biomass in sand-shell, silty-sand, sand-gravel, silt, and, and clay habitats in the Mid-Atlantic Bight. Most of the mollusks in sand-gravel, sand-shell, and sand habitats are bivalves, although gastropods are important in silty sand, and annelids, hydroids, and bryozoans are important in sand-gravel habitats. Echinoderms (mostly sea cucumbers) dominate in silty-clay habitats of the Gulf of Maine and Georges Bank. In the Gulf of Maine and on Georges Bank, mollusks comprise 50 percent of the biomass in gravel habitats, but annelids, crustaceans, sea anemones, sponges, and tunicates are also important. In all areas, many of these groups, particularly the annelids and arthropods, serve as important prey items for fishery resources.

Seabirds with known fishing gear interactions in the Greater Atlantic Region include several species of gulls, shearwaters, Northern gannets, the common loon, cormorants, and brown pelicans. For more information on seabirds, see Endicott and Tipling (1997), Ward (1995), and Tove (2000).

	Species	Gulf of Maine	Georges Bank	Middle Atlantic Bight
Fishery Resources	American lobster	X	X	X
	American plaice	X		
	Atlantic bluefish	X		X
	Atlantic cod	X	X	
	Atlantic croaker			X
	Atlantic halibut	X		
	Atlantic herring	X	X	X
	Atlantic mackerel	X	X	X
	Atlantic sea scallop		X	X
	Atlantic surfclam	X	X	X
	Atlantic wolffish	X	X	
	Black sea bass		X	X
	Blue crab			X
	Butterfish		X	X
	Clearnose skate			X
	Deep-sea red crab	X	X	X
	Golden tilefish			X
	Haddock	X	X	
	Hagfish	X	X	X
	Horseshoe crab	X	X	X
	Jonah crab	X	X	
	King whiting			X
	Little skate		X	X
	Longfin squid		X	X
	Menhaden	X	X	X
	Monkfish	X	X	X
	Ocean pout	X	X	X
	Ocean quahog	X	X	X
	Offshore hake		X	X
	Pandalid shrimp	X		
	Pollock	X	X	
	Red hake	X	X	X
	Redfish	X		
	Rock crab	X	X	X
	Rosette skate			X
	Scup			X
	Shortfin squid	X	X	X
	Silver hake	X	X	X
	Smooth dogfish		X	X
	Spiny dogfish	X	X	X
	Spot			X
	Striped bass	X	X	X
	Summer flounder		X	X
	Whelks	X	X	X
	White hake	X	X	X
	Windowpane		X	X
	Winter flounder	X	X	X
	Winter skate	X	X	X
	Witch flounder	X		
	Yellowtail flounder	X	X	X

	Species	Gulf of Maine	Georges Bank	Middle Atlantic Bight
Protected Resources	North Atlantic right whale	X	X	X
	Humpback whale	X	X	X
	Fin whale	X	X	X
	Blue whale[49]			
	Sei whale	X	X	
	Sperm whale		X	X
	Minke whale	X	X	X
	Risso's dolphin		X	X
	Short-finned pilot whale			X
	Long-finned pilot whale	X	X	X
	White sided dolphin	X	X	X
	Common dolphin	X	X	X
	Spotted dolphin		X	X
	Bottlenose dolphin		X	X
	Harbor seal	X		X
	Gray seal	X		
	Harp seal	X		
	Hooded seal	X		
	Leatherback sea turtle	X	X	X
	Kemp's ridley sea turtle	X		X
	Green sea turtle	X		X
	Loggerhead sea turtle		X	X
	Atlantic sturgeon	X	X	X
	Atlantic salmon	X		
	Cusk (candidate species)	X	X	X
Other Non-fishery Resources	Amphipods (spp.)	X	X	X
	Annelid worm (spp.)	X	X	X
	Barndoor skate		X	
	Brittle star (spp.)	X	X	X
	Coral (spp.)	X	X	X
	Greater shearwater	X		
	Grenadier (spp.)	X	X	X
	Hermit crab (spp.)	X	X	X
	Jellyfish (spp.)	X	X	X
	Kelp (spp.)	X	X	X
	Lumpfish	X	X	X
	Northern gannet	X	X	X
	Northern stone crab	X	X	X
	Sand dollar (spp.)	X	X	X
	Sand lance (spp.)	X	X	X
	Sculpin (spp.)	X	X	X
	Sea anemone (spp.)	X	X	X
	Sea cucumber (spp.)	X		X
	Sea raven	X	X	X
	Sea robin (spp.)	X	X	X
	Sea squirt (spp.)	X	X	X
	Snail (spp.)	X	X	X
	Spider crab (spp.)	X		X
	Sponge (spp.)	X	X	X
	Spotted hake		X	X
	Starfish (spp.)	X	X	X
	Thorny skate	X	X	
	Zooplankton (spp.)	X	X	X

Table 70. List of example biological resources and the geographic regions where the resources are most commonly found.

[49] Blue whales are considered only an occasional "visitor" to this region.

7.1.3 Socio-Economic Considerations

Analyses of socio-economic impacts are generally conducted at three levels: The level of the individual fishing vessel, the level of the fishing sector or fleet (typically defined as all permit holders of one type – e.g., all commercial moratorium summer flounder permit holders), and at the level of the fishing community. Individual impacts of fishing regulations (changes to the cost of operations, changes to expected revenues, profits, etc.) occur at the level of the fishing vessel or permit holder, while cumulative impacts across the fishery occur at the level of the sector, fleet, fishing port and/or community. The relative impacts of any proposed regulatory change depend upon several factors: Whether a vessel holds a permit in the affected fishery; whether a vessel holds multiple permits (permits in addition to the affected fishery); the dependence on fishing, and on the affected fishery in particular, of the permit holder; the number of affected permit holders in a sector, fleet, or community; the number of permit holders in the affected fishery versus alternative fisheries; and the overall dependence on fishing, and on the affected fishery in particular, of the fishing community.

As described in chapter 2, most fisheries managed under FMPs subject to this amendment include both limited access permits as well as open access permits. Only the fisheries for Atlantic bluefish and skates remain entirely open access.[50] In the Greater Atlantic Region, approximately 3,700 vessels hold at least one limited access permit. Of these, approximately 1,600 vessels hold only a limited access lobster permit and, therefore, are not subject to the regulations implemented under the FMPs affected by this amendment. This leaves approximately 2,100 vessels with at least one limited access permit issued under a subject FMP. In addition to these vessels, an additional 1,877 vessels hold at least one open access permit (but no limited access permits) in an FMP fishery.

In 2011, the dealer purchase report database includes 550 ports with recorded landings among the 12 states in the Greater Atlantic Region. Of these, the top 99 ports contribute 90 percent of the total ex-vessel value of all ports in the region, and 50 percent of the total ex-vessel value comes from only 10 ports. Nationally, 14 Greater Atlantic Region ports rank in the top 50 of all ports in the country for both quantity of fish landed and for total ex-vessel value of the fish landed (see Table 71).

New Bedford, MA, the top port nationally by value in recent years, is a primary port for Atlantic sea scallops, monkfish, and the large-mesh groundfish species (e.g., yellowtail flounder, winter flounder, haddock, and Atlantic cod). Cape May, NJ, is another leading sea scallop port, and is also a primary port for squid (Longfin and *Illex*) and Atlantic mackerel. The Hampton, VA, area (including Newport News, VA) is also a primary port for Atlantic sea scallops, as well as summer flounder and blue crabs. Gloucester, MA, is an important port for American lobster, groundfish, monkfish, and

[50] The permit structure under the Skate FMP remains open access, as there is no limited access skate permit. However, effectively only the skate bait exemption fishery is completely open access. With the exception of the skate bait exemption fishery, possession of more than a low incidental catch level of skates requires the vessel to be operating on either a monkfish, sea scallop, or Northeast multispecies day-at-sea (DAS), which in turn requires the vessel to hold a limited access permit in at least one of these fisheries.

Atlantic herring. Stonington, ME is similarly an important port for American lobster, Atlantic herring, Atlantic sea scallops, and groundfish. Point Judith, RI, is a primary port for American lobster, squid (Longfin and *Illex*), summer flounder, monkfish, and silver hake. Reedville, VA, one of the top ports in the country by weight of landings, deals primarily in menhaden as well as blue crabs, but does not feature as a primary port for any Greater Atlantic Region FMP species.

	Quantity (million pounds)			Value (million dollars)	
Port	2010	2011	Port	2010	2011
Reedville, VA	426	414	New Bedford, MA	306	369
New Bedford, MA	133	117	Cape May-Wildwood, NJ	81	103
Gloucester, MA	89	77	Hampton Roads Area, VA	75	88
Portland, ME	38	61	Gloucester, MA	57	59
Point Judith, RI	36	41	Stonington, ME	45	48
Cape May-Wildwood, NJ	43	40	Point Judith, RI	32	40
Rockland, ME	23	38	Reedville, VA	34	36
Wanchese-Stumpy Point, NC	26	25	Long Beach-Barnegat, NJ	26	34
Atlantic City, NJ	24	23	Portland, ME	19	28
Stonington, ME	17	19	Provincetown-Chatham, MA	20	27
Hampton Roads Area, VA	16	18	Point Pleasant, NJ	23	27
Provincetown-Chatham, MA	16	18	Rockland, ME	11	24
Point Pleasant, NJ	21	15	Wanchese-Stumpy Point, NC	22	22
Boston, MA	12	13	Montauk, NY	18	19

Table 71. Commercial fishery landings and value at major Greater Atlantic Region ports, 2010-2011 (from NMFS 2012).

Figure 46 and Figure 47 display 2011 commercial fishing landings for major U.S. ports, both by weight and by value. These figures display the relative importance of Greater Atlantic Region ports compared to other major U.S. ports. Based on a classification scheme developed by Hall-Arber et al. (2001), the top-ranked ports in New England are: New Bedford, MA; Portland, ME; Gloucester, MA; Chatham, MA; Point Judith, RI; and Portsmouth, NH. This ranking accounts for overall fishery dependence and availability of fishing infrastructure. For a more detailed description of the fishing communities in the New England area, see Hall-Arber et al. (2001). This document provides profiles of many ports from Connecticut to Maine, and evaluates fishery dependence. For a more detailed description of the fishing communities of the Mid-Atlantic area, see McCay and Cieri (2000), for profiles of many ports from North Carolina to New York.

As noted earlier, economic impacts of a fishery management action are most directly seen at the level of the individual vessel, but larger scale economic impacts are also seen at the level of the fishing sector and fleet. Cumulative economic impacts are also often expected at the port or community level. Social impacts (as differing from purely economic impacts) can also be seen at the level of the individual vessel (sometimes differentiated based on position on the vessel – owner, captain, crew, etc.), the fishing sector, fleet, port, or community. Ports and communities with the highest degree of dependence on a fishery subject to a management action are the ones most likely to face social impacts as well as economic impacts resulting from a management action. The above mentioned references (Hall-Arber et al., 2001, and McCay and Cieri,

2000) provide detailed information of the social characteristics of New England and Mid-Atlantic ports and fishing communities.

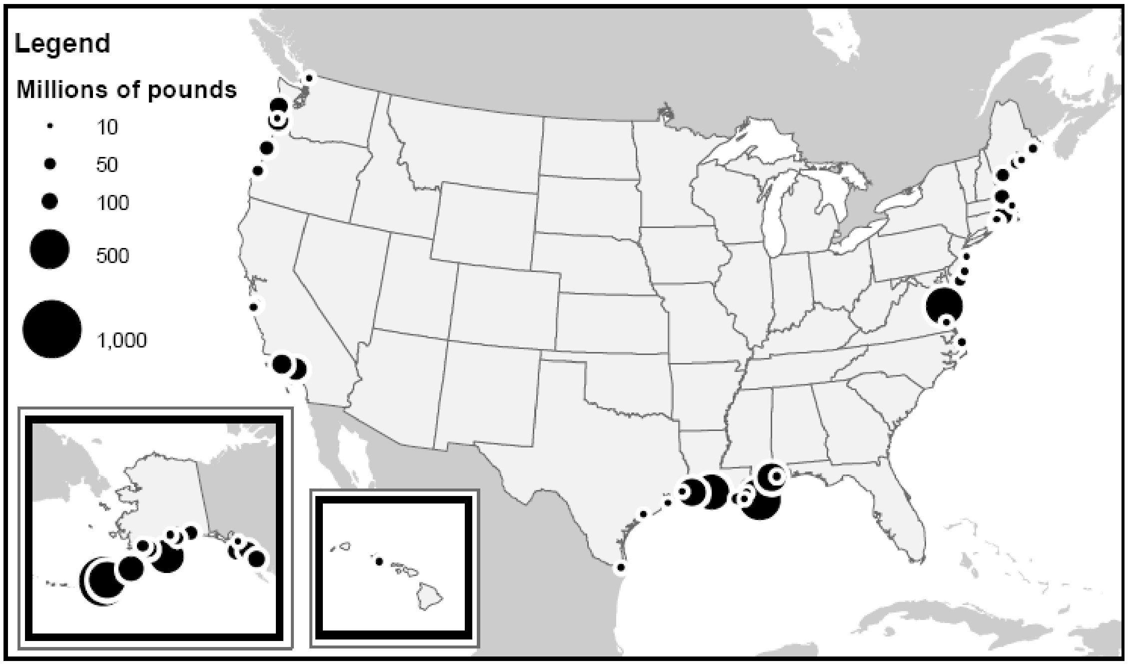

Figure 46. 2011 commercial fishery landings, by weight, at major U.S. ports (from NMFS 2012).

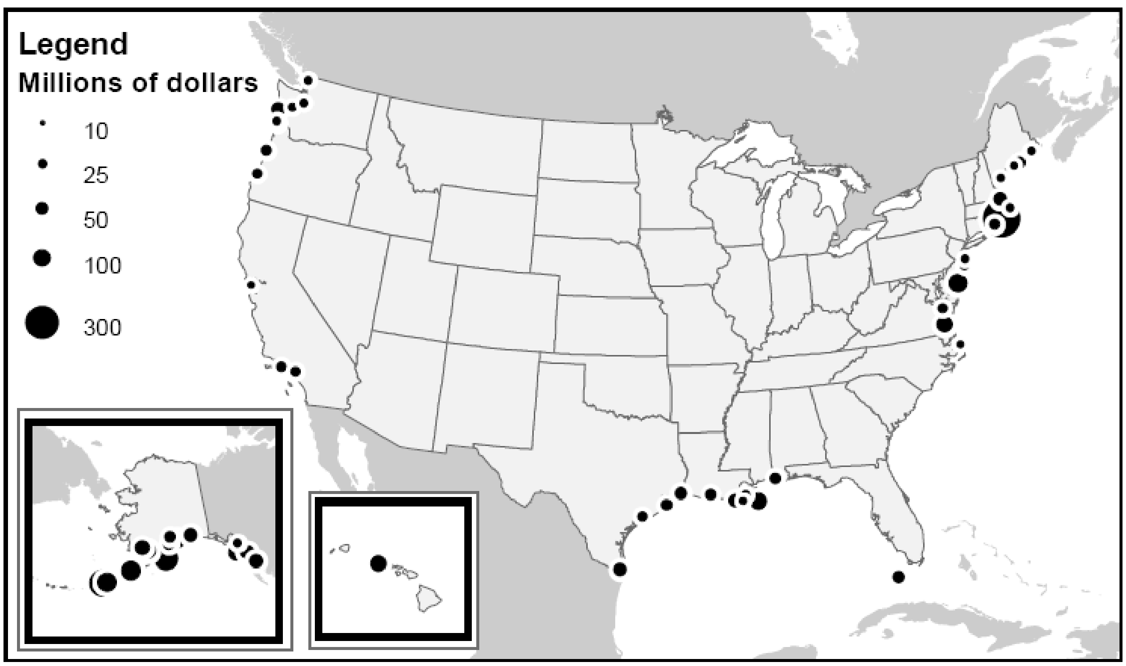

Figure 47. 2011 commercial fishery landings, by value, at major U.S. ports (from NMFS 2012).

7.2 Consequences of the Alternatives Under Consideration

The National Environmental Policy Act requires that an EA briefly describe the probable environmental impacts of the proposed action and alternatives to the proposed action considered by the action agency (NEPA, section 102(2)(E)). The following sections address the reasonably foreseeable direct, indirect, and cumulative effects of the alternatives being considered for the SBRM.

As noted above in the introduction to the affected environment (section 7.1), this amendment is wholly procedural in nature—focused on the methodology and mechanisms by which data and information on the types and rates of bycatch occurring in Greater Atlantic Region fisheries are obtained and utilized by scientists and fishery managers. Subsequently, there are no expected direct physical or biological impacts associated with the alternatives under consideration. As described below, there are some potential economic effects associated with an alternative for bycatch reporting and monitoring, but, overall and due to the nature of the program to be implemented through this amendment, there very few functional differences (as far as environmental effects generally considered in an EA are concerned) between the status quo alternatives and the other alternatives under consideration.

The expected direct effects are generally well-defined for most fishery management actions, but indirect effects are often less so. While NEPA requires consideration of "reasonably foreseeable effects," it does not require consideration of remote and speculative impacts; these effects remain outside the scope of a NEPA analysis (Bass et al. 2001). During the development of this amendment, there have been occasions when discussions began to diverge from how bycatch data may best be collected into discussions about the likely management implications of an "improved" data collection program. These discussions generally focused on the potential for improvements in stock assessments and on the types of management measures that may be necessary to address bycatch concerns where they may exist.

There are three reasons why these types of potential downstream effects (e.g., subsequent management measures to address bycatch issues) of this action are considered too remote and speculative to be appropriate for consideration in this amendment. First, while this amendment is focused on structuring an SBRM to obtain the highest quality bycatch data possible, implementation of this amendment does not, by itself, guarantee that there would be an improvement in data quality over the status quo. In some, if not many, cases, the analyses conducted in support of this amendment have demonstrated that the data currently being collected are of sufficient quality (i.e., precision and accuracy) to meet the objectives of the SBRM (i.e., the CVs associated with many fishing mode-species combinations are already at or less than the target proposed to be established by this amendment). Also, while increases in target observer coverage levels for some fisheries may be expected to improve data quality in those fishing modes, realization of an improvement in data quality is contingent upon sufficient funding for the observer program to fully staff the target coverage level on a continuing basis.

The second reason these types of potential effects are too remote and speculative to be appropriate for consideration in this amendment is that there is no way to predict the effect that an improvement in data quality would have for managing the affected fisheries. While any improvements in data quality would give assessment scientists and fishery managers more confidence in the data, there is no way to predict whether the resulting data would indicate that future estimates of discards would be higher or lower than current estimates. Because any change in the direction of bycatch estimation cannot be predicted at this time, there is no way to predict whether changes in management would be required to address any potential issues that may arise.

The third reason is that the management measures that might be implemented, should action be determined to be necessary to address a bycatch concern, also cannot be predicted. Depending on the specific fishery, resource species, time, area, and manner of interaction leading to the bycatch concern, different types of management measures would be appropriate. Some types of bycatch concerns may best be addressed with a bycatch quota, others may best be addressed with an area or seasonal closure, and yet others may best be addressed through changes to the fishing gear used. As the actual environmental impacts of these potential management changes would vary with and depend upon the type of measure proposed, the management system to be changed, and the time, area, and species fished, there is no way to speculate as to what the most likely environmental impacts may be.

Therefore, because these types of potential management actions, which may eventually stem from implementation of the SBRM, are too remote and speculative to be adequately or meaningfully addressed in this amendment, this NEPA analysis focuses solely on the potential direct, indirect, and cumulative effects expected to be immediately associated with the proposed action and primary alternatives. Any future management actions that may result from the information collected under this SBRM would be subject to all the requirements of NEPA at the appropriate time.

The discussion of environmental effects that follows is organized to present separately the relevant biological, physical, and socio-economic considerations of the alternatives associated with each item described in chapter 6. Thus, for each item, the effects on biological resources of the alternatives are discussed, followed by the effects on the physical environment (habitat) of the alternatives, and then followed by the socio-economic effects of the alternatives. In this way, full consideration may be given to all the potential impacts associated with a single item before proceeding to the next item. Due to the administrative nature of this action, by which is meant that the action is focused on establishing a procedural methodology, including analytical techniques used to determine the effectiveness of a bycatch monitoring program and the allocation of at-sea fisheries observer coverage levels, rather than on implementing changes to fishing operations (e.g., gear, area, season, etc.), in many cases there are no environmental impacts associated with the elements of the SBRM under consideration. In these cases, an explanation for this conclusion is presented, but no separate discussion of the alternatives is provided. Separate discussion of the likely impacts of alternatives is only provided where there are measurable differences in impacts between the alternatives.

7.2.1 Environmental Consequences of Item 1: Bycatch Reporting and Monitoring Mechanisms

This item includes two alternatives addressing the mechanisms through which information on bycatch may be collected and reported. In addition to the status quo, an alternative is considered that would supplement the status quo bycatch reporting and monitoring mechanisms with an electronic video monitoring program. Due to concerns regarding the state of the technology required to implement electronic monitoring, the level of detail of the information that can be obtained through this technology, and the appropriateness of this type of system to Greater Atlantic Region fisheries, the status quo is the preferred alternative for this item.

7.2.1.1 Effects on Biological Resources

Because the alternatives considered under this item deal entirely with the procedural and administrative mechanisms by which data and information regarding fishery discards are collected (e.g., FVTRs, at-sea observers, seafood dealer purchase reports, MRIP, etc.), neither of the alternatives would affect the level of fishing effort, fishing operations, the species targeted, or areas or times fished in the Greater Atlantic Region. The status quo alternative proposes maintaining the current bycatch collection mechanisms. As discussed in Chapter 5.6.2, in some fishing modes there is evidence for a difference between observed and unobserved fishing trips. However, current research does not indicate whether this observer effect would affect the accuracy of discard estimates. Recent analysis indicates that any bias in discard rates that may be present would have to be at least 5 to 10 times greater than currently observed in order to pose an appreciable risk of exceeding the ABC or OFL. The bias analyses conducted to date do not suggest behavioral differences of this magnitude. Current bycatch collection mechanisms are thought to have minimal if any direct impacts on biological resources. The electronic monitoring alternative, while it would introduce a new bycatch monitoring technology, would impose no regulatory changes or constraints to the how, where, what, or when of fishing operations, but would only require the purchase and installation of an additional piece of electronic equipment on fishing vessels. Therefore, there are expected to be minimal to no direct or indirect impacts on biological resources (including fishery resources, protected resources, and other non-fishery resources) associated with either alternative. The biases that could occur and result in potential impacts could occur under either alternative; thus, there are no expected differences in the potential biological impacts between the two alternatives.

7.2.1.2 Effects on the Physical Environment (Habitat)

Because neither the status quo alternative nor the electronic monitoring alternative would impose or result in any changes in fishing effort or behavior, fishing gears used, or areas fished, there are no potential impacts to the physical environment (including EFH) associated with the alternatives under consideration for this item. Similar to impacts on biological impacts, due to the nature of the alternatives considered for this item, there are no differences between alternatives as far as potential impacts on the physical environment (including EFH) of the Greater Atlantic Region.

7.2.1.3 Socio-Economic Effects

The electronic monitoring alternative, because it would introduce an additional fishing vessel monitoring technology into the fisheries for which it was required, can be distinguished from the status quo alternative. There are financial costs associated with implementation of this new technology that would exceed those associated with the status quo. These potential socio-economic impacts are described below.

7.2.1.3.1 Alternative 1.1 –Status Quo (Preferred Alternative)

7.2.1.3.2 A number of small ongoing costs are associated with the status quo alternative, including but not limited to, costs for maintenance of electronic transmission devices such as eVTR and VMS, transmission fees, and costs associated with hosting an observer or at-sea monitor onboard the vessel. Generally these costs are low, and therefore have a minor, negative economic impact. Alternative 1.2 – Implement Electronic Monitoring

The economic impacts associated with the alternative to implement an electronic video monitoring program for one or more fisheries in the Greater Atlantic Region are derived directly from the expected costs to purchase, install, and maintain the electronic monitoring systems. These costs could be borne in either of two ways: A requirement that all permitted vessels participating in the subject fishery purchase, install, and maintain the equipment themselves (industry pays); or NMFS purchases the equipment for the industry participants and provides it for their use (government pays). Based on the various VMS programs implemented in the Greater Atlantic Region in recent years, it appears likely that implementation of any type of electronic monitoring program for bycatch would follow the industry-pays model and all costs associated with purchasing, installing, and maintaining the equipment would be borne by the affected vessel permit holders.

Based on cost estimates as of May 2006, it is likely that the cost to purchase a complete electronic video monitoring system would be approximately $7,200 per vessel (Archipelago Marine Research, Ltd. 2006).[51, 52] Installation costs are highly variable and depend upon the size of the vessel, the number of cameras to be installed, and other complicating factors such as the need to retrofit the vessel to support the installation of the equipment. Kinsolving (2006) estimates installation costs as ranging from $650 to $4,225 per vessel, based on a service rate of $65 per hour and the installation time ranging from 10 hours to as many as 65 hours per vessel, depending on the aforementioned complexity. In addition to the cost to purchase and install a system, it is expected that an annual registration fee would be required by the contractor providing the equipment and this is estimated to be approximately $600 per year. Maintenance costs

[51] Archipelago Marine Research, Ltd. (2006), identifies the costs to purchase, install, and maintain a complete electronic monitoring system. While this fee schedule is focused on the British Columbia groundfish longline fisheries, the costs identified are presumed to be transferable to other fisheries. Published costs in Canadian dollars were converted to U.S. dollars based on the published exchange rate for September 7, 2006.

[52] Kinsolving (2006) also provides estimates of the cost to purchase a complete electronic monitoring system, ranging from $4,250, if off-the-shelf components are used, to $8,000 if a package system is purchased from an approved contractor. For the purposes of this analysis, the costs published by Archipelago Marine Research, Ltd. (2006), were used to simplify the analysis and to clearly identify the source of the costs used.

would be expected to vary, but for the purposes of analysis, Kinsolving's (2006) estimate of $975 per year is used. The total first year costs would be approximately $10,200 per vessel, with continuing costs of approximately $1,600 per vessel per year for the second year and beyond (see Table 72).

	Year 1 (per vessel)	Year 2+ (per vessel)
Equipment purchase	$7,194	N/A
Installation costs (average)	$2,438	N/A
Annual program registration fee	$608	$608
Annual maintenance	N/A	$975
Total	**$10,240**	**$1,583**

Table 72. Estimated costs per fishing vessel to purchase, install, and maintain an electronic video monitoring system (Archipelago Marine Research, Ltd. 2006; Kinsolving 2006).

The information presented above and in Table 72 provide an estimate of the per vessel costs of implementing the electronic monitoring alternative. The next step is to estimate the number of affected vessels within the fisheries for which this alternative would be considered. Table 73 below identifies the primary vessel permit categories established for each FMP, with the number of permit holders in 2012. By simply multiplying the cost information by the number of permit holders, an estimate of the overall cost to a fishery can be calculated.

Estimating total costs region-wide is more difficult if more than one fishery would be affected and required to implement electronic monitoring, because most fishing vessels hold permits in more than one fishery. Summing the totals presented in Table 73 for all affected fisheries would result in an over-estimation of the total costs (i.e., vessels with multiple permits would not have to obtain multiple systems). Also, imposition of this type of program in an open access fishery (such as bluefish) would most likely result in a decrease in permit holders, as it would not be cost effective for many participants to incur the expense in order to remain in the fishery. Table 73 does not include party/charter permits for any fisheries.

The costs discussed above address only the purchase, installation, and annual maintenance of the electronic video monitoring systems, but do not address the costs associated with extracting the data from the video recording systems, or storing, maintaining, editing, and reviewing the data. This would be a major component of the electronic monitoring program and must be addressed. For the purpose of this analysis, it is assumed that NMFS would bear these costs and perform all data-related tasks itself (or through a contractor). Thus, the individual vessel and fleet costs do not need to be adjusted to account for these aspects of implementing such a program. However, the costs to the government could be substantial (Kinsolving 2006).

Type of Permit	Number of Permits	Fleet-wide Cost	
		Year 1	Year 2+
Atlantic Bluefish Open Access	2,633	$26,961,920	$4,168,039
Red Crab Limited Access	5	$51,200	$7,915
Red Crab Open Access	1,490	$15,257,600	$2,358,670
Atlantic Herring Limited Access	93	$952,320	$147,219
Atlantic Herring Open Access	2,044	$20,930,560	$3,235,652
Sea Scallop Limited Access	824	$8,437,760	$1,304,392
Black Sea Bass Limited Access	764	$7,823,360	$1,209,412
Dogfish Open Access	2,639	$27,023,360	$4,177,537
Monkfish Limited Access	683	$6,993,920	$1,081,189
Monkfish Open Access	1,736	$17,776,640	$2,748,088
NE Multispecies Limited Access	1,172	$12,001,280	$1,855,276
NE Multispecies Open Access	1,351	$13,834,240	$2,138,633
Scup Limited Access	718	$7,352,320	$1,136,594
Skate Open Access	2,242	$22,958,080	$3,549,086
Squid/Mackerel/Butterfish Limited Access	400	$4,096,000	$633,200
Squid/Mackerel/Butterfish Open Access	2,212	$22,650,880	$3,501,596
Summer Flounder Limited Access	865	$8,857,600	$1,369,295
Surfclam/Ocean Quahog Limited Access	37	$378,880	$58,571
Surfclam/Ocean Quahog Open Access	720	$7,372,800	$1,139,760
Tilefish Open Access	2,061	$21,104,640	$3,262,563

Table 73. Number of permits by FMP permit category for 2012 calendar year, and the estimated total fleet costs associated with implementation of the electronic monitoring alternative.

Agency or contractor personnel would be required to obtain the video data from fishing vessels (either through dockside extraction or a mail-in hard drive exchange program), to review the video footage in order to document discard events, to oversee and perform quality control on the extracted data, and to archive and maintain the data. Video reviewing and data archiving equipment would also be required. Kinsolving (2006) estimates that data storage systems would be required to support approximately 20 terabytes of data per year, but this was an estimate solely for the Pacific rockfish pilot program, which has a fleet of approximately 25 vessels (consolidating to 18 active vessels) that make an average of seven fishing trips per year, with trips averaging 3 days each. Therefore, extrapolating to determine the data storage needs were this program implemented in the Greater Atlantic Region would most likely be orders of magnitude greater. Thus, the costs to the government to implement an electronic monitoring program would likely be substantial.

Comparatively, the costs associated with the electronic monitoring alternative appear much greater, therefore impacts are expected to be moderately negative when compared to the status quo alternative. Future consideration of electronic monitoring programs would need to weigh the benefits of such a program against the substantial costs to both the fishing industry and the Federal government, although as technologies improve, costs may decrease. Although the cost basis used in this analysis is representative of current costs (using 2006 data), these costs are driven somewhat by the limited number of vendors currently operating in the market. The costs associated with electronic video monitoring would be expected to decrease as more vendors enter the market.

7.2.2 Environmental Consequences of Item 2: Analytical Techniques and Allocation of Observers

This item includes four alternatives addressing the processes by which the appropriate target levels of at-sea observer effort would be determined and how that observer effort would be allocated across the Greater Atlantic Region fishing modes. The alternatives considered under this item are: 1) a return to the allocation process used prior to the 2007 SBRM Omnibus Amendment; 2) an alternative that uses an integrated allocation approach to determine the initial target observer coverage levels; 3) the status quo, which uses the integrated allocation approach combined with an importance filtering process to refine the initial target observer coverage levels; and 4) an alternative that would establish baseline percent coverage levels based on the types of species (common or rare) expected to be encountered by participants in the fishing modes. While the coverage rate for fishery observers may change as a result of these alternatives, the requirement to carry an observer would not change. As is currently required, any fishing vessel holding one or more Federal permits that is asked to carry an observer must do so.

7.2.2.1 Effects on Biological Resources

Because the alternatives considered under this item deal entirely with the process by which target observer coverage levels are determined and allocated across fishing modes, none of the alternatives would affect the level of fishing activity, fishing operations, the species targeted, or areas or times fished in the Greater Atlantic Region. The differences between the alternatives would be in the target observer coverage levels set for each fishing mode, but the target observer coverage levels would be set prior to determining whether available resources could support such coverage so it is not possible to determine the degree to which realized coverage levels would vary among these three alternatives. Even so, the implications to biological resources of changes in observer coverage levels across the fishing modes that may be linked to differences in how observer effort is allocated are negligible. If some fishing vessels alter their behavior in the presence of a fishery observer (e.g., to avoid a bycatch “hot spot” when an observer is present), then there may be some tangential impacts to some species, but, as described in chapter 5 and Appendix A, evidence of such an “observer effect” is minimal for Greater Atlantic Region fisheries. Therefore, there are no direct or indirect impacts on biological resources (including fishery resources, protected resources, and other non-fishery resources) associated with any of the alternatives. As there are no biological impacts associated with these alternatives, there are no differences among them.

7.2.2.2 Effects on the Physical Environment (Habitat)

Because neither the status quo alternative nor the other alternatives would directly impose or likely result in any changes in fishing effort or behavior, fishing gears used, or areas fished, there are no potential impacts to the physical environment (including EFH) associated with the alternatives under consideration for this item. There are also no differences among the alternatives.

7.2.2.3 Socio-Economic Effects

Because the alternatives considered under this item focus entirely on the process by which target observer coverage levels are determined and allocated across fishing modes, the only socio-economic impacts that could be associated with these alternatives would be for fisheries in which the fishing industry itself pays for the at-sea observers. In the Greater Atlantic Region, the fisheries observer program operates entirely through a contract service funded by NMFS, with the single exception of the sea scallop industry-funded program. In this case, increases in target observer coverage levels would increase initial costs to the vessels carrying observers. However, under the provisions of the regulations establishing the sea scallop industry-funded observer program, any vessel required to carry an observer is authorized either to catch and retain additional sea scallops above the standard possession limit or to have their DAS charged at a reduced rate in order to offset the costs associated with carrying the observer. Both the increased possession limit and reduced DAS are subject to the continued availability of a set-aside from the annual total allowable catch and fleet DAS allocation. The intent of the observer set-aside is to offset all costs to the vessel of carrying an observer; however, should the set-aside be exhausted, fishing vessels carrying observers would bear the full costs.

Other than the sea scallop industry-funded observer program, no other industry-funded observer programs are authorized in the Greater Atlantic Region. The At-Sea Monitor Program was designed to be an industry-funded program to support the Northeast multispecies sector management program. Although the programs function similarly, the NEFOP and At-Sea Monitor Program are separate and each is tailored to meet specific monitoring objectives. The allocation and funding of at-sea monitors is separate and distinct from SBRM at-sea observers. Therefore, this action would not change the At-Sea Monitoring Program.

Returning to the allocation process used prior to the 2007 SBRM Omnibus Amendment could potentially decrease spending by the Federal Government from reduced levels of observer coverage and reduced statistical analyses and reports to be prepared for use by fishery managers. Using 2004 as the case study, there were 8,429 observer sea days utilized in 2004. Under the status quo alternative for this element, 9,874 observer sea days would have been required based on 2004 data. The status quo alternative represented an increase of 1,445 observer sea days. Given a per day total cost of $1,150 to pay the observer and cover the cost of all associated overhead for the contractor and the Government, that equates to an increase of $1,661,750 from the 2004 spending level (a 17 percent increase). Theoretically, a return to the allocation process prior to the 2007 SBRM Omnibus Amendment could also result in a return to these lower costs. However, this alternative may not represent the best scientific information available and may no longer meet the purpose and need of this action.

As the four alternatives considered for determining appropriate observer coverage levels and allocating observer effort operate independent of the budget process used to determine the available resources for funding observer coverage in any given year, there are no effective differences among the four alternatives regarding the socio-economic impacts that may be associated with these alternatives.

7.2.3 Environmental Consequences of Item 3: SBRM Standard

This item includes two alternatives addressing whether an SBRM standard should be established as part of the SBRM. The first alternative would result in no SBRM standard, while the status quo alternative would establish a CV of 30 percent as the performance standard for the SBRM. The SBRM standard would be used as a gauge to determine whether observer coverage levels in a previous fishing year were sufficient to provide data of the desired precision (indicated by a CV of 30 percent). The SBRM standard would also be used as part of the process to determine target observer coverage levels for future fishing years (see Item 2).

7.2.3.1 Effects on Biological Resources

The status quo process wherein no SBRM standard is used still results in an administrative process designed to provide optimal observer allocation based on several concurrent fishery information needs that are responsive to statute and regulation. These include, but are not limited to bycatch and catch estimation and protected species interactions monitoring. Similarly, the establishment of a CV standard that relies on an estimated CV performance analysis before the year begins to allocate observers to meet information and SBRM requirements, is a largely administrative process. In both alternatives, there can be and has been year-to-year variability in observer allocation. Such variances could impact allocation of observers in future years; however, the distinction in processes are the key elements. The resultant allocation of observers could have some level of indirect impact in the form or more or less information on biological resources. However, the two alternative administrative processes do not have direct impact on biological resources. The fisheries and fishing behaviors are not likely to be significantly influenced by the status quo or establishment of an SBRM standard. The fisheries are more responsive to the limiting management system of available catch limits and fish availability, which in turn drive impacts on fishery, protected, and non-fishery related resources. The potential indirect effects on biological resources (fishery resources, protected resources, or other non-fishery resources) are expected to be low to nonexistent for either alternative.

7.2.3.2 Effects on the Physical Environment (Habitat)

7.2.3.3 Because neither the status quo alternative nor the CV standard would impose or result in any changes in fishing effort or behavior, fishing gears used, or areas fished, there are no potential impacts to the physical environment (including EFH) associated with the alternatives under consideration for this item. The potential impacts on the physical environment is driven more by the potential fishery limitations of catch limits and fish availability. The observer allocation process is not expected to result in differences between alternatives as far as potential impacts on the physical environment (including EFH) of the Greater Atlantic Region. Socio-Economic Effects

Due to the nature of the alternatives under consideration for this item, which are limited to a decision on whether or not to establish a performance measure of a 30 percent CV standard for the SBRM, there are no direct or indirect socio-economic effects on fishing vessels, fleets, or ports anticipated for either alternative.

7.2.4 Environmental Consequences of Item 4: SBRM Review/Reporting Process

This item includes three alternatives addressing whether the SBRM should include a reporting/evaluation process to present information on bycatch rates in the Greater Atlantic Region fisheries, and also to compare the effectiveness of the SBRM against the performance standard. The status quo alternative would result in no requirements for an SBRM reporting process, while the other alternatives (either alone or in combination) would establish a periodic reporting and evaluation process as a formal component of the SBRM. The requirement to provide periodic reporting would specify the types of information to be provided in the reports, and time intervals for which the reports must be prepared (semi-annually, annually, every 3 years, every 5 years, or as part of an existing required reporting process).

7.2.4.1 Effects on Biological Resources

Due to the nature of the alternatives under consideration for this item, which are limited to a decision on whether or not to establish a requirement for a periodic reporting and evaluation process for the SBRM, there are no direct or indirect effects on any biological resources (fishery resources, protected resources, or other non-fishery resources) anticipated for any of the alternatives.

7.2.4.2 Effects on the Physical Environment

Due to the nature of the alternatives under consideration for this item, which are limited to a decision on whether or not to establish a requirement for a periodic reporting and evaluation process for the SBRM, there are no direct or indirect effects on the physical environment (including EFH) anticipated for any of the alternatives.

7.2.4.3 Socio-Economic Effects

Due to the nature of the alternatives under consideration for this item, which are limited to a decision on whether or not to establish a requirement for a periodic reporting and evaluation process for the SBRM, there are no direct or indirect socio-economic effects on fishing vessels, fleets, or ports anticipated for any of the alternatives.

7.2.5 Environmental Consequences of Item 5: Changes to the Framework Adjustment and/or Annual Adjustment Provisions

This item includes four alternatives addressing whether to authorize changes to certain aspects of the SBRM through actions other than a full amendment to an FMP. The status quo alternative would continue to require a full amendment to modify or update the provisions of the SBRM. The other alternatives would authorize changes to the SBRM through a framework adjustment to an FMP, or through a framework adjustment, annual adjustment, and/or annual/multi-year specifications. The provisions of the SBRM subject to such changes include: (1) The CV-based performance standard; (2) the means by which discard data are collected/obtained in a fishery; (3) fishery stratification (changes to this provision would be allowed without formal Council action under alternative 5.4); (4) SBRM reporting; and (5) industry-funded observers and/or observer set-aside programs.

7.2.5.1 Effects on Biological Resources

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding the appropriate mechanisms that may be used to develop and implement potential changes to the SBRM, there are no direct or indirect effects on any biological resources (fishery resources, protected resources, or other non-fishery resources) anticipated for any of the alternatives. Any impacts that may be associated with actually implementing a change to the SBRM through one of these mechanisms (a full amendment, a framework adjustment, an annual adjustment, and/or an annual/multi-year specification) would be fully analyzed in the documents supporting the action.

7.2.5.2 Effects on the Physical Environment

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding the appropriate mechanisms that may be used to develop and implement potential changes to the SBRM, there are no direct or indirect effects on any physical environment (including EFH) anticipated for any of the alternatives. Any impacts that may be associated with actually implementing a change to the SBRM through one of these mechanisms (a full amendment, a framework adjustment, an annual adjustment, and/or an annual/multi-year specification) would be fully analyzed in the documents supporting the action.

7.2.5.3 Socio-Economic Effects

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding the appropriate mechanisms that may be used to develop and implement potential changes to the SBRM, there are no direct or indirect socio-economic effects on fishing vessels, fleets, or ports anticipated for any of the alternatives. Any impacts that may be associated with actually implementing a change to the SBRM through one of these mechanisms (a full amendment, a framework adjustment, an annual adjustment, and/or an annual/multi-year specification) would be fully analyzed in the documents supporting the action.

7.2.6 Environmental Consequences of Item 6: Prioritization Process for SBRM Observer Allocations

This item includes eight alternatives across three components addressing how observer coverage allocations would be prioritized and determined to account for insufficient Federal budgets that would limit the Agency's ability to fully provide the observer coverage levels initially calculated under the SBRM. Two of the alternatives focus on a trigger mechanism for determining when there are insufficient funds available. The status quo funding trigger would allow NMFS, through its normal budgetary process, to determine the amount of funds available for SBRM. The alternative funding trigger would specify the proportions of identified funding sources used to fund observer coverage under the SBRM each year.

The funding available for SBRM in any given year is dependent on future allocation decisions of Congress. As such, it cannot be predicted whether, or to what extent, there will be a funding shortfall in any given year. The alternatives under consideration would determine the process to follow in order to prioritize available funding. The alternatives do not dictate a specific outcome of the reallocation of available sea days, nor do the alternatives dictate which fishing modes would receive fewer observer sea days.

Three alternatives provide methods for redistributing the available observer sea days if resources are determined to be limiting. The Council consultation alternative would establish a consultation process, whereby the Regional Administrator and Science and Research Director would develop a prioritization based on stock assessment needs and other legal mandates, and consult with the Councils. This alternative is very similar to what was implemented by the 2007 SBRM Omnibus Amendment and was found legally deficient by the Court in *Oceana* v. *Locke*. The two other alternatives propose formulaic methods to redistribute a limited number of observer sea days. The proportional reduction method would reduce the number of sea days assigned to each fishing mode by the same percentage as the funding shortfall. The penultimate cell method of prioritizing sea days would reduce the number of sea days required by using an iterative process of eliminating from consideration the cell that requires the highest number of projected sea days to achieve the SBRM performance standard.

The specific impact of redistributing observer sea days is largely dependent on the degree of funding shortfall in any given year. As mentioned, whether or to what extent available funding will fall short depends on future funding allocation decisions of Congress. Therefore, the degree of impact of each of these alternatives on the observer coverage for a specific fishing mode in a future year would be purely speculative. However, some general impacts may be discerned. The Council consultation alternative is an ad hoc approach to redistributing available observer sea days, and therefore the potential impact on observer coverage in specific modes would be speculative. The proportional reduction method reduces the coverage on all fishing modes by the percentage of the funding shortfall. Therefore all fishing modes would have at least one, and possibly more, species or species group, where the observer coverage would not be expected to achieve a CV-based performance standard. The penultimate approach would focus on cells (fishing mode/species group combinations) that require a large number of observer sea days to achieve the CV-based performance standard. As a result, this alternative would result in the fewest number of cells that do not achieve the CV-based performance standard, and could result in fishing modes that still achieve the performance standard for all species/species groups. However, which specific fishing modes would be more likely to be affected in any given year would depend on the degree of any funding shortfall, and the sample size analysis as described in Chapter 5. Therefore any potential impact would be a result of the total available funding and not the process used to prioritize it.

The final three alternatives address how observer coverage would be allocated if the available funding were ever so restricted that it could not provide observer sea days for the minimum pilot coverage for each fishing mode. The first alternative would direct the Regional Administrator and the Science Research Director to develop an ad-hoc proposal of which fleets would not get coverage based on any applicable legal mandates, management priorities, or data needs and to present this proposal to the Councils for their consideration and recommendations. The second alternative would remove the shortfall by sequentially eliminating coverage in fleets which have the highest minimum pilot coverage days. This alternative would have the greatest impact on fleets with the longest average trip length, and would impact the fewest fleets. In 2012, the five fleets with the highest minimum pilot coverage were Mid-Atlantic shrimp trawl, New England large-mesh haddock separator trawl, New England hagfish pots, New England crab pots, and Mid-Atlantic longline (Table 7, Appendix H). The third alternative would eliminate the shortfall by sequentially eliminating coverage in fleets that had the highest ratio of minimum pilot coverage to days absent from port based on FVTR reports in the previous year. This alternative would eliminate coverage from fleets with low numbers of days absent from port, therefore preserve coverage for the most active fishing modes. In 2012, the five fleets with the highest ratio were New England small-mesh gillnets, Mid-Atlantic large-mesh Ruhle trawl, New England small-mesh Ruhle trawl, Mid-Atlantic hagfish pots, and Mid-Atlantic large-mesh haddock separator trawl (Table 8, Appendix H). These alternatives represent a different form of prioritization that would only apply under extreme funding limitations. Which specific fleets might ultimately be impacted by these alternatives would depend on fleet activity in the preceding years, and the severity of the funding shortfall. As with the other prioritization alternatives, any potential impact would be a result of the total available funding and not the process used to prioritize it.

The environmental implications of changes in observer coverage levels across the fishing modes that may be linked to differences in how observer effort is allocated is negligible. Some fishing vessels could alter their behavior in the presence of a fishery observer (e.g., to avoid a bycatch "hot spot" when an observer is present), however, as described in chapter 5 and Appendix A, evidence of such an "observer effect" is minimal for Greater Atlantic Region fisheries.

7.2.6.1 Effects on Biological Resources

Due to the nature of the alternatives under consideration for this item, which are limited to a decision regarding the appropriate process to follow in order to prioritize available funding for the purpose of allocating observer coverage levels, there are no direct or indirect effects on any biological resources (fishery resources, protected resources, or other non-fishery resources) anticipated for any of the alternatives.

7.2.6.2 Effects on the Physical Environment

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding the appropriate process to follow in order to prioritize available funding for the purpose of allocating observer coverage levels, there are no direct or indirect effects on the physical environment (including EFH) anticipated for either of the alternatives.

7.2.6.3 Socio-Economic Effects

Due to the nature of the alternatives under consideration for this item, which are limited to a decision regarding the appropriate process to follow in order to prioritize available funding for the purpose of allocating observer coverage levels, there are no direct or indirect socio-economic effects on fishing vessels, fleets, or ports anticipated for either of the alternatives.

7.2.7 Environmental Consequences of Item 7: Industry-Funded Observer Programs

This item includes three alternatives addressing whether the SBRM Omnibus Amendment should establish and authorize observer service provider approval and certification procedures and requirements, and/or add provisions allowing industry-funded observer programs and observer set-aside programs as measures that can be implemented through framework adjustments. The status quo alternative would result in no change to the regulations on observer service provider approval and certifications that currently apply to the sea scallop fishery. The other alternatives would not actually implement any industry-funded observer programs or observer set-aside programs, but would create the mechanisms needed to more quickly and easily develop and implement such provisions in any of the Councils' FMPs.

7.2.7.1 Effects on Biological Resources

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding creating the mechanisms needed to develop and implement industry-funded observer programs rather than actually implementing any such programs, there are no direct or indirect effects on any biological resources (fishery resources, protected resources, or other non-fishery resources) anticipated for any of the alternatives. Any impacts that may be associated with actually implementing an industry-funded observer program and/or an observer set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

7.2.7.2 Effects on the Physical Environment (Habitat)

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding creating the mechanisms needed to develop and implement industry-funded observer programs rather than actually implementing any such programs, there are no direct or indirect effects on any physical environment (including EFH) anticipated for any of the alternatives. Any impacts that may be associated with actually implementing an industry-funded observer program and/or an observer set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

7.2.7.3 Socio-Economic Effects

Due to the nature of the alternatives under consideration for this item, which are limited to decisions regarding creating the mechanisms needed to develop and implement industry-funded observer programs rather than actually implementing any such programs, there are no direct or indirect socio-economic effects on fishing vessels, fleets, or ports anticipated for any of the alternatives. Any impacts that may be associated with actually implementing an industry-funded observer program and/or an observer set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

7.3 Cumulative Effects Analysis

According to CEQ NEPA regulations, cumulative effects are effects that result from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that take place over a period of time.

In general, a cumulative effects assessment should address:

- The area in which the effects of the proposed action will occur;
- the impacts that are expected in that area from the proposed action;
- other past, present, and reasonably foreseeable actions that have or are expected to have impacts in the area;
- the impacts or expected impacts from these other actions; and
- the overall impact that can be expected if the individual impacts are allowed to accumulate.

7.3.1 The Temporal and Geographical Scope of the Action

The temporal scope of past and present actions for the physical environment (habitat), biological resources, and socio-economic cumulative effects assessment, is primarily focused on actions that have occurred after implementation of the FMPs amended by this action, as detailed in Section 2 (starting in 1977 for Atlantic surfclam and ocean quahog). The temporal range considered for protected resources begins in the 1990's when NMFS started generating stock assessments for marine mammals and developed recovery plans for sea turtles that inhabit waters of the U.S. EEZ. The temporal scope for future actions extends about 20 years (2035) into the future.

The geographic scope considered for analysis of impacts to the physical environment/habitat/EFH and biological resources is the Western Atlantic Ocean to the limit of the U.S. EEZ, from the U.S./Canadian maritime boundary through North Carolina. The geographic scope for the assessment of socio-economic effects is defined as those U.S. fishing communities directly involved in the harvest or processing of the managed resources, which were found to occur in the coastal states from Maine through North Carolina.

7.3.2 Past, Present and Future Foreseeable Actions

This section describes past, present, and future foreseeable actions that have effects on the valued ecosystem components (VECs) evaluated in this amendment.

7.3.2.1 Fishery management actions

Federal FMPs are developed to optimize yield in U.S. fisheries and to comply with the Magnuson-Stevens Act as reauthorized through 2007. The legislation promotes long-term positive impacts on the environment in the context of fisheries activities, stipulating that management plans must comply with a set of National Standards that collectively serve to optimize the conditions of the human environment. Specific goals of fishery management plans include improving or maintaining the stock structure and abundance of target species, improving economic and social outcomes, and minimizing incidental impacts, for example relative to protected resources and other non-target species. Under this regulatory regime, the cumulative impacts of past, present, and future Federal fishery management actions on the VECs should be expected to result in positive long-term outcomes, although these actions are often associated with offsetting impacts. For example, constraining fishing effort frequently results in negative short-term socio-economic impacts for fishery participants in order to bring about long-term sustainability of a given resource.

This section describes past, present, and future foreseeable FMP actions (Table **74**). Future actions for all FMPs may include additional ecosystem considerations, either within the current FMP structure or as part of an overarching ecosystem plan. The New England and Mid-Atlantic Councils and the Atlantic States Marine Fisheries Commission do not currently have ecosystem plans in place, but all three groups are working on expanding their efforts in this sphere and future management actions will be developed in the context of ongoing environmental change.

In some cases, as was done with this amendment, FMP actions are developed in an omnibus fashion to update many plans at once. These amendments are considered amendments to the individual fishery management plans, and the actions associated with these amendments are described in the table below as needed, by FMP. Examples of this include the 1999 New England Council EFH amendment, which designated EFH across all species managed by the Council at that time. Another example is the recent Mid-Atlantic Council ACL/AM omnibus amendment, which implemented annual catch limits and accountability measures. The New England Council took a plan-specific approach to implementing ACLs and AMs. Conversely, while New England is taking an omnibus approach to EFH updates, the Mid-Atlantic has been updating their EFH provisions plan by plan. In general, the designation of EFH is expected to have indirect, positive impacts on managed resources by guiding the development of conservation-oriented fishery management measures, and through conservation measures recommended for non-fishing projects via the EFH consultation process. Annual catch limits and accountability measures are also expected to have generally positive impacts of managed resources because these measures are designed to limit catches to biologically sustainable levels and to provide both proactive and reactive measures to ensure that these catch limits are not exceeded. Eliminating overfishing and reducing the number of overfished stocks is expected to generate long run benefits to the human community. Future foreseeable omnibus amendments include:

Omnibus Essential Fish Habitat Amendment 2

This amendment is currently under development by the New England Council and will update EFH designations for all fishery species managed by the Council. In addition, this action considers the designation of new Habitat Areas of Particular Concern and minimizing the adverse effects of fishing to the extent practicable by considering changes and additions to the areas currently closed to fishing for protection of habitat and control of groundfish mortality.

The Industry-Funded Monitoring Omnibus Amendment

This amendment is currently under development as a joint action of the New England and Mid-Atlantic Councils in coordination with NMFS. Through that action, the Councils are considering measures that would allow the Councils to implement future industry-funded monitoring coverage in some FMPs above the levels required by the SBRM, and specific coverage levels for the Atlantic mackerel and Atlantic herring fisheries to address management priorities in those fisheries.

Fishery Management Plan	Past actions	Present actions	Future foreseeable actions
Northeast Multispecies FMP	FMP completed in 1986 by NEFMC to reduce fishing mortality and promote rebuilding. Past measures included input controls such as days-at-sea, mesh size, trip, and fish size, and permit limits, and seasonal and year-round management areas. EFH was designated in 1999.	Current management includes annual catch limits by stock and accountability measures for overages. Most fishing conducted within the sector system. Limits on mesh-size, fish size, and permits are still used, along with area management. Trip limits and days-at-sea are infrequently relied upon.	Amendment 18: considering capping accumulation limits, changes to fleet structure. Ongoing specifications actions will allocate annual catch limits in response to updated assessment information. Updates to spawning closures on the multi-year Council priority list.
Monkfish FMP	FMP completed in 1999 by	Current management	Amendment 6: considering

Fishery Management Plan	Past actions	Present actions	Future foreseeable actions
	NEFMC and MAFMC to address concerns about small fish in landings, gear conflicts, and expanding directed fishery. Measures included permit and day-at-sea limits, trip limits, minimum fish sizes, seasonal spawning restrictions, and gear restrictions, as well as EFH designations. A subsequent action included designation of EFH management areas closed to monkfishing in Lydonia and Oceanographer canyons.	includes annual catch limits by stock and accountability measures for overages. In addition to original FMP measures, current management includes various exemption areas for trawls and gillnets where vessels can use large mesh and are not required to use a Multispecies day-at-sea. Management is closely tied to Northeast Multispecies FMP. Habitat closure areas in two canyons.	modifications to days-at-sea program and catch shares. Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Skate Complex FMP	FMP completed in 2003 by NEFMC to protect overfished skates and collect data about the fishery to improve management. Measures included federal permits, reporting requirements, possession limits for wing fishery, and prohibitions on landings of depleted species, as well as EFH designations.	Current management includes annual catch limits and accountability measures for overages. Possession limits now include both wing and bait fisheries.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Atlantic Sea Scallop FMP	FMP completed in 1982 by NEFMC to rebuild stock and reduce interannual fluctuations in abundance. Measures included limits on permits, days-at-sea, crew size, gear restrictions, and meat count restrictions. EFH was designated in 1999 and Amendment 10 (implemented 2004) designated EFH closures, which were updated via Amendment 15 (implemented 2011) updated these areas to be consistent with those in Multispecies Amendment 13	Current management includes annual catch limits and accountability measures for overages. Rotational closure/access area system combined with open area days-at-sea. Seasonal closures and groundfish sub-ACLs to limit fish bycatch, gear restrictions to limit turtle bycatch. No longer have meat count restrictions; 4 inch ring and rotational management used to optimize yield per recruit. Habitat closure areas.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information. Considering adjustments to Northern Gulf of Maine and LAGC management programs. Future adjustments may be made to rotational management program if additional resource is made available to fishery through lifting of habitat closures.
Atlantic Herring FMP	FMP completed in 1999 by NEFMC. Area-based quota/TAC system. EFH was also designated in 1999.	Current management includes annual catch limits and accountability measures for overages. Enhanced monitoring in groundfish management areas.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information. Actions under development will implement reporting and slippage provisions as well as monitoring adjustments. Coordination with MAFMC and ASFMC on river herring/shad monitoring/bycatch.
Deep-Sea Red Crab FMP	FMP completed in 2003 by NEFMC to address overfishing and the potential for overcapitalization. Measures included permit limits, trips limits, annual TACs, days-at-sea, and limits on gear and processing at sea, as well as the EFH designations.	Current management includes annual catch limits and accountability measures for overages.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Surfclam and Ocean Quahog FMP	FMP completed in 1977 by MAFMC. Initial approaches included limited entry, quarterly quotas, and fishing time	Fishery is currently managed as an ITQ system, with annual catch limits capping total catch and accountability	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.

Fishery Management Plan	Past actions	Present actions	Future foreseeable actions
	restrictions. ITQ system established in 1990.	measures for overages. Fishing is subject to food safety/PSP closures. During 2013 a large PSP closure exemption area was opened to clam dredging on Georges Bank.	
Atlantic Bluefish FMP	FMP completed in 1990 to control fishing effort.	Current management includes annual catch limits and accountability measures for overages. Quotas for recreational vs. commercial fisheries.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Atlantic Mackerel, Squid, and Butterfish FMP	Original FMPs in 1978. Consolidated into a single plan in 1983 by MAFMC.	Current management includes annual catch limits and accountability measures for overages. A plan amendment currently in development is considering deep-sea coral management areas in various slope and canyon environments within the mid-Atlantic region.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Spiny Dogfish FMP	Joint MAFMC-NEFMC FMP implemented in 2000.	Current management includes annual catch limits and accountability measures for overages. Catches controlled by quotas and trip limits.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Summer Flounder, Scup, and Black Sea Bass FMP	Merged into the summer flounder FMP in 1996.	Current management includes annual catch limits and accountability measures for overages. Catch and landings limits are the primary management tool; allocations between recreational and commercial fisheries. Also minimum fish sizes, bag Gear restricted areas to protect scup and black sea bass habitats.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Tilefish FMP	Golden tilefish in the Mid-Atlantic are managed by MAFMC (FMP in 2001). Total allowable landings, rebuilding plan, limited entry, and tiered commercial quota system.	Current management includes annual catch limits and accountability measures for overages. Commercial fishery under ITQ management, with catch limit in incidental fishery. Gear restricted areas to protect sensitive tilefish habitats in the heads of canyons.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
Northern Shrimp FMP	ASMFC plan implemented 1986. Management measures included minimum mesh size, seasonal closures, possession limits, and reporting requirements.	Assessments and specifications process ongoing, although currently the fishery is closed given the status of the stock.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.
American Lobster FMP	ASFMC plan in state waters, federally managed in Federal waters consistent with ASMFC approach. Area-based management system with trap limits, minimum-maximum size limits, and protections for egg-bearing females.	Area-based management system with trap limits, minimum-maximum size limits, and protections for egg-bearing females. Focus on fishing mortality reduction in Southern New England.	Ongoing specifications actions will allocate annual catch limits in response to updated assessment information.

Table 74. Past, present, and future foreseeable actions within the fishery management plans in operation in the Greater Atlantic Region.

7.3.2.2 Protected Resources Management

Protected resource management focuses on evaluation of stock status, identification of fisheries and other activities that interact with protected resources, and development of measures to minimize interactions and the negative impacts associated with interactions that do occur. Management may also include designation of critical habitats. Table 75 presents the past, present, and future foreseeable actions within the management plans for protected resources in the Greater Atlantic Region.

Plan	Past actions	Present actions	Future foreseeable actions
Harbor Porpoise Take Reduction Plan	Spatial and seasonal gear restrictions to minimize interaction, injuries, and mortalities between fishing gear and harbor porpoises, including requirements for pingers	Modifications to plan (effective September 30, 2013) eliminate consequence closure areas.	Continue previous actions
Atlantic Large Whale Take Reduction Plan	Spatial and seasonal gear restrictions to minimize interaction, injuries, and mortalities between vertical lines and large whale species	Changes to plan were published June 2014 (79 FR 36586)	Continue previous actions
Ship strike reduction programs	Reporting systems and speed restrictions to minimize ship strike events; education/outreach activities	Ongoing development of temporary speed restricted areas as needed	Continued updates to measures to reduce ship strikes as technology improves
Sea turtle regulations	Annual fisheries observer coverage requirements for certain fisheries; requirements on handling and resuscitation. Biological opinions have led to gear requirements in sea scallop fishery, summer flounder fishery, NC/VA large mesh gillnet fishery, and VA pound net fishery.	Continue previous actions	Continue previous actions
Shortnose Sturgeon Recovery Program	Fishing for, catching or keeping shortnose sturgeon illegal; federal agencies that conduct, fund or authorize activities that may adversely affect shortnose sturgeon must consult with NOAA; periodic status reviews; development and implementation of recovery plan (1998)	Continue previous actions	Continue previous actions
Atlantic Sturgeon Recovery Program	Fishing for, catching or keeping Atlantic sturgeon illegal; various restrictions by state	Continue previous actions	Continue previous actions
Atlantic Salmon Recovery Program and General Conservation Plan	Species listings by distinct population segment; designation of critical habitats	General Conservation Plan to promote fish passage and dam removals	Continue previous actions
Proactive Conservation Program for Species of Concern and Candidate Species	Grants to fund research activities, monitoring of status of species of concern/candidate species.	Continue previous actions	Continue previous actions
Stranding and disentanglement	Network of organizations that rescue and rehabilitate stranded	Continue previous actions	Continue previous actions

Plan	Past actions	Present actions	Future foreseeable actions
program	mammals and turtles to reduce mortalities associated with stranding		

Table 75. Past, present, and future foreseeable actions within the protected resources management plans in operation in the Greater Atlantic Region

7.3.2.3 Other uses of the marine environment

Non-fishing activities combine with fishery management efforts to affect the VECs considered in this action. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease the quality of the physical and biological environment, and, as such, may indirectly constrain the sustainability of the managed resources, protected resources, and human communities associated with fishing. Table 76 describes the non-fishing activities that affect estuarine/nearshore environments and offshore environments.

Activity	Past actions	Present actions	Future foreseeable actions
Liquefied natural gas facilities	Three New England import facilities, one land-based just north of Boston, MA, and two offshore of Cape Ann, MA. See www.northeastgas.org/about_lng.php.	Existing facilities are not especially active and imports of LNG have been down in New England. See www.northeastgas.org/about_lng.php.	The U.S. Department of Energy regulates import and export of natural gas and would approve new import facilities or import to export facility conversions. Given excess capacity at existing New England import terminals, new terminal construction does not appear likely, at least in the short term.
Offshore renewable wind energy	None – emerging use offshore the New England and Mid-Atlantic states	Leases have been sold in the Rhode Island/Massachusetts Wind Energy Area (July 2013), the Virginia Wind Energy Area (September 2013), for the Cape Wind project in Nantucket Sound (October 2010), the Bluewater Wind project off Delaware (November 2012), and the Deepwater Wind and Fishermen's Energy of New Jersey off New Jersey in October and November 2010. None of these wind energy areas overlap the area management alternatives directly, although they do encompass habitats for some of the managed species and protected resources identified above, as well as fishing grounds.	Environmental assessment and eventually development activities in current leases; leasing activities in additional wind energy areas, followed by assessment and perhaps development of wind energy installations.
Petroleum exploration	Seismic testing, drilling sediment cores and test wells. Leases sold and test wells drilled in late 1970s and early 1980s; given findings, no additional test well activity after that (see www.boem.gov/OCS-Report-MMS-2000-031/) for more information.	Bureau of Ocean Energy Management (BOEM) oversees these activities; currently we are within the 2012-2017 planning period. Currently there are no lease sales proposed in the Atlantic.	BOEM is currently developing the 2017-2022 Oil and Gas Leasing Program (see www.boem.gov/Five-Year-Program-2017-2022/) and a public request for information was published early summer 2014. It is not yet clear whether the 2017-2022 program will

Activity	Past actions	Present actions	Future foreseeable actions
			include potential leasing and exploration in the Atlantic.
Wave and tidal energy	Regulations for the Outer Continental Shelf Renewable Energy Program published in 2009; these include offshore wind energy as well as wave and current (i.e. hydrokinetic) energy projects. BOEM oversees development of these types of projects.	Information about current projects can be found here: en.openei.org/wiki/Marine_and_Hydrokinetic_Technology_Database. Various projects in Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut are in the siting/planning, site development, and device testing phases. There are no deployed projects in the New England region.	Future projects could be developed pursuant to the 2009 regulations.
Aquaculture	Existing facilities in New England are in currently in state waters only. There are facilities oriented towards commercial production as well as restoration aquaculture (e.g. oyster reefs, hatcheries).	Currently there are facilities in all coastal New England states, with the largest number of operations in Maine. NH, MA, RI, and CT focus mainly on shellfish, although NH has a steelhead trout facility. Maine raises a diversity of finfish and shellfish species including Atlantic salmon. Salmon is the dominant finfish aquaculture species in New England. Algae and seaweeds are also currently grown.	Expansion of aquaculture appears likely and could include offshore waters in the future. Many factors influence the rate of growth in this sector such as permitting concerns, availability of suitable sites, and regulatory stability. The National Sustainable Offshore Aquaculture Act of 2011 establishes a permitting and programmatic review system for offshore aquaculture sites, although the extensive regulatory requirements of the law could discourage entry into the system.
Offshore dredging and disposal: activities include mineral mining and vessel disposal		BOEM oversees offshore mineral extraction and has signed agreements with various states to evaluate sand resources for coastal resilience and restoration. The Environmental Protection Agency approves requests for vessel disposal offshore; two vessels have been disposed of in the past few years in the western Gulf of Maine.	BOEM/state collaborative surveys to identify geologic resources suitable for mining, while mapping habitat and cultural resources. Continued disposal of vessels at sea through EPA process (see www.epa.gov/region2/water/oceans/wrecks.htm)

Table 76. Past, present, and future foreseeable non-fishing activities within the Greater Atlantic Region

7.3.3 Baseline status of Valued Ecosystem Components

This section summarizes the current status of all VECs, based on past and present actions but not including the proposed action.

All VECs are influenced to some degree by changes in global climate. These climate shifts may alter the pattern and strength of ocean currents; change the rate of freshwater inflows; influence water temperature, acidity, and salinity; etc. These changes affect the physical environment directly, which in turn may shape the suitability of local habitats for non-target biological features, managed fish and shellfish species, and protected resources. Changes in the abundance and distribution of these biological resources affect the communities that prosecute fisheries for these resources. For example, if the target species important to a particular port community declines in abundance or its distribution shifts north or south due to environmental factors, there may be negative economic impacts locally, although there could be positive impacts due to increases in abundance of other species. It is impossible to pinpoint the degree to which these types of environmental changes are influencing the baseline status of the VECs analyzed in this action, but certainly regional-scale changes in climate combine with fishing and non-fishing human activities to shape the baseline status.

7.3.3.1 Managed Species

The managed species VEC includes the following fishery resources. Chapter 2 and Chapter 3 describes in detail the biology, status, and distribution of these resources, as well as the fisheries which prosecute them. The focus here is the status (overfished/overfishing occurring) of the various species, including the status by stock if the species is not managed as a single unit. Although technically a managed species, information about Atlantic salmon is located in the protected resources section, because the fishery management plan prohibits possession of Atlantic salmon and there is no commercial fishery for the stock.

In summary, the majority of stocks that overlap the Greater Atlantic Region are not overfished with overfishing not occurring (Table 77). A small number of stocks are at low abundance, but with low fishing mortality, or at high abundance, but with high fishing mortality. Cod, some flounders, and thorny skates are overfished with overfishing occurring. In general, past fishery management actions have contributed positively to stock status, but additional action will be necessary to rebuild all stocks in the region. With the exception of thorny skate, all stocks in the overfished/overfishing category are large-mesh groundfish managed under the Northeast Multispecies FMP.

Northeast multispecies FMP - large mesh species	
Species	**Status and trends**
Acadian redfish	Not overfished, overfishing not occurring. Biomass and recruitment are increasing.
American plaice	Not overfished, overfishing not occurring. Biomass is increasing but recent recruitment has been low.
Atlantic cod	Gulf of Maine and Georges Bank stocks: Overfished, overfishing occurring. Recent biomass and recruitment estimates are low.
Atlantic halibut	Overfished, less than 10% of target. Overfishing is not occurring, and fishing mortality rates are very low.
Atlantic wolffish	Overfished, but overfishing not occurring. Recent recruitment slightly below average, biomass very low.
Haddock	Gulf of Maine: not overfished, but overfishing is occurring. Declining biomass and high fishing mortality rate. Georges Bank: not overfished, overfishing not occurring. Record high recruitment in 2010.
Ocean pout	Overfished, but overfishing is not currently occurring.
Pollock	Not overfished, overfishing not occurring. Recently below average recruitment but above average biomass estimates.
White hake	Not overfished, overfishing not occurring. Recent recruitment and biomass slightly below average.
Windowpane flounder	Northern stock: overfished, and overfishing is occurring; but fishing mortality down and biomass up between last two assessments. Southern stock: not overfished, overfishing not occurring; which represents a status change since the previous assessment.

Winter flounder	Gulf of Maine: status unclear, but overfishing probably not occurring; spawning stock biomass increased between 2003-2009, but current recruitment is low. Georges Bank: not overfished with overfishing not occurring; increases in both biomass and recruitment and decreases in fishing mortality. Southern New England/Mid-Atlantic: overfished, but overfishing not occurring; recent low landings, recruitment, and spawning stock biomass.
Witch flounder	Overfished with overfishing occurring. High recent recruitment with slight increases in spawning stock biomass.
Yellowtail flounder	Cape Cod/Gulf of Maine: overfished with overfishing occurring. Little change in biomass, decreasing recruitment, but decrease in fishing mortality. Southern New England/Mid-Atlantic: overfishing not occurring; conflicting biomass estimates but likely not overfished. Georges Bank: overfished with overfishing occurring. Fishing mortality rates are increasing and biomass is decreasing.
Northeast multispecies FMP – small mesh species	
Species	**Status and trends**
Red hake	Northern and southern stocks: Neither is overfished, and overfishing is not occurring, although the status of northern red hake may change when the stock assessment is updated in 2014.
Offshore hake	No status determination due to lack of data.
Silver hake	Northern and southern stocks: Neither is overfished, and overfishing is not occurring.
Monkfish FMP	
Species	**Status and trends**
Monkfish	Northern and southern stocks: recent three assessments suggest they are not overfished with overfishing not occurring, but considerable uncertainty in the assessments.
Skates FMP	
Species	**Status and trends**
Smooth skate	Not overfished, overfishing not occurring.
Thorny skate	Overfished with overfishing occurring; biomass appears to be declining.
Barndoor skate	Not overfished, overfishing not occurring.
Little skate	Not overfished, overfishing not occurring.
Winter skate	Not overfished, but overfishing is occurring.
Clearnose skate	Not overfished, overfishing not occurring.
Rosette skate	Not overfished, overfishing not occurring.
Atlantic sea scallop FMP	
Species	**Status and trends**
Atlantic sea scallop	Not overfished, overfishing not occurring, but fishing mortality in 2009 was equal to the threshold value.
Atlantic herring FMP	
Species	**Status and trends**
Atlantic herring	Not overfished, overfishing not occurring.
Deep-sea red crab FMP	
Species	**Status and trends**
Deep-sea red crab	Unknown stock status; data poor stock.
Surfclam and ocean quahog FMP	
Species	**Status and trends**
Surfclam	Not overfished, overfishing not occurring.
Ocean quahog	Not overfished, overfishing not occurring.
Bluefish FMP	
Species	**Status and trends**
Atlantic bluefish	Not overfished, overfishing not occurring.

Atlantic mackerel, squid, and butterfish FMP	
Species	**Status and trends**
Atlantic mackerel	Not overfished, overfishing not occurring; substantial uncertainty in assessment.
Butterfish	Status unknown. Overfishing not likely.
Shortfin squid	Status unknown, but recent catch indices and landings within typical ranges.
Longfin squid	Not overfished, overfishing determination not possible.
Spiny dogfish FMP	
Species	**Status and trends**
Spiny dogfish	Not overfished, overfishing not occurring. Rebuilt biomass as of 2010.
Summer flounder, scup, and black sea bass FMP	
Species	**Status and trends**
Summer flounder	Not overfished, overfishing not occurring. Rebuilt as of 2011, with recent fishing mortality values fluctuating near the reference point.
Scup	Not overfished, overfishing not occurring; biomass approximately double the reference point.
Black sea bass	Not overfished, overfishing not occurring.
Golden tilefish FMP	
Species	**Status and trends**
Golden tilefish	Not overfished, overfishing not occurring. Rebuilt as of 2012.
Northern shrimp FMP	
Species	**Status and trends**
Northern shrimp	Collapsed; biomass has declined since 2007, and recruitment indices are poor.
American lobster FMP	
Species	**Status and trends**
American lobster	Gulf of Maine, Georges Bank, and Southern New England stocks: none are experiencing overfishing, but the Southern New England stock is overfished.

Table 77. Baseline status of managed species in the Greater Atlantic Region.

7.3.3.2 Protected resources

Various protected resources overlap the Greater Atlantic Region. The distribution and status of these species is described in detail in 7.1.2.2. In general, the various large whales and sea turtles that overlap the region are considered endangered under the Endangered Species Act. Some fish stocks including shortnose sturgeon, Atlantic sturgeon, and Atlantic salmon are also listed as endangered. Various small whale, dolphin, and pinniped species are protected by the Marine Mammal Protection Act.

In general, the status of protected resources is on a positive trajectory, with some exceptions (Table 78). Nest count data for turtles suggest improvements in the status of these species since 2004. Large whale assessments indicate general increases in the population sizes for these species, with slight increases in abundance for the most vulnerable of these animals, the North Atlantic Right Whale. Small cetacean and pinniped populations appear to generally be fairly stable or increasing in their abundance. The Atlantic sturgeon was only recently listed under the Endangered Species Act and assessments of the status of various distinct population segments are ongoing. The trend in abundance of Atlantic salmon in the Gulf of Maine DPS has been low and either stable or declining over the past several decades.

Sea Turtles		
Species	**Status**	**Potentially affected by this action**
Leatherback sea turtle	Endangered	Yes; seasonal occurrence in SNE/MAB.
Kemp's ridley sea turtle	Endangered	Yes; seasonal occurrence in SNE/MAB.
Green sea turtle	Endangered[c]	Yes; seasonal occurrence in SNE/MAB.
Loggerhead sea turtle, *Northwest Atlantic DPS*	Threatened	Yes; seasonal occurrence in SNE/MAB.
Hawksbill sea turtle	Endangered	No
Cetaceans		
Species	**Status**	**Potentially affected by this action**
North Atlantic right whale	Endangered	Yes
Humpback whale	Endangered	Yes
Fin whale	Endangered	Yes
Sei whale	Endangered	Yes
Blue whale	Endangered	No
Sperm whale	Endangered	No
Minke whale	Protected	Yes
Long-finned pilot whale	Protected	Yes
Short-finned pilot whale	Protected	Yes
Risso's dolphin	Protected	Yes; but mostly along shelf edge and slope, uncommon bycatch species
Atlantic white-sided dolphin	Protected	Yes
Common dolphin	Protected	Yes
Spotted dolphin	Protected	Yes; but uncommon bycatch species
Bottlenose dolphin[a]	Protected	Yes; but uncommon bycatch species
Harbor porpoise	Protected	Yes
Pinnipeds		
Species	**Status**	**Potentially affected by this action**
Harbor seal	Protected	Yes; most common seal in area
Gray seal	Protected	Yes; second most common seal in area
Harp seal	Protected	Yes; but less common
Hooded seal	Protected	Yes; but less common
Fish		
Species	**Status**	**Potentially affected by this action**
Shortnose sturgeon	Endangered	No
Atlantic salmon	Endangered	No
Atlantic sturgeon		
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	Yes
Cusk	Candidate	No
Dusky shark	Candidate	No

Table 78. Baseline status of protected resource species in the Greater Atlantic Region.

[a] Bottlenose dolphin (*Tursiops truncatus*), Western North Atlantic coastal stock is listed as depleted.
[c] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

7.3.3.3 Physical Environment and EFH

The physical environment, including EFH, relevant to this action includes nearshore and offshore marine habitats in the Gulf of Maine, on Georges Bank, in the Mid-Atlantic Bight, and along the continental slope. Fishery management actions have likely had a positive cumulative impact on the status of the physical and biological environment. Fishery management plans are required to evaluate and minimize to the extent practicable adverse effects of fishing on essential fish habitats, and these actions are assumed to have made a positive contribution to habitat condition since the habitat requirements were added to the Magnuson-Stevens Act in 1996. The overall amount of fishing activity also contributes to the condition of the physical and biological environment. In this region, bottom otter trawls are the primary source of fishery impacts on benthic habitats, and the use of this gear has been on the decline overall, due to declining activity in the large-mesh groundfish fishery. This trend likely contributes positively to the condition of the physical and biological environment.

Protected resource management actions that focus on reducing mortality rates of marine mammals, fish, and turtles may have indirect impacts on the condition of the physical and biological environment. Increases in abundance of protected resources due to conservation measures will influence marine food webs generally, which could ultimately affect the distribution and abundance of benthic fishes and non-target species of fishes and invertebrates that comprise the biological environment.

Other human uses of the marine environment are generally likely to have negative impacts on the physical and biological environment. However, these activities and their associated impacts tend to be concentrated near shore, and through the essential fish habitat consultation provisions of the Magnuson Stevens Act, the NMFS is provided the opportunity to request that measures be taken to mitigate negative impacts.

7.3.3.4 Human communities and the fishery

The various fisheries that are likely to be affected are described in Chapter 2. A summary is provided in Table 79 below. These include fisheries for large and small mesh Northeast multispecies, monkfish, skates, Atlantic sea scallops, Atlantic herring, deep-sea red crab, surfclams/ocean quahogs, bluefish, mackerel/squid/butterfish, dogfish, summer flounder/scup/black sea bass, tilefish, shrimp, and lobster. Recent fishery management plan actions should be consulted for detailed assessments of fishery status and communities affected. The status of these fisheries is mixed, with most fisheries relatively stable and others on the decline. Declining fishery conditions may be linked to poor stock conditions; this is the case with the Northeast Multispecies large-mesh fishery (some, but not all stocks at low abundance) and the northern shrimp fishery. In the monkfish fishery, landings have been on a downward trend, but monkfish catch limits do not appear to be the limiting factor. A number of other fisheries have stable landings that are below allocations (see below). Depending on the status of their dominant fisheries, the associated communities may be on a positive, stable, or negative trajectory. Fishery management actions and stock status are assumed to be the major contributors to fishery status and associated community impacts, with protected resources management and non-fishing uses of the marine environment contributing incidentally to fishery and community baseline status. Some protected resource conservation measures negatively impact fishing operations, restricting the use of particular gear types during specific seasons and in specific areas. In some cases these regulations restrict use of a gear entirely, but in other instances there are gear modifications required only, such as vessel speed restrictions, pinger requirements for gillnets, or use of turtle excluder dredges in the scallop fishery.

Fishery	Status and trends
Northeast multispecies large mesh fishery	Murphy et al. 2014 provides a summary of the economic performance of the Northeast multispecies fishery through the end of fishing year 2012 (April 2013). For all vessels with a valid limited access multispecies permit, gross nominal revenue from groundfish totaled nearly $70 million dollars, with 99% coming from sector vessels and 1% from the common pool. This total is lower than that for each of the 2009-2011 fishing years. Over this same period, average groundfish price per pound has increased, although this increase did not compensate for the decrease in landings, and non-groundfish revenues were not sufficient to make up the difference and overall revenues decreased among groundfish vessels. The number of active vessels has declined annually since 2009 to 764 in FY 2012. The number of trips and days absent decreased from FY 2011 to FY 2012.
Northeast multispecies small-mesh	The small mesh/whiting specifications will be updated this year (2014). A detailed update of the fishery trends was prepared for Amendment 19 to the Northeast Multispecies FMP (2012). Between 2002 and 2010, silver hake landings fluctuated between 5,000-8,000 mt, with landings around 8,000 mt ($11 million revenue) in 2010. About 25% of 2010 landings were from the northern area and the remaining landings were from the southern area. Offshore hake landings are very minor. Red hake are less commercially important, with between 400-900 mt landings over the same time period, and generally under $500,000 in revenue annually.
Monkfish	Landings in both the northern and southern areas combined have declined each year since FY2005, with the peak fishing year in FY2003, and were at the lowest level since the inception of the FMP in 1999. Monkfish landings increased between FY2002 and FY2003, principally due to the increase trip limits in the SMA but declined in FY2004 as trip limits and DAS allocations were reduced in that area. In FY2005 total landings increased by 1,272 mt, or about 7% due to an increase in SMA landings as a result of increased trip limits and DAS allocations, and in spite of a decline of 20% in NMA landings from the previous year. NMA landings have declined each year since FY2001, although trip limits were only established in FY2007, and in FY2008 were about 24% of what they were at the peak. The NMA is below the target TAL for FY2011 (63%) and FY2012 (67%); the SMA is also below the target TAL for FY2011 (65%) and FY2012 (58%).
Skate	The status of the skate fishery is summarized in Framework Adjustment 2 to the Northeast Skate Complex FMP (2014). The skate fishery caught 56% of the overall ACL in FY 2012; this was a decrease on FY 2011 landings. No AMs were triggered in FY 2012 as there was no overage. The wing fishery caught 70.5% of the wing TAL; the bait fishery caught 76.2% of the bait TAL. State landings in FY 2012 were 1,407 mt. Total discards in FY 2012 were 11,179 mt. Due to the relative absence of recreational skate fisheries, virtually all skate landings are derived from regional commercial fisheries. Commercial fishery landings never exceeded several hundred metric tons until the advent of distant-water fleets during the 1960s. Total skate landings have fluctuated between two levels between FY 2009 and 2012. The fluctuations in landings are largely attributable to the wing fishery as landings in the bait fishery have remained relatively stable. It is not clear what is driving the trend in wing landings as quota is not thought to be limiting to the fishery. One potential explanation is the decrease in winter skate survey index that suggests fewer winter skate were available to the fishery.
Atlantic sea scallop	Framework 25 to the Atlantic Sea Scallop FMP (2014) summarizes current trends in the fishery. In the fishing years 2003-2011, the landings from the northeast sea scallop fishery stayed above 50 million pounds, surpassing the levels observed historically. The increase in the abundance of scallops coupled with higher scallop prices increased the profitability of fishing for scallops by the general category vessels. As a result, general category landings increased from less than 0.4 million pounds during the 1994-1998 fishing years to more than 4 million pounds during the fishing years 2005-2009, peaking at 7 million pounds in 2005 or 13.5% of the total scallop landings. The landings by the general category vessels (including limited access general category landings by LA vessels, and vessels with incidental and NGOM permits), declined after 2009 as a result of the Amendment 11 implementation that restricts TAC for the limited access general category fishery to 5.5% of the total ACL. However, the landings by limited access general category IFQ fishery increased in 2012 from its levels in 2010 due to a higher projected catch and a higher ACT for all permit categories. Total fleet revenues more than quadrupled in 2011 ($582 million) fishing year from its level in 1994 ($123 million, in inflation adjusted 2011 dollars). Scallop ex-vessel prices increased after 2001 as the composition of landings changed to larger scallops that in general command a higher price than smaller scallops. However, the rise in prices was not the only factor that led to the increase in revenue in the recent years compared to 1994-1998. In fact, inflation adjusted ex-vessel prices in 2008-2009 were lower than prices in 1994. The increase in total fleet revenue was mainly due to the increase in scallop landings and the increase in the number of active limited access vessels during the same period. Total scallop revenue for the fleet declined to $546 million in 2012 fishing year as a result of the drop in price and landings.
Atlantic herring	The current status of the herring fishery is summarized in the specifications package submitted in 2013. Herring catches have been fairly consistent over the last ten years, increasing between 2011 and 2012 to 93,130 mt, down from a ten year high of 103,943 mt in 2009. In 2012 catch was slightly above the quota.

Fishery	Status and trends
Deep-sea red crab	The current status of the red crab fishery is summarized in the specifications package submitted in 2014. 2010-2012 landings were lower than the TAL, and appeared to be consistent with average landings since 2002. Landings were grouped by three fishing regions based on VTR-reported statistical area fished, and landings by region indicated that the fishery has been operating nearly equally in all regions in recent years. LPUE appeared stable between 2010 and 2012 and showed an increasing trend since 2007.
Surfclam and ocean quahog	The Mid-Atlantic Fishery Management Council surfclam and ocean quahog AP information documents (2013) summarize the current status of the clam fisheries. The number of vessels fishing for surfclams has been fairly stable over the last 15 years, with a ten year high of 42 vessels in 2012. Prices for surfclams increased slightly in 2012, and the ex-vessel value of the federal surfclam harvest was approximately $28.4 million. Further expansion of the fishery on Georges Bank is likely in the near term. The number of vessels targeting quahogs both in the mid-Atlantic/southern New England and off the Maine coast has declined somewhat in recent years. In 2012, prices declined very slightly from 2011, but overall ex-vessel value of non-Maine landings increased about 10% to $22.9 million in 2012. The Maine fishery ex-vessel value was reported at $1.75 million in 2012 according to data from dealers, a 23% decrease from 2011.
Bluefish	The Mid-Atlantic Fishery Management Council Bluefish AP Information Document (2013) summarizes the current status of the fishery. Recreational landings peaked at 21 million pounds in 2007, and have declined recently to 11 million pounds in 2012, well below allocations. Commercial landings, which were also well below allocations in 2012, have been relatively stable and are less than half the recreational landings in recent years.
Atlantic mackerel, squid, and butterfish	The Mid-Atlantic Fishery Management Council's AP information documents (2013) summarize the current status of these fisheries. Mackerel landings have declined since the mid-2000s, and were under 10,000 mt in 2012 (valued about $4 million). Ex-vessel prices have increased. Twenty percent or less of the quota has been landed since 2008. Illex squid landings have generally been increasing since the mid-2000s, and were just over 10,000 mt in 2012, however price and ex-vessel value declined between 2011 and 2012. Longfin squid landings have shown a general downward trend since the early 1990s, but have increased in the past few years to between 10-15 million pounds in 2012. Price has increased over time. Butterfish landings have been fairly flat since the early 2000s, below 1000 mt annually. CPI-adjusted price has generally fallen since the late 1980s. Butterfish landings were well below the quota in 2012.
Spiny dogfish	The Mid-Atlantic Fishery Management Council Spiny Dogfish AP Information Document (2013) summarizes the current status of the dogfish fishery. Toward the end of the federal rebuilding schedule that ended in 2010, substantial increases in stock biomass allowed for an increase in the federal quota in 2009 to 12 M lb while still maintaining the rebuilding fishing mortality rate. US landings increased annually between 2003 and 2011, and value has increased over the same period to a high of approximately $4.5 million in 2011.
Summer flounder, scup, and black sea bass	The Mid-Atlantic Fishery Management Council's AP information documents (2013) summarize the current status of these fisheries. All three have a significant recreational and commercial component. Both commercial and recreational summer flounder landings have been fairly flat over the past 10 years, totaling 13.31 million pounds and 6.29 million pounds, respectively, in 2012. Prices and ex-vessel revenues in the commercial fishery have increased recently. For scup, recreational landings have been relatively flat in recent years, but commercial landings have increased to about 19.9 million pounds in 2012 (2012 recreational landings were approximately 4.17 million pounds). Black sea bass landings are similar across the recreational and commercial fisheries, and have fluctuated between 3 and 8 million pounds over the past 30+ years. Commercial landings have increased since 2009 and were 1.7 million pounds in 2012. Prices have been increasing since the mid-1990s and thus ex-vessel values have increased since 2009 along with landings. Recreational landings decreased in 2011 but increased in 2012 to over 3 million pounds.
Golden tilefish	The Mid-Atlantic Fishery Management Council Golden Tilefish AP Information Document (January 2013) summarizes the current status of the tilefish fishery. Since 2001, golden tilefish landings have ranged from 1.6 (2007) to 2.7 (2004) million pounds. With the exception of FY 2003, 2004, and 2010 commercial tilefish landings have been below the commercial quota specified each year since the Tilefish FMP was first implemented. Commercial tilefish ex-vessel revenues have ranged from $2.5 to $5.6 million for the 1999 through 2011 period, generally rising during this time period.
Northern shrimp	The northern shrimp fishery is seasonal, targeting female shrimp when they come inshore to spawn. When the annual total allowable catch has been harvested, the fishery closes. Both the 2009/2010 and 2010/2011 seasons were relatively short (156 days and 90 days, respectively). Delays in reporting landings resulted in short notice of the early closures during these seasons, and the total allowable catches were exceeded in both years. As a result, Amendment 2 implemented trip limits, trap limits, and days out of the fishery, in an effort to slow down catch rates and extend the season. Despite these changes, the 2011/2012 season was also brief, opening on January 2, 2012 for trawls and February 1 for traps, and closing on February 17. The most recent assessment indicates collapse of the stock, and future prospects look bleak. In December 2013, the Commission's Northern Shrimp Section approved a moratorium for the 2014 northern shrimp fishing season.
American lobster	Landed revenues for American lobster increased between 2009 and 2011 from $310 million to $423 million dollars. Landings were approximately 100-125 million pounds over that same period.

Table 79. Baseline status of fisheries in the Greater Atlantic Region.

7.3.4 Cumulative Effects of the Alternatives

As established above, the actions being considered in this amendment focus solely on the administrative processes through which data and information on bycatch occurring in Greater Atlantic Region fisheries are collected, analyzed, and reported to fishery scientists and managers. This amendment does not address bycatch reduction or other issues related to the management measures utilized in Greater Atlantic Region fisheries. Although aspects of the proposed SBRM have been implemented previously and utilized in many ways in recent years, the Court ruling that both Amendment 10 to the Sea Scallop FMP and Amendment 13 to the Northeast Multispecies FMP failed to fulfill the Magnuson-Stevens Act requirement to establish an SBRM is evidence that the 2007 SBRM Amendment was unique in the Greater Atlantic Region as the first action to propose the establishment of a comprehensive SBRM for the region. This action proposes many of the same provisions as the 2007 SBRM Amendment, while addressing the deficiencies identified by the Court. As such, this action is similarly unique in the Greater Atlantic Region.

In many ways, this action simply formalizes the status quo mechanisms used in the Greater Atlantic Region to collect information and data on fisheries bycatch and to analyze bycatch data in order to effectively determine appropriate observer coverage levels and allocate observer effort across the many Greater Atlantic Region fisheries. This action would not result in any changes to fishing operations in areas covered by the subject FMPs. For these components of the SBRM, there are no incremental impacts to any fishing areas, including EFH or living marine resources associated with the proposed action, relative to the no action baseline. The SBRM elements proposed in this amendment that diverge from the status quo—implementation of an importance filter to establish and allocated target observer coverage levels, establishment of an SBRM performance standard, the requirement to conduct periodic evaluations and prepare a periodic SBRM report, the prioritization process, and the framework adjustment provisions—are purely administrative features intended to improve the effectiveness and the transparency of the SBRM. None of these additional components are associated with impacts to any fishing areas, including EFH or living marine resources within the Greater Atlantic Region that could be distinguished from the no action baseline.

The preferred alternative for Bycatch Reporting and Monitoring Mechanism has minor costs associated with equipment upkeep, transmission costs and costs associated with hosting an observer. Therefore this action is considered to have minor negative impacts on the socio-economic environment.

7.3.5 Cumulative Effects Summary

Given the largely administrative nature of this action, the preferred alternatives are not expected to impact the baseline of cumulative effects. For managed species, the impacts will remain non-significant, with some stocks experiencing minor to moderate negative impacts but overall condition of all stocks improving. For protected resources and physical habitat/EFH, this action will have no impact and the cumulative impacts will remain moderately positive. While this action is expected to have minor, negative socio-economic impacts, this is not expected to substantially impact the mixed, non-significant cumulative impacts present at baseline.

Relationship to Applicable Laws and Directives

8.1 Administrative Procedure Act (APA)

Section 553 of the APA establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice and opportunity for comment. At this time, the Councils are not requesting any abridgement of the rulemaking process for this action.

8.2 Coastal Zone Management Act (CZMA)

Section 307(c)(1) of the Federal CZMA of 1972 requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. However, because this action deals solely with the procedural and administrative mechanisms by which data and information on bycatch in Greater Atlantic Region fisheries are collected and reported, the preferred alternatives associated with this action do not directly affect the coastal zone of any state. In addition, pursuant to the CZMA regulations at 15 CFR 930.33(a)(2) and 930.35, a negative determination is not required, and coordination with the state coastal zone management agencies under section 307 of the CZMA is not necessary.

8.3 Endangered Species Act (ESA)

Section 7 of the ESA requires Federal agencies conducting, authorizing, or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. The impacts of the proposed alternatives on protected species are considered in chapter 7, section 7.2, and, based on the procedural nature of the action, the Councils have determined preliminarily that there would be no direct or indirect impacts on protected resources, including endangered or threatened species or their habitat.

8.4 E.O. 12866

A Regulatory Impact Review (RIR) is required by NMFS for all regulatory actions that either implement a new FMP or significantly amend an existing FMP. An RIR is required by NMFS for all regulatory actions that are part of the "public interest." The RIR is a required component of the process of preparing and reviewing FMPs or amendments and provides a comprehensive review of the economic impacts associated with proposed regulatory actions. The RIR addresses many concerns posed by the regulatory philosophy and principles of E.O. 12866. The RIR serves as the basis for assessing whether or not any proposed regulation is a "significant regulatory action" under criteria specified by E.O. 12866.

The RIR must provide the following information: (1) A comprehensive review of the level and incidence of economic impacts associated with a proposed regulatory action or actions; (2) a review of the problems and policy objectives prompting the regulatory proposals; and (3) an evaluation of the major alternatives that could be used to meet these objectives. In addition, an RIR must ensure that the regulatory agency systematically and comprehensively consider all available alternatives such that the public welfare can be enhanced in the most efficient and cost effective manner.

Under the Regulatory Flexibility Act (RFA) of 1980, as amended by Public Law 104-121, new FMPs or amendments also require an assessment of whether or not proposed regulations would have a significant economic impact on a substantial number of small business entities. The primary purposes of the RFA are to relieve small businesses, small organizations, and small Government agencies from burdensome regulations and record-keeping requirements, to the extent possible.

This section of the SBRM Omnibus Amendment provides an assessment and discussion of the potential economic impacts, as required of an RIR and the RFA, of various proposed actions consistent with the purpose of this action.

8.4.1 Statement of the Problem and Need for Action

The legal mandates addressed by this amendment are described in section 1.2. The specific issues driving the development of this amendment are described in sections 1.3 and 1.5. It is intended that the programs, procedures, and reporting requirements implemented through this amendment would ensure that the timeliness, accuracy, and precision of information collected on discards occurring in Greater Atlantic Region fisheries remains sufficient to support all relevant stock assessments and management decisions.

8.4.2 Management Objectives

The rationale for the Councils' proposed actions is found in section 6.10. The purpose and need for this amendment is found in section 1.4.

8.4.3 Description of the Affected Entities

As noted in earlier sections (see section 7.1 and 7.2), this amendment is wholly concerned with the procedures and mechanisms by which data and information on the types and rates of bycatch are obtained and utilized by scientists and fishery managers. Thus, the scope of the impacts associated with this amendment is atypical for an FMP amendment. Most FMP amendments focus on changes to fishing regulations in order to effect a direct change in either fishing effort or fishing practices, and these regulatory changes generally result in direct effect on fishing vessel operations (by modifying where, when, and/or how fishing may take place). These types of changes to fishing vessel operations almost always have socio-economic impacts on the participants of the subject fisheries.

However, as the focus of this amendment is on the methodology by which bycatch information is obtained, analyzed, and utilized, the impacts of the proposed actions are wholly administrative in nature. Therefore, although this amendment addresses all fisheries operating in the Greater Atlantic Region under a Council FMP, which encompasses Federal fishing vessel permit holders across 22 different permit categories (see Table 73), the actual economic impacts associated with this amendment are considered to be negligible. A further discussion of the vessels, ports, and communities subject to the FMPs amended through this action is provided in section 7.1.3, along with the general information provided in chapters 2 and 3. Specific information about the potential for economic impacts to result from this amendment, and the affected entities is provided in sections 7.2.1.3 and 7.2.2.3.

8.4.4 Description of the Alternatives

A complete description of the alternatives considered during the development of this amendment can be found in chapter 6.

8.4.5 Expected Economic Effects of the Alternatives

A complete evaluation of the expected economic effects of the various alternatives is presented throughout section 7.2. As noted in section 7.2, this action may increase spending by the Federal Government to pay for increased levels of observer coverage and to pay for additional statistical analyses and reports to be prepared for use by fishery managers. Using 2004 as the case study, there were 8,429 observer sea days utilized in 2004. Under the SBRM proposed in this amendment, 9,874 observer sea days would be required based on 2004 data. This represents an increase of 1,445 observer sea days. Given a per day total cost of $1,150 to pay the observer and cover the cost of all associated overhead for the contractor and the Government, that equates to an increase of $1,661,750 from the 2004 spending level.

8.4.6 Determination of Significance under E.O. 12866

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be significant. A “significant regulatory action” is one that is likely to: (1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, safety, or state, local, or tribal Governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in this Executive Order.

A regulatory program is “economically significant” if it is likely to result in the effects described above. The RIR is designed to provide information to determine whether the proposed regulation is likely to be “economically significant.”

NMFS has determined that, given the information presented above, there would be net benefits derived from the implementation of the proposed SBRM Omnibus Amendment. Because none of the factors defining “significant regulatory action” are triggered by this proposed action, the action has been determined to be not significant for the purposes of E.O. 12866.

8.5 E.O. 13132

This E.O. established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the measures under consideration in the SBRM Omnibus Amendment. This action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected states have been closely involved in the development of the proposed management measures through their representation on the Councils (all affected states are represented as voting members of at least one Regional Fishery Management Council). Thus far, no comments were received from any state officials relative to any federalism implications that may be associated with this action.

8.6 Information Quality Act

Pursuant to NOAA guidelines implementing section 515 of Public Law 106-554 (the Information Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of the information (including statistical information) disseminated by or for Federal agencies. The following section addresses these requirements.

Utility

The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the preferred alternatives is included so that intended users may have a full understanding of the preferred alternatives and their implications.

Until a proposed rule is prepared and published, this document is the principal means by which the information contained herein is available to the public. The information provided in this document is based on the most recent available information from the relevant data sources. The development of this document and the decisions made by the Councils to this point are the result of a multi-stage public process. Thus, the information contained in this document has been improved based on comments from the public, the fishing industry, members of the Councils, and NMFS.

This document is available in several formats, including printed publication and online through the Councils' and NMFS's web pages.

Integrity

Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NMFS adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

For purposes of the Pre-Dissemination Review, this document is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this product are based on either assessments subject to peer-review through the Stock Assessment Review Committee or on updates of those assessments prepared by scientists of the NEFSC. Landing and revenue information is based on information collected through the FVTR and seafood dealer purchase report databases. Information on catch composition is based on reports collected by the NMFS observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources, and the analyses have been reviewed by members of the SBRM Fishery Management Action Team. A formal peer review of the primary analytical components of the document was conducted by members of the Councils' Science and Statistical Committees.

The analyses conducted in support of the proposed action were conducted using information from the most recent complete calendar years, through 2012 or 2013, depending on the database. Some analysis in Chapter 5 illustrates the design of the

SBRM and the process used to estimate discards. This illustrative analysis was initially conducted in 2007, and uses data from 2004. As an illustration of a process, the validity of the analysis is not dependent on using data from a specific year. Therefore, repeating this analysis with data from a different fishing year would not provide any additional insight or value, and the original analysis has been retained. The data used in the analyses provide the best available information on catch and landings by participants in Greater Atlantic Region fisheries subject to the amended FMPs, bycatch rates in these fisheries, and recent coverage rates by the fishery observer program. Specialists (including professional members of plan development teams, technical teams, committees, and Council staff) who worked with these data are familiar with the most current analytical techniques and with the available data and information relevant to the fisheries of the Greater Atlantic Region.

The policy choices are clearly articulated, in chapter 6 of this document, as the management alternatives considered in this action. The supporting science and analyses, upon which the policy choices are based, are summarized and described in chapters 5, 6, and 7, and Appendix A, of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency.

The review process used in preparation of this document involves the responsible Councils, the NEFSC, the GARFO, and NMFS Headquarters. The Center's technical review is conducted by senior level scientists with specialties in population dynamics, stock assessment methods, demersal resources, population biology, and the social sciences. The Council review process involves public meetings at which affected stakeholders have opportunity to provide comments on the document. Review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. Final approval of the action proposed in this document and clearance of any rules prepared to implement resulting regulations would be conducted by staff at NMFS Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

A draft of the 2007 SBRM Omnibus Amendment document was made available to the public for review in November and December of 2006, during which time two public hearings were held on the draft amendment. Based on the comments received during this process, several changes were made to the draft amendment that were incorporated in the final document. This SBRM Omnibus Amendment builds on the work of the 2007amendment and therefore reflects the public input on that document. A draft of this SBRM Omnibus Amendment was made available for public review and comment in November and December of 2013. There will be an additional opportunity for the public to review this document during the Magnuson-Stevens Act-mandated 60-day review period for the approval of the amendment.

8.7 Magnuson-Stevens Act

The preferred alternatives identified in this amendment do not propose to modify any of the management measures previously implemented under any of the FMPs to be amended through this action which were found to be fully in compliance with all national standards of the Magnuson-Stevens Act. The actions currently proposed to be implemented through this amendment are wholly administrative in nature and are focused solely on the procedures and mechanisms by which data and information on the types and rates of bycatch occurring in Greater Atlantic Region fisheries are obtained and utilized by scientists and fishery managers. All the actions identified in the preferred alternatives are intended to address the requirement in § 303(a)(11) of the Magnuson-Stevens Act to "establish a standardized bycatch reporting methodology to assess the amount and type of bycatch occurring in a fishery" to ensure that all Greater Atlantic Region FMPs are fully in compliance with this required provision. This action does not address any other required provision under the Magnuson-Stevens Act, and does not directly address any of the national standards. Due to the nature of the measures in the proposed action, there would be no direct impacts on any habitat or EFH; therefore, an EFH consultation is not required.

8.8 Marine Mammal Protection Act (MMPA)

The impacts of the preferred alternatives on protected species are considered in chapter 7, section 7.1, and, based on the procedural nature of the action, the Councils have concluded preliminarily that there would be no direct or indirect impacts on marine mammals, that the preferred alternatives appear consistent with the provisions of the MMPA, and that the preferred alternatives would not alter existing measures to protect the species likely to inhabit the management units of the subject fisheries.

8.9 National Environmental Policy Act (NEPA)

8.9.1 Environmental Assessment

An assessment of the expected impacts of the preferred alternatives, and other alternatives considered as part of this amendment, is presented in chapter 7. This environmental assessment was prepared according to the provisions of NOAA Administrative Order 216-6.

8.9.1.1 <u>Need for the Action</u>

The purpose and need for this action are described in section 1.4 of this document. Other sections in chapter 1 describe the specific problem to be addressed (section 1.3) and the issued to be resolved (section 1.5).

8.9.1.2 Management Alternatives

The alternatives to the proposed action are identified and described in chapter 6 of this document.

8.9.1.3 Environmental Impacts of the Proposed Action and Alternatives

A description of the affected environment (section 7.1), along with a description of the environmental impacts of the proposed action and the alternatives (sections 7.2 and 7.3) are provided in chapter 7.

8.9.1.4 Agencies and Persons Consulted

The development of this amendment was a joint effort between the Mid-Atlantic and New England Fishery Management Councils and NOAA's National Marine Fisheries Service. No other Federal agencies participated in the development of this action. For a list of persons that contributed to or were consulted during the development of this amendment, see chapter 10.

8.9.2 Finding of No Significant Impact for the SBRM Omnibus Amendment

NOAA Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant in making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria.

8.9.2.1 Criteria to Determine Significance of Action

8.9.2.1.1 Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

Response: The measures proposed in the SBRM Omnibus Amendment are not expected to jeopardize the sustainability of any target species that may be affected by the action. As described in chapters 1 (Introduction and Background) and 6 (Proposed Action and Other Alternatives Considered), the focus of this amendment is on the methodology by which bycatch information is obtained, analyzed, and utilized. The measures would not impose or result in any changes to fishing operations, fishing behavior, fishing gears used, or areas fished. As such, the impacts of the preferred alternatives, described and analyzed in chapter 7 (Environmental Consequences), on any species that may be affected by the measures are wholly administrative in nature; there are no expected direct or indirect physical or biological impacts associated with the preferred alternatives.

8.9.2.1.2 *Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?*

Response: The measures proposed in the SBRM Omnibus Amendment are not expected to jeopardize the sustainability of any non-target species that may be affected by the action. As described in chapters 1 (Introduction and Background) and 6 (Proposed Action and Other Alternatives Considered), the focus of this amendment is on the methodology by which bycatch information is obtained, analyzed, and utilized. The measures would not impose or result in any changes to fishing operations, fishing behavior, fishing gears used, or areas fished. As such, the impacts of the preferred alternatives, described and analyzed in chapter 7 (Environmental Consequences), on any species that may be affected by the measures are wholly administrative in nature; there are no expected direct or indirect physical or biological impacts associated with the preferred alternatives.

8.9.2.1.3 *Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?*

Response: The unique characteristics of the geographic area impacted by the SBRM Omnibus Amendment include the presence of Essential Fish Habitat (EFH) and an abundance of life forms of commercial and non-commercial value. The value of this area was described in the amendment (see section 7.1.1), and an analysis of the action on ocean and coastal habitats and EFH was conducted. The measures proposed in the SBRM Omnibus Amendment are not expected to result in any direct physical or biological impacts to the affected environment and therefore would not cause substantial damage to ocean and coastal habitats or EFH. As described in chapters 1 (Introduction and Background) and 6 (Proposed Action and Other Alternatives Considered), the focus of this amendment is on the methodology by which bycatch information is obtained, analyzed, and utilized. As such, the impacts of the preferred alternatives, described and analyzed in chapter 7 (Environmental Consequences), are entirely administrative in nature with no associated direct impacts on the environment. Because this action would not result in direct adverse impacts to ocean and coastal habitats or EFH, an EFH consultation under the Magnuson-Stevens Act would neither be required nor conducted.

8.9.2.1.4 *Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?*

Response: The preferred alternatives described in chapter 6 (Proposed Action and Other Alternatives Considered) would not impose or result in any changes to fishing operations, fishing behavior, fishing gears used, or areas fished. The measures are entirely administrative in nature. Therefore, implementation of the SBRM Omnibus Amendment would not have a direct impact on the public health or safety of either people directly involved in the fishing industry or the public at large.

8.9.2.1.5 *Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?*

Response: The measures proposed in the SBRM Omnibus Amendment are not expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species. As described in chapters 1 (Introduction and Background) and 6 (Proposed Action and Other Alternatives Considered), this amendment is solely concerned with establishing the methodology to be used to obtain, analyze, and report information regarding discards occurring in Greater Atlantic Region fisheries. The measures would not impose or result in any changes to fishing operations, fishing behavior, fishing gears used, or areas fished. As such, the impacts of the preferred alternatives, described and analyzed in chapter 7 (Environmental Consequences), are wholly administrative in nature; there are no expected direct or indirect adverse impacts on any endangered or threatened species, or their critical habitat, associated with the preferred alternatives.

8.9.2.1.6 *Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

Response: The preferred alternatives described in chapter 6 and analyzed in chapter 7 would not impose or result in any changes in fishing operations or behavior, fishing gears used, or areas fished. The impacts of establishing the methodology to be used to obtain, analyze, and report information regarding discards occurring in Greater Atlantic Region fisheries are administrative. Because the impacts of the SBRM would be procedural, with no direct or indirect impacts to the marine environment, there are no expected impacts to biodiversity or ecosystem function in the affected area.

8.9.2.1.7 *Are significant social or economic impacts interrelated with natural or physical environmental effects?*

Response: The preferred alternatives would continue the status quo program for bycatch reporting and monitoring for Federally-managed species managed by the New England and Mid-Atlantic Fishery Management Councils. There are no economic or social impacts associated with this alternative that could be distinguished from taking no action. This is not to say that there are no costs associated with the current information collection program, but rather that for purposes of analyzing the implications of this action, there would be no incremental changes to the costs currently imposed or any social or economic impacts interrelated with any natural or physical environmental effects.

8.9.2.1.8 *Are the effects on the quality of the human environment likely to be highly controversial?*

Response: The impacts on the quality of the human environment of the SBRM are not expected to be highly controversial. The SBRM Omnibus Amendment endeavors to establish a rigorous methodology to ensure that the discard data obtained by NMFS is of the highest quality possible, with high levels of precision and accuracy to meet the needs of the scientists and managers that utilize the data. A group of external peer reviewers concluded that the technical components of the SBRM do "a commendable job of formulating a comprehensive approach to the problem of assessing bycatch rates in multiple fisheries." The overall consensus of the reviewers is that the document "provides a rigorous objective framework for addressing the problem of bycatch monitoring." The effects of these methodologies, including data collection, analysis and reporting to fisheries scientists and managers, on the human environment are described in chapter 7 and are found to be minimal, temporary, and/or indistinguishable from baseline conditions.

8.9.2.1.9 Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

Response: The SBRM Omnibus Amendment would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor is it expected to cause loss or destruction to significant scientific, cultural, or historical resources, because none of these features are present in the affected area. The SBRM Omnibus Amendment is specific only to Federally-managed fisheries that operate in the Exclusive Economic Zone (EEZ), as described in chapters 1, 2, and 7, and the unique areas described herein do not occur in the action area.

8.9.2.1.10 Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: Implementation of the SBRM Omnibus Amendment is not expected to result in highly uncertain effects on the human environment or involve unique or unknown risks. The preferred data collection, analytic methodologies, and reporting alternatives presented in the document (chapter 6) were developed using the best available science and are consistent with currently employed tools and practices. The analyses provided in the document clearly demonstrate that none of the elements of the SBRM would result in direct or indirect impacts to the environment (chapter 7) that are distinguishable from current (baseline) conditions. Furthermore, the SBRM Omnibus Amendment endeavors to establish a rigorous methodology to ensure that the discard data obtained by NMFS are of the highest quality possible, with high levels of precision and accuracy to meet the needs of the scientists and managers that utilize the data. A group of external peer reviewers concluded that the technical components of the SBRM do "a commendable job of formulating a comprehensive approach to the problem of assessing bycatch rates in multiple fisheries." The overall consensus of the reviewers is that the document "provides a rigorous objective framework for addressing the problem of bycatch monitoring."

8.9.2.1.11 Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: As described in chapter 7 of the document, the actions being considered as part of the SBRM solely address the administrative processes through which data and information on bycatch occurring in Greater Atlantic Region fisheries are collected, analyzed, and reported to fishery scientists and managers. The SBRM Omnibus Amendment does not address bycatch reduction or other issues related to the management measures utilized in Greater Atlantic Region fisheries. Although elements of the SBRM have been implemented previously and utilized in many ways in recent years, the Court ruling that both Amendment 10 to the Sea Scallop FMP and Amendment 13 to the Northeast Multispecies FMP failed to fulfill the Magnuson-Stevens Act requirement to establish an SBRM (described in chapter 1) is evidence that the 2007 SBRM Omnibus Amendment was unique in the Greater Atlantic Region as the first action to propose the establishment of a comprehensive SBRM for the region. In the time since the 2007 SBRM Omnibus Amendment was vacated by the Court ruling in *Oceana* v. *Locke*, the Greater Atlantic Region has been without a formal SBRM. This SBRM Omnibus Amendment proposes to once again establish a comprehensive SBRM for the region.

Overall, the SBRM Omnibus Amendment simply formalizes the status quo mechanisms used in the Greater Atlantic Region to collect information and data on fisheries bycatch and to analyze bycatch data in order to effectively determine appropriate observer coverage levels and allocate observer effort across the many Greater Atlantic Region fisheries. For these components of the SBRM, there are no incremental impacts to any fishing areas or living marine resources associated with the proposed action relative to the no action baseline. The SBRM elements proposed in the amendment that diverge from the status quo— creation of a prioritization process that determines available funding for SBRM and adjusts coverage levels within available funding, the requirement to conduct periodic evaluations and prepare a periodic SBRM report, establishment of provisions for industry funded observer programs, and adopting provisions for modifying the SBRM through framework adjustments or annual specifications—are purely administrative features intended to improve the effectiveness and the transparency of the SBRM. These additional components are not associated with impacts to any fishing areas or living marine resources within the Greater Atlantic Region that could be distinguished from the no action baseline (chapter 7). Therefore, given the limited and procedural nature of this action and the preferred alternatives, the SBRM Omnibus Amendment is not related to any other actions with individually insignificant but cumulatively significant impacts.

8.9.2.1.12 Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the

National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Response: There is no evidence that the implementation of the SBRM Omnibus Amendment will adversely affect entities listed in or eligible for listing in the National Register of Historic Places or will cause loss or destruction of significant scientific, cultural, or historic resources. Compliance with the preferred measures will not result in the permanent loss or destruction of resources.

8.9.2.1.13 Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

Response: The implementation of the SBRM Omnibus Amendment would not result in any actions that would be expected to result in the introduction or spread of a nonindigenous species. The measures included in the SBRM Omnibus Amendment are administrative in nature (chapter 7).

8.9.2.1.14 Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

Response: The implementation of the SBRM Omnibus Amendment does not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. The data collection, data analysis, and reporting tools being implemented are required in order for the agency to meet objectives under the Magnuson-Stevens Act and three Court Orders (described in chapter 1). The measures included in the SBRM Omnibus Amendment were designed and chosen to achieve specific objectives given local conditions and issues, and are therefore not expected to establish a precedent for future actions. In the future, NMFS would similarly evaluate bycatch related data reporting, collection and analysis needs in order to respond to specific issues, such as changes to environmental, regulatory, economic, and/or fishing industry conditions. Therefore, SBRM requirements for each FMP and/or administrative region would be evaluated separately based upon its own unique factual situation. Furthermore, while data collected under the SBRM may influence fisheries management decisions throughout the region for years to come, each of those future management decisions would be the subject of its own environmental review under NEPA. As such, this action would not establish a precedent for any forthcoming decision or analysis.

8.9.2.1.15 Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: There is no evidence that implementation of the SBRM Omnibus Amendment would result in a violation of a Federal, state, or local law for environmental protection. In fact, the SBRM Omnibus Amendment is expected to support Federal laws because it was developed to address the requirements of the Magnuson-Stevens Act to include, in all FMPs, an SBRM (chapter 1). Furthermore, and analysis of the relationship of the SBRM with applicable Federal laws and Executive Orders was conducted (chapter 8) and it was determined that the measures included in the SBRM Omnibus Amendment are consistent with all applicable Federal laws and Executive Orders.

8.9.2.1.16 Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: In part, the SBRM Omnibus Amendment simply formalizes the status quo mechanisms used in the Greater Atlantic Region to collect information and data on fisheries bycatch and to analyze bycatch data in order to effectively determine appropriate observer coverage levels and allocate observer effort across the many Greater Atlantic Region fisheries (chapter 6). For these components of the SBRM, there are no incremental impacts to any fishing areas or living marine resources associated with the proposed action relative to the no action baseline. The SBRM elements proposed in the amendment that diverge from the status quo— creation of a prioritization process that determines available funding for SBRM and adjusts coverage levels within available funding, the requirement to conduct periodic evaluations and prepare a periodic SBRM report, establishment of provisions for industry funded observer programs, and adopting provisions for modifying the SBRM through framework adjustments or annual specifications— are purely administrative features intended to improve the effectiveness and the transparency of the SBRM. These additional components are not associated with impacts to any target or non-target species within the Greater Atlantic Region that could be distinguished from the no action baseline (chapter 7). Therefore, given the limited and administrative nature of this action and the preferred alternatives, the SBRM Omnibus Amendment may not reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species.

8.9.2.2 Determination

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the SBRM Omnibus Amendment, it is hereby determined that the SBRM Omnibus Amendment will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

[signature] 3/10/15

Administrator, NMFS Greater Atlantic Region — Date

8.10 Paperwork Reduction Act (PRA)

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. The preferred alternatives currently associated with this action do not propose to modify any existing collections, or to add any new collections; therefore, no review under the PRA is necessary.

8.11 Regulatory Flexibility Act (RFA)

The objective of the RFA is to require consideration of the capacity of those affected by regulations to bear the direct and indirect costs of regulation. If an action would have a significant impact on a substantial number of small entities, an Initial Regulatory Flexibility Analysis must be prepared to identify the need for action, alternatives, potential costs and benefits of the action, the distribution of these impacts, and a determination of net benefits. The RFA requires the Federal rulemaker to examine the impacts of proposed and existing rules on small businesses, small organizations, and small Governmental jurisdictions.

Small entities include "small businesses," "small organizations," and "small governmental jurisdictions." The Small Business Administration (SBA) has established size standards for all major industry sectors in the U.S. including commercial finfish harvesters (NAICS code 114111), commercial shellfish harvesters (NAICS code 114112), other commercial marine harvesters (NAICS code 114119), for-hire businesses (NAICS code 487210), marinas (NAICS code 713930), seafood dealers/wholesalers (NAICS code 424460), and seafood processors (NAICS code 311710). A business primarily involved in finfish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $20.5 million for all its affiliated operations worldwide. For commercial shellfish harvesters, the other qualifiers apply and the receipts threshold is $5.5 million. For other commercial marine harvesters, for-hire businesses, and marinas, the other qualifiers apply and the receipts threshold is $7.5 million. A business primarily involved in seafood processing is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual employment, counting all individuals employed on a full-time, part-time, or other basis not in excess of 500 employees for all its affiliated operations worldwide. For seafood dealers/wholesalers, the other qualifiers apply and the employment threshold is 100 employees. A small organization is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. Small governmental jurisdictions are governments of cities, boroughs, counties, towns, townships, villages, school districts, or special districts, with populations of fewer than 50,000.

If an action is determined to affect a substantial number of small entities, the analysis must include:

1. A description and estimate of the number of small entities and total number of entities in a particular affected sector, and the total number of small entities affected; and

2. Analysis of the economic impact on small entities, including the direct and indirect compliance costs of completing paperwork or recordkeeping requirements, effect on the competitive position of small entities, effect on the small entity's cash flow and liquidity, and ability of small entities to remain in the market.

If it is clear that an action would not have a significant economic impact on a substantial number of small entities, the RFA allows Federal agencies to certify the proposed action to that effect to the SBA. The decision on whether or not to certify is generally made after the final decision on the preferred alternatives for the action and may be documented at either the proposed rule or the final rule stage.

Based on the information and analyses provided in earlier sections of this amendment, it is clear that this action would not have a significant economic impact on a substantial number of small entities, and that certification under the RFA is warranted. The remainder of this section establishes the factual basis for this determination, as recommended by the Office of Advocacy at the SBA.

8.11.1 Basis and Purpose of the Action

The legal basis for this amendment can be found in section 303(a)(11) of the Magnuson-Stevens Act, which requires that each FMP "establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery." This is described further in section 1.2. The action is needed to ensure that all FMPs of the Greater Atlantic Region, developed under the jurisdiction of the New England and Mid-Atlantic Councils, comply with the SBRM requirements of the Magnuson-Stevens Act. The purpose of the action is to: (1) Explain the methods and processes by which bycatch is currently monitored and assessed for Greater Atlantic Region fisheries; (2) determine whether these methods and processes need to be modified and/or supplemented; (3) establish standards of precision for bycatch estimation for all Greater Atlantic Region fisheries; and, thereby, (4) document the SBRMs established for all fisheries managed through the FMPs of the Greater Atlantic Region. The purpose, need, and objectives of the SBRM Omnibus Amendment are described further in section 1.4.

8.11.2 Description and Estimate of the Number of Small Entities to Which the Action Applies

The implementation of this action will formally establish, as the SBRM, the methods and procedures by which data and information on discards occurring in Greater Atlantic Region fisheries are obtained, processed, and utilized. Because the primary mechanisms used to collect data and information on discards are the at-sea observers and the FVTRs, the small entities to which the SBRM applies include all federally permitted fishing vessels operating in the Greater Atlantic Region subject to one or more of the affected FMPs (see Table 1). Table 73 identifies the number of fishing vessels holding each category of Federal commercial fishing permit in the Greater Atlantic Region. Because of the transitory nature of open access permits, and due to the overlap associated with vessels holding multiple permits, it is difficult to determine the exact number of affected entities. As described in section 7.1, there are approximately 2,100 fishing vessels that hold at least one limited access permit (excluding the permits for American lobster, which are not subject to this amendment), and approximately 1,900 fishing vessels that hold at least one open access permit but no limited access permits. This indicates an approximate total of 4,000 fishing vessels subject to the provisions of the FMPs addressed by this amendment and, therefore, subject to the provisions of the SBRM.

Some of the vessels with Federal fishing permits may be considered to be part of the same firm, because they may have the same owners. Firms are classified as finfish, shellfish, or for-hire based on the activity from which they derive the most revenue. Permitted vessels were grouped together according to common owners. The resulting groupings were then treated as fishing businesses for purposes of identifying small and large firms. Based on these criteria there are 948 finfish firms, 2741 shellfish firms, and 454 for-hire firms in the Greater Atlantic Region. Of those firms, 20 shellfish firms are considered large entities. All other firms meet the criteria for small entities.

8.11.3 Economic Impacts on Small Entities

The economic impacts associated with each alternative considered in the development of this amendment are evaluated throughout section 7.2. For the purposes of the RFA certification review, the following addresses the economic impacts associated with each element of the proposed action.

8.11.3.1 Bycatch Reporting and Monitoring Mechanisms

This element of the proposed action focuses on the specific mechanisms by which data and information on discards are obtained. The proposed action is to maintain the status quo for all fisheries subject to the SBRM Omnibus Amendment, including FVTRs, at-sea observers, MRIP, VMS, and industry-based surveys, among others. Because the proposed action is to maintain the status quo, with no change, there are no marginal changes to the economic impacts on small entities associated with this element. A non-preferred alternative to implement electronic video monitoring in one or more fisheries would have resulted in potentially significant economic costs to the participants of the affected fisheries; however, this alternative was not selected (see section 7.2.1.3.2).

8.11.3.2 Analytical Techniques and Allocation of Observers

This element of the proposed action establishes the procedures used to analyze data on discards occurring in Greater Atlantic Region fisheries and to determine the appropriate allocation of at-sea observers on fishing vessels in order to obtain sufficiently accurate and precise discard data. The proposed action is to expand upon and refine the current methodology to encompass 56 distinct fishing modes across 15 species and species groups. While this element of the proposed action has implications for the quality of the discard data obtained for all Greater Atlantic Region fisheries, this action is wholly centered on the analytical tools and methodologies used to determine appropriate levels and allocations of at-sea observers. There are no direct or indirect costs to fishing vessel permit holders associated with this element.

The only way for this element of the proposed action to have an economic impact on fishing vessel permit holders is if the participants of the fishery pay for the at-sea observers. In this case, an observer allocation methodology that resulted in increased levels of observer coverage could be said to impose additional costs to those participants. However, in the Greater Atlantic Region, the at-sea fisheries observer program operates entirely through a contract service funded by NMFS, with the single exception of the sea scallop industry-funded observer program. As described in section 7.2.2.3, the Sea Scallop FMP includes provisions to compensate scallop vessels required to carry and pay for an observer through either an increased trip limit, extra trips to an access area, or extra DAS. The intent of the compensation program is to offset the costs of carrying an observer such that the realized cost to the vessel is zero. Thus, within the bounds of the compensation program, an increase in the observer coverage level would not have an economic impact on the affected entities, as any increase in initial costs (paying for the observer) would be offset by the compensation.

This amendment proposes no additional industry-funded observer programs, although it does create a framework adjustment process should either Council wish to establish one in the future. However, any economic impacts associated with such a program would be identified and analyzed in the future management action that establishes the program.

8.11.3.3 SBRM Performance Standard

This element of the proposed action establishes that the intent of the previous element is to allocate an appropriate level of at-sea observers to each of the 56 subject fishing modes such that the data on discards occurring in each fishing mode achieve a CV of no more than 30 percent for each relevant bycatch species or species group. Under the proposed action, a CV of 30 percent becomes the performance standard against which the effectiveness of the SBRM may be judged. It also serves as the basis for determining the appropriate levels and allocation of at-sea observers across all 56 fishing modes.

Similar to the previous element, while this element of the proposed action has implications for the quality of the discard data obtained for all Greater Atlantic Region fisheries, this action is solely concerned with the performance standard used as the basis to determine appropriate levels and allocations of at-sea observers. There are no direct or indirect costs to fishing vessel permit holders associated with this element.

The only way that this element could be associated with costs to fishing vessels would be through the level of the CV selected as the performance standard. That is, a CV higher than 30 percent (e.g., 40 percent) would likely require lower levels of observer coverage in some fisheries to meet the performance standard, while a lower CV (e.g., 20 percent) may require higher levels of coverage in some fisheries. However, as noted for the previous element, all at-sea observers are paid for by NMFS with the exception of the sea scallop fishery. Thus, with the exception of the sea scallop fishery, which has an established compensation program to offset the costs of observers to vessels, all the costs of increased levels of observer coverage are borne by NMFS, not by the fishery participants.

8.11.3.4 SBRM Review/Reporting Process

This element of the proposed action establishes a formal review and reporting process for the SBRM. There are two components to this element of the amendment: The first would establish an annual report, to be prepared by the NEFSC, for the Councils that presents information on discards occurring in the managed fisheries, as documented by at-sea fisheries observers; and the second would establish a more comprehensive periodic report that presents information on and evaluates the effectiveness of the SBRM at achieving the performance standard (see section 6.4 for more detail on what would be included in these reports).

Although this element is considered a critical component of the SBRM, the impacts associated with this action are incurred solely by NMFS and the Councils, who must prepare the reports. The action proposed for this element has no potential direct or indirect economic impact on regulated entities.

8.11.3.5 Framework Adjustment Provisions

This element of the proposed action provides the Councils with a mechanism to more efficiently modify certain aspects of the SBRM as conditions in the fisheries or management needs evolve. Framework adjustments and annual specifications enable the Councils to develop fishery management actions through a process that is more timely and streamlined than the process to develop and submit a full FMP amendment. The impacts associated with this action are incurred solely by NMFS and the Councils, who must prepare, review, and implement the fishery management actions developed under the abbreviated procedures. The action proposed for this element has no potential direct or indirect economic impact on regulated entities.

8.11.3.6 Prioritization Process

This element of the proposed action establishes the steps to be followed by NMFS to redistribute at-sea observer coverage levels and allocations determined through the analytical components of the SBRM in response to a funding limitation. The preferred alternatives would establish a formulaic process for determining whether there is a funding shortfall, and then, if necessary, adjust at-sea observer coverage levels within available funding. The impacts associated with this action are incurred solely by NMFS, who must determine funding available for SBRM, and then implement the formulaic process for prioritizing observer days if necessary. . The action proposed for this element has no potential direct or indirect economic impact on regulated entities.

8.11.3.7 Industry-Funded Observer Programs

This element of the proposed action establishes and authorizes observer service provider approval and certification procedures and requirements, and adds provisions allowing industry-funded observer programs and observer set-aside programs as measures that can be implemented through framework adjustments. The proposed action would not actually implement any industry-funded observer programs or observer set-aside programs, but would create the mechanisms needed to more quickly and easily develop and implement such provisions in any of the Councils' FMPs. Although there may be economic impacts to fishing vessel permit holders associated with any future industry-funded observer programs, any such impacts that may be associated with actually implementing an industry-funded observer program and/or an observer set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

8.11.4 Criteria Used to Evaluate the Action

8.11.4.1 Significant Economic Impacts

The RFA requires Federal agencies to consider two criteria to determine the significance of regulatory impacts: Disproportionality and profitability. If either criterion is met for a substantial number of small entities, then the action should not be certified.

8.11.4.1.1 Disproportionality

As noted above, none of the elements of this proposed action are associated with economic impacts on small entities. Therefore, no small entities are disproportionately affected (put at a disadvantage) relative to large entities, and the disproportionality criterion is not met.

8.11.4.1.2 Profitability

As noted above, none of the elements of this proposed action are associated with economic impacts on small entities. Therefore, no reductions in profit are expected for any small entities, and the profitability criterion is not met.

8.11.4.2 Substantial Number of Small Entities

Indirectly, the methodologies established by this action apply generally across all federally managed fisheries operating in the Greater Atlantic Region under the subject FMPs. However, although a substantial number of entities are involved in these fisheries, none of these entities are expected to incur any economic impacts as a result of this action.

8.11.5 Description of, and Explanation of, the Basis for All Assumptions Used

Because the actions proposed in this amendment all are focused on the administrative aspects of the methodology used to obtain and analyze data and information on discards occurring in Greater Atlantic Region fisheries, there are no direct or indirect economic impacts associated with this amendment. No assumptions are necessary to conduct the analyses in support of this conclusion.

List of Public Meetings

List of public meetings at which the development of the 2007 SBRM Omnibus Amendment or this SBRM Omnibus Amendment were discussed:

Joint SBRM Oversight Committee Meetings

1. April 3, 2006 – Mystic, CT
2. May 2, 2006 – Virginia Beach, VA
3. June 12, 2006 – Newport, RI
4. September 6, 2006 – Warwick, RI
5. September 25, 2006 – Peabody, MA
6. April 9, 2007 – Mystic, CT

Science and Statistical Committee Meeting

1. August 22, 2006 – Warwick, RI

Mid-Atlantic Fishery Management Council Meetings

1. January 17, 2006 – Annapolis, MD
2. May 4, 2006 – Virginia Beach, VA
3. August 3, 2006 – Philadelphia, PA
4. October 12, 2006 – Kitty Hawk, NC
5. February 15, 2007 – Claymont, DE
6. June 14, 2007 – Hampton, VA
7. April 11, 2012 – Duck, NC
8. June 14, 2012 – New York, NY
9. October 17, 2012 – Long Branch, NJ
10. April 10, 2013 – Raleigh, NC
11. June 13, 2013 – Eatontown, NJ
12. April 10, 2014 – Montauk, NY

New England Fishery Management Council Meetings

1. January 31, 2006 – Portland, ME
2. April 4, 2006 – Mystic, CT
3. June 13, 2006 – Newport, RI
4. September 27, 2006 – Peabody, MA
5. February 7, 2007 – Portsmouth, NH
6. April 10, 2007 – Mystic, CT
7. June 21, 2007 – Portland, ME
8. April 24, 2012 – Mystic, CT
9. June 19, 2012 – Portland, ME
10. September 27, 2012 – Plymouth, MA
11. April 25, 2013 – Mystic, CT

12. June 20, 2013 – Portland, ME
13. April 23, 2014 – Mystic, CT

New England Fishery Management Council Ad-Hoc SBRM Committee Meeting

1. January 16, 2014 – Portsmouth, NH

Public Hearings on the Draft 2007 Amendment

1. November 14, 2006 – Gloucester, MA
2. December 13, 2006 – New York, NY

Public Comment Periods on the Draft Amendment Document

1. September 27 – October 27, 2013
2. November 19 – December 19, 2013

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Glossary of Terms

Accuracy. The closeness of a measured or estimated value (e.g., population parameter) to its true value. Accuracy should not be confused with precision, which relates to the variability of the measured or estimated value (i.e., the closeness of repeated measurements of the same quantity).

Allocation. The practice of apportioning resources among various entities. Under the SBRM, allocation often regards the assignment of observer effort across the various sampling strata; i.e., geographical region (by port of departure), fishing modes (gear type and mesh size), access area, and trip category.

Bias. A systematic difference between the expected value of a statistical estimate and the quantity it estimates. Absent bias, precision will lead to accuracy; thus, bias and accuracy are used interchangeably, but bias is generally associated with the design of sampling program. Eliminating potential sources of bias improves the accuracy of the results.

Biomass (B). (1) The total weight of a group (or stock) of living organisms (e.g., fish, plankton) or of some defined fraction of it (e.g., spawners) in an area, at a particular time. (2) Measure of the quantity, usually by weight in pounds or metric tons (2,205 lb or 1 metric ton), of a stock at a given time.

Bycatch. According to the Magnuson-Stevens Act, bycatch includes all fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Fish released alive under a recreational catch and release fishery management program are not considered bycatch. The words bycatch and discard are used interchangeably in SBRM documents.

Catch. (1) To undertake any activity that results in taking fish out of its environment dead or alive. To bring fish on board a vessel dead or alive. (2) The total number (or weight) of fish caught by fishing operations, including retained catch (landings) and discarded catch (bycatch). (3) The component of fish encountering fishing gear that is retained by the gear.

Coefficient of variation (CV). A standard measure of precision, calculated as the ratio of the square root of the variance of the bycatch estimate (i.e., the standard error) to the bycatch estimate itself. The higher the CV, the larger the standard error is relative to the estimate. A lower CV reflects a smaller standard error relative to the estimate. A 0-percent CV means there is no variance in the sampling distribution. Alternatively, CVs of 100 percent or higher indicate that there is considerable variance in the estimate.

Discard. To release or return fish to the sea, dead or alive, whether or not such fish are brought fully on board a fishing vessel. Fish (or parts of fish) can be discarded for a variety of reasons such as having physical damage, being a non-target species for the trip, and compliance with management regulations such as minimum size limits or quotas.

The terms discard and bycatch are used interchangeably in SBRM documents.

Effort. The amount of time and fishing power used to harvest fish; includes gear size, boat size, and horsepower.

Environmental assessment (EA). As part of the National Environmental Policy Act (NEPA) process, an EA is a concise public document that provides evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI).

Finding of no significant impact (FONSI). As part of the National Environment Policy Act (NEPA) process, a FONSI is a document that explains why an action that is not otherwise excluded from the NEPA process, and for which an environmental impact statement (EIS) will not be prepared, will not have a significant effect on the human environment.

Fish. Means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.

Fishing mode. A way of grouping fishing activities according to the fishing gears used, port of departure, mesh size, and, in some cases, regulatory fishing program, rather than by FMP or species of fish landed. There are 56 fishing modes defined in the Greater Atlantic Region for the purpose of the SBRM Omnibus Amendment.

Fishing vessel trip report (FVTR) or **Logbook.** A detailed, usually official, record of a vessel's fishing activity registered systematically onboard the fishing vessel, usually including information on catch and its species composition, the corresponding fishing effort, and location. Some form of trip report must be completed and submitted by every holder of a Federal fishing permit in the Greater Atlantic Region, except those who hold a Federal permit only for lobster.

Marine Recreational Fisheries Statistical Survey (MRFSS). An annual national survey conducted by NMFS, in cooperation with the coastal states, to estimate the number, catch, and effort of recreational fishermen. MRFSS was phased out and replaced by MRIP in 2011.

Marine Recreational Information Program (MRIP). An annual national survey conducted by NMFS, in cooperation with the coastal states, along with the supporting statistical methods, that are used to estimate the number, catch, and effort of recreational fishermen.

National Standard 9. A provision in the Magnuson-Stevens Act that requires that "conservation and management measures shall, to the extent practicable, (a) minimize bycatch; and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." NMFS has defined the term "to the extent practicable" to include a consideration of the effects of reducing bycatch and bycatch mortality on the overall benefit to the Nation.

Observer. At-sea fishery observers are generally biologists trained to collect information on board fishing vessels. They may be deployed for various reasons including monitoring interactions with protected species, measuring catch composition and disposition (including discards), validating or adjusting self-reported data, tracking in-season quotas (including bycatch quotas), or a variety of other reasons. The regional observer program is administered by the Northeast Fisheries Science Center.

Precision. The degree of agreement of repeated measurements of the same quantity or object.

Sampling design. The sampling design of a scientific survey refers to the statistical techniques and methods adopted for selecting a sample and obtaining estimates of the survey variables from the selected sample.

Standardized bycatch reporting methodology (SBRM). The combination of sampling design, data collection procedures, and analyses used to estimate bycatch in fisheries. An SBRM is required to be implemented for each fishery under section 303(a)(11) of the Magnuson-Stevens Act.

Stock assessment. The process of collecting and analyzing biological and statistical information to determine the changes in the abundance of fishery stocks in response to fishing, and, to the extent possible, to predict future trends of stock abundance. Stock assessments are based on resource surveys; knowledge of the habitat requirements, life history, and behavior of the species; the use of environmental indices to determine impacts on stocks; and catch statistics. Stock assessments are used as a basis to assess and specify the present and probable future condition of a fishery.

Stock Assessment and Fishery Evaluation (SAFE) report. A report that provides a summary of the most recent biological condition of a stock of fish and the economic and social condition of the recreational fishermen, commercial fishermen, and seafood processors who use the fish. The report provides information to the fishery management councils for determining harvest levels.

Total allowable catch (TAC). The annual recommended or specified regulated catch for a species or species group. The regional fishery management council sets the TAC from the range of acceptable biological catch (ABC).

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