UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

APR 23 2013

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

TITLE: Northeast (NE) Multispecies Fishery Management Plan (FMP); Framework Adjustment 50 and Associated Rules

LOCATION: Northeastern United States, Northwest Atlantic, Exclusive Economic Zone

SUMMARY: Framework Adjustment 50 sets specifications for fishing years (FYs) 2013-2015, including 2013 total allowable catches for U.S./Canada stocks, and revises the rebuilding program and management measures for Southern New England/Mid-Atlantic winter flounder. The action also implements recreational management measures for FY 2013. In addition, three emergency rulemakings are being implemented in order to set the FY 2013 catch limits for Georges Bank yellowtail flounder and white hake and reduce the amount of Gulf of Maine cod carryover available to sectors from FY 2012 to FY 2013.

RESPONSIBLE
OFFICIAL: John K. Bullard
Regional Administrator
National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA)
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The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, environmental impact statements were not prepared. Copies of the finding of no significant impact (FONSI), including the environmental assessments (EA), are enclosed for your information.

Although NOAA is not soliciting comments on the completed EA/FONSI, we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the Responsible Official named above.

Sincerely,

Patricia A. Montanio
NOAA NEPA Coordinator

Enclosure

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Framework Adjustment 50
to the Northeast Multispecies FMP

Fishing Year 2013 Recreational Management Measures

Secretarial Emergency Action to Modify Sector Carryover and Set Fishing Year 2013 Catch Limits for Georges Bank Yellowtail Flounder and White Hake

Prepared by the
New England Fishery Management Council
In consultation with the
Mid-Atlantic Fishery Management Council
National Marine Fisheries Service

Initial Framework Meeting:	December 20, 2012
Final Framework Meeting:	January 30, 2013
Date Submitted:	March 22, 2013
Date Resubmitted:	April 15, 2013
Modified by NMFS:	April 22, 2013

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1.0 Executive Summary

In New England, the New England Fishery Management Council (NEFMC) is charged with developing management plans that meet the requirements of the Magnuson-Stevens Act (M-S Act). The Northeast Multispecies Fishery Management Plan (FMP) specifies the management measures for thirteen groundfish species (cod, haddock, yellowtail flounder, pollock, plaice, witch flounder, white hake, windowpane flounder, Atlantic halibut, winter flounder, redfish, Atlantic wolffish, and ocean pout) off the New England and Mid-Atlantic coasts. The FMP has been updated through a series of amendments and framework adjustments. The most recent major amendment, published as Amendment 16, became effective on May 1, 2010. This amendment adopted a broad suite of management measures in order to achieve fishing mortality targets and meet other requirements of the M-S Act. Included in Amendment 16 was a process for setting specifications for the fishery and updating measures through framework actions. Framework 44 to the FMP set specifications for fishing years (FY) 2010-2012. It became effective concurrently with Amendment 16 on May 1, 2010. Framework 45 modified several management measures to improve administration of the fishery and revised several specifications; it was implemented May 1, 2011. Framework 46 was implemented September 14, 2011 and modified the provisions that restrict mid-water trawl catches of haddock. Framework Adjustment 47 was implemented May 1, 2012 and adjusted ACLs and other management measures. In 2011, the NEFMC also approved Amendment 17, which allowed for NOAA-sponsored state-operated permit banks to function within the structure of Amendment 16. Framework Adjustment 48 was approved by the Council on December 20, 2012, but has not yet been approved by NMFS. That action proposes revised status determination criteria for several stocks, modifies the sub-ACL system, adjusts monitoring measures for the groundfish fishery, and changes several accountability measures (AMs). Framework Adjustment 49 is a joint Northeast Multispecies/Atlantic Sea Scallop action that modifies the dates for scallop vessel access to the year-round groundfish closed areas; this action is in review and has not yet been approved.

Amendment 16 made major changes to the FMP. For several groundfish stocks, the mortality targets adopted by Amendment 16, and the resulting specifications in Framework 44, represented substantial reductions from existing levels. For other stocks, the mortality targets were at or higher than existing levels and mortality could remain the same or even increase. Because most fishing trips in this fishery catch a wide range of species, it is impossible to design effort control measures that will change mortality in a completely selective manner for individual species. The management measures adopted by Amendment 16 to reduce mortality where necessary were also expected to reduce fishing mortality unnecessarily on other, healthy stocks. As a result of these lower fishing mortality rates, yield from healthy stocks could be sacrificed and the management plan may not provide optimum yield - the amount of fish that will provide the greatest overall benefit to the nation. Amendment 16 created opportunities to target these healthy stocks. The FMP allows vessels with groundfish permits to either fish under the days-at-sea (DAS) effort control system or to join sectors, which are small groups of self-selected fishermen that receive an allocation of annual catch entitlement (ACE) based upon the catch history of each member. The Amendment also adopted a system of Annual Catch Limits (ACLs) and Accountability Measures (AMs) that are designed to ensure catches remain below desired targets.

This framework action would continue to improve management of the fishery. It incorporates the results of new stock assessments into the setting of specifications, including the catch limits for the U.S./Canada Resource Sharing Understanding and the distribution of ACLs to various components of the fishery. It also modifies the rebuilding strategy for SNE/MA winter flounder and changes the measures for that stock so that it can be landed, with appropriate AMs.

The measures that are considered in this action were first considered as part of Framework Adjustment 48. During the final decision for FW 48, the Council removed the specifications (OFLs/ABCs/ACLs) and decided to submit them as a separate action. The Council also decided to modify the SNE/MA winter flounder rebuilding strategy. This action would implement those decisions.

The *need* for this action is to set specifications for FY 2013 – 2015 that are consistent with the best available science and to modify the rebuilding program and associated management measures for SNE/MA winter flounder. There are several *purposes*: to adopt specifications, to adopt the U.S./Canada Total Allowable Catches (TACs), to modify the formal rebuilding program for SNE/MA winter flounder, and to modify the possession restrictions and AMs for that stock.

Proposed Action

Under the provision of the M-S Act, the Council submits proposed management actions to the Secretary of Commerce for review. The Secretary of Commerce can approve, disapprove, or partially approve the action proposed by the Council. In the following alternative descriptions, measures identified as Preferred Alternatives constitute the Council's proposed management action.

If the Preferred Alternatives identified in this document are adopted as the Proposed Action, this action would implement a range of measures designed to achieve mortality targets and net benefits from the fishery. Details of the measures summarized below can be found in Section 4.0.

The Preferred Alternatives include:

- *Formal Rebuilding Programs and Annual Catch Limits:*
    - *Revised rebuilding strategy for SNE/MA winter flounder*. The preferred alternative would target a rebuilding date of 2023 with a median probability of success for this stock. Short-term catch advice might deviate from the rebuilding strategy in order to account for projection uncertainty.
    - *Revised Annual Catch Limit Specifications*. The preferred alternative would adopt new Overfishing Limits (OFLs), Acceptable Biological Catches (ABCs), and Annual Catch Limits (ACLs) for most multispecies stocks. This alternative would also distribute the ABCs to the various components of the fishery.

- *Commercial and Recreational Fishery Measures.* These measures, based on the Preferred Alternatives, would affect commercial and recreational fishing.
    - *SNE/MA winter flounder landings restrictions:* The preferred alternative would remove the prohibition on landing SNE/MA winter flounder. This change would apply to both commercial and recreational vessels.
    - *Commercial Fishery Accountability Measures: Revised AM for SNE/MA winter flounder*. The preferred alternative would allocate SNE/MA winter flounder to groundfish sectors, and sectors would be subject to the normal requirements for allocated stocks: catches must not exceed the allocation, fishing in a stock area is halted should this occur, and any overages are deducted from the following year's allocation. For common pool groundfish fishing vessels, the AM would be modified to require the use of selective gear in specific areas if the AM is exceeded.
    - *Recreational Management Measures: Revised GOM haddock recreational measures for FY 2013.* The NMFS-preferred alternative would revise the GOM haddock minimum fish size from 18 inches to 21 inches. This measure is not part of FW50, and is being implemented through Regional Administrator authority granted by FW48 in order to adjust recreational management measures prior to the fishing year.

Summary of Environmental Consequences

The environmental impacts of all of the alternatives under consideration are described in Section 7.0. Biological impacts are described in Section 7.1, impacts on essential fish habitat are described in Section 7.2, impacts on endangered and other protected species are described in Section 7.3, the economic impacts are described in Section 7.4, and social impacts are described in Section 7.5. Cumulative effects are described in Section 7.6. Summaries of the impacts of the Preferred Alternatives are provided in the following paragraphs. As required by NEPA, the Preferred Alternatives are compared to the No Action alternative. Throughout the document, more informative comparisons are also made between the Preferred Alternatives and 2012.

Biological Impacts

The extension of the SNE/MA winter flounder rebuilding plan will result in increased fishing mortality and slower stock rebuilding than would be the case under the No Action alternative. The revised specifications for multispecies stocks will increase the probability that mortality targets will be achieved, and stock rebuilding will continue, consistent with the adopted rebuilding plans, when compared to the No Action alternatives. Coupled with these changes are adjustments to measures that will facilitate the landing of SNE/MA winter flounder and make sure that catches of this stock are consistent with the revised rebuilding objectives.

Essential Fish Habitat (EFH) Impacts

The preferred alternatives are expected to result in a slight increase in habitat impacts when compared to the No Action alternative. This is due to two factors: the modification in the

SNE/MA winter flounder rebuilding strategy and associated measures that will allow this stock to be landed, and the specifications that would be higher under the preferred alternative than under No Action. When compared to 2012 catch limits, however, the catch limits are much lower, which will lead to reduced groundfish fishing and a decrease in habitat impacts when compared to 2012.

Impacts on Endangered and Other Protected Species

When compared to recent fishing activity, the reduced specifications for most stocks that result from the preferred alternatives are likely to lead to reduced impacts on endangered and protected species. Impacts of the preferred alternative for specifications may be higher than under the No Action alternative, however, because there are many stocks that would not have any specifications under the No Action alternative, which could reduce fishing effort. The revised SNE/MA winter flounder rebuilding strategy and associated measures may result in a small increase in groundfish fishing activity in the stock area but this small increase is not expected to impact protected species.

Economic Impacts

The preferred alternative will likely result in an increase in groundfish fishing vessel revenues when compared to No Action. This is not informative, however, since the No Action alternative would not adopt specifications for many stocks and so most groundfish fishing activity would be curtailed. The preferred alternative would be expected to reduce groundfish fishing revenues by about $24.8 million from FY 2011 (about 28 percent) and by about $13.5 million from the predicted FY 2012 groundfish fishing revenues. Net revenues would be expected to show smaller declines, because more efficient trips are expected to be taken as fishermen target stocks with larger quotas. The modified SNE/MA winter flounder rebuilding plan and the associated measures may add about $5.4 million to groundfish fishing revenues if the entire ACL is caught. In sum, nominal groundfish fishing revenues in FY 2013 are likely to be lower than the groundfish fishing revenues in any year since at least 1994. The economic impacts will not be uniformly distributed, and are expected to fall more heavily on smaller vessels that target inshore stocks such as GOM cod, CC/GOM yellowtail flounder, and GOM haddock.

Social Impacts

In general, the preferred alternatives are likely to result in positive social benefits when compared to the No Action alternative, but when compared to previous fishing years the benefits are likely to be primarily negative. This is due to the reduced ACLs which are expected to lead to reduced groundfish fishing revenues. The revised SNE/MA winter flounder rebuilding strategy, and the changes to measures associated with that change would lead to some positive social benefits as it would reduce regulatory discarding. The benefits from this latter change, however, will not outweigh the effects of the other ACL reductions.

Alternatives to the Proposed Action

If the Proposed Action is based on the Preferred Alternatives there are a number of alternatives that would not be adopted. In all cases these alternatives are the No Action alternatives. These alternatives are briefly described below.

- *Formal Rebuilding Programs and Annual Catch Limits*
    - *Rebuilding strategy for SNE/MA winter flounder*: The No Action option would continue to target as low a fishing mortality as possible in order to rebuild this stock as soon after the original target date of 2014 as can be accomplished.
    - *Annual Catch Limit Specifications*: The No Action alternative would not adopt new specifications for GOM cod, GOM haddock, GB cod, GB haddock, GB yellowtail flounder, witch flounder, white hake, plaice, CC/GOM yellowtail flounder. Without specification of an ACL, a catch would not be allocated to the groundfish fishery and targeted groundfish fishing activity would not occur for these stocks.
- *Commercial and Recreational Fishery Measures*
    - *SNE/MA Winter Flounder Landing Limit*. The No Action option would continue to prohibit landing of this stock by commercial and recreational fishermen.
    - *Commercial Fishery Accountability Measures: SNE/MA Winter Flounder AM*. The No Action option would retain either a prohibition on landing SNE/MA winter flounder as a proactive AM, or as recommended by Framework 48, would continue an area-based AM that is currently under review as part of that action.
    - *Recreational Management Measures: The No Action option would maintain a minimum fish size of 18 inches for GOM haddock.*

Impacts of Alternatives to the Proposed Action

In many cases, the No Action alternatives would not have met current requirements of the M-S Act. Only the most substantial impacts are highlighted below.

Biological Impacts
Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the SNE/MA winter flounder rebuilding strategy, it would lead to a drastic reduction in groundfish fishing activity. This option would be expected to result in reduced fishing mortality rates and faster stock rebuilding than the preferred alternatives.

Essential Fish Habitat Impacts
Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the SNE/MA winter flounder rebuilding strategy, it would lead to a drastic reduction in groundfish fishing activity. This option would be expected to result in reduced habitat impacts when compared to the preferred alternatives.

Impacts on Endangered and Other Protected Species
Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the SNE/MA winter flounder rebuilding strategy, it would lead to a drastic reduction in

groundfish fishing activity. This option would be expected to result in reduced fishing impacts on endangered and other protected species.

Economic Impacts

Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the SNE/MA winter flounder rebuilding strategy, it would lead to a drastic reduction in groundfish fishing activity. As a result, fishing vessel revenues on groundfish fishing trips would decline dramatically when compared to the preferred alternative or recent fishing years. Gross fishing vessel revenues on groundfish fishing trips could be as low as $3-4 million, and in any case would probably be less than $10 million.

Social Impacts

Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the SNE/MA winter flounder rebuilding strategy, it would lead to a drastic reduction in groundfish fishing activity and reduced groundfish fishing revenues. Overall, this would likely lead to dramatic changes in the size and demographics of the groundfish fishery, dissatisfaction with the fishing industry and management, and a negative impact on fishermen's attitudes and beliefs.

2.0 Contents

2.1 Table of Contents

2.2 List of Tables

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2.4 List of Appendices

[1] NMFS added Appendix V after the Council submitted FW50 on March 22, 2013. NMFS completed additional analysis and drafted this appendix in support of the Secretarial emergency action to reduce the maximum GOM cod carryover available to 1.85 percent from FY 2012 to FY 2013. This action is not part of FW50.

2.5 List of Acronyms

ABC	Acceptable Biological Catch
ACE	Annual Catch Entitlement
ACL	Annual Catch Limit
ALWTRP	Atlantic Large Whale Take Reduction Plan
AM	Accountability Measure
APA	Administrative Procedures Act
ASAP	Age-structured assessment program; assessment model
ASM	At-sea monitoring
ASMFC	Atlantic States Marine Fisheries Commission
B	Biomass
CAA	Catch at Age
CAI	Closed Area I
CAII	Closed Area II
CC	Cape Cod
CEQ	Council on Environmental Quality
CHOIR	Coalition for the Atlantic Herring Fishery's Orderly, Informed, and Responsible Long-Term Development
CPUE	Catch per unit of effort
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAM	Dynamic Area Management
DAP	Domestic Annual Processing
DAS	Days-at-sea
DEA	Data Envelopment Analysis
DFO	Department of Fisheries and Oceans (Canada)
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DSEIS	Draft Supplemental Environmental Impact Statement
DSM	Dockside monitoring
DWF	Distant-Water Fleets
E.O.	Executive Order
EA	Environmental Assessment
ECPA	East Coast Pelagic Association
ECTA	East Coast Tuna Association
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ETA	Elephant Trunk Area

F	Fishing mortality rate
FAAS	Flexible Area Action System
FEIS	Final Environmental Impact Statement
FMP	Fishery Management Plan
FSCS	Fisheries Scientific Computer System
FSEIS	Final Supplemental Environmental Impact Statement
FW	Framework
FY	Fishing year
GAMS	General Algebraic Modeling System
GB	Georges Bank
GEA	Gear Effects Evaluation
GIFA	Governing International Fisheries Agreement
GIS	Geographic Information System
GMRI	Gulf of Maine Research Institute
GOM	Gulf of Maine
GRT	Gross registered tons/tonnage
HAPC	Habitat area of particular concern
HCA	Habitat Closed Area
HPTRP	Harbor Porpoise Take Reduction Plan
I/O	Input/output
ICNAF	International Commission for the Northwest Atlantic Fisheries
IFQ	Individual fishing quota
IOY	Initial Optimal Yield
IRFA	Initial Regulatory Flexibility Analysis
ITQ	Individual transferable quota
IVR	Interactive voice response reporting system
IWC	International Whaling Commission
IWP	Internal Waters Processing
JVP	Joint Venture Processing
LISA	Local Indicator of Spatial Association
LOA	Letter of authorization
LPUE	Landings per unit of effort
LWTRP	Large Whale Take Reduction Plan
M	Natural Mortality Rate
MA	Mid-Atlantic
MA DMF	Massachusetts Division of Marine Fisheries
MAFAC	Marine Fisheries Advisory Committee
MAFMC	Mid-Atlantic Fishery Management Council
MARFIN	Marine Fisheries Initiative
ME DMR	Maine Department of Marine Resources
MEY	Maximum economic yield

MMC	Multispecies Monitoring Committee
MMPA	Marine Mammal Protection Act
MPA	Marine protected area
MRFSS	Marine Recreational Fishery Statistics Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum sustainable yield
MWT	Midwater trawl; includes paired mid-water trawl when referring to fishing activity or vessels in this document
mt	Metric Tons
NAO	North Atlantic Oscillation
NAPA	National Academy of Public Administration
NAS	National Academy of Sciences
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fishery Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office
NLCA	Nantucket Lightship closed area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NS	National Standard
NSGs	National Standard Guidelines
NSTC	Northern Shrimp Technical Committee
NT	Net tonnage
NWA	Northwest Atlantic
OBDBS	Observer database system
OA2	Omnibus Essential Fish Habitat Amendment 2
OCS	Outer Continental Shelf
OFL	Overfishing Limit
OLE	Office for Law Enforcement (NMFS)
OY	Optimum yield
PBR	Potential Biological Removal
PDT	Plan Development Team
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
PS/FG	Purse Seine/Fixed Gear
PSC	Potential Sector Contribution
QCM	Quota change model
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action

RIR	Regulatory Impact Review
RMA	Regulated Mesh Area
RPA	Reasonable and Prudent Alternatives
SA	Statistical Area
SAFE	Stock Assessment and Fishery Evaluation
SAP	Special Access Program
SARC	Stock Assessment Review Committee
SASI	Swept Area Seabed Impact
SAV	Submerged Aquatic Vegetation
SAW	Stock Assessment Workshop
SBNMS	Stellwagen Bank National Marine Sanctuary
SCAA	Statistical catch-at-age assessment model
SEIS	Supplemental Environmental Impact Statement
SFA	Sustainable Fisheries Act
SFMA	Southern Fishery Management Area (monkfish)
SIA	Social Impact Assessment
SNE	Southern New England
SNE/MA	Southern New England-Mid-Atlantic
SSB	Spawning stock biomass
SSC	Scientific and Statistical Committee
TAC	Total allowable catch
TALFF	Total Allowable Level of Foreign Fishing
TC	Technical Committee
TED	Turtle excluder device
TEWG	Turtle Expert Working Group
TMGC	Trans-boundary Management Guidance Committee
TMS	Ten minute square
TRAC	Trans-boundary Resources Assessment Committee
TRT	Take Reduction Team
TSB	Total stock biomass
USAP	U.S. At-Sea Processing
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VEC	Valued Ecosystem Component
VMS	Vessel monitoring system
VPA	Virtual population analysis
VTR	Vessel trip report
WGOM	Western Gulf of Maine
WO	Weighout
YPR	Yield per recruit

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3.0 Introduction and Background

3.1 Background

The primary statute governing the management of fishery resources in the Exclusive Economic Zone (EEZ) of the United States is the Magnuson-Stevens Fishery Conservation and Management Act (M-S Act). In brief, the purposes of the M-S Act are:

> (1) to take immediate action to conserve and manage the fishery resources found off the coasts of the United States;
>
> (2) to support and encourage the implementation and enforcement of international fishery agreements for the conservation and management of highly migratory species;
>
> (3) to promote domestic and recreational fishing under sound conservation and management principles;
>
> (4) to provide for the preparation and implementation, in accordance with national standards, of fishery management plans which will achieve and maintain, on a continuing basis, the optimum yield from each fishery;
>
> (5) to establish Regional Fishery Management Councils to exercise sound judgment in the stewardship of fishery resources through the preparation, monitoring, and revisions of such plans under circumstances which enable public participation and which take into account the social and economic needs of the States.

In New England, the New England Fishery Management Council (NEFMC) is charged with developing management plans that meet the requirements of the M-S Act.

The Northeast Multispecies Fishery Management Plan (FMP) specifies the management measures for thirteen groundfish species (cod, haddock, yellowtail flounder, pollock, plaice, witch flounder, white hake, windowpane flounder, Atlantic halibut, winter flounder, yellowtail flounder, ocean pout, and Atlantic wolffish) off the New England and Mid-Atlantic coasts. Some of these species are sub-divided into individual stocks that are attributed to different geographic areas. Commercial and recreational fishermen harvest these species. The FMP has been updated through a series of amendments and framework adjustments.

Amendment 16, which became effective on May 1, 2010, adopted a broad suite of management measures in order to achieve the fishing mortality targets necessary to rebuild overfished stocks and meet other requirements of the M-S Act. In 2011, the NEFMC also approved Amendment 17, which allowed for NOAA-sponsored state-operated permit banks to function within the structure of Amendment 16. Amendment 16 greatly expanded the sector management program and adopted a process for setting Annual Catch Limits that requires catch levels to be set in biennial specifications packages. Several lawsuits challenged various provisions of Amendment 16, including the amendment's provisions related to sectors and some of the accountability measures.

Five framework adjustments have updated the measures in Amendment 16. The first, published as Framework 44, became effective on May 1, 2010 concurrently with Amendment 16. It adopted the required specifications for regulated northeast multispecies stocks for fishing years 2010-2012, as well as stocks managed by the U.S./Canada Resource Sharing Agreement. It was also used to incorporate the best available information in adjusting effort control measures adopted in Amendment 16. Framework 45 became effective on May 1, 2011. It built upon revisions made to the sector program in Amendment 16 and Framework 44, set specifications required under the U.S./Canada Resource Sharing Agreement, and incorporated an updated stock assessment for pollock. Framework 46 was implemented in September 14, 2011 and modified the provisions that restrict mid-water trawl catches of haddock. Framework Adjustment 47 was implemented May 1, 2012 and set specifications for some groundfish stocks for FY 2012-2014, modified AMs for the groundfish fishery and the administration of the scallop fishery AMs, revised common pool management measures. Framework Adjustment 48 was approved by the Council on December 20, 2012, but has not yet been approved by NMFS. That action proposes revised status determination criteria for several stocks, modifies the sub-ACL system, adjusts monitoring measures for the groundfish fishery, and changes several accountability measures (AMs). It is expected that Framework 48 will be implemented at the same time as FW 50. Framework Adjustment 49 is a joint Northeast Multispecies/Atlantic Sea Scallop action that modifies the dates for scallop vessel access to the year-round groundfish closed areas; this action is in review and has not yet been approved.

3.2 Purpose and Need for the Action

Under the Northeast Multispecies FMP the NMFS Regional Administrator, in consultation with the Council, is required to determine the specifications for the groundfish fishery. The best available science is reviewed to determine the status of the resource and fishery. These data, in conjunction with the ABC control rules adopted in Amendment 16, are used to set appropriate specifications for the stocks. Previous actions have established evaluation protocols and rebuilding plans for stocks; these are revised with the updated science. Periodic frameworks are used to adjust strategies in response to the evaluations that adjust rebuilding plans and overfishing.

This framework adds to elements of Amendment 16 to prevent overfishing. Similar modifications to Amendment 16 have been made in recent frameworks. This framework would also modify measures from Amendment 16 regarding the management measures for SNE/MA winter flounder. These specifications and adjustments to Amendment 16, listed in the following table, are intended to meet the goals and many of the objectives of the Northeast Multispecies FMP, as modified in Amendment 16.

The measures that are considered in this action were first considered as part of Framework Adjustment 48. During the final decision for FW 48, the Council removed the specifications (OFLs/ABCs/ACLs) and decided to submit them as a separate action. The Council also decided to modify the SNE/MA winter flounder rebuilding strategy. This action would implement those decisions.

To better demonstrate the link between the purpose and need for this action, the following table summarizes the need for the action and corresponding purposes.

Need for Framework 50	*Corresponding Purpose for Framework 50*
Set specifications for ACLs in Fishing Years 2013-2015 consistent with best available science, the ABC control rules adopted in Amendment 16 to the Northeast Multispecies FMP, the International Fisheries Agreement Clarification Act, and the most recent relevant law	• Measures to adopt ACLs, including relevant sub-ACLs and incidental catch TACs • Measures to adopt TACs for U.S./Canada area
Modify rebuilding program for SNE/MA winter flounder consistent with the status of stocks, the National Standard guidelines, and the requirements of the MSA	• Modification of the formal rebuilding program for SNE/MA winter flounder • Modification of accountability measures for SNE/MA winter flounder • Modification of measures that apply to SNE/MA winter flounder

3.3 Brief History of the Northeast Multispecies Management Plan

Groundfish stocks were managed under the M-S Act beginning with the adoption of a groundfish plan for cod, haddock, and yellowtail flounder in 1977. This plan relied on hard quotas (total allowable catches, or TACs), and proved unworkable. The quota system was rejected in 1982 with the adoption of the Interim Groundfish Plan, which relied on minimum fish sizes and codend mesh regulations for the Gulf of Maine and Georges Bank to control fishing mortality. The interim plan was replaced by the Northeast Multispecies FMP in 1986, which established biological targets in terms of maximum spawning potential and continued to rely on gear restrictions and minimum mesh size to control fishing mortality.

Amendment 5 was a major revision to the FMP. Adopted in 1994, it implemented reductions in time fished (days-at-sea, or DAS) for some fleet sectors and adopted year-round closures to control mortality. A more detailed discussion of the history of the management plan up to 1994 can be found in Amendment 5 (NEFMC 1994). Amendment 7 (NEFMC 1996), adopted in 1996, expanded the DAS program and accelerated the reduction in DAS first adopted in Amendment 5. After the implementation of Amendment 7, there were a series of amendments and smaller changes (framework adjustments) that are detailed in Amendment 13 (NEFMC 2003).

Amendment 13 was developed over a four-year period to meet the M-S Act requirement to adopt rebuilding programs for stocks that are overfished and to end overfishing. Amendment 13 also brought the FMP into compliance with other provisions of the M-S Act. Subsequent to the implementation of Amendment 13, FW 40A provided opportunities to target healthy stocks, FW 40B improved the effectiveness of the effort control program, and FW 41 expanded the vessels eligible to participate in a Special Access Program (SAP) that targets GB haddock. FW 42 included measures to implement the biennial adjustment to the FMP as well as a Georges Bank yellowtail rebuilding strategy, several changes to the Category B (regular) DAS Program and two Special Access Programs, an extension of the DAS leasing program, and introduced the differential DAS system. FW 43 adopted haddock catch caps for the herring fishery and was implemented August 15, 2006.

Amendment 16 was adopted in 2009 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 M-S Act. 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. An appeal of the lawsuit filed by the Cities of Gloucester and New Bedford and several East Coast fishing industry members against Amendment 16 was heard by the U.S. Court of Appeals for the First Circuit in Boston in September, 2012. The court ruled against the plaintiffs and the provisions of Amendment 16 were upheld. Framework 44 was also adopted in 2009, and it set specifications for FY 2010 – 2012 and incorporated the best available information in adjusting effort control measures adopted in Amendment 16. Framework 45 was approved by the Council in 2010 and adopts further modifications to the sector program and fishery specifications; it was implemented May 1, 2011. Framework 46 revised the allocation of haddock to be caught by the herring fishery and was implemented in August 2011. Amendment 17, which authorizes the function of NOAA-sponsored state-operated permit bank, was implemented on April 23, 2012. Framework 47, implemented on May 1, 2012, set specifications for some groundfish stocks for FY 2012 – 2014, modified AMs for the groundfish fishery and the administration of the scallop fishery AMs, and revised common pool management measures; modification of the Ruhle trawl definition and clarification of regulations for charter/party and recreational groundfish vessels fishing in groundfish closed areas were proposed under the RA authority. Framework 48 is under review and may modify several ACLs and AMs, adjust monitoring measures, and provide opportunities to increase landings of some stocks.

A more detailed description of the history of the FMP is included in Amendment 16, and each of these actions can be found on the internet at http://www.nefmc.org.

3.4 National Environmental Policy Act (NEPA)

NEPA provides a structure for identifying and evaluating the full spectrum of environmental issues associated with Federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. This document includes the required NEPA analyses.

4.0 Alternatives Under Consideration

4.1 Formal Rebuilding Programs and Annual Catch Limits

4.1.1 SNE/MA Winter Flounder Rebuilding Strategy

4.1.1.1 Option 1: No Action

If this option would be adopted, the rebuilding strategy for SNE/MA winter flounder would continue to target an ending date of 2014 with a median probability of success. Since the stock is unlikely to rebuild by that date in the absence of all fishing mortality, the management objective would be to reduce fishing mortality to as close to 0 as possible until the stock is rebuilt.

Rationale: This option would attempt to rebuild the SNE/MA winter flounder stock as soon after the original rebuilding period ending date (2014) as possible. Management measures that prohibited retention of SNE/MA winter flounder resulted in fishing mortality of less than 0.10 in CY 2010 and 2011.

4.1.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

This option would adopt a new strategy that would target rebuilding of SNE/MA winter flounder by 2023 with a median probability of success. Short-term catch advice during the rebuilding period may be reduced below the projected rebuilding catch in order to account for uncertainty in stock projections.

The current estimate of the rebuilding fishing mortality is F=0.175. This estimate would be revised during the course of the rebuilding program.

Rationale: This option would acknowledge that rebuilding cannot be achieved by 2014 and would restart the rebuilding period timeline as of 2013. Because the stock can rebuild in less than ten years in the absence of all fishing mortality (Tmin= 2019), the maximum period is ten years (Tmax). Adopting this period would rebuild as quickly as possible taking into account the needs of fishing communities. As analyzed in Section 7.4.1.1.2, this strategy would return greater net benefits than a strategy that targets an end date between 2019 and 2023. Because stock projections have demonstrated a tendency to predict more rapid stock growth than is realized, short term catch advice may reduce catches from the rebuilding fishing mortality rate in order to account for the uncertainty in projections. If the stock increases more rapidly than originally projected, the rebuilding fishing mortality rate will be recalculated and could lead to increases in catch.

4.1.2 Annual Catch Limit Specifications

4.1.2.1 Option 1: No Action

If the No Action option is selected, the specifications for FY 2013-FY 2014 would remain as adopted by FW 47. For many stocks there would not be any specifications for these years. The FY 2013 - FY 2014 ABCs would be as specified in Table 1.

If this option is selected, there would be no specific allocations made for the US/CA Resource Sharing Understanding quotas for FY 2013. These quotas are specified annually.

If this option is selected, there would be no specific allocations to the scallop fishery. While these allocations are typically made for a multi-year period, none have been specified beyond FY 2012.

Rationale: This No Action option is required by NEPA. While it would rebuild stocks quickly, it would not address M-S Act requirements to achieve OY and consider the needs of fishing communities.

Table 1 – No Action/Option 1 Northeast Multispecies OFLs, ABCs, ACLs, and other ACL sub-components for FY 2012 (metric tons, live weight). Values are rounded to the nearest metric ton.
(1) Grayed out values may be adjusted as a result of future recommendations of the TMGC. Values shown for GB haddock and cod are preliminary estimates subject to change.

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Groundfish Sub-ACL	Comm Groundfish Sub-ACL	Rec Groundfish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non_Sector Groundfish Sub-ACL	MWT Sub_ ACL	Total ACL
GB Cod[(1)]	2013												
	2014												
	2015												
GOM Cod	2013												
	2014												
	2015												
GB Haddock[(1)]	2013												
	2014												
	2015												
GOM Haddock	2013												
	2014												
	2015												
GB Yellowtail Flounder[(1)]	2013												
	2014												
	2015												
SNE/MA Yellowtail Flounder	2013												
	2014												
	2015												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Groundfish Sub-ACL	Comm Groundfish Sub-ACL	Rec Groundfish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non_Sector Groundfish Sub-ACL	MWT Sub_ ACL	Total ACL
CC/GOM Yellowtail Flounder	2013												
	2014												
	2015												
Plaice	2013												
	2014												
	2015												
Witch Flounder	2013												
	2014												
	2015												
GB Winter Flounder	2013	4,819	3,750	0	188	0	3,384		0	3,361	23	0	3,572
	2014	4,626	3,598	0	180	0	3,247		0	3,225	22	0	3,427
	2015												
GOM Winter Flounder	2013	1,458	1,078	272	54	0	715		0	679	36	0	1,040
	2014	1,458	1,078	272	54	0	715		0	679	36	0	1,040
	2015												
SNE/MA Winter Flounder	2013	2,637	697	195	139	0	337		0	0	337	0	672
	2014	3,471	912	255	182	0	441		0	0	441	0	879
	2015												
Redfish	2013												
	2014												
	2015												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Groundfish Sub-ACL	Comm Groundfish Sub-ACL	Rec Groundfish Sub-ACL	Prelim-inary Sectors Sub-ACL	Preliminary Non_Sector Groundfish Sub-ACL	MWT Sub_ ACL	Total ACL
White Hake	2013												
	2014												
	2015												
Pollock	2012	19,887	15,400	754	1,370	0	12,612		0	12,518	94	0	14,736
	2013	20,060	15,600	756	1,380	0	12,791		0	12,695	95	0	14,927
	2014	20,554	16,000	760	1,400	0	13,148		0	13,050	98	0	15,308
N. Window-pane Flounder	2013												
	2014												
	2015												
S. Window-pane Flounder	2013												
	2014												
	2015												
Ocean Pout	2013												
	2014												
	2015												
Atlantic Halibut	2013												
	2014												
	2015												
Atlantic Wolffish	2013												
	2014												
	2015												

Table 2 – Option 1 preliminary incidental catch TACs for Special Management Programs (metric tons, live weight). These values may change as a result of changes in sector membership.

	Cat B (regular) DAS Program			CAI Hook Gear Haddock SAP			EUS/CA Haddock SAP		
Stock	**2013**	**2014**	**2015**	**2013**	**2014**	**2015**	**2013**	**2014**	**2015**
GB cod									
GOM cod									
GB Yellowtail									
CC/GOM yellowtail									
SNE/MA Yellowtail									
Plaice									
Witch Flounder									
White Hake									
SNE/MA Winter Flounder									
GB Winter Flounder									
Pollock									

Table 3 – Proposed CAI Hook Gear Haddock SAP TACs, FY 2013-2014

Year	Exploitable Biomass (thousand mt)	WGB Exploitable Biomass	B(year)/B2004	TAC (mt, live weight)
2013- 2014				

4.1.2.2 Option 2: Revised Annual Catch Limit Specifications (Preferred Alternative)

If Option 2 is selected, the specifications for FY 2013 through FY 2015 would be as specified in Table 8.

The specifications in Table 8 reflect two other decisions that influence the values in the table. The first is the specification of quotas for EGB cod, EGB haddock, and GB yellowtail flounder for the U.S./Canada Resource Sharing area. The second is the identification of sub-ACLs for the scallop fishery for three stocks: GB yellowtail flounder, SNE/MA yellowtail flounder, and SNE/MAB windowpane flounder.

Benchmark assessments were completed for GB cod and GOM cod in December 2012. Because the results of these assessments were not available until January 2013, early drafts of this document indicated a broad range of possible ABCs for these two stocks. Once the assessments were completed, specific ABCs were recommended by the SSC and adopted by the Council, . so the preliminary ranges are not shown. Since the SSC forwarded two ABCs for GOM cod, both are included in Table 8.

U.S./Canada TACs[2]

This alternative would specify TACs for the U.S./Canada Management Area for FY 2013 as indicated in Table 4 below. These TACs would be in effect for the entire fishing year, unless NMFS determines that FY 2012 catch of GB cod, haddock, or yellowtail flounder from the U.S./Canada Management Area exceeded the pertinent 2012 TAC. If the TAC in a particular fishing year is exceeded, the Understanding and the regulations require that the TAC for the subsequent fishing year is reduced by the amount of the overage. In order to minimize any disruption to the fishing industry, NMFS would attempt to make any necessary TAC adjustment in the first quarter of the fishing year.

Two alternatives were considered for GB yellowtail flounder. The TMGC recommended a 500 mt total quota for 2013 based on the 2012 assessment. The second value is based on an SSC decision that 1,150 mt could be a backstop ABC if measures are adopted to allow only a bycatch fishery. The Council-preferred alternative is the 1,150 mt value. The NMFS-preferred alternative is 500 mt.

A comparison of the proposed FY 2013 U.S. TACs and the FY 2012 U.S. TACs is shown in Table 5. Changes to the U.S. TACs reflect changes to the percentage shares, stock status, and the TMGC recommendations.

[2] This section was modified by NMFS after the Council submitted FW50 on March 22, 2013. The revisions, which are underlined, reflect the Secretarial emergency action to implement a GB yellowtail flounder quota of 500 mt for FY 2013.

Table 4 - Proposed FY 2013 U.S./Canada TACs (mt) and Country Shares

TAC	Eastern GB Cod	Eastern GB Haddock	GB Yellowtail Flounder
Total Shared TAC	600 mt	10,400 mt	500/ 1150 mt preferred
U.S. TAC	96 mt	3,952 mt	215 / 495 preferred
Canada TAC	504 mt	6,448 mt	285/ 656 preferred

Table 5 - Comparison of the Proposed FY 2013 U.S. TACs and the FY 2012 U.S. TACs (mt)

Stock	U.S. TAC		Percent Change
	FY 2013	FY 2012	
Eastern GB cod	96 mt	162 mt	-41%
Eastern GB haddock	3,952 mt	6,880	-43%
GB yellowtail	215 mt	564 mt	-62%
	495 mt		-12%

Scallop Fishery Sub-ACLs

This option would specify scallop fishery sub-ACLs for GB yellowtail flounder, SNE/MA yellowtail flounder, and possibly SNE/MAB windowpane flounder. Changes to the administration of those sub-ACLs are being considered in Framework 48, which has not yet been approved. For this reason, the tables below reflect all the options that may result from the Framework 48 decision, and identify the Preferred Alternatives.

Sub-ACLs for the two yellowtail flounder stocks were adopted in Amendment 16. FW 48 considers three alternatives for specifying how the sub-ACL for GB yellowtail flounder is calculated (see Section 4.1.3 of FW 48). The possible values based on the alternatives are shown below. The selected scallop fishery management alternative that will probably be implemented is Alternative 2. For those alternatives that are based on the expected scallop fishery catch of yellowtail flounder, the amount that would be allocated depends on both the scallop management alternative selected and the overall GB yellowtail flounder ABC. These values are shown in Table 6. The values shown are for the sub-ABC, which is then reduced for management uncertainty.

For SNE/MA yellowtail flounder, the Council selected an allocation for the scallop fishery. For reference, the expected catches for the various scallop management alternatives are shown in

Table 7. In FY 2010 – FY 2012, the sub-ACL for this stock was based on 90 percent of the estimated scallop fishery catch, but the Council is not bound by this decision. The preferred alternative would allocate the scallop fishery 90 percent of the high estimate in Table 7. In addition, this sub-ACL would be managed in a manner similar to the GB yellowtail flounder sub-ACL in order to prevent the loss of available yield of this stock. NMFS would evaluate catches of SNE/MA yellowtail flounder by the scallop fishery by January 15 of the fishing year. Should the estimate indicate that the scallop fishery will catch less than 90 percent of the entire sub-ACL, NMFS will reduce the scallop fishery sub-ACL to the amount expected to be caught and increase the groundfish sub-ACL by up to the difference between the original estimate and the revised estimate. The increase in the groundfish sub-ACL will be distributed to sectors and the common pool. If the amount of yellowtail flounder projected to be caught by the scallop fishery exceeds the scallop fishery sub-ACL, there will not be any changes to the sub-ACL.

For SNE/MA windowpane flounder FW 48 may establish a scallop fishery sub-ACL. If this sub-ACL is adopted, the scallop fishery would be allocated 36 percent of the ABC. These values are shown in Table 8.

Rationale: This measure would adopt new specifications for groundfish stocks that are consistent with the most recent assessment information. For most stocks, only one alternative to No Action is shown. This is because these catches represent the best scientific information, as determined by the Council's Science and Statistical Committee, and the M-S Act requires that catches not be set higher than these levels.

The U.S. and Canada coordinate management of three stocks that overlap the boundary between the two countries on Georges Bank. Typically, the amount to be caught each year is agreed upon by the Transboundary Management Guidance Committee (TMGC). This measure considers the recommendations of the TMGC that are consistent with the most recent assessments of those stocks, with the exception of the Council preferred alternative for GB yellowtail flounder. As described above, the Council preferred alternative for GB yellowtail flounder is not consistent with the TMGC's recommendation for FY 2013, and is based on its SSC recommendation. The SSC's recommendation for 1,150 mt was not based on the most recent assessment for the stock. The NMFS preferred alternative of 500 mt for GB yellowtail flounder is consistent with the TMGC recommendation and the 2012 assessment, which NMFS considers the best scientific information available.

The specification of sub-ACLs for the scallop fishery will help ensure that bycatches of GB and SNE/MA yellowtail flounder, and SNE/MA windowpane flounder, are controlled and do not lead to overfishing. These changes to the sub-ACLs were submitted in FW 48, and the tables reflect the values if those decisions are implemented.

p fishery catch of GB yellowtail flounder, 90 percent of that estimate, and 8 and 16 percent of the GB yellowtail flounder ABC.
e U.S. share under an ABC of 500 mt; greyed out values exceed the U.S. share with an ABC of 1,150 mt. Note scallop sub-ABCs are
nagement uncertainty. Fixed percentages shown for U.S. share of 215 mt and 495 mt. Scallop Alternative 2 is the Preferred Alternative
ework Adjustment 24.

Scallop FW 24 Management Alternative								
ction	Alt1		Alt2		Alt3		Alt4	
2014	2013	2014	2013	2014	2013	2014	2013	2014
cted scallop fishery catch of GB yellowtail flounder								
96.5	46.9	42.6	40.7	65.9	43.4	56.2	26.4	38.1
186.0	106.6	123.0	85.3	127.0	90.0	108.0	55.1	71.0
325.2	194.3	*234.4*	152.8	*220.1*	161.4	186.7	97.4	121.5
t 90 percent of expected scallop fishery catch of GB yellowtail flounder								
86.9	42.2	38.4	36.7	59.3	39.1	50.6	23.8	34.3
167.4	95.9	110.7	76.8	114.3	81.0	97.2	49.6	63.9
292.7	174.9	211.0	137.5	198.1	145.2	168.0	87.6	109.4
p Sub-ABC at a Fixed Percentage Allocation of GB YTF ABC								
17.2/39.6								
34.4/79.2								

Table 7 – Estimated scallop fishery catch of SNE/MA yellowtail flounder and scallop fishery sub-ABC. Note these sub-ABCs are reduced to account for management uncertainty. Alternative 2 is the Preferred Alternative in Scallop Framework 24.

	Scallop FW 24 Management Alternative														
	No Action			Alt 1			Alt 2			Alt 3			Alt 4		
	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
	Estimated scallop fishery catches of SNE/MA yellowtail flounder														
Low	59.4	61.2	67.5	55.8	64.8	63	59.4	64.8	63	55.8	64.8	63.9	59.4	65.7	63
Medium	66	68	75	62	72	70	66	72	70	62	72	71	66	73	70
High	72.6	74.8	82.5	68.2	79.2	77	72.6	79.2	77	68.2	79.2	78.1	72.6	80.3	77
	Scallop Sub-ABC at 90 percent of estimated catches shown above														
Low	53.5	55.1	60.8	50.2	58.3	56.7	53.5	58.3	56.7	50.2	58.3	57.5	53.5	59.1	56.7
Medium	59.4	61.2	67.5	55.8	64.8	63.0	59.4	64.8	63.0	55.8	64.8	63.9	59.4	65.7	63.0
High	65.3	67.3	74.3	61.4	71.3	69.3	65.3	71.3	69.3	61.4	71.3	70.3	65.3	72.3	69.3

Table 8 – Option 2 Northeast Multispecies OFLs, ABCs, ACLs, and other ACL sub-components for FY 2013 – FY 2015 (metric tons, live weight). Values are rounded to the nearest metric ton. Sector shares based on 2012 PSCs. UPDATED 11/01/2012.

(1) Grayed out values will be adjusted as a result of future recommendations of the TMGC.

(2) Assumes scallop sub-ABC of 40 percent at both ABC values; small-mesh sub-ABC of 2 percent

(3) Assumes scallop sub-ABC is 40 pct for both ABC values; no small mesh sub-ACL.

(4) Other sub-components would be a sub-ACL for SNE/MA windowpane flounder if a FW 48 Preferred Alternative is adopted

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components (4)	Scallops	Groundfish Sub-ACL	Comm Groundfish Sub-ACL	Rec Groundfish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non_Sector Groundfish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
GB Cod()	2013	3,279	2,002	20	80	0	1,807		0	1,775	32	0	1,907
	2014	3,570	2,002	20	80	0	1,807		0	1,775	32	0	1,907
	2015	4,191	2,002	20	80	0	1,807		0	1,775	32	0	1,907
GOM Cod 2013-2015		1,634	1,249	83	41	0		669	391	656	13		
	Pref	1,635	**1,550**	103	51	0		830	486	814	16	0	1,470
GB Haddock(1)	2013	46,185	29,335	293	1,173	0	26,196		0	26,124	72	273	27,936
	2014	46,268	35,699	357	1,428	0	31,879		0	31,792	87	332	33,996
	2015	56,293	43,606	436	1,744	0	38,940		0	38,833	107	406	41,526
GOM Haddock	2013	371	290	4	6	0		187	74	186	1	3	274
	2014	440	341	5	7	0		220	87	218	2	3	323
	2015	561	435	6	9	0		280	111	279	2	4	412
GB Yellowtail Flounder(2)	2013 Council Pref.	Unk.	495	0	9.9	192.1	268.9		0	265.8	3.1	9.2	480.1
	2013 NMFS Pref.	882	215	0	4.3	83.4	116.8		0.0	115.4	1.3	4.0(4)	208.5
GB Yellowtail Flounder(3)	2013 Council Pref.	Unk.	495	0	9.9	192.1	278.5		0	275.3	3.2	0.0	480.4
	2013 NMFS Pref.	882	215	0	4.3	83.4	121.0		0.0	119.6	1.4	0.0	208.7

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Groundfish Sub-ACL	Comm Groundfish Sub-ACL	Rec Groundfish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non_Sector Groundfish Sub-ACL	MWT Sub_ ACL	Total ACL
SNE/MA Yellowtail Flounder	2013	1,021	700	7	28	61	570		0	455	115	0	665
	2014	1,042	700	7	28	66	564		0	450	114	0	665
	2015	1,056	700	7	28	64	566		0	452	114	0	665
CC/GOM Yellowtail Flounder	2013	713	548	33	11	0	479		0	467	12	0	523
	2014	936	548	33	11	0	479		0	467	12	0	523
	2015	1,194	548	33	11	0	479		0	467	12	0	523
Plaice	2013	2,035	1,557	31	31	0	1,420		0	1,396	24	0	1,482
	2014	1,981	1,515	30	30	0	1,382		0	1,359	23	0	1,442
	2015	2,021	1,544	31	31	0	1,408		0	1,385	24	0	1,470
Witch Flounder	2013	1,196	783	23	117	0	610		0	601	9	0	751
	2014	1,512	783	23	117	0	610		0	601	9	0	751
	2015	1,846	783	23	117	0	610		0	601	9	0	751
GB Winter Flounder	2013	4,819	3,750	0	113	0	3,528		0	3,508	21	0	3,641
	2014	4,626	3,598	0	108	0	3,385		0	3,366	20	0	3,493
	2015												
GOM Winter Flounder	2013	1,458	1,078	272	54	0	714.7		0	690.3	24.4	0	1,040
	2014	1,458	1,078	272	54	0	714.7		0	690.3	24.4	0	1,040
	2015												
SNE/MA Winter Flounder	2013	2,732	1,676	235	168	0	1,210		0	968	242	0	1,612
	2014	3,372	1,676	235	168	0	1,210		0	968	242	0	1,612
	2015	4,439	1,676	235	168	0	1,210		0	968	242	0	1,612
Redfish	2013	15,468	10,995	110	220	0	10,132		0	10,091	41	0	10,462
	2014	16,130	11,465	115	229	0	10,565		0	10,522	43	0	10,909
	2015	16,845	11,974	120	239	0	11,034		0	10,989	45	0	11,393

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Groundfish Sub-ACL	Comm Groundfish Sub-ACL	Rec Groundfish Sub-ACL	Prelim-inary Sectors Sub-ACL	Preliminary Non_Sector Groundfish Sub-ACL	MWT Sub_ ACL	Total ACL
White Hake	2013 Council pref.	5,306	3,638	36	73	0	3,352		0	3,326	27	0	3,462
	2013 NMFS pref.	5,462	4,177	42	84	0	3,853		0	3,822	31	0	3,978
	2014												
	2015												
Pollock	2013	20,060	15,600	936	1,092	0	12,893		0	12,810	84	0	14,921
	2014	20,554	16,000	960	1,120	0	13,224		0	13,138	86	0	15,304
	2015												
N. Window-pane Flounder	2013	202	151	2	44	0	98		0	0	98	0	144
	2014	202	151	2	44	0	98		0	0	98	0	144
	2015	202	151	2	44	0	98		0	0	98	0	144
S. Window-pane Flounder	2013	730	548	55	384	0	102		0	0	102	0	540
	2014	730	548	55	384	0	102		0	0	102	0	540
	2015	730	548	55	384	0	102		0	0	102	0	540
S. Window-pane Flounder Scallop Sub-ACL	2013	730	548	55	186	183	102		0	0	102	0	527
	2014	730	548	55	186	183	102		0	0	102	0	527
	2015	730	548	55	186	183	102		0	0	102	0	527
Ocean Pout	2013	313	235	2	21	0	197		0	0	197	0	220
	2014	313	235	2	21	0	197		0	0	197	0	220
	2015	313	235	2	21	0	197		0	0	197	0	220
Atlantic Halibut	2013	164	99	40	5	0	52		0	0	52	0	96
	2014	180	109	44	5	0	57		0	0	57	0	106
	2015	198	119	48	6	0	62		0	0	62	0	116
Atlantic Wolffish	2013	94	70	1	3	0	62		0	0	62	0	65
	2014	94	70	1	3	0	62		0	0	62	0	65
	2015	94	70	1	3	0	62		0	0	62	0	65

Table 9 – Option 2 preliminary incidental catch TACs for Special Management Programs (metric tons, live weight). These values may change as a result of changes in sector membership. GB winter flounder and SNE/MA yellowtail flounder are no longer a stock of concern and has been deleted.

	Cat B (regular) DAS Program			CAI Hook Gear Haddock SAP			EUS/CA Haddock SAP		
Stock	**2013**	**2014**	**2015**	**2013**	**2014**	**2015**	**2013**	**2014**	**2015**
GB cod	0.0/0.6			0.0/0.2			0.0/0.4		
GOM cod	0.1/0.4								
GB Yellowtail	0.0						0.0		
CC/GOM yellowtail	0.1	0.1	0.1						
Plaice	1.2	1.2	1.2						
Witch Flounder	0.5	0.5	0.5						
White Hake (*Council preferred)*	0.5								
White Hake (*NMFS preferred)*	0.6								
SNE/MA Winter Flounder	3.4	4.4							

Table 10 – Proposed CAI Hook Gear Haddock SAP TACs, FY 2013 - 2015

Year	Exploitable Biomass (thousand mt)	WGB Exploitable Biomass	B(year)/B2004	TAC (mt, live weight)
2013	133,391	46,687	1.709	1,932
2014	136,753	47,864	1.752	1,980
2015	169,027	59,159	2.166	2,448

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4.2 Commercial and Recreational Fishery Measures

4.2.1 SNE/MA Winter Flounder Landing Restrictions

4.2.1.1 Option 1: No Action

Landing of SNE/MA winter flounder would continue to be prohibited to commercial and recreational groundfish fishing vessels.

Rationale: The prohibition on retention was adopted by Amendment 16 to discourage fishing on this stock so that fishing mortality could be reduced as close to 0 as possible. Fishing mortality has been reduced to below F_{MSY} as a result. This measure would continue the prohibition in order to rebuild this stock as quickly as possible.

4.2.1.2 Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

This option would allow the landing of SNE/MA winter flounder by commercial and recreational groundfish fishing vessels. Sectors would receive an allocation of this stock, and sector vessels would be required to land all legal-sized SNE/MA winter flounder. Common-pool vessels would be allowed to land legal-sized fish, subject to any trip limits or other in-season restrictions that may be adopted to ensure the ACL is not exceeded.

Rationale: This measure would allow landings of SNE/MA winter flounder in order to promote achieving OY, and would help mitigate the economic impacts of the low ACLs of other stocks. It would also allow collection of biological samples from landed fish.

4.2.2 Commercial Fishery Accountability Measures

4.2.2.1 Option 1: No Action

If this option is adopted, AMs for this fishery would remain as adopted by Amendment 16 and subsequent framework actions. The AM system that has been adopted is designed to reduce the probability of overfishing by adjusting management measures if a groundfish fishery ACL is exceeded. For sector vessels, the AM for most stocks is the requirement that sectors stop fishing in a stock area when an ACE is caught, and there is a pound-for-pound penalty in the following year if the sector's ACE is exceeded. Common pool vessels are subject to a TAC system that closes specific areas if a quota is exceeded. There are exceptions to these general statements that are described below.

The AMs for SNE/MA winter flounder would not be changed if this option is adopted. The current AM prohibits possession, but a change may result from FW 48 that would implement gear restrictions for groundfish fishing trips in certain areas if the total ACL is exceeded. Either of these measures would remain in place if this option is adopted.

4.2.2.2 Option 2: Revised AM for SNE/MA Winter Flounder (Preferred Alternative)

This option would modify the AMs for SNE/MA winter flounder for sector and common pool groundfish fishing vessels. This measure would replace the area-based AM for SNE/MA winter flounder that was proposed in FW 48 for sector vessels.

The stock would be allocated to sectors based on the PSC of each permit in the sector and all sector management provisions would apply. In general, the PSC for each permit would be determined as specified by Amendment 16. Sector vessels would be required to land legal-size SNE/MA winter flounder, and catches (landings and discards) would be charged against the sector's ACE. Sectors would be required to ensure that catches remain below the allocated ACE. If a sector exceeds its ACE, there are deductions in the ACE allocated to that sector in the following year.

For common pool vessels, the amount of this stock available to the common pool could be caught by common pool vessels. Common pool vessels would be subject to the area-based AM that was the Preferred Alternative in FW 48. Because this stock would be allocated and groundfish fishing vessels would be allowed to land it, the common pool AM would be triggered if the common pool exceeds the amount that is allocated to it by more than the management uncertainty buffer. Common pool vessels would also be subject to in-season adjustments in trip limits and/or DAS if necessary to control catches as a proactive AM.

Should an overage of the overall ACL result from fishing activity by other components of the fishery that do not have a specified sub-ACL and AMs, the overage will be distributed among the components of the fishery that do have a sub-ACL and the pertinent AMs would be triggered as necessary to account for the overage.

If the common pool AM is implemented trawl vessels fishing in the common pool would be required to use approved selective trawl gear that reduces the catch of demersal species. Approved gears include the separator trawl, Ruhle trawl, mini-Ruhle trawl, rope trawl, and other gear authorized by the Council in a management action or approved for use consistent with the process defined in 50 CFR 648.85 (b)(6). There would be no restrictions on longline or gillnet gear.

This measure differs from the groundfish fishery AM for SNE/MA winter flounder that would be implemented by FW 48. That AM would only be implemented if the total ACL (as opposed to the groundfish sub-ACL) is projected to be exceeded by an amount that exceeds the management uncertainty buffer. Should a sub-ACL be allocated to other fisheries and AMs developed for those fisheries, the AMs for either (or both) fisheries will be implemented only if the total ACL for the stock is exceeded. If only one fishery exceeds its sub-ACL the AM will be implemented only for that fishery.

Areas: The applicable areas where gear restrictions would apply are shown in Figure 1.The areas are designed to account for an AM overage of up to 20 percent. The areas would be implemented for common pool sub-ACL overages that exceed the management uncertainty buffer. Should an overage exceed 20 percent of the ACL, the AM will be implemented and then this measure will be reviewed in a future action.

Block 1:
41-10N 071-40W
East to Block Island Coastline at 41-10N
East along Block Island Coastline to 41-10N
41-10N 071-20W
41-00NI 071-20W
41-00N 071-40W

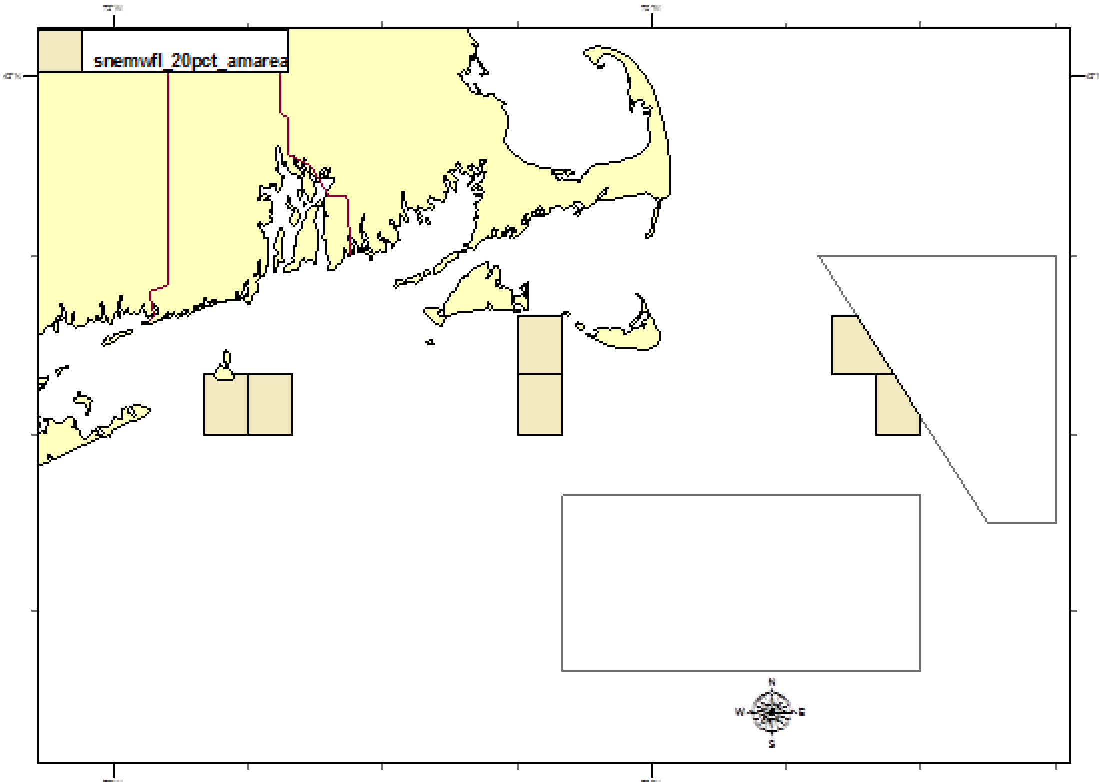
Block 2:
41-20N 070-30W
41-20N 070-20W
41-00N 070-20W
41-00N 070-30W

Block 3
41-20N 069-20W
41-20N 069-10W
41-10N 069-10W
41-10N 069-20W

Block 4:
41-20N 069-20W
Closed Area I Boundary at 41-20N
Closed Area I Boundary at 069-00W
41-00N 069-00W
41-00N 069-10W
41-10N 069-10W
41-10N 069-20W

Rationale: This measure adopts AMs that are more appropriate for a stock that can be landed by sectors and common pool vessels.

Figure 1 –SNE/MA winter flounder AM area preferred alternative for common pool vessels



4.2.1 Recreational Fishery Measures

The 2013 GOM haddock recreational management measures are implemented by NMFS under Regional Administrator authority provided by FW48. These measures are not part of FW50. FW48 adopted a proactive AM for the recreational fishery that allows the Regional Administrator to adjust management measures prior to the fishing year to ensure that the recreational fishery catches, but does not exceed, its sub-ACL.

4.2.1.1 Option 1: No Action on GOM Haddock Recreational Measures

If this option is adopted, GOM haddock recreational management measures will remain as specified for the 2012 fishing year, as follows:

Table 11 – Minimum Fish Sizes and Possession Limits for Recreational and Charter/Party Vessels

Species		Total Length (in)	Possession Limit	
Atlantic cod	Inside GOM Regulated Mesh Area	19	9 fish per person per day (possession prohibited Nov 1- Apr 15)	
	Outside GOM Regulated Mesh Area	22	**Private:** 10 fish per person per day	**Charter/Party**: No limit
haddock		18	Unlimited	

These measures would apply to both private anglers and recreational fishermen on party or charter vessels.

Framework 48 proposes to modify the recreational fishery AM and give the Regional Administrator authority to adjust recreational management measures for the upcoming fishing year to ensure the recreational fishery catches, but does not exceed, its sub-ACL. This measure has not been approved yet due to the timing of Framework 48. In part because of the timing complications involved with the concurrent Framework 48 and 50 actions, the Framework 48 provisions also specify that NMFS will consult with the Council on measures for the FY 2013 recreational fisheries. To satisfy this objective, the Council convened its Recreational Advisory Panel (RAP) on February 15, 2013, to provide NMFS guidance on FY 2013 management measures. For GOM cod, the RAP recommended a 9-fish possession limit and a minimum fish size of 19 in. This is the no action alternative for GOM cod and is the NMFS preferred alternative.

Rationale: Based on the the available analysis, the no action GOM cod recreational management measures are expected to provide an 82-percent probability of not exceeding the recreational sub-ACL. This same analysis indicates that the no action haddock recreational measures are not expected to adequately constrain recreational catch below the FY 2013 sub-ACL. The no action haddock measures are only projected to keep catch below the sub-ACL 11 percent of the time (11 out of 100 simulations).

4.2.1.2 Option 2: Revised GOM Haddock Recreational Measures (NMFS preferred)

If adopted, this alternative would increase the minimum fish size for recreationally caught haddock from 18 to 21 inches. The possession limit would remain unlimited and the season open year round.

Rationale: Based on available analysis, the 2- inch minimum fish size increase for GOM haddock recreational management measures is expected to provide a 63-percent probability of not exceeding the recreational sub-ACL. This measure was recommended by the RAP and is the NMFS preferred alternative.

5.0 Alternatives Considered and Rejected

No alternatives were considered and rejected for this action.

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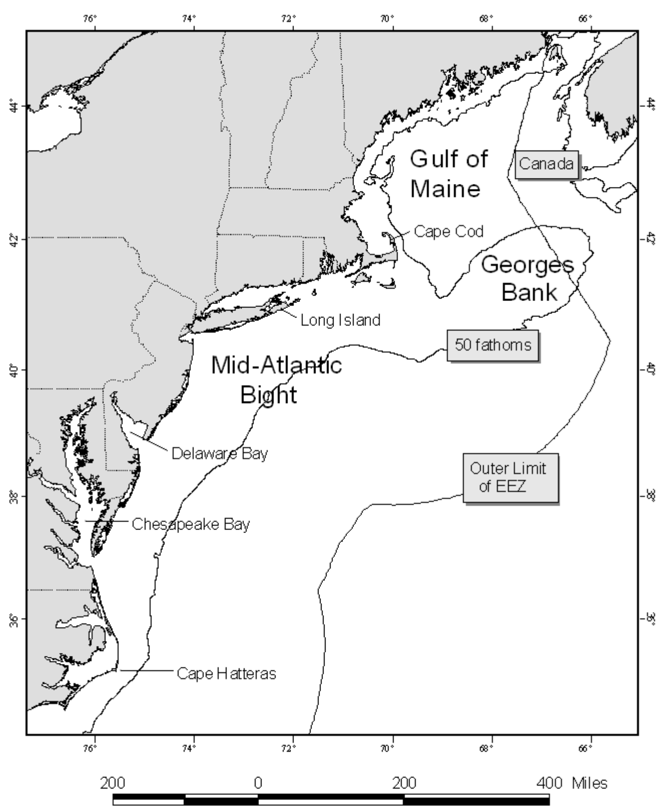
6.0 Affected Environment

The Valued Ecosystem Components (VECs) affected by the Preferred Alternatives include the physical environment, Essential Fish Habitat (EFH), target species, non-target species/bycatch, protected resources, and human communities, which are described below.

6.1 Physical Environment/Habitat/EFH

The Northeast U.S. Shelf Ecosystem (Figure 2) includes the area from the Gulf of Maine south to Cape Hatteras, North Carolina. It extends from the coast seaward to the edge of the continental shelf and offshore to the Gulf Stream (Sherman et al. 1996). The continental slope includes the area seaward of the shelf, out to a depth of 6,562 feet (ft) [2,000 meters (m)]. Four distinct sub-regions comprise the NMFS Northeast Region: the Gulf of Maine, Georges Bank, the southern New England/Mid-Atlantic region, and the continental slope. Sectors primarily fish in the inshore and offshore waters of the Gulf of Maine, Georges Bank, and the southern New England/Mid-Atlantic areas. Therefore, the description of the physical and biological environment focuses on these sub-regions. Information in this section was extracted from Stevenson et al. (2004).

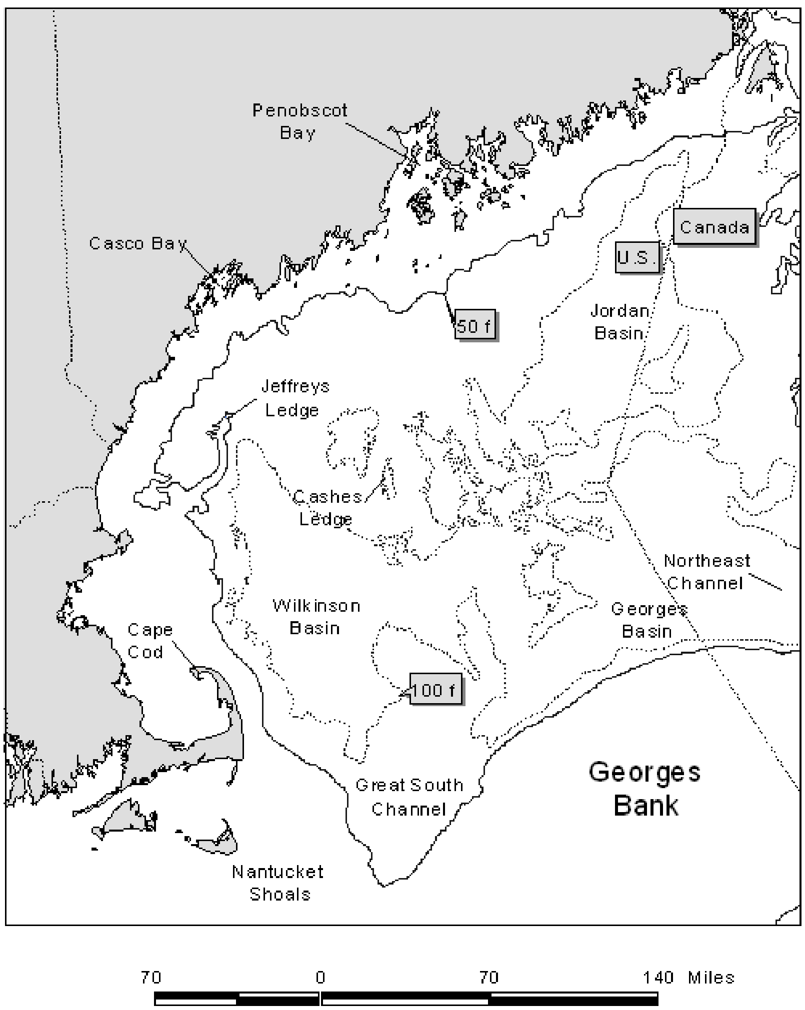
Figure 2 - Northeast U.S Shelf Ecosystem



6.1.1 Gulf of Maine

The Gulf of Maine is bounded on the east by Browns Bank, on the north by the Nova Scotia (Scotian) Shelf, on the west by the New England states, and on the south by Cape Cod and Georges Bank (Figure 3). The Gulf of Maine is a boreal environment characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. There are 21 distinct basins separated by ridges, banks, and swells. Depths in the basins exceed 820 ft (250 m), with a maximum depth of 1,148 ft (350 m) in Georges Basin, just north of Georges Bank. High points within the Gulf of Maine include irregular ridges, such as Cashes Ledge, which peaks at 30 ft (9 m) below the surface.

Figure 3 - Gulf of Maine



The Gulf of Maine is an enclosed coastal sea that was glacially derived and is characterized by a system of deep basins, moraines, and rocky protrusions (Stevenson et al. 2004). The Gulf of Maine is topographically diverse from the rest of the continental border of the U.S. Atlantic coast (Stevenson et al. 2004). Very fine sediment particles created and eroded by the glaciers have collected in thick deposits over much of the seafloor of the Gulf of Maine, particularly in its deep basins. These mud deposits blanket and obscure the irregularities of the underlying bedrock, forming topographically smooth terrains. In the rises between the basins, other materials are usually at the surface. Unsorted glacial till covers some morainal areas, sand predominates on some high areas, and gravel,[3] sometimes with boulders, predominates others. Bedrock is the predominant substrate along the western edge of the Gulf of Maine, north of Cape Cod in a narrow band out to a water depth of about 197 ft (60 m). Mud predominates in coastal valleys and basins that often abruptly border rocky substrates. Gravel, often mixed with shell, is common adjacent to bedrock outcrops and in fractures in the rock. Gravel is most abundant at depths of 66 to 131 ft (20 to 40 m), except off eastern Maine where a gravel-covered plain exists to depths of at least 328 ft (100 m). Sandy areas are relatively rare along the inner shelf of the western Gulf of Maine, but are more common south of Casco Bay, especially offshore of sandy beaches.

The geologic features of the Gulf of Maine coupled with the vertical variation in water properties (e.g., salinity, depth, temperature) combine to provide a great diversity of habitat types that support a rich biological community. To illustrate this, a brief description of benthic invertebrates and demersal (i.e., bottom-dwelling) fish that occupy the Gulf of Maine is provided below. Additional information is provided in Stevenson et al. (2004), which is incorporated by reference.

The most common groups of benthic invertebrates in the Gulf of Maine reported by Theroux and Wigley (1998) in terms of numbers collected were annelid worms, bivalve mollusks, and amphipod crustaceans. Bivalves, sea cucumbers, sand dollars, annelids, and sea anemones dominated biomass. Watling (1998) identified seven different bottom assemblages that occur on the following habitat types:

1) Sandy offshore banks: fauna are characteristically sand dwellers with an abundant interstitial component;
2) Rocky offshore ledges: fauna are predominantly sponges, tunicates, bryozoans, hydroids, and other hard bottom dwellers;
3) Shallow [< 197 ft (60 m)] temperate bottoms with mixed substrate: fauna population is rich and diverse, primarily comprised of polychaetes and crustaceans;
4) Primarily fine muds at depths of 197 to 459 ft (60 to 140 m) within cold Gulf of Maine Intermediate Water:[4] fauna are dominated by polychaetes, shrimp, and cerianthid anemones;
5) Cold deep water, muddy bottom: fauna include species with wide temperature tolerances which are sparsely distributed, diversity low, dominated by a few polychaetes, with brittle stars, sea pens, shrimp, and cerianthids also present;
6) Deep basin, muddy bottom, overlaying water usually 45 to 46 °F (7 to 8°C): fauna densities are not high, dominated by brittle stars and sea pens, and sporadically by tube-making amphipods; and

3 The term "gravel," as used in this analysis, is a collective term that includes granules, pebbles, cobbles, and boulders in order of increasing size. Therefore, the term "gravel" refers to particles larger than sand and generally denotes a variety of "hard bottom" substrates.

4 Maine Intermediate Water is described as a mid-depth layer of water that preserves winter salinity and temperatures, and is located between more saline Maine bottom water and the warmer, stratified Maine surface water. The stratified surface layer is most pronounced in the deep portions of the western Gulf of Maine.

7) Upper slope, mixed sediment of either fine muds or mixture of mud and gravel, water temperatures always greater than 46 °F (8°C): upper slope fauna extending into the Northeast Channel.

Two studies (Gabriel 1992, Overholtz and Tyler 1985) reported common[5] demersal fish species by assemblages in the Gulf of Maine and Georges Bank:

- Deepwater/Slope and Canyon: offshore hake, blackbelly rosefish, Gulf stream flounder;
- Intermediate/Combination of Deepwater Gulf of Maine-Georges Bank and Gulf of Maine-Georges Bank Transition: silver hake, red hake, goosefish (monkfish);
- Shallow/Gulf of Maine-Georges Bank Transition Zone: Atlantic cod, haddock, pollock;
- Shallow water Georges Bank-southern New England: yellowtail flounder, windowpane flounder, winter flounder, winter skate, little skate, longhorn sculpin;
- Deepwater Gulf of Maine-Georges Bank: white hake, American plaice, witch flounder, thorny skate; and
- Northeast Peak/Gulf of Maine-Georges Bank Transition: Atlantic cod, haddock, pollock.

6.1.2 Georges Bank

Georges Bank is a shallow (10 to 492 ft [3 to 150 m depth]), elongated ((100 miles [mi] (161 kilometer [km] wide) by 20 mi (322 km long)) extension of the continental shelf that was formed during the Wisconsinian glacial episode (Figure 2). It has a steep slope on its northern edge, a broad, flat, gently sloping southern flank, and steep submarine canyons on its eastern and southeastern edges. It has highly productive, well-mixed waters and strong currents. The Great South Channel lies to the west. Natural processes continue to erode and rework the sediments on Georges Bank. Erosion and reworking of sediments by the action of rising sea level as well as tidal and storm currents may reduce the amount of sand and cause an overall coarsening of the bottom sediments (Valentine and Lough 1991).

Bottom topography on eastern Georges Bank consists of linear ridges in the western shoal areas; a relatively smooth, gently dipping seafloor on the deeper, easternmost part; a highly energetic peak in the north with sand ridges up to 30 m high and extensive gravel pavement; and steeper and smoother topography incised by submarine canyons on the southeastern margin. The central region of Georges Bank is shallow, and the bottom has shoals and troughs, with sand dunes superimposed within. The area west of the Great South Channel, known as Nantucket Shoals, is similar in nature to the central region of Georges Bank. Currents in these areas are strongest where water depth is shallower than 164 ft (50 m). Sediments in this region include gravel pavement and mounds, some scattered boulders, sand with storm-generated ripples, and scattered shell and mussel beds. Tidal and storm currents range from moderate to strong, depending upon location and storm activity.

Oceanographic frontal systems separate the water masses of the Gulf of Maine and Georges Bank from oceanic waters south of Georges Bank. These water masses differ in temperature, salinity, nutrient

[5] Other species were listed as found in these assemblages, but only the species common to both studies are listed.

concentration, and planktonic communities. These differences influence productivity and may influence fish abundance and distribution.

Georges Bank has historically had high levels of both primary productivity and fish production. The most common groups of benthic invertebrates on Georges Bank in terms of numbers collected were amphipod crustaceans and annelid worms, while sand dollars and bivalves dominated the overall biomass (Theroux and Wigley 1998). Using the same database, Theroux and Grosslein (1987) identified four macrobenthic invertebrate assemblages that occur on similar habitat type:

1) The Western Basin assemblage is found in comparatively deep water (492 to 656 ft [150 to 200 m]) with relatively slow currents and fine bottom sediments of silt, clay, and muddy sand. Fauna are comprised mainly of small burrowing detritivores and deposit feeders, and carnivorous scavengers.
2) The Northeast Peak assemblage is found in variable depths and current strength and includes coarse sediments, consisting mainly of gravel and coarse sand with interspersed boulders, cobbles, and pebbles. Fauna tend to be sessile (coelenterates, brachiopods, barnacles, and tubiferous annelids) or free-living (brittle stars, crustaceans, and polychaetes), with a characteristic absence of burrowing forms.
3) The Central Georges Bank assemblage occupies the greatest area, including the central and northern portions of Georges Bank in depths less than 328 ft (100 m). Medium-grained shifting sands predominate this dynamic area of strong currents. Organisms tend to be small to moderately large with burrowing or motile habits. Sand dollars are most characteristic of this assemblage.
4) The Southern Georges Bank assemblage is found on the southern and southwestern flanks at depths from 262 to 656 ft (80 to 200 m), where fine-grained sands and moderate currents predominate. Many southern species exist here at the northern limits of their range. Dominant fauna include amphipods, copepods, euphausiids, and starfish.

Common demersal fish species in Georges Bank are offshore hake, blackbelly rosefish, Gulf stream flounder, silver hake, red hake, goosefish (monkfish), Atlantic cod, haddock, pollock, yellowtail flounder, windowpane flounder, winter flounder, winter skate, little skate, longhorn sculpin, white hake, American plaice, witch flounder, and thorny skate.

6.1.3 Southern New England/Mid-Atlantic Bight

The Mid-Atlantic Bight includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream (Figure 2). The northern portion of the Mid-Atlantic Bight is sometimes referred to as southern New England. It generally includes the area of the continental shelf south of Cape Cod from the Great South Channel to Hudson Canyon. The Mid-Atlantic Bight consists of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, North Carolina. The shelf slopes gently from shore out to between 62 to 124 ft (100 and 200 km) offshore where it transforms to the slope (328 to 656 ft [100 to 200 m water depth]) at the shelf break. In both the Mid-Atlantic Bight and on Georges Bank, numerous canyons incise the slope, and some cut up onto the shelf itself (Stevenson et al. 2004). Like the rest of the continental shelf, sea level fluctuations during past ice ages largely shaped the topography of the Mid-Atlantic Bight. Since that time, currents and waves have modified this basic structure.

The sediment type covering most of the shelf in the Mid-Atlantic Bight is sand, with some relatively small, localized areas of sand-shell and sand-gravel. Silty sand, silt, and clay predominate on the slope. Permanent sand ridges occur in groups with heights of about 33 ft (10 m), lengths of 6 to 31 mi (10 to 50 km), and spacing of 1 mi (2 km). The sand ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Sand waves are usually found in patches of 5 to 10 with heights of about 7 ft (2 m), lengths of 164 to 328 ft (50 to 100 m), and 0.6 to 1 mi (1 to 2 km) between patches. Sand waves are temporary features that form and re-form in different locations. They usually occur on the inner shelf, especially in areas like Nantucket Shoals where there are strong bottom currents. Because tidal currents southwest of Nantucket Shoals and southeast of Long Island and Rhode Island slow significantly, there is a large mud patch on the seafloor where silts and clays settle out.

Artificial reefs are another important Mid-Atlantic Bight habitat. Artificial reefs formed much more recently on the geologic time scale than other regional habitat types. These localized areas of hard structure have been formed by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle and Zetlin 2000). In general, reefs are important for attachment sites, shelter, and food for many species. In addition, fish predators, such as tunas, may be drawn by prey aggregations or may be behaviorally attracted to the reef structure. Estuarine reefs, such as blue mussel beds or oyster reefs, are dominated by epibenthic organisms, as well as crabs, lobsters, and sea stars. These reefs are hosts to a multitude of fish, including gobies, spot, bass (black sea and striped), perch, toadfish, and croaker. Coastal reefs consist of either exposed rock, wrecks, kelp, or other hard material. Boring mollusks, algae, sponges, anemones, hydroids, and coral generally dominate these coastal reefs. These reef types also host lobsters, crabs, sea stars, and urchins, as well as a multitude of fish, including; black sea bass, pinfish, scup, cunner, red hake, gray triggerfish, black grouper, smooth dogfish, and summer flounder. These epibenthic organisms and fish assemblages are similar to the reefs farther offshore, which generally consist of rocks and boulders, wrecks, and other types of artificial reefs. There is less information available for reefs on the outer shelf, but the fish species associated with these reefs include tilefish, white hake, and conger eel.

In terms of numbers, amphipod crustaceans and bivalve mollusks dominate the benthic inhabitants of this primarily sandy environment. Mollusks (70%) dominate the biomass (Theroux and Wigley 1998). Pratt (1973) identified three broad faunal zones related to water depth and sediment type:

1) The “sand fauna” zone is dominated by polycheates and was defined for sandy sediments (1 percent or less silt) that are at least occasionally disturbed by waves, from shore out to a depth of about 164 ft (50 m).
2) The “silty sand fauna” zone is dominated by amphipods and polychaetes and occurs immediately offshore from the sand fauna zone, in stable sands containing a small amount of silt and organic material.
3) Silts and clays become predominant at the shelf break and line the Hudson Shelf Valley supporting the “silt-clay fauna.”

While substrate is the primary factor influencing demersal species distribution in the Gulf of Maine and Georges Bank, latitude and water depth are the primary influence in the Mid-Atlantic Bight area.

Colvocoresses and Musick (1984) identified the following assemblages in the Mid-Atlantic subregion during spring and fall.[6]

- Northern (boreal) portions: hake (white, silver, red), goosefish (monkfish), longhorn sculpin, winter flounder, little skate, and spiny dogfish;
- Warm temperate portions: black sea bass, summer flounder, butterfish, scup, spotted hake, and northern searobin;
- Water of the inner shelf: windowpane flounder;
- Water of the outer shelf: fourspot flounder; and
- Water of the continental slope: shortnose greeneye, offshore hake, blackbelly rosefish, and white hake.

6.1.4 Habitat requirements of groundfish (focus on demersal lifestages)

Habitats provide living things with the basic life requirements of nourishment and shelter. This ultimately provides for both individual and population growth. The quantity and quality of available habitat influences the fishery resources of a region. Depth, temperature, substrate, circulation, salinity, light, dissolved oxygen, and nutrient supply are important parameters of a given habitat. These parameters determine the type and level of resource population that the habitat supports. Table 11 briefly summarizes the habitat requirements for each of the large-mesh groundfish species/stocks managed by the Northeast Multispecies FMP. Information for this table was extracted from the original Northeast Multispecies FMP and profiles available from NMFS (Clark 1998). EFH information for egg, juvenile, and adult life stages for these species was compiled from Stevenson et al. 2004 (Table 11). Note that EFH for the egg stage was included for species that have a demersal egg stage (winter flounder and ocean pout); all other species' eggs are found either in the surface waters, throughout the water column, or are retained inside the parent until larvae hatch. The egg habitats of these species are therefore not generally subject to interaction with gear and are not listed in Table 15.

[6] Other species were listed as found in these assemblages, but only the species common to both spring and fall seasons are listed.

Table 12 – Summary of Geographic Distribution, Food Sources, Essential Fish Habitat Features and Commercial Gear used to Catch each Species in the Northeast Multispecies Fishery Management Unit

Species	Geographic Region of the Northwest Atlantic	Food Source	Essential Fish Habitat		Commercial Fishing Gear Used
			Water Depth	Substrate	
Atlantic cod	Gulf of Maine, Georges Bank and southward	Omnivorous (invertebrates and fish)	(J): 82-245 ft (25-75 m)	(J): Cobble or gravel bottom substrates	Otter trawl, bottom longlines, gillnets
			(A): 33-492 ft (10-150 m)	(A): Rocks, pebbles, or gravel bottom substrate	
Haddock	southwestern Gulf of Maine and shallow waters of Georges Bank	Benthic feeders (amphipods, polychaetes, echinoderms), bivalves, and some fish	(J): 115-328 ft (35-100 m)	(J): Pebble and gravel bottom substrates	Otter trawl, bottom longlines, gillnets
			(A): 131-492 ft (40-150 m)	(A): Broken ground, pebbles, smooth hard sand, smooth areas between rocky patches	
Acadian redfish	Gulf of Maine, deep portions of Georges Bank and Great South Channel	Crustaceans	(J): 82-1,312 ft (25-400 m)	(J): Bottom habitats with a substrate of silt, mud, or hard bottom	Otter trawl
			(A): 164-1,148 ft (50-350 m)	(A): Same as for (J)	
Pollock	Gulf of Maine, extends to Georges Bank, and the northern part of Mid-Atlantic Bight	Juvenile feed on crustaceans, adults also feed on fish and mollusks	(J): 0-820 ft (0-250 m)	(J): Bottom habitats with aquatic vegetation or substrate of sand, mud, or rocks	Otter trawl, gillnets
			(A): 49-1,198 ft (5-365 m)	(A): Hard bottom habitats including artificial reefs	
Atlantic Halibut	Gulf of Maine, Georges Bank	Juveniles feed on annelid worms and crustaceans, adults mostly feed on fish	(J): 66-197 ft (20-60 m)	(J): Bottom habitat with a substrate of sand, gravel, or clay	Otter trawl, bottom longlines
			(A): 328-2,297 ft (100-700 m)	(A): Same as for (J)	
			(J): 262 ft (<80 m)	(J): Bottom habitat, often smooth areas near rocks or algae	

Species	Geographic Region of the Northwest Atlantic	Food Source	Essential Fish Habitat		Commercial Fishing Gear Used
			Water Depth	Substrate	
Ocean Pout	Gulf of Maine, Cape Cod Bay, Georges Bank, southern New England, middle Atlantic south to Delaware Bay	Juveniles feed on amphipods and polychaetes. Adults feed mostly on echinoderms as well as on mollusks and crustaceans	(E): <164 ft (<50 m)	(E): Bottom habitats, generally hard bottom sheltered nests, holes, or crevices where juveniles are guarded.	Otter trawl
			(L): <164 ft (<50 m)	(L): Hard bottom nesting areas	
			(J): 262 ft (<80 m)	(J): Bottom habitat, often smooth areas near rocks or algae	
			(A): 361 ft (<110 m)	(A): Bottom habitats; dig depressions in soft sediments	
White hake	Gulf of Maine, Georges Bank, southern New England	Juveniles feed mostly on polychaetes and crustaceans; adults feed mostly on crustaceans, squids, and fish	(J): 16-738 ft (5-225 m)	(J): Bottom habitat with seagrass beds or substrate of mud or fine-grained sand	Otter trawl, gillnets
			(A): 16-1,066 ft (5-325 m)	(A): Bottom habitats with substrate of mud or fine grained sand	
Yellowtail flounder	Gulf of Maine, southern New England, Georges Bank	Amphipods and polychaetes	(J): 66-164 ft (20-50 m)	(J): Bottom habitats with substrate of sand or sand and mud	Otter trawl
			(A): 66-164 ft (20-50 m)	(A): Same as for (J)	
American plaice	Gulf of Maine, Georges Bank	Polychaetes, crustaceans, mollusks, echinoderms	(J): 148-492 ft (45-150 m)	(J): Bottom habitats with fine grained sediments or a substrate of sand or gravel	Otter trawl
			(A): 148-574 ft (45–175 m)	(A): Same as for (J)	
Witch flounder	Gulf of Maine, Georges Bank, Mid-Atlantic Bight/southern New England	Mostly polychaetes (worms), echinoderms	(J): 164-1,476 ft (50-450 m)	(J): Bottom habitats with fine grained substrate	Otter trawl
			(A): 82-984 ft) (25-300 m)	(A): Same as for (J)	

Species	Geographic Region of the Northwest Atlantic	Food Source	Essential Fish Habitat		Commercial Fishing Gear Used
			Water Depth	Substrate	
Winter flounder	Gulf of Maine, Georges Bank, Mid-Atlantic Bight/southern New England	Polychaetes, crustaceans	(E): 16 ft (<5 m)	(E): Bottom habitats with a substrate of sand, muddy sand, mud, and gravel	Otter trawl, gillnets
			(J): 0.3-32 ft (0.1-10 m) (3-164 ft age 1+) (1-50 m)	(J): Bottom habitats with a substrate of mud or fine grained sand	
			(A): 3.2-328 ft (1-100 m)	(A): Bottom habitats including estuaries with substrates of mud, sand, gravel	
Atlantic wolffish	Gulf of Maine & Georges Bank	Mollusks, brittle stars, crabs, and sea urchins	(J): 131.2-787.4 ft (40-240 m)	(J): Rocky bottom and coarse sediments	Otter trawl, bottom longlines, and gillnets
			(A): 131.2-787.4 ft (40-240 m)	(A): Same as for (J)	
Windowpane flounder	Gulf of Maine, Georges Bank, Mid-Atlantic Bight/southern New England	Juveniles mostly crustaceans; adults feed on crustaceans and fish	(J): 3.2-328 ft (1-100 m)	(J): Bottom habitats with substrate of mud or fine grained sand	Otter trawl
			(A): 3.2-574 ft (1-75 m)	(A): Same as for (J)	

6.1.1 Essential Fish Habitat (EFH) designations

The Sustainable Fisheries Act defines EFH as “[t]hose waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The proposed action could potentially affect EFH for benthic life stages of species that are managed under the Northeast Multispecies FMP; Atlantic sea scallop; monkfish; deep-sea red crab; northeast skate complex; Atlantic herring; summer flounder, scup, and black sea bass; tilefish; squid, Atlantic mackerel, and butterfish; Atlantic surfclam and ocean quahog FMPs. EFH for the species managed under these FMPs includes a wide variety of benthic habitats in state and Federal waters throughout the Northeast U.S. Shelf Ecosystem. Table 15 summarizes the EFH descriptions of the general substrate or bottom types for all the benthic life stages of the species managed under these FMPs. Full descriptions and maps of EFH for each species and life stage are available on the NMFS Northeast Region website at http://www.nero.noaa.gov/hcd/index2a.htm. In general, EFH for species and life stages that rely on the seafloor for shelter (e.g., from predators), reproduction, or food is vulnerable to disturbance by bottom tending gear. The most vulnerable habitat is more likely to be hard or rough bottom with attached epifauna.

6.1.2 Gear Types and Interaction with Habitat

Groundfish vessels fish for target species with a number of gear types: trawl, gillnet, fish pots/traps, and hook and line gear (including jigs, handline, and non-automated demersal longlines) as part of the FY 2012 operations. This section discusses the characteristics of each of the proposed gear types as well as the typical impacts to the physical habitat associated with each of these gear types.

6.1.2.1 Gear Types

Table 13 - Description of the Gear Types Used by the Multispecies Fishery

	Gear Type			
	Trawl	**Sink/ Anchor Gillnets**	**Bottom Longlines**	**Hook and Line**
Total Length	Varies	295 ft (90 m) long per net	~1,476 ft (451 m)	Varies by target species
Lines	N/A	Leadline and floatline with webbing (mesh) connecting	Mainline is parachute cord. Gangions (lines from mainline to hooks) are 15 inches (38 cm) long, 3 to 6 inches (8 to 15 cm) apart, and made of shrimp twine	One to several with mechanical line fishing
Nets	Rope or large-mesh size, depends upon target species	Monofilament, mesh size depends on the target species (groundfish nets minimum mesh size of 6.5 inches [16.5 cm])	No nets, but 12/0 circle hooks are required	No nets, but single to multiple hooks, "umbrella rigs"
Anchoring	N/A	22 lbs (10 kg) Danforth-style anchors are required at each end of the net string	20-24 lbs (9-11 kg) anchors, anchored at each end, using pieces of railroad track, sash weights, or Danforth anchors, depending on currents	No anchoring, but sinkers used (stones, lead)
Frequency/ Duration of Use	Tows last for several hours	Frequency of trending changes from daily (when targeting groundfish) to semi-weekly (when targeting monkfish and skate)	Usually set for a few hours at a time	Depends upon cast/target species

6.1.2.1.1 Trawl Gear

Trawls are classified by their function, bag construction, or method of maintaining the mouth opening. Function may be defined by the part of the water column where the trawl operates (e.g., bottom) or by the species that it targets (Hayes 1983). Mid-water trawls are designed to catch pelagic species in the water column and do not normally contact the bottom; however, mid-water trawls are prohibited in the Northeast multispecies fishery. Bottom trawls are designed to be towed along the seafloor and to catch a variety of demersal fish and invertebrate species.

Fishermen use the mid-water trawl to capture pelagic species throughout the water column. The mouth of the net typically ranges from 361 to 558 ft (110 m to 170 m) and requires the use of large vessels (Sainsbury 1996). Successful mid-water trawling requires the effective use of various electronic aids to find the fish and maneuver the vessel while fishing (Sainsbury 1996). Tows typically last for several hours and catches are large. Fishermen usually remove the fish from the net while it remains in the water alongside the vessel by means of a suction pump. Some fishermen remove the fish in the net by repeatedly lifting the codend aboard the vessel until the entire catch is in the hold.

Bottom otter trawls account for nearly all commercial bottom trawling activity. There is a wide range of otter trawl types used in the Northeast due to the diversity of fisheries and bottom types encountered in the region (Northeast Region Essential Fish Habitat Steering Committee 2002). The specific gear design used is often a result of the target species (whether found on or off the bottom) as well as the composition of the bottom (smooth versus rough and soft versus hard). A number of different types of bottom otter trawl used in the Northeast are specifically designed to catch certain species of fish, on specific bottom types, and at particular times of year. Fishermen tow bottom trawls at a variety of speeds, but average about 5.6 km/hour (3 knots). Several federal FMPs manage the use of this gear. Bottom trawling is also subject to a variety of state regulations throughout the region.

A flatfish trawl is a type of bottom otter trawl designed with a low net opening between the headrope and the footrope and more ground rigging on the sweep. This type of trawl is designed so that the sweep follows the contours of the bottom, to get fish like flounders. Flounders lie in contact with the seafloor and flatfish trawls look to get flounder up off the bottom and into the net. It is used on smooth mud and sand bottoms. A high-rise or fly net with larger mesh has a wide net opening and is used to catch demersal fish that tend to rise higher off the bottom than flatfish (Northeast Region Essential Fish Habitat Steering Committee 2002).

Bottom otter trawls are rigged with rockhopper gear for use on "hard" bottom (i.e., gravel or rocky bottom), mud or sand bottom with occasional boulders. This type of gear seeks to sweep over irregularities in the bottom without damaging the net. The sweep in trawls rigged for fishing on smooth bottoms looks to herd fish into the path of the net (Mirarchi 1998).

The raised-footrope trawl was designed to provide vessels with a means of continuing to fish for small-mesh species without catching groundfish. Raised-footrope trawls fish about 1.6 to 2.0 ft (0.5 to 0.6 m) above the bottom (Carr and Milliken 1998). Although the doors of the trawl still ride on the bottom, underwater video and observations in flume tanks have confirmed that the sweep in the raised-footrope trawl has much less contact with the seafloor than the traditional cookie sweep (Carr and Milliken 1998).

The haddock separator trawl and Ruhle trawl (bottom trawls), are used to minimize the catch of cod. The design of these gears considers the behavior of fish in response to gear. A haddock separator trawl is a groundfish trawl modified to a vertically oriented trouser trawl configuration. It has two extensions arranged one over the other. A codend is attached to the upper extension, and the bottom extension is left open with no codend attached. A horizontal large mesh separating panel constructed with a minimum of 6-inch diamond mesh must be installed between the selvedges joining the upper and lower panels [648.85(a)(3)(iii)(A)]. Haddock generally swim to the upper part of a net and cod swim to the lower part of the net. By inserting a mesh panel in the net, and using two codends, the net effectively divides the catch. The cod can escape if the codend on the lower part of the net is left open (NEFMC 2003). Overall, the haddock separator trawl has had mixed results in commercial fishing operations. The expected ratios of haddock to cod have not been realized. Catches of other demersal species, such as flounders, skates, and monkfish, have also been higher than expected. However, the separator trawl has reduced catches of these species compared to normal fishing practices (NEFMC 2009a).

The Ruhle trawl (previously known as the haddock rope trawl or eliminator trawl) is a four-seam bottom groundfish trawl with a rockhopper. It is designed to reduce the bycatch of cod while retaining or increasing the catch of haddock and other healthy stocks [648.85(b)(6)(iv)(J)(*3*)]. NMFS approved the

Ruhle trawl for use in the DAS program and in the Eastern U.S./Canada Haddock SAP on July 14, 2008 (73 FR 40186) after nearly two years of testing to determine efficacy. Experiments comparing traditional and the new trawl gear showed that the Ruhle trawl reduced bycatch of cod and flounders, while simultaneously retaining the catch of healthier stocks, primarily haddock. The large, 8-foot mesh in the forward end (the wings) of the Ruhle trawl net allows cod and other fish to escape because of their body shapes and unique behavior around the netting (NOAA 2008).

6.1.2.1.2 Gillnet Gear

Sectors would also use individual sink/anchor gillnets which are about 295 ft (90 m) long. They are usually fished as a series of 5 to 15 nets attached end-to-end. A vast majority of “strings” consist of 10 gillnets. Gillnets typically have three components: the leadline, webbing, and floatline. In New England, leadlines are approximately 66 lbs/net (30 kilogram (kg)/net). Webs are monofilament, with the mesh size depending on the species of interest. Nets are anchored at each end using materials such as pieces of railroad track, sash weights, or Danforth anchors, depending on currents. Anchors and leadlines have the most contact with the bottom. For New England groundfish, frequency of tending gillnets ranges from daily to semiweekly (Northeast Region Essential Fish Habitat Steering Committee 2002).

A bottom gillnet is a large wall of netting equipped with floats at the top and lead weights along the bottom. Bottom gillnets are anchored or staked in position. Fish are caught while trying to pass through the net mesh. Gillnets are highly selective because the species and sizes of fish caught are dependent on the mesh size of the net. The meshes of individual gillnets are uniform in size and shape, hence highly selective for a particular size of fish (Jennings et al. 2001). Bottom gillnets are fished in two different ways, as "standup" and "tiedown" nets (Williamson 1998). Standup nets typically catch Atlantic cod, haddock, pollock, and hake and are soaked (duration of time the gear is set) for 12 to 24 hours. Tiedown nets are set with the floatline tied to the leadline at 6-ft (1.8 m) intervals, so that the floatline is close to the bottom and the net forms a limp bag between each tie. They are left in the water for 3-4 days, and are used to catch flounders and monkfish.

6.1.2.1.3 Fish Traps/Pots

Some sectors would use fish traps/pots. This EA assumes these traps/pots are similar to lobster pots. Lobster pots are typically rectangular and consist of two sections, the chamber and the parlor. The chamber has an entrance on both sides of the pot and usually contains the bait. Lobsters enter the parlor via a tunnel (Everhart and Youngs 1981). Escape vents in both areas of the pot minimize the retention of sub-legal sized lobsters (DeAlteris 1998).

Lobster pots are fished as either a single pot per buoy (although two pots per buoy are used in Cape Cod Bay, and three pots per buoy in Maine waters), or a “trawl” or line with up to one hundred pots. The Northeast Fishery Science Center (NEFSC 2002) provides the following important features of lobster pots and their use:

- About 95 percent of lobster pots are made of plastic-coated wire.
- Floating mainlines may be up to 25 ft (8 m) off bottom; sinking groundlines are used where entanglements with marine mammals are a concern.
- Soak time depends on season and location - usually 1 to 3 days in inshore waters in warm weather to weeks in colder waters.

- Offshore pots are larger [more than 4 ft (1 m) long] and heavier (~ 100 lbs or 45 kg), with an average of about 40 pots/trawl and 44 trawls/vessel. They have a floating mainline and are usually deployed for a week at a time.

6.1.2.1.4 Hook and Line Gear

Hand Lines/Rod and Reel

Sectors would also use handlines. The simplest form of hook and line fishing is the hand line. It may be fished using a rod and reel or simply "by hand." The gear consists of a line, sinker (weight), gangion, and at least one hook. The line is typically stored on a small spool and rack and varies in length. The sinkers vary from stones to cast lead. The hooks can vary from single to multiple arrangements in "umbrella" rigs. Fishermen use an attraction device such as natural bait or an artificial lure with the hook. Hand lines can be carried by currents until retrieved or fished in such a manner as to hit bottom and bounce (Stevenson et al. 2004). Fishermen use hand lines as well as rods and reels in the Northeast Region to catch a variety of demersal species.

Mechanized Line Fishing

Mechanized line-hauling systems use electrical or hydraulic power to work the lines on the spools. They allow smaller fishing crews to work more lines. Fishermen mount the reels, also called "bandits," on the vessel bulwarks with the mainline wound around a spool. They take the line from the spool over a block at the end of a flexible arm. Each line may have a number of branches and baited hooks.

Fishermen use jigging machines to jerk a line with several unbaited hooks up in the water to attract a fish. Fishermen generally use fish jigging machine lines in waters up to 1,970 ft (600 m) deep. Hooks and sinkers can contact the bottom. Depending upon the way the gear is used, it may catch a variety of demersal species.

Bottom Longlines

Sectors would also use bottom longlines. This gear consists of a long length of line to which short lengths of line ("gangions") carrying baited hooks are attached. Longlining is undertaken for a wide range of bottom species. Bottom longlines typically have up to six individual longlines strung together for a total length of more than 1,476 ft (450 m) and are deployed with 20 to 24 lbs (9 to 11 kg) anchors. The mainline is a parachute cord. Gangions are typically 16 in (40 cm) long and 3 to 6 in (1 to 1.8 m) apart and are made of shrimp twine. These bottom longlines are usually set for a few hours at a time (Northeast Region Essential Fish Habitat Steering Committee 2002).

All hooks must be 12/0 circle hooks. A "circle hook is a hook with the point turned back towards the shank. The barbed end of the hook is displaced (offset) relative to the parallel plane of the eyed-end or shank of the hook when laid on its side. Habitat impacts from bottom long lines are negligible.

6.1.2.2 Gear Interaction with Habitat

Commercial fishing in the region has historically used trawls, gillnets, and bottom longline gear. Fishermen have intensively used trawls throughout the region for decades and currently account for the majority of commercial fishing activity in the multispecies fishery off New England.

The most recent Multispecies FMP action to include a comprehensive evaluation of gear effects on habitat was Amendment 13 (NEFMC 2003). Amendment 13 described the general effects of bottom trawls on benthic marine habitats. This analysis primarily used an advisory report prepared for the International Council for the Exploration of the Seas. This report identified a number of possible effects of bottom otter trawls on benthic habitats (International Council for the Exploration of the Seas 2000). The International Council for the Exploration of the Seas report is based on scientific findings summarized in Lindeboom and de Groot (1998). The report focuses on the Irish Sea and North Sea, but assesses effects in other areas. The report generally concluded that: (1) low-energy environments are more affected by bottom trawling; and (2) bottom trawling affects the potential for habitat recovery (i.e., after trawling ceases, benthic communities and habitats may not always return to their original pre-impacted state). The report also concluded the following about direct habitat effects:

- Loss or dispersal of physical features such as peat banks or boulder reefs results in changes that are always permanent and lead to an overall change in habitat diversity. This in turn leads to the local loss of species and species assemblages dependent on such features;
- Loss of structure-forming organisms such as bryozoans, tube-dwelling polychaetes, hydroids, seapens, sponges, mussel beds, and oyster beds results in changes that may be permanent leading to an overall change in habitat diversity. This in turn leads to the local loss of species and species assemblages dependent on such biogenic features;
- Changes are not likely to be permanent due to a reduction in complexity caused by redistributing and mixing of surface sediments and the degradation of habitat and biogenic features, leading to a decrease in the physical patchiness of the seafloor; and
- Changes are not likely to be permanent due to alteration of the detailed physical features of the seafloor by reshaping seabed features such as sand ripples or damaging burrows and associated structures that provide important habitats for smaller animals and can be used by fish to reduce their energy requirements.

The Committee on Ecosystem Effects of Fishing for the National Research Council's Ocean Studies Board (National Research Council 2002) also prepared evaluation of the habitat effects of trawling and dredging that was evaluated during Amendment 13. Trawl gears evaluated included bottom otter trawls. This report identified four general conclusions regarding the types of habitat modifications caused by trawls:

- Trawling reduces habitat complexity;
- Repeated trawling results in discernible changes in benthic communities;
- Bottom trawling reduces the productivity of benthic habitats; and
- Fauna that live in low natural disturbance regimes are generally more vulnerable to fishing gear disturbance.

The report from a "Workshop on the Effects of Fishing Gear on Marine Habitats off the Northeastern U.S." sponsored by the NEFMC and Mid-Atlantic Fishery Management Council (MAFMC) (NEFSC 2002) provides additional information for various Northeast region gear types. A panel of fishing industry members and experts in the fields of benthic ecology, fishery ecology, geology, and fishing gear technology convened for the purpose of assisting the NEFMC, MAFMC, and NMFS with:

- evaluating the existing scientific research on the effects of fishing gear on benthic habitats;
- determining the degree of impact from various gear types on benthic habitats in the Northeast;
- specifying the type of evidence that is available to support the conclusions made about the degree of impact;
- ranking the relative importance of gear impacts to various habitat types; and
- providing recommendations on measures to minimize those adverse impacts.

The panel was provided with a summary of available research studies that summarized information relating to the effects of bottom otter trawls, bottom gillnets, and bottom longlines. Relying on this information plus professional judgment, the panel identified the effects and the degree of impact of these gears on mud, sand, and gravel/rock habitats.

The panel's report provides additional information on the recovery times for each type of impact for each gear type in mud, sand, and gravel habitats ("gravel" includes other hard-bottom habitats). This information made it possible for the panel to rank these three substrates in terms of their vulnerability to the effects of bottom trawling. The report also notes that other factors such as frequency of disturbance from fishing and from natural events are also important. In general, the panel determined that impacts from trawling are greater in gravel/rock habitats with attached epifauna. The panel ranked impacts to biological structure higher than impacts to physical structure. Effects of trawls on major physical features in mud (deep water clay-bottom habitats) and gravel bottom were described as permanent. Impacts to biological and physical structure were given recovery times of months to years in mud and gravel. Impacts of trawling on physical structure in sand were of shorter duration (days to months) given the exposure of most continental shelf sand habitats to strong bottom currents and/or frequent storms.

According to the panel, impacts of sink gillnets and bottom longlines on sand and gravel habitats would result in low degree impacts (NEFSC 2002). Duration of impacts to physical structures from these gear types would be expected to last days to months on soft mud, but could be permanent on hard bottom clay structures along the continental slope. Impacts to mud would be caused by gillnet lead lines and anchors. Physical habitat impacts from sink gillnets and bottom longlines on sand would not be expected.

Amendment 13 also summarized the contents of a second expert panel report, produced by the Pew Charitable Trusts and entitled "Shifting Gears: Addressing the Collateral Impacts of Fishing Methods in U.S. Waters" (Morgan and Chuenpagdee 2003). This group evaluated the habitat effects of 10 different commercial fishing gears used in U.S. waters. The report concluded that bottom trawls have relatively high habitat impacts; bottom gillnets and pots and traps have low to medium impacts; and bottom longlines have low impacts. As in the International Council for the Exploration of the Seas and National Research Council reports, the panel did not evaluate individual types of trawls and dredges. The impacts of bottom gillnets, traps, and bottom longlines were limited to warm or shallow water environments with rooted aquatic vegetation or "live bottom" environments (e.g., coral reefs).

Going beyond Amendment 13 analyses, one purpose of the ongoing Omnibus Essential Fish Habitat Amendment 2 (OA2) is to evaluate existing habitat management areas and develop new habitat management areas. To assist with this effort, the Habitat PDT developed an analytical approach to characterize and map habitats and to assess the extent to which different habitat types are vulnerable to different types of fishing activities. This body of work, termed the Swept Area Seabed Impact approach, includes a quantitative, spatially-referenced model that overlays fishing activities on habitat through time to estimate both potential and realized adverse effects to EFH. The approach is detailed in this document, available on the Council webpage: http://www.nefmc.org/habitat/sasi_info/110121_SASI_Document.pdf.

The spatial domain of the SASI model is US Federal waters (between 3-200 nm offshore) from Cape Hatteras to the US-Canada border. Within this region, habitats were defined based on natural disturbance regime and dominant substrate. Understanding natural disturbance regime is important because it may mask or interact with human-caused disturbance. Energy at the seabed was inferred from an oceanography model (flow) and a coastal relief model (depth) and was binned into areas of high or low energy. Substrate type is an important determinant of habitat because it influences the distribution of managed species, structure-forming epifauna, and prey species by providing spatially discrete resources such as media for burrowing organisms, attachment points for vertical epifauna, etc. The dominant substrate map was composed of thousands of visual and grab sample observations, with grid size based on the spacing of the observations. The underlying spatial resolution of the substrate grid is much higher on Georges Bank and on the tops of banks and ledges in the Gulf of Maine than it is in deeper waters. For this reason, additional data sources were used during habitat management area development.

One of the outputs of the model is habitat vulnerability, which is related in part to the characteristics of the habitat itself, and part to the quality of the impact. Because of a general need for attachment sites, epifauna that provided a sheltering function for managed species tend to be more diverse and abundant in habitats containing larger grain sized substrates. Structurally complex and/or long-lived epifaunal species are more susceptible to gear damage and slower to recover. Recovery rates were assumed to be retarded in low energy areas, such that overall vulnerability (susceptibility + recovery) of low energy areas is greater than high energy areas, other factors being equal. When combined with the underlying substrate and energy distribution, the susceptibility and recovery scores assigned to the inferred mix of epifaunal and geological features generated a highly patchy vulnerability map. Locations where high proportions by area map out as cobble-dominated or cobble- and boulder-dominated tended to show higher vulnerability scores. Although the literature on fixed gear impacts is relatively sparse, it was estimated that mobile gears have a greater per-unit area swept impact than fixed gears.

6.2 Groundfish Species

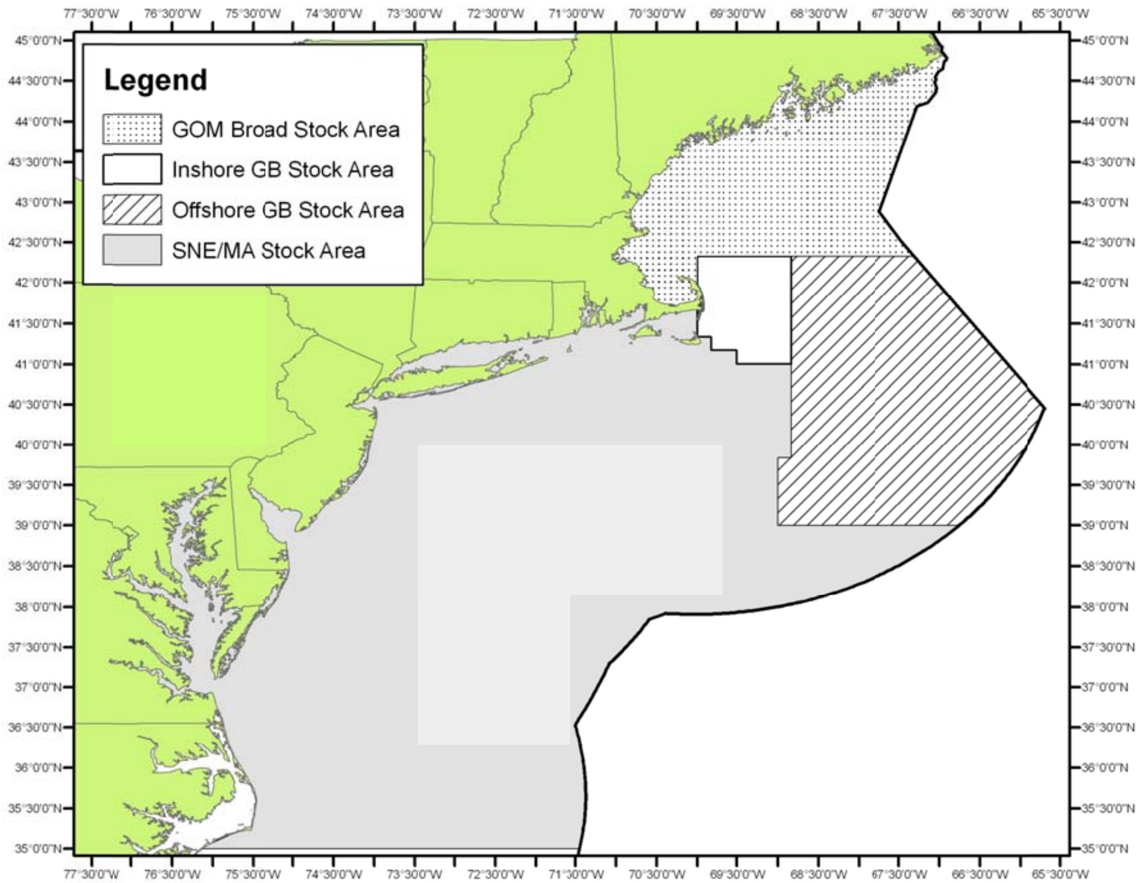
This section describes the life history and stock population status for each allocated fish stock the sectors harvest under the Northeast Multispecies FMP. Figure 4identifies the four broad stock areas used in the fishery. Please refer to the species habitat associations described in Section 4.2 for information on the interactions between gear and species. Section 6.1 also provides a comparison of depth-related demersal fish assemblages of Georges Bank and the Gulf of Maine. This section concludes with an analysis of the interaction between the gear types the sectors intend to use (as described in Section 6.1.2.1) and allocated target species. The following discussions have been adapted from the GARM III report (NEFSC 2008) and the EFH Source Documents: Life History and Habitat Characteristics are assessable via the NEFSC website at http://www.nefsc.org (NEFSC 2010).

6.2.1 Species and Stock Status Descriptions

The allocated target stocks for the sectors are GOM Cod, GB Cod, GOM Haddock, GB Haddock, American Plaice, Witch Flounder, GOM Winter Flounder, GB Winter Flounder, Cape Cod/GOM

Yellowtail Flounder, GB Yellowtail Flounder, SNE/MA Yellowtail Flounder, Redfish, Pollock and White Hake.

Figure 4 - Broad stock areas as defined in Amendment 16



Spiny dogfish, skates, and monkfish are considered in this EA as "non-allocated target species and bycatch" in Sections 4.4 and 5.1. Northeast Multispecies FMP does no allocate these species. They and are managed under their own FMPs.

The Northeast Multispecies FMP also manages Atlantic halibut, ocean pout, windowpane flounder, and SNE/MA winter flounder. However, sectors do not receive an allocation of these species. Sector and common pool vessels cannot land wolffish, ocean pout, windowpane flounder, and inshore GB and SNE/MA winter flounder, but can retain one halibut per trip. Wolffish are provisionally managed under the Northeast Multispecies FMP Amendment 16 to the Northeast Multispecies FMP (NEFMC 2009a) addresses these species. These species are discussed in Section 6.3.

6.2.1.1 Gulf of Maine Cod

Life History: The Atlantic cod, *Gadus morhua*, is a demersal gadoid species found on both sides of the North Atlantic. In the western North Atlantic, cod occur from Greenland to North Carolina. In U.S. waters, cod are assessed and managed as two stocks: Gulf of Maine and Georges Bank. GOM cod attain sexual maturity at a later age than GB cod due to differences in growth rates between the two stocks. The greatest concentrations of cod off the Northeast coast of the U.S. are on rough bottoms in waters between 33 and 492 ft (10 and 150 m) and at temperatures between 32 and 50°F (0 and 10°C). Spawning occurs year-round, near the ocean bottom, with a peak in winter and spring. Peak spawning corresponds to water temperatures between 41 and 45°F (5 and 7°C). It is delayed until spring when winters are severe and peaks in winter when mild. Eggs are pelagic, buoyant, spherical, and transparent. They drift for 2 to 3 weeks before hatching. The larvae are pelagic for about three months until reaching 1.6 to 2.3 in (4 to 6 cm), at which point they descend to the seafloor. Most remain on the bottom after this descent, and there is no evidence of a subsequent diel, vertical migration. Adults tend to move in schools, usually near the bottom, but also occur in the water column.

Population Status: The inshore GOM stock appears to be relatively distinct from the offshore cod stocks on the banks of the Scotian Shelf and Georges Bank based on tagging studies. GOM cod spawning stock biomass has increased since the late 1990's from 12,236 ton (11,100 metric tons [mt]) in 1997 to 37,479 ton (34,000 mt) in 2007. However, the stock remains low relative to historic levels and is subject to a formal stock rebuilding plan. The 2010 biomass estimate, the most recent estimate available, was 8 percent of the biomass rebuilding target. The GOM cod stock is overfished and overfishing is occurring.

6.2.1.2 Georges Bank Cod

Life History: The GB cod stock, *Gadus morhua*, is the most southerly cod stock in the world. The greatest concentrations off the Northeast coast of the U.S. are on rough bottoms in waters between 33 and 492 ft (10 and 150 m) and at temperatures between 32 and 50° F (0 and 10°C). Spawning occurs year-round, near the ocean bottom, with a peak in winter and spring. Peak spawning corresponds to water temperatures between 41 and 45°F (5 and 7°C). It is delayed until spring when winters are severe and peaks in winter when mild. Eggs are pelagic, buoyant, spherical, and transparent. They drift for 2 to 3 weeks before hatching. The larvae are pelagic for about 3 months until reaching 1.6 to 2.3 in (4 to 6 cm), at which point they descend to the seafloor. Most remain on the bottom after this descent, and there is no evidence of a subsequent diel, vertical migration. Adults tend to move in schools, usually near the bottom, but also occur in the water column.

Population Status: GB cod are a transboundary stock harvested by both the U.S. and Canadian fishing fleets. The GB cod stock is overfished and overfishing is occurring.

6.2.1.3 Gulf of Maine Haddock

Life History: The GOM haddock, *Melanogrammus aeglefinus*, is a commercially-exploited groundfish found in the North Atlantic Ocean. This demersal gadoid species occurs from Cape May, New Jersey to the Strait of Belle Isle, Newfoundland in the western North Atlantic. A total of six distinct haddock stocks have been identified. Two of these haddock stocks occur in U.S. waters associated with Georges Bank and the Gulf of Maine.

Haddock are highly fecund broadcast spawners. They spawn over various substrates including rocks, gravel, smooth sand, and mud. Haddock release their eggs near the ocean bottom in batches where a courting male then fertilizes them. After fertilization, haddock eggs become buoyant and rise to the surface water layer. In the Gulf of Maine, spawning occurs from early February to May, usually peaking in February to April. Jeffreys Ledge and Stellwagen Bank are the two primary spawning sites in the Gulf of Maine. Fertilized eggs are buoyant and remain in the water column where subsequent development occurs. Larvae metamorphose into juveniles in roughly 30 to 42 days at lengths of 0.8 to 1.1 in (2 to 3 cm). Small juveniles initially live and feed in the epipelagic zone. Juveniles remain in the upper part of the water column for 3 to 5 months. Juveniles visit the ocean bottom in search of food. Juveniles settle into a demersal existence once they locate suitable bottom habitat. Haddock do not make extensive seasonal migrations. Haddock prefer deeper waters in the winter and tend to move shoreward in summer.

Population Status: The GOM haddock stock is not overfished but overfishing is occurring. The stock size has been decreasing and is approaching an overfished condition. Should the stock size drop below the minimum stock size threshold, a formal stock rebuilding program would need to be put in place.

6.2.1.4 Georges Bank Haddock

Life History: The general life history of GB haddock, *Melanogrammus aeglefinus*, is comparable to the GOM haddock as described above. On Georges Bank, spawning occurs from January to June, usually peaking from February to early-April. Georges Bank is the principal haddock spawning area in the Northeast U.S. Shelf Ecosystem. GB haddock spawning concentrates on the northeast peak of Georges Bank.

Median age and size of maturity differ slightly between the GB and GOM haddock stocks. GARM III found that the GOM fishery does not target haddock. The fleet targets mostly flatfish using large square (6.5 inch [16.5 cm]) mesh gear. This leads to reduced selectivity on haddock. The GOM haddock have lower weights at age than the GB stock and the age at 50 percent maturity was also lower for GOM haddock than GB haddock.

Population Status: The GB haddock stock is a transboundary resource co-managed with Canada. Substantial declines have recently occurred in the weights at age due to slower than average growth. This was particularly true of the 2003 year-class. This decline is affecting productivity in the short-term. The growth of subsequent year-classes is returning to the earlier rates. The stock is not overfished and overfishing is not occurring. The fishing mortality rate for this stock has been low in recent years.

6.2.1.5 American Plaice

Life History: The American plaice, *Hippoglossoides platessoides*, is an arctic-boreal to temperate-marine pleuronectid (righteye) flounder that inhabits both sides of the North Atlantic on the continental shelves of northeastern North America and northern Europe. Off the U.S. coast, American plaice are managed as a single stock in the Gulf of Maine-Georges Bank region. American plaice are batch spawners. They release eggs in batches every few days over the spawning period. Adults spawn and fertilize their eggs at or near the bottom. Buoyant eggs lack oil globules and will drift into the upper water column after release. Eggs hatch at the surface and the amount of time between fertilization and hatching varies with the water temperature. Transformation of the larvae and migration of the left eye begins when the larvae are approximately 0.8 in (20 millimeters (mm)). Dramatic physiological transformations occur during the juvenile stage. The body shape continues to change, flattening and increasing in depth from side to side. As the migration of the left eye across the top of the head to the right side reaches completion, descent towards the seafloor begins. In U.S. and Canadian waters, American plaice is a sedentary species migrating only for spawning and feeding.

Population Status: In the Gulf of Maine and Georges Bank area, the American plaice stock is not overfished and overfishing is not occurring. However, a stock assessment conducted in 2012 indicates that the stock will not rebuild by 2014, the currently specified rebuilding target date, even if no fishing is allowed on the stock in FY 2013. Because of this inadequate rebuilding progress, a revised rebuilding program is necessary and will be developed for use no later than May 1, 2014.

6.2.1.6 Witch Flounder

Life History: The witch flounder, *Glyptocephalus cynoglossus*, is a demersal flatfish distributed on both sides of the North Atlantic. In the western North Atlantic, the species ranges from Labrador southward, and closely associates with mud or sand-mud bottom. In U.S. waters, witch flounder are common throughout the Gulf of Maine, in deeper areas on and adjacent to Georges Bank, and along the shelf edge as far south as Cape Hatteras, North Carolina. NMFS manages witch flounder as a unit stock.

Spawning occurs at or near the bottom; however, the buoyant eggs rise into the water column where subsequent egg and larval development occurs. The pelagic stage of witch flounder is the longest among the species of the family *Pleuronectidae*. Descent to the bottom occurs when metamorphosis is complete, at 4 to 12 months of age. There has been a decrease in both the age and size of sexual maturity in recent years. Witch flounder spawn from March to November, with peak spawning occurring in summer. The general trend is for spawning to occur progressively later from south to north. In the Gulf of Maine-Georges Bank region, spawning occurs from April to November, and peaks from May to August. Spawning occurs in dense aggregations that are associated with areas of cold water. Witch flounder spawn at 32 and 50 °F (0 to 10^{o}C).

Population Status: Witch flounder are overfished and overfishing is occurring.

6.2.1.7 Gulf of Maine Winter Flounder

Life History: The winter flounder, *Psuedopleuronectes americanus*, is a demersal flatfish distributed in the western North Atlantic from Labrador to Georgia. Important U.S. commercial and recreational fisheries exist from the Gulf of Maine to the Mid-Atlantic Bight. NMFS manages and assesses winter flounder in U.S. waters as three stocks: Gulf of Maine, southern New England/Mid-Atlantic, and Georges Bank. Adult GOM winter flounder migrate inshore in the fall and early winter and spawn in late winter and early spring. Winter flounder spawn from winter through spring, with peak spawning occurring in Massachusetts Bay and south of Cape Cod during February and March, and somewhat later along the coast of Maine, continuing into May. After spawning, adults typically leave inshore areas when water temperatures exceed 59 °F (15^{o}C) although some remain inshore year-round. The eggs of winter flounder are demersal, adhesive, and stick together in clusters. Larvae are initially planktonic but become increasingly bottom-oriented as metamorphosis approaches. Metamorphosis is when the left eye migrates to the right side of the body and the larvae become “flounder-like”. It begins around 5 to 6 weeks after hatching, and finishes by the time the larvae are 0.3 to 0.4 in (8 to 9 mm) in length at about 8 weeks after hatching. Newly metamorphosed young-of-the-year winter flounder reside in shallow water where individuals may grow to about 4 in (100 mm) within the first year.

Population Status: The exact status determination for GOM winter flounder is unknown. Overfishing is not occurring.

6.2.1.8 Georges Bank Winter Flounder

Life History: The life history of the GB winter flounder**,** *Psuedopleuronectes americanus*, is comparable to the GOM winter flounder life history described above.

Population Status: The stock is not overfished and not undergoing overfishing.

6.2.1.9 Cape Cod/Gulf of Maine Yellowtail Flounder

Life History: The yellowtail flounder, *Limanda ferruginea*, is a demersal flatfish that occurs from Labrador to Chesapeake Bay. It generally inhabits depths between 131 to 230 ft (40 and 70 m). NMFS manages three stocks off the U.S. coast including the Cape Cod/GOM, GB, and SNE/MA stocks. Spawning occurs in the western North Atlantic from March through August at temperatures of 41 to 54 °F (5 to 12°C). Spawning takes place along continental shelf waters northwest of Cape Cod. Yellowtail flounder spawn buoyant, spherical, pelagic eggs that lack an oil globule. Pelagic larvae are brief residents in the water column with transformation to the juvenile stage occurring at 0.5 to 0.6 in (11.6 to 16 mm) standard length. There are high concentrations of adults around Cape Cod in both spring and autumn. The median age at maturity for females is 2.6 years off Cape Cod.

Population Status: The Cape Cod/GOM yellowtail flounder stock continues to be overfished and overfishing is continuing. However, fishing mortality has been declining since 2004 and was at the lowest level observed in the time series in 2009. Spawning stock biomass has increased the past few years.

6.2.1.10 Georges Bank Yellowtail Flounder

Life History: The general life history of the GB yellowtail flounder, *Limanda ferruginea*, is comparable to the Cape Cod/GOM yellowtail described above. The median age at maturity for females is 1.8 years on Georges Bank. Spawning takes place along continental shelf waters of Georges Bank.

Population Status: GB yellowtail flounder is overfished, and overfishing is occurring.

6.2.1.11 Southern New England/Mid-Atlantic Yellowtail Flounder

Life History: The general life history of the SNE/MA yellowtail flounder, *Limanda ferruginea*, is comparable to the Cape Cod/GOM yellowtail described above. The median age at maturity for females is 1.6 years off southern New England.

Population Status: Based on a 2012 assessment, the SNE/MA yellowtail flounder stock is not overfished, not subject to overfishing, and is rebuilt. The assessment concluded that the stock is less productive than previously believed and, as a result, the overall biomass at recently seen low levels represents the rebuilt state of nature for the stock.

6.2.1.12 Redfish

Life History: The Acadian redfish, *Sebastes fasciatus* Storer, and the deepwater redfish, *S. mentella* Travin, are virtually indistinguishable from each other based on external characteristics. Deepwater redfish are less prominent in the more southerly regions of the Scotian Shelf and appear to be virtually absent from the Gulf of Maine. Conversely, Acadian redfish appear to be the sole representative of the genus Sebastes. NMFS manages Acadian redfish inhabiting the U.S. waters of the Gulf of Maine and deeper portions of Georges Bank and the Great South Channel as a unit stock.

The redfish are a slow growing, long-lived, ovoviviparous species with an extremely low natural mortality rate. Redfish fertilize their eggs internally. The eggs develop into larvae within the oviduct, and are released near the end of the yolk sac phase. The release of larvae lasts for 3 to 4 months with a peak in late May to early June. Newly spawned larvae occur in the upper 10 m of the water column; at 0.4 to 1.0 in (10 to 25 mm). The post-larvae descend below the thermocline when about 1 in (25 mm) in length. Young-of-the-year are pelagic until reaching 1.6 to 2.0 in (40 to 50 mm) at 4 to 5 months old. Therefore, young-of-the-year typically move to the bottom by early fall of their first year. Redfish of 9 in (22 cm) or greater are considered adults. In general, the size of landed redfish positively correlates with depth. This may be due to a combination of differential growth rates of stocks, confused species identification (deepwater redfish are a larger species), size-specific migration, or gender-specific migration (females are larger). Redfish make diurnal vertical migrations linked to their primary euphausiid prey. Nothing is known about redfish breeding behavior. However, redfish fertilization is internal and fecundity is relatively low.

Population Status: The redfish stock is not overfished and overfishing is not occurring.

6.2.1.13 Pollock

Life History: Pollock, *Pollachius virens*, occur on both sides of the North Atlantic. In the western North Atlantic, the species is most abundant on the western Scotian Shelf and in the Gulf of Maine. There is considerable movement of pollock between the Scotian Shelf, Georges Bank, and the Gulf of Maine. Although some differences in meristic and morphometric characters exist, there are no significant genetic differences among areas. As a result, pollock are assessed as a single unit. The principal pollock spawning sites in the western North Atlantic are in the western Gulf of Maine, Great South Channel, Georges Bank, and on the Scotian Shelf. Spawning takes place from September to April. Spawning time is more variable in northern sites than in southern sites. Spawning occurs over hard, stony, or rocky bottom. Spawning activity begins when the water column cools to near 46 °F (8^oC) and peaks when temperatures are approximately 40 to 43 °F (4.5 to 6^oC). Thus, most spawning occurs within a comparatively narrow range of temperatures.

Pollock eggs are buoyant and rise into the water column after fertilization. The pelagic larval stage lasts for 3 to 4 months. At this time the small juveniles or “harbor pollock” migrate inshore to inhabit rocky subtidal and intertidal zones. Pollock then undergo a series of inshore-offshore movements linked to temperature until near the end of their second year. At this point, the juveniles move offshore where the pollock remain throughout the adult stage. Pollock are a schooling species and occur throughout the water column. With the exception of short migrations due to temperature changes and north-south movements for spawning, adult pollock are fairly stationary in the Gulf of Maine and along the Nova Scotian coast. Male pollock reach sexual maturity at a larger size and older age than females. Age and size at maturity of pollock have declined in recent years. This similar trend has also been reported in other marine fish species such as haddock and witch flounder.

Population Status: The pollock stock is not subject to overfishing, is not overfished, and was declared rebuilt in 2010.

6.2.1.14 White Hake

Life History: The white hake, *Urophycis tenuis*, occurs from Newfoundland to southern New England and is common on muddy bottom throughout the Gulf of Maine. The depth distribution of white hake varies by age and season. Juvenile white hake typically occupy shallower areas than adults, but individuals of all ages tend to move inshore or shoalward in summer and disperse to deeper areas in winter. The northern spawning group of white hake spawns in late summer (August-September) in the southern Gulf of St. Lawrence and on the Scotian Shelf. The timing and extent of spawning in the Georges Bank - Middle Atlantic spawning group has not been clearly determined. The eggs, larvae, and early juveniles are pelagic. Older juvenile and adult white hake are demersal. The eggs are buoyant. Pelagic juveniles become demersal at 2.0 to 2.4 in (50 to 60 mm) total length. The pelagic juvenile stage lasts about two months. White hake attain a maximum length of 53 in (135 cm) and weigh up to 49 lbs (22 kg). Female white hake are larger than males.

Population Status: The 2008 assessment for white hake concluded the stock was overfished and overfishing was occurring. A new comprehensive stock assessment is planned for early 2013. The 2013 asessment results were not available when the Council submitted this EA for NMFS' evaluation. Since then, the assessment results have become available and indicate the stock is not overfished and overfishing is not occurring.

6.2.1.15 SNE/MA Winter Flounder

Life History: The winter flounder, blackback, or lemon sole, *Psuedopleuronectes americanus*, is a demersal flatfish distributed in the western North Atlantic from Labrador to Georgia. Winter flounder prefer mud, sand, clay, and even gravel habitat, but offshore populations may occur on hard bottom (Collette and Klein-MacPhee 2002). They migrate inshore in the fall and early winter and spawn in late winter and early spring (Pereira et al. 1999), with peak spawning occurring in Massachusetts Bay and south of Cape Cod during February and March, continuing into May. After spawning, adults typically leave inshore areas when water temperatures exceed 59 °F (15^{o}C) although some remain inshore year-round. The eggs of winter flounder are demersal, adhesive, and stick together in clusters. Larvae are initially planktonic but become increasingly bottom-oriented as metamorphosis approaches. Metamorphosis is when the left eye migrates to the right side of the body and the larvae become "flounder-like". It begins around 5 to 6 weeks after hatching, and finishes by the time the larvae are 0.3 to 0.4 in (8 to 9 mm) in length at about 8 weeks after hatching. Newly metamorphosed young-of-the-year winter flounder reside in shallow water where individuals may grow to about 4 in (100 mm) within the first year (Collette and Klein-MacPhee 2002). In U.S. waters, the resource is assessed and managed as three stocks: Gulf of Maine, Southern New England/Mid-Atlantic (SNE/MA), and Georges Bank.

Population Status: A benchmark assessment completed for SNE/MA winter flounder in 2011 concluded that this stock was overfished but overfishing was not occurring in 2010 (NEFSC 2011).

6.2.2 Gulf of Maine-Georges Bank Windowpane Flounder

Life History: Windowpane flounder or sand flounder, *Scophthalmus aquosus*, is a left-eyed, flatfish species that occurs in the northwest Atlantic from the Gulf of St. Lawrence to Florida (Collette and Klein-MacPhee 2002). Windowpane prefer sandy bottom habitats. They occur at depths from the high water mark to 656 ft (200 m), with the greatest abundance at depths < 180 ft (55 m), and at temperatures between 32º-80ºF (0º-26.8ºC) (Moore 1947). On Georges Bank, the species is most abundant at depths < 60 m during late spring through autumn but overwintering occurs in deeper waters out to 366 m (Chang et al. 1999). Windowpane flounders are assessed and managed as two stocks: Gulf of Maine-Georges Bank (GOM/GB) and Southern New England-Mid-Atlantic Bight (SNE/MA) due to differences in growth rates, size at maturity, and relative abundance trends. Windowpane generally reach sexual maturity between ages 3 and 4 (Moore 1947), though males can mature at age 2 (Grosslein and Azarovitz 1982). On Georges Bank, median length at maturity is nearly the same for males (8.7 in, 22.2 cm) and females (8.9 in, 22.5 cm) (O'Brien et al. 1993). Spawning occurs on Georges bank during July and August and peaks again between October and November at temperatures of 55º- 61ºF (13º-16ºC) (Morse and Able 1995). Eggs incubate for 8 days at 50º-55ºF (10º-13ºC) and eye migration occurs approximately 17- 26 days after hatching (G. Klein-MacPhee, unpubl. data, as cited in Collette and Klein-MacPhee 2002). During the first year of life, spring-spawned fish have significantly faster growth rates than autumn-spawned fish, which may result in differential natural mortality rates between the two cohorts (Neuman et al. 2001). Young windowpane settle inshore and then move offshore to deeper waters as they grow. Trawl survey data suggest that windowpane on Georges Bank aggregate in shallow water during summer and early fall and move offshore in the winter and early spring (Grosslein and Azarovitz 1982).

Population Status: Indices from NEFSC fall surveys are used as an indicator of stock abundance and biomass. These biomass indices have fluctuated above and below the time series median as fishing mortality rates have fluctuated below and above the point where the stock could replenish itself. Biomass indices increased to levels at or slightly above the median during 1998-2003, but then fell below the median from 2004-2010 and was 29% of B_{MSY} in 2010 (NEFSC 2012). According to a 2012 assessment update, the stock was overfished and overfishing was occurring in 2010.

6.2.3 Southern New England-Mid-Atlantic Bight Windowpane Flounder

Life History: Windowpane flounder, *Scophthalmus aquosus*, is a left-eyed, flatfish species that occurs in the northwest Atlantic from the Gulf of St. Lawrence to Florida, with the greatest abundance on Georges Bank and in the New York Bight (Collette and Klein-MacPhee 2002). Windowpane prefer sandy bottom habitats at depths < 180 ft (55 m), but they occur at depths from the high water mark to 656 ft (200 m) and at temperatures between 32º-80ºF (0º-26.8ºC) (Moore 1947). Windowpane flounders are assessed and managed as two stocks: Gulf of Maine-Georges Bank (GOM/GB) and Southern New England-Mid-Atlantic Bight (SNE/MA) due to differences in growth rates, size at maturity, and relative abundance trends. Windowpane generally reach sexual maturity between ages 3 and 4 (Moore 1947), though males can mature at age 2 (Grosslein and Azarovitz 1982). In Southern New England, median length at maturity is nearly the same for males (8.5 in, 21.5 cm) and females (8.3 in, 21.2 cm) (O'Brien et al. 1993). A split spawning season occurs between Virginia and Long Island with peaks in spring and fall (Chang et al. 1999). Spawning occurs in the southern Mid-Atlantic during April and May and then peaks again in October or November (Morse and Able 1995). Eggs incubate for 8 days at 50º-55ºF (10º-13ºC) and eye migration occurs approximately 17- 26 days after hatching (G. Klein-MacPhee, unpubl. data, as cited in Collette and Klein-MacPhee 2002). During the first year, spring-spawned fish have significantly faster growth rates than autumn-spawned fish, which may lead to different natural mortality rates (Neuman et al. 2001).

Population Status: A 2012 assessment update indicated that in 2010 biomass was well above the B_{MSY} proxy (146%) and overfishing was not occurring (NEFSC 2012). As a result this stock has been declared rebuilt.

6.2.4 Atlantic Wolffish

Life History: Atlantic wolffish, *Anarhichas lupus*, is a benthic fish distributed on both sides of the North Atlantic Ocean. In the northwest Atlantic the species occurs from Davis Straits off of Greenland to Cape Cod and sometimes in southern New England and New Jersey waters (Collette and Klein-MacPhee 2002). In the Georges Bank-Gulf of Maine region, abundance is highest in the southwestern portion at depths of 263-394 ft (80 - 120 m), but wolffish are also found in waters from 131-787 ft (40 to 240 m) (Nelson and Ross 1992) and at temperatures of 29.7º-50.4º F (-1.3º-10.2º C) (Collette and Klein-MacPhee 2002). They prefer complex benthic habitats with large stones and rocks (Pavlov and Novikov 1993). Atlantic wolffish are mostly sedentary and solitary, except during mating season. There is some evidence of a weak seasonal shift in depth between shallow water in spring and deeper water in fall (Nelson and Ross 1992). Most individuals mature by age 5-6 when they reach approximately 18.5 in (47 cm) total length (Nelson and Ross 1992, Templeman 1986). However, size at first maturity varies regionally; northern fish mature at smaller sizes than faster growing southern fish. There is conflicting information about the spawning season for Atlantic wolffish in the Gulf of Maine-Georges Bank region. Peak spawning period is believed to occur from September to October (Collette and Klein-MacPhee 2002), though laboratory studies have shown that wolffish can spawn most of the year (Pavlov and Moksness 1994). Eggs are laid in masses and that the males are thought to brood for several months. Incubation time is dependent on water temperature and may be 3 to 9 months. Larvae and early juveniles are pelagic between 20 and 40 mm TL, with settlement beginning by 50 mm TL (Falk-Petersen and Hansen 1990).

Population Status: NEFSC spring and fall bottom trawl survey indices show abundance and biomass of Atlantic wolffish generally has declined over the last two to three decades. However, Atlantic wolffish are encountered infrequently on NEFSC bottom trawl surveys and there is uncertainty as to whether the NEFSC surveys adequately sample this species (NDPSWG, 2009). Atlantic wolffish continues to be considered a data poor species. An assessment update in 2012 determined that the stock is overfished, but overfishing is not occurring.

6.2.5 Atlantic Halibut

Life History: Atlantic halibut, *Hippoglossus hippoglossus*, is the largest species of flatfish found in the northwest Atlantic Ocean. This long-lived, late-maturing flatfish is distributed from Labrador to southern New England (Collette and Klein-MacPhee 2002). They prefer sand, gravel, or clay substrates at depths up to 1000 m (Scott and Scott 1988; Miller et al. 1991). Along the coastal Gulf of Maine, halibut move to deeper water in winter and shallower water in summer (Collette and Klein-MacPhee 2002). Atlantic halibut reach sexual maturity between 5 to 15 years and the median female age of maturity in the Gulf of Maine-Georges Bank region is 7 years (Sigourney et al. 2006). In general, Atlantic halibut spawn once per year in synchronous groups during late winter through early spring (Neilson et al. 1993) and females can produce up to 7 million eggs per year depending on size (Haug and Gulliksen 1988). Spawning is believed to occur in waters of the upper continental slope at depths of 200 m or greater (Scott and Scott 1988). Halibut eggs are buoyant but drift suspended in the water at depths of 54-90 m (Tåning 1936). Incubation times are 13-20 days depending on temperature (Blaxter et al. 1983), how long halibut live in the plankton after hatching is not known.

Population Status: Survey indices are highly variable because the NEFSC trawl surveys catch low numbers of halibut. The spring survey abundance index suggested a relative increase during the late 1970s to the early 1980s, a decline during the 1990s, and an increase since the late 1990s. Based on the results of a 2012 assessment update, Atlantic halibut is overfished and overfishing is not occurring (NEFSC 2012).

6.2.5.1.1 Ocean Pout

Life History: Ocean pout, *Zoarces americanus*, is a demersal eel-like species found in the northwest Atlantic from Labrador to Delaware. Ocean pout are most common sand and gravel bottom (Orach-Meza 1975) at an average depth of 49-262 ft (15-80 m) (Clark and Livingstone 1982) and temperatures of 43º-48º F (6º-9º C) (Scott 1982). In U.S. waters, ocean pout are assessed and managed as a unit stock from the Gulf of Maine to Delaware. In the Gulf of Maine, median length at maturity for males and females was 11.9 in (30.3 cm) and 10.3in (26.2 cm), respectively. Median length at maturity for males and females from Southern New England was 12.6 in (31.9 cm) and 12.3in (31.3 cm), respectively (O'Brien et al. 1993). According to tagging studies conducted in Southern New England, ocean pout appear not to migrate, but do move between different substrates seasonally. In Southern New England-Georges Bank they occupy cooler rocky areas in summer, returning in late fall (Orach-Meza 1975). In the Gulf of Maine, they move out of inshore areas in the late summer and then return in the spring. Spawning occurs between September and October in Southern New England (Olsen and Merriman 1946) and in August and September in Newfoundland (Keats et al. 1985). Adults aggregate in rocky areas prior to spawning. Eggs are internally fertilized (Mercer et al. 1993; Yao and Crim 1995a) and females lay egg masses in encased in a gelatinous matrix that they then guard during the incubation period of 2.5-3 months (Keats et al. 1985). Ocean pout hatch as juveniles on the bottom and are believed to remain there throughout their lives (Methven and Brown 1991; Yao and Crim 1995a).

Population Status: Between 1975 and 1985, NEFSC spring trawl survey biomass indices increased to record high levels, peaking in 1981and 1985. Since 1985, survey catch per tow indices have generally declined, and the 2010 index was the lowest value in the time series. Catch and exploitation rates have also been low, but stock size has not increased. A 2012 assessment update determined that in 2010 ocean pout was overfished, but overfishing was not occurring (NEFSC 2012).

6.2.6 Assemblages of Fish Species

Georges Bank and the Gulf of Maine have historically had high levels of fish production. Several studies have identified demersal fish assemblages over large spatial scales. Overholtz and Tyler (1985) found five depth-related groundfish assemblages for Georges Bank and the Gulf of Maine that were persistent temporally and spatially. The study identified depth and salinity as major physical influences explaining assemblage structure. Table 13 (adapted from Amendment 16) compares the six assemblages identified in Gabriel (1992) with the five assemblages from Overholtz and Tyler (1985). This EA considers these assemblages and relationships to be relatively consistent. Therefore, these descriptions generally describe the affected area. The assemblages include allocated target species, as well as non-allocated target species and bycatch. The terminology and definitions of habitat types in Table 13 vary slightly between the two studies. For further information on fish habitat relationships, see Table 11.

Table 14 -Comparison of Demersal Fish Assemblages of Georges Bank and the Gulf of Maine

Overholtz and Tyler (1985)		Gabriel (1992)	
Assemblage	**Species**	**Species**	**Assemblage**
Slope and Canyon	offshore hake, blackbelly rosefish, Gulf stream flounder, fourspot flounder, goosefish, silver hake, white hake, red hake	offshore hake, blackbelly rosefish, Gulf stream flounder, fawn cusk-eel, longfin hake, armored sea robin	Deepwater
Intermediate	silver hake, red hake, goosefish, Atlantic cod, haddock, ocean pout, yellowtail flounder, winter skate, little skate, sea raven, longhorn sculpin	silver hake, red hake, goosefish, northern shortfin squid, spiny dogfish, cusk	Combination of Deepwater Gulf of Maine/Georges Bank and Gulf of Maine-Georges Bank Transition
Shallow	Atlantic cod, haddock, pollock, silver hake, white hake, red hake, goosefish, ocean pout	Atlantic cod, haddock, pollock	Gulf of Maine-Georges Bank Transition Zone
	yellowtail flounder, windowpane winter flounder, winter skate, little skate, longhorn sculpin, summer flounder, sea raven, sand lance	yellowtail flounder, windowpane winter flounder, winter skate, little skate, longhorn sculpin	Shallow Water Georges Bank-southern New England
Gulf of Maine-Deep	white hake, American plaice, witch flounder, thorny skate, silver hake, Atlantic cod, haddock, cusk, Atlantic wolffish	white hake, American plaice, witch flounder, thorny skate, redfish	Deepwater Gulf of Maine-Georges Bank
Northeast Peak	Atlantic cod, haddock, pollock, ocean pout, winter flounder, white hake, thorny skate, longhorn sculpin	Atlantic cod, haddock, pollock	Gulf of Maine-Georges Bank Transition Zone

6.2.7 Stock Status Trends

The most recent stock assessments for the groundfish stocks can be found via the NEFSC website at http://www.nefsc.noaa.gov/saw/. The information in this section is adapted from the most recent stock assessment report for the groundfish stocks. The information in this section is adapted from the most recent stock assessment report for the groundfish stocks. Table 14 summarizes the status of the northeast groundfish stocks.

Table 15 - Status of the Northeast Groundfish Stocks for fishing year 2013

Stock Status	Stock (assessment source)
Overfished and Overfishing Biomass < ½ B_{MSY} and F > F_{MSY}	GB Cod (GARM III) GOM Cod (SARC 54) Cape Cod/GOM Yellowtail Flounder (assessment update) Witch Flounder (assessment update) Northern Windowpane (operational assessment) GB Yellowtail Flounder (2012 TRAC)
Overfished but not Overfishing Biomass < ½ B_{MSY} and F $\leq$ F_{MSY}	Ocean Pout (assessment update) Atlantic Halibut (assessment update) GOM Winter Flounder (SARC 52)[b] Atlantic wolffish (assessment update) SNE/MA Winter Flounder
Not Overfished but Overfishing Biomass $\geq$ ½ B_{MSY} and F > F_{MSY}	GOM Haddock (assessment update)
Not Overfished and not Overfishing Biomass $\geq$ ½ B_{MSY} and F $\leq$ F_{MSY}	Pollock (SARC 50) Acadian Redfish (assessment update) SNE/MA yellowtail flounder (SARC 54) American Plaice (assessment update) GB Haddock (assessment update) GB Winter Flounder(SARC 52) Southern Windowpane (assessment update) White Hake (SARC 56)

Notes:

B_{MSY} = biomass necessary to produce maximum sustainable yield (MSY)

F_{MSY} = fishing mortality rate that produces the MSY

[b] Rebuilding, but no defined rebuilding program due to a lack of data. Unknown whether the stock is overfished.

Assessment references (available at http://www.nefsc.noaa.gov/saw/)

Northeast Fisheries Science Center. 2008. Assessment of 19 Northeast Groundfish Stocks through 2007: Report of the 3rd Groundfish Assessment Review Meeting (GARM III), Northeast Fisheries Science Center, Woods Hole, Massachusetts, August 4-8, 2008. US Dep Commer, NOAA Fisheries, Northeast Fish Sci Cent Ref Doc. 08-15; 884 p + xvii.

Northeast Fisheries Science Center. 2010. 50th Northeast Regional Stock Assessment Workshop (50th SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 10-17; 844 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026

Northeast Fisheries Science Center. 2011. 52nd Northeast Regional Stock Assessment Workshop (52nd SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-17; 962 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026

Northeast Fisheries Science Center. 2012. 53rd Northeast Regional Stock Assessment Workshop (53rd SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-03; 33 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026

Northeast Fisheries Science Center. 2012. 54th Northeast Regional Stock Assessment Workshop (54th SAW)

Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-14; 40 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026,

Northeast Fisheries Science Center. 2012. Assessment or Data Updates of 13 Northeast Groundfish Stocks through 2010. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-06; 789 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026

Northeast Fisheries Science Center. 2013. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-04; 42 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026

6.2.8 Interaction between Gear and Allocated Target Species

FY 2010 through FY 2011 data show that the majority of fish of all species caught on groundfish trips are caught with trawls. GARM III indicated that only cod and white hake are caught in significant numbers by gillnets. Only haddock are caught in significant numbers by hook and line.

6.3 Non-Allocated Target Species and Bycatch

Non-allocated target species are species which sector vessels are not assigned an ACE but can target and land. Bycatch refers to fish which are harvested in a fishery, but are discarded and not sold or kept for personal use. Non-allocated target species and bycatch may include a broad range of species. For purposes of this assessment the non-allocated target species and bycatch most likely to be affected by the sector operations plans include spiny dogfish, skates, and monkfish. This approach follows the convention established in Amendment 16. Spiny dogfish, skates, and monkfish were the top three non-groundfish species landed by multispecies vessels in FY 2006 and FY 2007 under the Category B (regular) DAS program (Amendment 16, Table 87). American lobster is also included as a non-target bycatch species for FY 2012 because many sector vessels also fish in the lobster fishery. These species have no allocation under the Northeast Multispecies FMP and are managed under separate FMPs. Fishermen commonly land monkfish and skates. Spiny dogfish tend to be relatively abundant in catches. Fishermen may land some spiny dogfish, but dogfish are often the predominant component of the discarded bycatch. Fishermen may discard monkfish when regulations or market conditions constrain the amount of the catch that they can land.

Scallops, whiting, fluke and fluke squid are included in this section because fishing activity for these species will be affected by measures in this action that are designed to reduce or control catches of groundfish species by these fisheries. This is primarily due to the groundfish sub-ACLs allocated to fisheries for these species.

Atlantic halibut, Gulf of Maine-Georges Bank windowpane flounder, Southern New England-Mid-Atlantic Bight windowpane flounder, ocean pout, Atlantic wolffish, and Southern New England/Mid-Atlantic (SNE/MA) winter flounder are part of the Multispecies FMP, but are not allocated to sectors. Therefore, impacts to these species are assessed under this VEC as bycatch.

6.3.1 Spiny Dogfish

Life History: The spiny dogfish, *Squalus acanthias*, occurs in the western North Atlantic from Labrador to Florida. Regulators consider spiny dogfish to be a unit stock off the coast of New England. In summer, dogfish migrate northward to the Gulf of Maine-Georges Bank region and into Canadian waters. They return southward in autumn and winter. Spiny dogfish tend to school by size and, when mature, by sex. The species bears live young, with a gestation period of about 18 to 22 months, and produce between 2 to 15 pups with an average of 6. Size at maturity for females is around 31 in (80 cm), but can vary from 31 to 33 in (78 cm to 85 cm) depending on the abundance of females.

Population Management and Status: The NEFMC and MAFMC jointly develop the spiny dogfish FMP for federal waters. The Atlantic States Marine Fisheries Commission (ASMFC) concurrently develops a plan for state waters. Spawning stock biomass of spiny dogfish declined rapidly in response to a directed fishery during the 1990's. NFMS initially implemented management measures for spiny dogfish in 2001. These measures have been effective in reducing landings and fishing mortality. Based upon the 2009 updated stock assessment performed by the Northeast Fisheries Science Center, the spiny dogfish stock is not presently overfished and overfishing is not occurring. NMFS declared the spiny dogfish stock rebuilt for the purposes of U.S. management in May 2010.

6.3.2 Skates

Life History: The seven species in the Northeast Region skate complex are: little skate (*Leucoraja erinacea*), winter skate (*L. ocellata*), barndoor skate (*Dipturus laevis)*, thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). The barndoor skate is the most common skate in the Gulf of Maine, on Georges Bank, and in southern New England. Georges Bank and southern New England is the center of distribution for the little and winter skates in the Northeast Region. . The thorny and smooth skates typically occur in the Gulf of Maine. The clearnose and rosette skates have a more southern distribution, and occur primarily in southern New England and the Chesapeake Bight.

Skates are not known to undertake large-scale migrations. Skates tend to move seasonally in response to changes in water temperature. Therefore, they move offshore in summer and early autumn and then return inshore during winter and spring. Skates lay eggs enclosed in a hard, leathery case commonly called a mermaid's purse. Incubation time is 6 to 12 months, with the young having the adult form at the time of hatching.

Population Management and Status: NMFS implemented the Northeast Skate Complex Fishery Management Plan (Skate FMP) in September 2003. The FMP required by both dealers and vessels to report skate landings by species (http://www.nefmc.org/skates/fmp/fmp.htm). Possession prohibitions of barndoor, thorny, and smooth skates in the Gulf of Maine were also provisions of the FMP. The FMP implemented a trip limit of 10,000 lbs (4,536 kg) for winter skate, and required fishermen to obtain a Letter of Authorization to exceed trip limits for the little skate bait fishery.

In 2010 Amendment 3 to the Skate FMP implemented a rebuilding plan for smooth skate and established an ACL and annual catch target for the skate complex, total allowable landings for the skate wing and bait fisheries, and seasonal quotas for the bait fishery. Amendment 3 also reduced possession limits, in-season possession limit triggers, and other measures to improve management of the skate fisheries. Due to insufficient information about the population dynamics of skates, there remains considerable uncertainty about the status of skate stocks. Based on NEFSC bottom trawl survey data through autumn

2011/spring 2012 one skate species was overfished (thorny) and overfishing was not occurring in any of the seven skate species.

Skate landings have generally increased since 2000. The landings and catch limits proposed by Amendment 3 have an acceptable probability of promoting biomass growth and achieving the rebuilding (biomass) targets for thorny skates. Modest reductions in landings and a stabilization of total catch below the median relative exploitation ratio should cause skate biomass and future yield to increase.

6.3.3 Monkfish

Life History: Monkfish, *Lophius americanus,* also called goosefish, occur in the western North Atlantic from the Grand Banks and northern Gulf of St. Lawrence south to Cape Hatteras, North Carolina. Monkfish occur from inshore areas to depths of at least 2,953 ft (900 m). Monkfish undergo seasonal onshore-offshore migrations. These migrations may relate to spawning or possibly to food availability.

Female monkfish begin to mature at age 4 with 50 percent of females maturing by age 5 (about 17 in [43 cm]). Males generally mature at slightly younger ages and smaller sizes (50 percent maturity at age 4.2 or 14 in [36 cm]). Spawning takes place from spring through early autumn. It progresses from south to north, with most spawning occurring during the spring and early summer. Females lay a buoyant egg raft or veil that can be as large as 39 ft (12 m) long and 5 ft (1.5 m) wide, and only a few mm thick. The larvae hatch after about 1 to 3 weeks, depending on water temperature. The larvae and juveniles spend several months in a pelagic phase before settling to a benthic existence at a size of about 3 in (8 cm).

Population Management and Status: NMFS implemented the Monkfish FMP in 1999 (NEFMC and MAFMC 1998). The FMP included measures to stop overfishing and rebuild the stocks through a number of measures. These measures included:

- 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.

The Monkfish FMP defines two management areas for monkfish (northern and southern), divided roughly by an east-west line bisecting Georges Bank. Monkfish in both management regions are not overfished and overfishing is not occurring.

6.3.4 Summer Flounder

Life History: Summer flounder, *Paralichthys dentatus*, occur in the western North Atlantic from the southern Gulf of Maine to South Carolina. Summer flounder are concentrated in bays and estuaries from late spring though early autumn, when an offshore migration to the outer continental shelf is undertaken.

Spawning occurs during autumn and early winter, and the larvae are transported toward coastal areas by prevailing water currents. Development of post larvae and juveniles occurs primarily within bays and estuarine areas. Most fish are sexually mature by age 2. Female summer flounder may live up to 20 years, but males rarely live for more than 10 years. Growth rates differ appreciably between the sexes with females attaining weights up to 11.8 kg (26 lbs.).

Population Management and Status: The FMP was developed by the Mid-Atlantic Fishery Management Council in 1988. Scup and black sea bass were later incorporated into the FMP. Amendment 2, implemented in 1993, established 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. In 1999, Amendment 12 revised the 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 for a streamlined process for relatively minor changes to management measures.

The stock is not overfished and overfishing is not occurring, although the stock is still rebuilding (NEFSC 2008).

6.3.5 American lobster

Life History: The American lobster, *Homarus americanus*, occurs in continental shelf waters from Maine to North Carolina. The American lobster is long-lived and known to reach more than 40 pounds in body weight (Wolff, 1978). Lobsters are encased in a hard external skeleton that is periodically cast off (molted) to allow growth and mating to take place. Eggs are carried under the female's abdomen during the 9 to 12 month incubation period. Larger lobsters produce eggs with greater energy content and thus, may produce larvae with higher survival rates (Attard and Hudon, 1987). Seasonal timing of egg extrusion and larval hatching is somewhat variable among areas and may also vary due to seasonal weather patterns. Overall, hatching tends to occur over a four month period from May – September, occurring earlier and over a longer period in the southern part of the range. The pelagic larvae molt four times before they resemble adults and settle to the bottom. They will molt more than 20 times over a period of 5 to 8 years before they reach the minimum legal size to be harvested. Cooper and Uzmann, (1971) and Uzmann, et al., (1977) observed that tagged lobster were observed to move to relatively cool deep canyon areas in late fall and winter, and then migrate back to shallower and relatively warm water in spring and summer.

Population Management and Status: The states and NMFS cooperatively manage the American lobster resource and fishery under the framework of the Atlantic States Marine Fisheries Commission (ASMFC). States have jurisdiction for implementing measures in state waters, while NMFS implements complementary regulations in federal waters. Inshore landings have increased steadily since the early 1970s. Fishing effort is intense and increasing throughout much of the range of the species. The majority of the landings are reportedly harvested from state waters (within 3 miles of shore). The most recent peer-reviewed stock assessment for American lobster, published by the ASMFC in 2009, identifies the status of the three biological stock units, delineated primarily on the basis of regional differences in life history parameters, such as lobster distribution and abundance, patterns of migration, location of spawners, and the dispersal and transport of larvae. These stock units are the Gulf of Maine, Georges Bank, and Southern New England. While each area has an inshore and offshore component, Gulf of Maine and Southern New England areas support predominantly inshore fisheries and the Georges Bank supports a predominantly offshore fishery. The most recent 2009 Stock Assessment Report concluded that "(t)he American lobster fishery resource presents a mixed picture, with stable abundance for much of the Gulf of Maine stock, increasing abundance for the Georges Bank stock, and decreased abundance and recruitment yet continued high fishing mortality for the Southern New England stock (ASMFC 2009).

6.3.6 Whiting (Silver Hake)

This description is quoted from the NEFSC Status of Fishery Resources (http://www.nefsc.noaa.gov/sos/spsyn/pg/silverhake/).

Life History: Silver hake, also known as whiting, *Merluccius bilinearis*, range primarily from Newfoundland to South Carolina. Silver hake are fast swimmers with sharp teeth, and are important fish predators that also feed heavily on crustaceans and squid (Lock and Packer 2004). In U.S. waters, two stocks have been identified based on differences of head and fin lengths (Almeida 1987), otolith morphometrics (Bolles and Begg 2000), otolith growth differences, and seasonal distribution patterns (Lock and Packer 2004). The northern silver hake stock inhabits Gulf of Maine - Northern Georges Bank waters, and the southern silver hake stock inhabits Southern Georges Bank - Middle Atlantic Bight waters. Silver hake migrate in response to seasonal changes in water temperatures, moving toward shallow, warmer waters in the spring. They spawn in these shallow waters during late spring and early summer and then return to deeper waters in the autumn (Brodziak et al. 2001). The older, larger silver hake especially prefer deeper waters. During the summer, portions of both stocks can be found on Georges Bank, whereas during the winter fish in the northern stock move to deep basins in the Gulf of Maine, while fish in the southern stock move to outer continental shelf and slope waters. Silver hake are widely distributed, and have been observed at temperature ranges of 2-17° C (36-63° F) and depth ranges of 11-500 m (36-1,640 ft). However, they are most commonly found between 7-10º C (45-50º F) (Lock and Packer 2004).

Population Management and Status: Due to their abundance and availability, silver hake have supported important U.S. and Canadian fisheries as well as distant-water fleets. Landings increased to 137,000 mt in 1973 and then declined sharply with increased restrictions on distant-water fleet effort and implementation of the Magnuson Fishery Conservation and Management Act (MFCMA) in 1977. U.S. landings during 1987-1996 were relatively stable, averaging 16,000 mt per year, but have gradually declined to a historic low of 6,800 mt in 2005.

The otter trawl remains the principal gear used in the U.S. fishery, and recreational catches have been low since 1985. Silver hake are managed under the New England Fishery Management Council's Northeast Multispecies Fishery Management Plan ("nonregulated multispecies" category). In 2000, the New England Fishery Management Council implemented Amendment 12 to this FMP, and placed silver hake into the "small mesh multispecies" management unit, along with red hake and offshore hake. This amendment established retention limits based on net mesh size, adopted overfishing definitions for northern and southern stocks, identified essential fish habitat for all life stages, and set requirements for fishing gear (NEFMC 2000). In 2005, the 3-year average exploitation index for 2003-2005 was below the FMSY proxy and the 3-year average biomass index remained above the ½ BMSY proxy, indicating that the stock is not overfished and overfishing is not occurring.

6.3.7 Loligo Squid

This description is quoted from the NEFSC Status of Fishery Resources (http://www.nefsc.noaa.gov/sos/spsyn/iv/lfsquid/).

Life History: Longfin inshore squid (*Loligo pealeii*) are distributed primarily in continental shelf waters located between Newfoundland and the Gulf of Venezuela (Cohen 1976; Roper et al. 1984). In the northwest Atlantic Ocean, longfin squid are most abundant in the waters between Georges Bank and Cape Hatteras where the species is commercially exploited. The stock area extends from the Gulf of Maine to Cape Hatteras. Distribution varies seasonally. North of Cape Hatteras, squid migrate offshore during late autumn to overwinter in warmer waters along the shelf edge and slope, and then return inshore during the spring where they remain until late autumn (Jacobson 2005). The species lives for about nine months, grows rapidly, and spawns year-round (Brodziak and Macy 1996) with peaks during late spring and autumn. Individuals hatched in summer grow more rapidly than those hatched in winter and males grow faster and attain larger sizes than females (Brodziak and Macy 1996).

Population Management and Status: The domestic fishery occurs primarily in Southern New England and Mid-Atlantic waters, but some fishing also occurs along the edge of Georges Bank. Fishing patterns reflect seasonal Loligo distribution patterns and effort is generally directed offshore during October through April and inshore during May through September. The fishery is dominated by small-mesh otter trawlers, but near-shore pound net and fish trap fisheries occur during spring and summer. Since 1984, annual offshore landings have generally been three-fold greater than inshore landings. The stock is managed by the Mid-Atlantic Fishery Management Council under the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (FMP). Management measures for the L. pealeii stock include annual total allowable catches (TACs) which have been partitioned into seasonal quotas since 2000 (trimesters in 2000 and quarterly thereafter), a moratorium on fishery permits, and a minimum codend mesh size of 1 7/8 inches.

6.3.8 Atlantic Sea Scallops

Life History: This description is quoted from the NEFSC Status of Fishery Resources (http://www.nefsc.noaa.gov/sos/spsyn/iv/lfsquid/). Sea scallops *Placopecten magellanicus* are distributed in the northwest Atlantic Ocean from Newfoundland to North Carolina, mainly on sand and gravel sediments where bottom temperatures remain below 20^{o}C (68^{o}F). North of Cape Cod, concentrations generally occur in shallow water less than 40 m (22 fathoms) deep. South of Cape Cod and on Georges Bank, sea scallops typically occur at depths between 25 and 200 m (14 to 110 fathoms), with commercial concentrations generally between 35 and 100 m (19 to 55 fathoms). Sea scallops are filter feeders, feeding primarily on phytoplankton, but also on microzooplankton and detritus (Hart and Chute 2004). Sea scallops grow rapidly during the first several years of life. Between ages 3 and 5, they commonly increase 50 to 80% in shell height and quadruple their meat weight. Sea scallops have been known to live more than 20 years. They usually become sexually mature at age 2, but individuals younger than age 4 probably contribute little to total egg production. Sexes are separate and fertilization is external. Spawning usually occurs in late summer and early autumn; spring spawning may also occur, especially in the Mid-Atlantic Bight. Sea scallops are highly fecund; a single large female can release hundreds of millions of eggs annually. Larvae remain in the water column for four to seven weeks before settling to the bottom. Sea scallops attain commercial size at about four to five years old, though historically, three year olds were often exploited.

Population and Management Status: The commercial fishery for sea scallops is conducted year round, primarily using offshore New Bedford style scallop dredges. A small percentage of the fishery employs otter trawls, mostly in the Mid-Atlantic. The principal U.S. commercial fisheries are in the Mid-Atlantic (from Virginia to Long Island, New York) and on Georges Bank and neighboring areas, such as the Great South Channel and Nantucket Shoals. There is also a small, primarily inshore fishery for sea scallops in the Gulf of Maine. Recreational fishing is insignificant. Sea scallops have a somewhat uncommon combination of life-history attributes: low mobility, rapid growth, and low natural mortality. The Council established the Scallop FMP in 1982. A number of Amendments and Framework Adjustments have been implemented since that time to adjust the original plan. The scallop resource was last assessed in 2010 (SARC 50) and it was not overfished, and overfishing was not occurring. The Scallop PDT has evaluated biomass and fishing mortality since and based on 2012 estimates, biomass is 119,000 mt, well above the threshold for an overfished stock (1/2 Bmsy = 62,000 mt), and almost at Bmsy (125,000 mt). The estimate of fishing mortality overall is 0.34, above the target F of 0.32 but below the overfishing limit threshold of 0.38. Total catch has been stable at about 20-30,000 mt since 2001, up from about 5,000 mt harvests of the late 1990s.

6.3.9 Interaction between Gear and Non-allocated Target Species and Bycatch

The majority of the proposed sectors have minimal operational history; therefore, the analysis of interactions between gear and non-allocated target species and bycatch is based in part on catch information for the Northeast Multispecies FMP common pool fishery from FY 1996 to FY 2006. It is also based on sector data from FY 2009 to FY 2011, as presented in Section 6.5.8.

The Final Supplemental Environmental Impact Statement to Amendment 2 to the Monkfish FMP (NEFMC and MAFMC 2003) evaluated the potential adverse effects of gears used in the directed monkfish fishery. It evaluated impacts for monkfish and other federally-managed species, as well as the effects of fishing activities regulated under other federal FMPs on monkfish. Bottom trawls and bottom gillnets and the two gears used in the monkfish fishery. Amendment 2 to the Monkfish FMP (NEFMC and MAFMC 2003) describes these gears in detail. Sectors would use these same gears in FY 2012.

Fishermen in the Northeast Region harvest skates in two very different ways. Fishermen harvest whole skates for lobster bait. They also harvest skate wings for food. Vessels tend to catch skates when targeting other species like groundfish, monkfish, and scallops. The vessels will land skate if the price is high enough. The recent NEFMC Amendment to the Skate FMP and accompanying Final Supplemental Environmental Impact Statement (NEFMC 2009b) contain detailed information about skate fisheries.

Dogfish have the potential to interact with all gear types used by sectors. A status review for Atlantic sturgeon was completed in 2007 which indicated that five distinct population segments (DPS) of Atlantic sturgeon exist in the United States (ASSRT 2007). On October 6, 2010, NMFS proposed listing these five DPSs of Atlantic sturgeon along the U.S. East Coast as either threatened or endangered species (75 FR 61872 and 75 FR 61904). A final listing was published on February 6th, 2012 (77 FR 5880 and 75 FR 5914). The GOM DPS of Atlantic sturgeon has been listed as threatened, and the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon have been listed as endangered. Atlantic sturgeon from any of the five DPSs could occur in areas where the multispecies fishery operates Atlantic sturgeon are known to be captured in sink gillnet, drift gillnet, and otter trawl gear (Stein et al. 2004a, ASMFC TC 2007). Of these gear types, sink gillnet gear poses the greatest known risk of mortality for bycaught sturgeon (ASMFC TC 2007). Sturgeon deaths were rarely reported in the otter trawl observer dataset, as well as sink gillnet and drift gillnet gear (ASMFC TC 2007).

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 and 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).

Table 15 shows that otter trawl gear caught the majority of non-allocated target species and bycatch between FY 1996 to FY 2006.

Table 16 - Landings (mt) for Non-allocated Target Species and Bycatch by Gear Type[a]

	Gear Type									
	Trawl		Gillnet		Dredge		Other Gear		Total[b]	
Species	Landings	Discard	Landings	Discard	Landings	Discard	Landings	Discard	Landings	Discard
Monkfish	NA	16,516	NA	6,526	NA	16,136	NA	4 [c]	228,000	39,182
Skates	117,381	315,308	29,711	26,601	--	146,725	4,413	2646 [d]	151,505	491,280
Dogfish	24,368	61,914	72,712	39,852	--	--	946	--	98,026	101,766

Notes:

NA = landings or discard data not available for individual fishery gear type for this species.

-- = None reported

[a] monkfish 1996-2006, skates 1996-2006, dogfish 1996-2005

[b.] Total landings or discards may differ slightly from the sum of the individual fishery entries due to differences in rounding.

[c] Shrimp Trawl

[d] Line and shrimp trawl

Source: Northeast Data Poor Stocks Working Group 2007a; Northeast Data Poor Stocks Working Group 2007b ; Sosebee et al. 2008; NEFSC 2006a.

6.4 Protected Resources

Numerous protected species inhabit the environment within the Northeast Multispecies FMP management unit. Therefore, many protected species potentially occur in the operations area of the fishery. These species are under NMFS jurisdiction and are afforded protection under the Endangered Species Act of 1973 (ESA) and/or the Marine Mammal Protection Act of 1972 (MMPA). As listed in Table 16, 17 marine mammal, sea turtle, and fish species are classified as endangered or threatened under the ESA, three others are candidate species under the ESA. The remaining species in Table 16 are protected by the MMPA and are known to interact with the Northeast multispecies fishery. Non ESA-listed species protected by the MMPA that utilize this environment and have no documented interaction with the Northeast multispecies fishery will not be discussed in this statement.

6.4.1 Species Present in the Area

Table 16 lists the species, protected either by the ESA, the MMPA, or both, that may be found in the environment utilized by sectors. Table 16 also includes three candidate fish species, as identified under the ESA.

A status review for Atlantic sturgeon was completed in 2007 which indicated that five distinct population segments (DPS) of Atlantic sturgeon exist in the United States (ASSRT 2007). On October 6, 2010, NMFS proposed listing these five DPSs of Atlantic sturgeon along the U.S. East Coast as either threatened or endangered species (75 FR 61872 and 75 FR 61904). A final listing was published on February 6th, 2012 (77 FR 5880 and 75 FR 5914). The GOM DPS of Atlantic sturgeon has been listed as threatened, and the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon have been listed as endangered. Atlantic sturgeon from any of the five DPSs could occur in areas where the multispecies fishery operates Atlantic sturgeon are known to be captured in sink gillnet, drift gillnet, and otter trawl gear (Stein *et al*. 2004a, ASMFC TC 2007). Of these gear types, sink gillnet gear poses the greatest known risk of mortality for bycaught sturgeon (ASMFC TC 2007). Sturgeon deaths were rarely reported in the otter trawl observer dataset , as well as sink gillnet and drift gillnet gear (ASMFC TC 2007).

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 and 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).

Table 17 - Species Protected Under the Endangered Species Act and/or Marine Mammal Protection Act that May Occur in the Operations Area for the FY 2013 Sectors[a]

Species	Status
Cetaceans	
North Atlantic right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sperm whale (*Physeter macrocephalus*	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
Pilot whale (*Globicephala spp*.)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Spotted dolphin (*Stenella frontalis*)	Protected
Bottlenose dolphin (*Tursiops truncatus*)[b]	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected
Sea Turtles	
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered
Green sea turtle (*Chelonia mydas*)	Endangered[c]
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic DPS	Threatened
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered
Fish	
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered
Atlantic sturgeon *(Acipenser oxyrinchus)*	
Gulf of Maine DPS	Threatened
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered
Cusk (*Brosme brosme*)	Candidate
Alewife (*Alosa pseudo harengus*)	Candidate
Blueback herring (*Alosa aestivalis*)	Candidate
Pinnipeds	
Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandicus*)	Protected

Species	Status
Hooded seal (*Cystophora cristata*)	Protected

Notes:

[a] MMPA-listed species occurring on this list are only those species that have a history of interaction with similar gear types within the action area of the Northeast Multispecies Fishery, as defined in the 2012 List of Fisheries.

[b] 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.

Notes:

[a] MMPA-listed species occurring on this list are only those species that have a history of interaction with similar gear types within the action area of the Northeast Multispecies Fishery, as defined in the 2012 List of Fisheries.

[b] 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.

6.4.2 Species Potentially Affected

The multispecies fishery has the potential to affect the fish, sea turtle, cetacean, and pinniped species discussed below. A number of documents contain background information on the range-wide status of the protected species that occur in the area and are known or suspected of interacting with fishing gear (demersal gear including trawls, gillnets, and bottom longlines). These documents include sea turtle status reviews and biological reports (NMFS and USFWS 1995; Turtle Expert Working Group 1998, 2000, 2007, 2009; NMFS and USFWS 2007a, 2007b, recovery plans for ESA-listed cetaceans and sea turtles (NMFS 1991, 2005; NMFS and USFWS 1991a, 1991b; NMFS and USFWS 1992), the marine mammal stock assessment reports (e.g., Waring et al. 1995; 2011), and other publications (e.g., Clapham et al. 1999, Perry et al. 1999, Best et al. 2001, Perrin et al. 2002, ASSRT 2007).

6.4.2.1 Sea Turtles

Loggerhead, leatherback, Kemp's ridley, and green sea turtles occur seasonally in southern New England and Mid-Atlantic continental shelf waters north of Cape Hatteras, North Carolina. Turtles generally 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). A reversal of this trend occurs in the fall when water temperatures cool. Turtles pass Cape Hatteras by December and return 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 species typically occur as far north as Cape Cod whereas the more cold-tolerant leatherbacks occur in more northern Gulf of Maine waters in the summer and fall (Shoop and Kenney 1992, STSSN database http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp).

On March 16, 2010, NMFS and USFWS published a proposed rule (75 FR 12598) to divide the worldwide population of loggerhead sea turtles into nine DPSs, as described in the 2009 Status Review. Two of the DPSs were proposed to be listed as threatened and seven of the DPSs, including the Northwest Atlantic Ocean DPS, were proposed to be listed as endangered. NMFS and the USFWS accepted comments on the proposed rule through September 13, 2010 (75 FR 30769, June 2, 2010). On March 22, 2011 (76 FR 15932), NMFS and USFWS extended the date by which a final determination on the listing action will be made to no later than September 16, 2011. This action was taken to address the interpretation of the existing data on status and trends and its relevance to the assessment of risk of extinction for the Northwest Atlantic Ocean DPS, as well as the magnitude and immediacy of the fisheries bycatch threat and measures to reduce this threat. New information or analyses to help clarify these issues were requested by April 11, 2011.

On September 22, 2011, NMFS and USFWS issued a final rule (76 FR 58868), determining that the loggerhead sea turtle is composed of nine DPSs (as defined in Conant *et al*., 2009) that constitute species that may be listed as threatened or endangered under the ESA. Five DPSs were listed as endangered (North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea), and four DPSs were listed as threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and Southwest Indian Ocean). Note that the Northwest Atlantic Ocean (NWA) DPS and the Southeast Indo-Pacific Ocean DPS were original proposed as endangered. The NWA DPS was determined to be threatened based on review of nesting data available after the proposed rule was published, information provided in public comments on the proposed rule, and further discussions within the agencies. The two primary factors considered were population abundance and population trend. NMFS and USFWS found that an endangered status for the NWA DPS was not warranted given the large size of the nesting population, the overall nesting population remains widespread, the trend for the nesting population appears to be stabilizing, and substantial conservation efforts are underway to address threats.

The September 2011 final rule also noted that critical habitat for the two DPSs occurring within the U.S. (NWA DPS and North Pacific DPS) will be designated in a future rulemaking. Information from the public related to the identification of critical habitat, essential physical or biological features for this species, and other relevant impacts of a critical habitat designation was solicited.

This proposed action only occurs in the Atlantic Ocean. As noted in Conant *et al*. (2009), the range of the four DPSs occurring in the Atlantic Ocean are as follows: NWA DPS – north of the equator, south of 60° N latitude, and west of 40° W longitude; Northeast Atlantic Ocean (NEA) DPS – north of the equator, south of 60° N latitude, east of 40° W longitude, and west of 5° 36' W longitude; South Atlantic DPS – south of the equator, north of 60° S latitude, west of 20° E longitude, and east of 60° W longitude; Mediterranean DPS – the Mediterranean Sea east of 5° 36' W longitude. These boundaries were determined based on oceanographic features, loggerhead sightings, thermal tolerance, fishery bycatch data, and information on loggerhead distribution from satellite telemetry and flipper tagging studies. Sea turtles from the NEA DPS are not expected to be present over the North American continental shelf in U.S. coastal waters, where the proposed action occurs (P. Dutton, NMFS, personal communication, 2011). Previous literature (Bowen *et al*. 2004) has suggested that there is the potential, albeit small, for some juveniles from the Mediterranean DPS to be present in U.S. Atlantic coastal foraging grounds. These data should be interpreted with caution however, as they may be representing a shared common haplotype and lack of representative sampling at Eastern Atlantic rookeries. Given that updated, more refined analyses are ongoing and the occurrence of Mediterranean DPS juveniles in U.S. coastal waters is rare and uncertain, if even occurring at all, for the purposes of this assessment we are making the determination that the Mediterranean DPS is not likely to be present in the action area. Sea turtles of the South Atlantic DPS do not inhabit the action area of this subject fishery (Conant *et al*. 2009). As such, the remainder of this assessment will only focus on the NWA DPS of loggerhead sea turtles, listed as threatened.

In general, sea turtles are a long-lived species and reach sexual maturity relatively late (NMFS SEFSC 2001; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Sea turtles are injured and killed by numerous human activities (NRC 1990; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Nest count data are a valuable source of information for each turtle species since the number of nests laid reflects the reproductive output of the nesting group each year. A decline in the annual nest counts has been measured or suggested for four of five western Atlantic loggerhead nesting groups through 2004 (NMFS and USFWS 2007a), however, data collected since 2004 suggests nest counts have stabilized or increased (TEWG 2009). Nest counts for Kemp's ridley sea turtles as well as leatherback and green sea turtles in the Atlantic demonstrate increased nesting by these species (NMFS and USFWS 2007b, 2007c, 2007d).

6.4.2.2 Large Cetaceans

The most recent Marine Mammal Stock Assessment Report (SAR) (Waring et al. 2012), covering the time period between 2005 and 2009, reviewed the current population trend for each of these cetacean species within U.S. Economic Exclusion Zone (EEZ) waters. The SAR also estimated annual human-caused mortality and serious injury. Finally, it described the commercial fisheries that interact with each stock in the U.S. Atlantic. The following paragraphs summarize information from the SAR.

The western North Atlantic baleen whale species (North Atlantic right, humpback, fin, sei, and minke whales) follow a general annual pattern of migration. They migrate from high latitude summer foraging grounds, including the Gulf of Maine and Georges Bank, to low latitude winter calving grounds (Perry et al. 1999, Kenney 2002). However, this is a simplification of species movements as the complete winter distribution of most species is unclear (Perry et al. 1999, Waring et al. 2012). 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). Blue whales are most often sighted along the east coast of Canada, particularly in the Gulf of St. Lawrence. They occur only infrequently within the U.S. EEZ (Waring et al. 2002).

North Atlantic right whales are federally listed as endangered under the ESA and a revised recovery plan was published in June 2005. Available information suggests that the North Atlantic right whale population increased at a rate of 2.4 percent per year between 1990 and 2007. The total number of North Atlantic right whales is estimated to be at least 396 animals in 2006 (Waring et al. 2012). The minimum rate of annual human-caused mortality and serious injury to right whales averaged 2.4 mortality or serious injury incidents per year during 2005 to 2009 (Waring et al. 2012). Of these, fishery interactions resulted in an average of 0.8 mortality or serious injury incidents per year, all in U.S. waters. The potential biological removal (PBR) level for this stock is 0.8 animals per year (Waring et al. 2012).

Humpback whales are also listed as endangered under the ESA, and a recovery plan was published for this species in 1991. The North Atlantic population of humpback whales is conservatively estimated to be 7,698 (Waring et al. 2012). The best estimate for the GOM stock of humpback whale population is 847 whales and current data suggest that the Gulf of Maine humpback whale stock is steadily increasing in size (Waring et al. 2012). The minimum rate of annual human-caused mortality and serious injury to humpback whales averaged 5.2 mortality or serious injury incidents per year during 2005 to 2009 (Waring et al. 2012). Of these, fishery interactions resulted in an average of 3.8 mortality or serious injury incidents per year (3.4 from U.S. waters and 0.4 from Canadian waters). The PBR for this stock is 1.1 animals per year (Waring et al. 2012).

Fin, sei, and sperm whales are all federally listed as endangered under the ESA, with recovery plans currently in place. Based on data available for selected areas and time periods, the minimum population estimates for these western North Atlantic whale stocks are 3,269 fin whales, 208 sei whales (Nova Scotia stock) (Waring et al. 2012), and 3,539 sperm whales (Waring et al. 2007). Insufficient information exists to determine population trends for these large whale species.

The minimum rate of annual human-caused mortality and serious injury to fin whales averaged 2.6 mortality or serious injury incidents per year during 2005 to 2009 (Waring et al. 2012). Of these, fishery interactions resulted in an average of 0.8 mortality or serious injury incidents per year (0.6 from U.S. waters and 0.2 from Canadian waters). The PBR for this stock is 6.5 animals per year (Waring et al. 2012). For sei whales, the minimum rate of annual human-cause mortality and serious injury averaged 1.2 per year, of which 0.6 were a result of fishery interactions. PBR for the Nova Scotia sei whale stock is 0.4 (Waring et al. 2012). For both fin and sei whales, these estimates are likely biased low due to the low detection rate for these species. The most recent SAR for the North Atlantic sperm whale stock is from 2007 (covering the years 2001-2005) and during that time period, there were no recorded mortality or serious injury incidents due to entanglements (Waring et al. 2007). PBR for this stock is 7.1 animals per year.

Minke whales are not ESA-listed but are protected under the MMPA, with a minimum population estimate of 6,909 animals for the Canadian east coast stock; however, a population trend analysis has not been conducted for this stock (Waring et al. 2012). The minimum rate of annual human-caused mortality and serious injury averaged 5.9 per year during 2005 to 2009, and of these, 3.5 animals per year were recorded through observed fisheries and 0.8 per year were attributed to U.S. fisheries using strandings and entanglement data (Waring et al. 2012). PBR for this stock is 69 animals per year.

More details on fisheries interactions with these species, as well as management actions in place to reduce entanglement risk, can be found in Section 6.4.4.

6.4.2.3 Small Cetaceans

There is fishing related mortality of numerous small cetacean species (dolphins, pilot whales, and harbor porpoises) associated with Northeast Multispecies fishing gear. Seasonal abundance and distribution of each species off the coast of the Northeast U.S. varies with respect to life history characteristics. Some species such as white-sided dolphins and harbor porpoises primarily occupy continental shelf waters. Other species such as the Risso's dolphin occur primarily in continental shelf edge and slope waters. Still other species like the common dolphin and the spotted dolphin occupy all three habitats. Waring et al. (2012) summarizes information on the distribution and geographic range of western North Atlantic stocks of each species.

The most commonly observed small cetaceans recorded as bycatch in multispecies fishing gear (e.g., gillnets and trawls) are harbor porpoises, white-sided dolphins, common dolphins, and pilot whales. These species are described in a bit more detail here. Harbor porpoises are found seasonally within New England and Mid-Atlantic waters. In the Mid-Atlantic, porpoises are present in the winter/spring (typically January through April) and in southern New England waters from December through May. In the Gulf of Maine, porpoises occur largely from the fall through the spring (September through May) and in the summer are found in northern Maine and through the Bay of Fundy and Nova Scotia area. White-sided dolphin distribution shifts seasonally, with a large presence from Georges Bank through the Gulf of Maine from June through September, with intermediate presence from Georges Bank through the lower Gulf of Maine from October through December. Low numbers are present from Georges Bank to Jeffrey's Ledge from January through May (Waring et al. 2012). Common dolphins are widely distributed over the continental shelf from Maine through Cape Hatteras, North Carolina. From mid-January to May they are dispersed from North Carolina through Georges Bank, and then move onto Georges Bank and the Scotia shelf from the summer to fall. They are occasionally found in the Gulf of Maine (Waring et al. 2012). Pilot whales are generally distributed along the continental shelf edge off the northeastern U.S. coast in the winter and early spring. In late spring, the move onto Georges Bank and into the Gulf of Maine and remain until late fall. They do occur along the Mid-Atlantic shelf break between Cape Hatteras, North Carolina and New Jersey (Waring et al. 2012). Since pilot whales are difficult to differentiate at sea, they are generally considered *Globicephala* sp. when they are recorded at sea (Waring et al. 2012).

6.4.2.4 Pinnipeds

Harbor seals have the most extensive distribution of the four species of seal expected to occur in the area. Harbor seals sighting have occurred far south as 30° N (Katona et al. 1993, Waring et al. 2012). Their approximate year-round range extends from Nova Scotia, through the Bay of Fundy, and south through Maine to northern Massachusetts (Waring et al. 2012). Their more seasonal range (September through May) extends from northern Massachusetts south through southern New Jersey, and stranding records indicate occasional presence of harbor seals from southern New Jersey through northern North Carolina (Waring et al. 2012). Gray seals are the second most common seal species in U.S. EEZ waters. They occur from Nova Scotia through the Bay of Fundy and into waters off of New England (Katona et al. 1993; Waring et al. 2011) year-round from Maine through southern Massachusetts (Waring et al. 2012). A more seasonal distribution of gray seals occurs from southern Massachusetts through southern New Jersey from September through May. Similar to harbor seals, occasional presence from southern New Jersey through northern North Carolina indicate occasional presence of gray seals in this region (Waring et al. 2012). Pupping for both species occurs in both U.S. and Canadian waters of the western North Atlantic. The majority of harbor seal pupping is thought to occur in U.S. waters. While there are at least three gray seal pupping colonies in U.S., the majority of gray seal pupping likely occurs in Canadian waters. Observations of harp and hooded seals are less common in U.S. EEZ waters. Both species form aggregations for pupping and breeding off eastern Canada in the late winter/early spring. They then travel to more northern latitudes for molting and summer feeding (Waring et al. 2006). Both species have a seasonal presence in U.S. waters from Maine to New Jersey, based on sightings, stranding, and fishery bycatch information (Waring et al. 2012).

6.4.2.5 Atlantic Sturgeon

Atlantic sturgeon is an anadromous species that spawns in relatively low salinity, river environments, but spends most of its life in the marine and estuarine environments from Labrador, Canada to the Saint Johns River, Florida (Holland and Yelverton 1973, Dovel and Berggen 1983, Waldman et al. 1996, Kynard and Horgan 2002, Dadswell 2006, ASSRT 2007). Tracking and tagging studies have shown that subadult and adult Atlantic sturgeon that originate from different rivers mix within the marine environment, utilizing ocean and estuarine waters for life functions such as foraging and overwintering (Stein et al. 2004a, Dadswell 2006, ASSRT 2007, Laney et al. 2007, Dunton et al. 2010). Fishery-dependent data as well as fishery-independent data demonstrate that Atlantic sturgeon use relatively shallow inshore areas of the continental shelf; primarily waters less than 50 m (Stein et al. 2004b, ASMFC 2007, Dunton et al. 2010). The data also suggest regional differences in Atlantic sturgeon depth distribution with sturgeon observed in waters primarily less than 20 m in the Mid-Atlantic Bight and in deeper waters in the Gulf of Maine (Stein et al. 2004b, ASMFC 2007, Dunton et al. 2010). Information on population sizes for each Atlantic sturgeon DPS is very limited. Based on the best available information, NMFS has concluded that bycatch, vessel strikes, water quality and water availability, dams, lack of regulatory mechanisms for protecting the fish, and dredging are the most significant threats to Atlantic sturgeon.

Comprehensive information on current abundance of Atlantic sturgeon is lacking for all of the spawning rivers (ASSRT 2007). Based on data through 1998, an estimate of 863 spawning adults per year was developed for the Hudson River (Kahnle *et al*. 2007), and an estimate of 343 spawning adults per year is available for the Altamaha River, GA, based on data collected in 2004-2005 (Schueller and Peterson 2006). Data collected from the Hudson River and Altamaha River studies cannot be used to estimate the total number of adults in either subpopulation, since mature Atlantic sturgeon may not spawn every year, and it is unclear to what extent mature fish in a non-spawning condition occur on the spawning grounds. Nevertheless, since the Hudson and Altamaha Rivers are presumed to have the healthiest Atlantic sturgeon subpopulations within the United States, other U.S. subpopulations are predicted to have fewer spawning adults than either the Hudson or the Altamaha (ASSRT 2007). It is also important to note that the estimates above represent only a fraction of the total population size as spawning adults comprise only a portion of the total population (e.g., this estimate does not include subadults and early life stages).

Since the ESA listing of Atlantic sturgeon, the NEFSC has completed new population estimates using data from the Northeast Area Monitoring and Assessment (NEAMAP) survey (Kocik et al. 2013). This report is available here: http://www.nefsc.noaa.gov/publications/crd/. Atlantic sturgeon are frequently sampled during the NEAMAP survey. NEAMAP has been conducting trawl surveys from Cape Cod, Massachusetts to Cape Hatteras, North Carolina in nearshore waters at depths to 18.3 meters (60 feet) during the fall since 2007 and depths up to 36.6 meters (120 feet) during the spring since 2008 using a spatially stratified random design with a total of 35 strata and 150 stations per survey. The information from this survey can be directly used to calculate minimum swept area population estimates during the fall, which range from 6,980 to 42,160 with coefficients of variation between 0.02 and 0.57 and during the spring, which range from 25,540 to 52,990 with coefficients of variation between 0.27 and 0.65. These are considered minimum estimates because the calculation makes the unlikely assumption that the gear will capture 100 percent of the sturgeon in the water column along the tow path. Efficiencies less than 100 percent will result in estimates greater than the minimum. The true efficiency depends on many things including the availability of the species to the survey and the behavior of the species with respect to the gear. True efficiencies much less than 100 percent are common for most species. The NEFSC's analysis also calculated estimates based on an assumption of 50 percent efficiency, which reasonably accounts for the robust, yet not complete sampling of the Atlantic sturgeon, oceanic temporal and spatial ranges, and the documented high rates of encounter with NEAMAP survey gear and Atlantic sturgeon. For this analysis, NMFS has determined that the best available data at this time are the population estimates derived from NEAMAP swept area biomass because the estimates are derived directly from empirical data with few assumptions. NMFS has determined that using the median value of the 50 percent efficiency as the best estimate of the Atlantic sturgeon ocean population is most appropriate at this time. This results in a total population size estimate of 67,776 fish, which is considerably higher than the estimates that were available at the time of listing. This estimate is the best available estimate of Atlantic sturgeon abundance at the time of this analysis. The ASMFC has begun work on a benchmark assessment for Atlantic sturgeon to be completed in 2014, which would be expected to provide an updated population estimate and stock status. The ASMFC is currently collecting public submissions of data for use in the assessment:
http://www.asmfc.org/press_releases/2013/pr20AtlSturgeonStockAssmtPrep.pdf.

6.4.3 Species and Habitats Not Likely to be Affected

NMFS has determined that the action being considered in this EA is not likely to adversely affect shortnose sturgeon, the Gulf of Maine distinct population segment (DPS) of Atlantic salmon, hawksbill sea turtles, blue whales, or sperm whales, all of which are listed as endangered species under the ESA. Further, the action considered in this EA is not likely to adversely affect North Atlantic right whale (discussed in Section 6.4.2.2) critical habitat. The following discussion provides the rationale for these determinations.

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They occupy rivers along the western Atlantic coast from St. Johns River in Florida, to the Saint John River in New Brunswick, Canada. Although, the species is possibly extirpated from the Saint Johns River system. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while some northern populations are amphidromous (NMFS 1998). Since groundfish fishermen would not operate in or near the rivers where concentrations of shortnose sturgeon are most likely found, it is highly unlikely that sectors would affect shortnose sturgeon.

The wild populations of Atlantic salmon are listed as endangered under the ESA. Their freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Juvenile salmon in New England rivers typically migrate to sea in spring after a one- to three-year period of development in freshwater streams. They remain at sea for two winters before returning to their U.S. natal rivers to spawn (Kocik and Sheehan 2006). Results from a 2001-2003 post-smolt trawl survey in the nearshore waters of the Gulf of Maine indicate that Atlantic salmon post-smolts are prevalent in the upper water column throughout this area in mid to late May (Lacroix, Knox, and Stokesbury 2005). Therefore, commercial fisheries deploying small-mesh active gear (pelagic trawls and purse seines within 10 m of the surface) in nearshore waters of the Gulf of Maine may have the potential to incidentally take smolts. However, it is highly unlikely that the action being considered will affect the Gulf of Maine DPS of Atlantic salmon given that operation of the multispecies fishery does not occur in or near the rivers where concentrations of Atlantic salmon are likely to be found. Additionally, multispecies gear operates in the ocean at or near the bottom rather than near the surface where Atlantic salmon are likely to occur. Thus, this species will not be considered further in this EA.

North Atlantic right whales occur in coastal and shelf waters in the western North Atlantic (NMFS 2005). Section 6.4.4 discusses potential fishery entanglement and mortality interactions with North Atlantic right whale individuals. The western North Atlantic population in the U.S. primarily ranges from winter calving and nursery areas in coastal waters off the southeastern U.S. to summer feeding grounds in New England waters (NMFS 2005). North Atlantic Right Whales use five well-known habitats annually, including multiple in northern waters. These northern areas include the Great South Channel (east of Cape Cod); Cape Cod and Massachusetts Bays; the Bay of Fundy; and Browns and Baccaro Banks, south of Nova Scotia. NMFS designated the Great South Channel and Cape Cod and Massachusetts Bays as Northern Atlantic right whale critical habitat in June 1994 (59 FR 28793). NMFS has designated additional critical habitat in the southeastern U.S. Multispecies gear operates in the ocean at or near the bottom rather than near the surface. It is not known whether the bottom-trawl, or any other type of fishing gear, has an impact on the habitat of the Northern right whale (59 FR 28793). As discussed in the FY 2010 and FY 2011 sector EAs and further in Section 5.1, sectors would result in a negligible effect on physical habitat. Therefore, FY 2013 sector operations would not result in a significant impact on Northern right whale critical habitat. Further, mesh sizes used in the multispecies fishery do not significantly impact the Northern right whale's planktonic food supply (59 FR 28793). Therefore, Northern right whale food sources in areas designated as critical habitat would not be adversely affected by sectors. For these reasons, Northern right whale critical habitat will not be considered further in this EA.

The hawksbill turtle is uncommon in the waters of the continental U.S. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges, but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. There are accounts of hawksbills in south Florida and individuals have been sighted along the east coast as far north as Massachusetts; however, east coast sightings north of Florida are rare (NMFS 2009a). Sector operations would not occur in waters that are typically used by hawksbill sea turtles. Therefore, it is highly unlikely that sector operations would affect this turtle species.

Blue whales do not regularly occur in waters of the U.S. EEZ (Waring et al. 2002). In the North Atlantic region, blue whales are most frequently sighted from April to January (Sears 2002). No blue whales were observed during the Cetacean and Turtle Assessment Program surveys of the mid- and North Atlantic areas of the outer continental shelf (Cetacean and Turtle Assessment Program 1982). Calving for the species occurs in low latitude waters outside of the area where the sectors would operate. Blue whales feed on euphausiids (krill) that are too small to be captured in fishing gear. There were no observed fishery-related mortalities or serious injuries to blue whales between 1996 and 2000 (Waring et al. 2002). The species is unlikely to occur in areas where the sectors would operate, and sector operations would not affect the availability of blue whale prey or areas where calving and nursing of young occurs. Therefore, the Proposed Action would not be likely to adversely affect blue whales.

Unlike blue whales, sperm whales do regularly occur in waters of the U.S. EEZ. However, the distribution of the sperm whales in the U.S. EEZ occurs on the continental shelf edge, over the continental slope, and into mid-ocean regions (Waring et al. 2007). Sperm whale distribution is typically concentrated east-northeast of Cape Hatteras in winter and shifts northward in spring when whales are found throughout the Mid-Atlantic Bight (Waring et al. 2006). 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 (Waring et al. 1999). In contrast, the sectors would operate in continental shelf waters. The average depth over which sperm whale sightings occurred during the Cetacean and Turtle Assessment Program surveys was 5,879 ft (1,792 m) (Cetacean and Turtle Assessment Program 1982). Female sperm whales and young males almost always inhabit open ocean, deep water habitat with bottom depths greater than 3,280 ft (1,000 m) and at latitudes less than 40° N (Whitehead 2002). Sperm whales feed on large squid and fish that inhabit the deeper ocean regions (Perrin et al. 2002). There were no observed fishery-related mortalities or serious injuries to sperm whales between 2001 and 2005 (Waring et al. 2007). Sperm whales are unlikely to occur in water depths where the sectors would operate, sector operations would not affect the availability of sperm whale prey or areas where calving and nursing of young occurs. Therefore, the Proposed Action would not be likely to adversely affect sperm whales.

Although marine turtles and large whales could be potentially affected through interactions with fishing gear, NMFS has determined that the continued authorization of the multispecies fishery, and therefore the FY 2011 sectors, would not have any adverse effects on the availability of prey for these species. Sea turtles feed on a variety of plants and animals, depending on the species. However, none of the turtle species are known to feed upon groundfish. Right whales and sei whales feed on copepods (Horwood 2002, Kenney 2002). The multispecies fishery will not affect the availability of copepods for foraging right and sei whales because copepods are very small organisms that will pass through multispecies fishing gear rather than being captured in it. Humpback whales and fin whales also feed on krill as well as small schooling fish such as sand lance, herring and mackerel (Aguilar 2002, Clapham 2002). Multispecies fishing gear operates on or very near the bottom. Fish species caught in multispecies gear are species that live in benthic habitat (on or very near the bottom) such as flounders. As a result, this gear does not typically catch schooling fish such as herring and mackerel that occur within the water column. Therefore, the continued authorization of the multispecies fishery or the approval of the FY 2013 sector operations plans will not affect the availability of prey for foraging humpback or fin whales.

6.4.4 Interactions Between Gear and Protected Resources

Marine Mammals

NMFS categorizes commercial fisheries based on a two-tiered, stock-specific fishery classification system that addresses both the total impact of all fisheries on each marine mammal stock as well as the impact of individual fisheries on each marine mammal stock. NMFS bases the system on the numbers of animals per year that incur incidental mortality or serious injury due to commercial fishing operations relative to a marine mammal stock's PBR level. Tier 1 takes into account the cumulative mortality and serious injury to marine mammals caused by commercial fisheries. Tier 2 considers marine mammal mortality and serious injury caused by the individual fisheries. This EA uses Tier 2 classifications to indicate how each type of gear proposed for use in the Proposed Action may affect marine mammals (NMFS 2009b). Table 17 identifies the classifications used in the final List of Fisheries for FY 2012 (76 FR 73912; November 29, 2011; NMFS 2011), which are broken down into Tier 2 Categories I, II, and III.

Interactions between gear and a given species occur when fishing gear overlaps both spatially and trophically with the species' niche. Spatial interactions are more "passive" and involve inadvertent interactions with fishing gear when the fishermen deploy gear in areas used by protected resources. Trophic interactions are more "active" and occur when protected species attempt to consume prey caught in fishing gear and become entangled in the process. Spatial and trophic interactions can occur with various types of fishing gear used by the multispecies fishery through the year. Many large and small cetaceans and sea turtles are more prevalent within the operations area during the spring and summer. However they are also relatively abundant during the fall and would have a higher potential for interaction with sector activities that occur during these seasons. Although harbor seals may be more likely to occur in the operations area between fall and spring, harbor and gray seals are year-round residents. Therefore, interactions could occur year-round. The uncommon occurrences of hooded and harp seals in the operations area are more likely to occur during the winter and spring, allowing for an increased potential for interactions during these seasons.

Table 18 - Descriptions of the Tier 2 Fishery Classification Categories (50 CFR 229.2)

Category	Category Description
Category I	A commercial fishery that has frequent incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is, by itself, responsible for the annual removal of 50 percent or more of any stock's PBR level.
Category II	A commercial fishery that has occasional incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is one that, collectively with other fisheries, is responsible for the annual removal of more than 10 percent of any marine mammal stock's PBR level and that is by itself responsible for the annual removal of between 1 percent and 50 percent, exclusive of any stock's PBR.
Category III	A commercial fishery that has a remote likelihood of, or no known incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is one that collectively with other fisheries is responsible for the annual removal of: a. Less than 50 percent of any marine mammal stock's PBR level, or b. More than 1 percent of any marine mammal stock's PBR level, yet that fishery by itself is responsible for the annual removal of 1 percent or less of that stock's PBR level. In the absence of reliable information indicating the frequency of incidental mortality and serious injury of marine mammals by a commercial fishery, the Assistant Administrator would determine whether the incidental serious injury or mortality is "remote" by evaluating other factors such as fishing techniques, gear used, methods used to deter marine mammals, target species, seasons and areas fished, qualitative data from logbooks or fisher reports, stranding data, and the species and distribution of marine mammals in the area or at the discretion of the Assistant Administrator.

Although interactions between protected species and gear deployed by the Northeast Multispecies fishery would vary, interactions generally include:

- becoming caught on hooks (bottom longlines)
- entanglement in mesh (gillnets and trawls)
- entanglement in the float line (gillnets and trawls)
- entanglement in the groundline (traps/pots, gillnets, trawls, and bottom longlines)
- entanglement in anchor lines (gillnets and bottom longlines), or
- entanglement in the vertical lines that connect gear to the surface and surface systems (gillnets, traps/pots, and bottom longlines).

NMFS assumes the potential for entanglements to occur is higher in areas where more gear is set and in areas with higher concentrations of protected species.

Table 18 lists the marine mammals known to have had interactions with gear used by the Northeast Multispecies fishery. This gear includes sink gillnets, traps/pots, bottom trawls, and bottom longlines within the Northeast Multispecies region, as excerpted from the List of Fisheries for FY 2012 ([76 FR 73912; November 29, 2011], also see Waring et al. 2012). Sink gillnets have the greatest potential for interaction with protected resources, followed by bottom trawls. There are no observed reports of interactions between bottom longline gear used in the Multispecies fishery and marine mammals in FY 2009 through FY 2011. However, interactions between the pelagic longline fishery and both pilot whales and Risso's dolphins led to the development of the Pelagic Longline Take Reduction Plan.

Table 19 shows trends in marine mammal and ESA listed species takes from FY 2009 to FY 2011 (fishing years as opposed to calendar years) as recorded in the ASM and observer program data. This data comes from trips that were potentially using sector ACE.

Table 19 - Marine Mammal Species and Stocks Incidentally Killed or Injured Based on Northeast Multispecies Fishing Areas and Gear Types (based on 2012 List of Fisheries)

Fishery		Estimated Number of Vessels/Persons	Marine Mammal Species and Stocks Incidentally Killed or Injured
Category	**Type**		
Category I	Mid-Atlantic gillnet	6,402	Bottlenose dolphin, Northern Migratory coastal [a] Bottlenose dolphin, Southern Migratory coastal [a] Bottlenose dolphin, Northern NC estuarine system [a] Bottlenose dolphin, Southern NC estuarine system [a] Bottlenose dolphin, WNA offshore Common dolphin, WNA Gray seal, WNA Harbor porpoise, GOM/Bay of Fundy Harbor seal, WNA Harp seal, WNA Humpback whale, Gulf of Maine Long-finned pilot whale, WNA Minke whale, Canadian east coast Short-finned pilot whale, WNA White-sided dolphin, WNA
	Northeast sink gillnet	3,828	Bottlenose dolphin, WNA, offshore Common dolphin, WNA Fin whale, WNA Gray seal, WNA Harbor porpoise, GOM/Bay of Fundy Harbor seal, WNA Harp seal, WNA Hooded seal, WNA Humpback whale, GOM Minke whale, Canadian east coast North Atlantic right whale, WNA Risso's dolphin, WNA White-sided dolphin, WNA

Fishery		Estimated Number of Vessels/Persons	Marine Mammal Species and Stocks Incidentally Killed or Injured
Category	Type		
Category II	Mid-Atlantic bottom trawl	1,388	Bottlenose dolphin, WNA offshore Common dolphin, WNA [a] Long-finned pilot whale, WNA [a] Risso's dolphin, WNA Short-finned pilot whale, WNA [a] White-sided dolphin, WNA
	Northeast bottom trawl	2,584	Common dolphin, WNA Harbor porpoise, GOM/ Bay of Fundy Harbor seal, WNA Harp seal, WNA Long-finned pilot whale, WNA Short-finned pilot whale, WNA White-sided dolphin, WNA [a]
	Atlantic mixed species trap/pot [c]	3,526	Fin whale, WNA Humpback whale, GOM
Category III	Northeast/Mid-Atlantic bottom longline/hook-and-line	>1,281	None documented in recent years

Notes:

[a] Fishery classified based on serious injuries and mortalities of this stock, which are greater than 50 percent (Category I) or greater than 1 percent and less than 50 percent (Category II) of the stock's PBR.

Table 20 - Marine Mammal and ESA listed Species Takes By Gear as Recorded in ASM and Observer Program Universe: Trips Potentially Using Sector ACE in FY 2009-FY2011 Data as of: October 18, 2012

Gear Name	Species Category	Common Name	Scientific Name	2009 Takes	2010 Takes	2011 Takes
GILL NET, DRIFT-SINK, FISH	pinniped	SEAL, HARBOR	PHOCA VITULINA CONCOLOR	2	0	0
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	PORPOISE, HARBOR	PHOCOENA PHOCOENA	18	31	10
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	PORPOISE/DOLPHIN, NK	PHOCOENIDAE/DELPHINIDAE	0	0	2
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	DOLPHIN, NK (MAMMAL)	DELPHINIDAE	0	0	1
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	DOLPHIN, WHITESIDED	LAGENORHYNCHUS ACUTUS	1	1	0
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	DOLPHIN,COMMON (OLD SADDLEBACK)	DELPHINUS DELPHIS (COMMON)	1	1	2
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	MARINE MAMMAL, NK	CETACEA/PINNIPEDIA	0	1	0
GILL NET, FIXED OR ANCHORED,SINK, OTHER	cetacean	WHALE, PILOT, NK	GLOBICEPHALA SP	0	1	0
GILL NET, FIXED OR ANCHORED,SINK, OTHER	pinniped	SEAL, HARBOR	PHOCA VITULINA CONCOLOR	27	4	30
GILL NET, FIXED OR ANCHORED,SINK, OTHER	pinniped	SEAL, NK	PHOCIDAE	9	9	0
GILL NET, FIXED OR ANCHORED,SINK, OTHER	pinniped	SEAL, GRAY	HALICHOERUS GRYPUS	52	41	53
GILL NET, FIXED OR ANCHORED,SINK, OTHER	pinniped	SEAL, HARP	PHOCA GROENLANDICA	2	1	0
GILL NET, FIXED OR ANCHORED,SINK, OTHER	turtle	TURTLE, NK HARD-SHELL	CHELONIIDAE	1	0	1
TRAWL,OTTER,BOTTOM,FISH	cetacean	DOLPHIN, WHITESIDED	LAGENORHYNCHUS ACUTUS	9	35	9
TRAWL,OTTER,BOTTOM,FISH	cetacean	DOLPHIN, NK (MAMMAL)	DELPHINIDAE	0	0	5
TRAWL,OTTER,BOTTOM,FISH	cetacean	PORPOISE, HARBOR	PHOCOENA PHOCOENA	0	1	4
TRAWL,OTTER,BOTTOM,FISH	cetacean	WHALE, PILOT, NK	GLOBICEPHALA SP	3	6	2
TRAWL,OTTER,BOTTOM,FISH	cetacean	DOLPHIN,COMMON (OLD SADDLEBACK)	DELPHINUS DELPHIS (COMMON)	3	6	4
TRAWL,OTTER,BOTTOM,FISH	cetacean	DOLPHIN, RISSOS	GRAMPUS GRISEUS	1	0	0
TRAWL,OTTER,BOTTOM,FISH	cetacean	WHALE, NK	CETACEA, WHALE	0	0	1
TRAWL,OTTER,BOTTOM,FISH	pinniped	SEAL, HARBOR	PHOCA VITULINA CONCOLOR	0	3	0
TRAWL,OTTER,BOTTOM,FISH	pinniped	SEAL, GRAY	HALICHOERUS GRYPUS	5	2	5
TRAWL,OTTER,BOTTOM,FISH	turtle	TURTLE, LOGGERHEAD	CARETTA CARETTA	1	0	2

Gear Name	Species Category	Common Name	Scientific Name	2009 Takes	2010 Takes	2011 Takes
TRAWL,OTTER,BOTTOM,FISH	turtle	TURTLE, LEATHERBACK	DERMOCHELYS CORIACEA	0	1	0
TRAWL,OTTER,BOTTOM,HADDOCK SEPARATOR	cetacean	DOLPHIN,COMMON (OLD SADDLEBACK)	DELPHINUS DELPHIS (COMMON)	0	2	6
TRAWL,OTTER,BOTTOM,HADDOCK SEPARATOR	cetacean	WHALE, PILOT, NK	GLOBICEPHALA SP	1	1	1
TRAWL,OTTER,BOTTOM,HADDOCK SEPARATOR	pinniped	SEAL, GRAY	HALICHOERUS GRYPUS	0	0	1
TRAWL,OTTER,BOTTOM,RUHLE	cetacean	WHALE, PILOT, NK	GLOBICEPHALA SP	2	0	0
TRAWL,OTTER,BOTTOM,RUHLE	cetacean	DOLPHIN, WHITESIDED	LAGENORHYNCHUS ACUTUS	0	1	0
TRAWL,OTTER,BOTTOM,RUHLE	cetacean	DOLPHIN,COMMON (OLD SADDLEBACK)	DELPHINUS DELPHIS (COMMON)	1	0	0
TRAWL,OTTER,BOTTOM,RUHLE	pinniped	SEAL, GRAY	HALICHOERUS GRYPUS	0	0	1

Marine mammals are taken in gillnets, trawls, and trap/pot gear used in the Northeast Multispecies area. Documented marine mammal interactions in Northeast sink gillnet and Mid-Atlantic gillnet fisheries include harbor porpoise, white-sided dolphin, harbor seal, gray seal, harp seal, hooded seal, pilot whale, bottlenose dolphin (various stocks), Risso's dolphin, and common dolphin. Table 20 and Table 21 summarize the estimated mean annual mortality of small cetaceans and seals that are taken in the Northeast sink gillnet and Mid-Atlantic gillnet fisheries according to the most recent SAR for each particular species.

Documented marine mammal interactions with Northeast and Mid-Atlantic bottom trawl fisheries include minke whale, harbor porpoise, white-sided dolphin, harbor seal, gray seal, harp seal, pilot whale, and common dolphin. Table 22 and Table 23 provide the estimated mean annual mortality of small cetaceans and seals that are taken in the Northeast and Mid-Atlantic bottom trawl fisheries, based on the most recent SAR for each particular species. The data in these tables are based on takes observed by fishery observers as part of the Northeast Fisheries Observer Program (NEFOP).

Table 21 - Estimated Marine Mammal Mortalities in the Northeast Sink Gillnet Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Harbor porpoise	05-09	559 (0.16)	701
Atlantic white-sided dolphin	05-09	36 (0.34)	190
Common dolphin (short-beaked)	05-09	26 (0.39)	1,000
Risso's dolphin	05-09	3 (0.93)	124
Western North Atlantic Offshore bottlenose dolphin	02-06	Unknown+	566
Harbor seal	05-09	332 (0.14)	Undetermined
Gray seal	05-09	678 (0.14)	Undetermined
Harp seal	05-09	174 (0.18)	Unknown
Hooded seal	01-05	25 (0.82)	Unknown

Source: Waring et al. (2009, 2012)

+While there have been documented interactions between the Western North Atlantic Offshore bottlenose dolphin stock and the Northeast sink gillnet fishery during the five year time period, estimates of bycatch mortality in the fishery have not been generated.

Table 22 - Estimated Marine Mammal Mortalities in the Mid-Atlantic Gillnet Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Harbor porpoise	05-09	318 (0.26)	701
Common dolphin (short-beaked)	05-09	2.2 (1.03)	1,000
Risso's dolphin	05-09	7 (0.73)	124
Bottlenose dolphin	06-08		
Western North Atlantic Northern Migratory Coastal stock		5.27 (0.19) min; 6.02 (0.19) max	71
Western North Atlantic Southern Migratory Coastal stock	06-08	5.71 (0/31 min; 41.91 (0.14) max	96
Northern North Carolina Estuarine System stock	06-08	2.39 (0.25) min; 18.99 (0.11) max	Undetermined
Southern North Carolina Estuarine System stock	06-08	0.61 (0.30) min; 0.92 (0.21) max	16
Western North Atlantic Offshore stock	02-06	Unknown+	566
Harbor seal	05-09	45 (0.39)	Undetermined
Harp seal	05-09	57 (0.5)	Unknown

Source: Waring et al. (2009, 2012)

+While there have been documented interactions between the Western North Atlantic Offshore bottlenose dolphin stock and the Mid-Atlantic gillnet fishery during the five year time period, estimates of bycatch mortality in the fishery have not been generated.

Table 23 - Estimated Marine Mammal Mortalities in the Northeast Bottom Trawl Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Minke whale	05-09	3.5 (0.34)	69
Harbor porpoise	05-09	6 (0.22)	701
Atlantic white-sided dolphin	05-09	160 (0.14)	190
Common dolphin (short-beaked)	05-09	23 (0.13)	1,000
Pilot whales*	05-09	12 (0.14)	93 (long-finned); 172 (short-finned)
Harbor seal	05-09	Unknown+	Undetermined
Gray seal	05-09	Unknown+	Undetermined
Harp seal	05-09	Unknown+	Unknown

Source: Waring et al. (2012)

*Total fishery-related serious injuries and mortalities to pilot whales (*Globicephala* sp.) cannot be differentiated to species due to uncertainty in species identification by fishery observers (Waring et al. 2012). However, separate PBRs have been calculated for long-finned and short-finned pilot whales.

[+]While there have been documented interactions between these species and the Northeast bottom trawl fishery during the five year time period, estimates of bycatch mortality in the fishery have not been generated.

Table 24 - Estimated Marine Mammal Mortalities in the Mid-Atlantic Bottom Trawl Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Atlantic white-sided dolphin	05-09	23 (0.12)	190
Common dolphin (short-beaked)	05-09	110 (0.13)	1,000
Pilot whales*	05-09	30 (0.16)	93 (long-finned); 172 (short-finned)

Source: Waring et al. (2012)

*Total fishery-related serious injuries and mortalities to pilot whales (*Globicephala* sp.) cannot be differentiated to species due to uncertainty in species identification by fishery observers (Waring et al. 2012). However, separate PBRs have been calculated for long-finned and short-finned pilot whales.

Takes of large whales are typically not documented within observer records as large whales are typically entangled in fixed fishing gear and the chances of observing an interaction are small. Although large whales can become anchored in gear, they more often swim off with portions of the fishing gear; therefore, documentation of their incidental take is based primarily on the observation of gear or markings on whale carcasses, or on whales entangled and observed at-sea. Even if a whale is anchored in fishing gear, it is extremely difficult to make any inferences about the nature of the entanglement event and initial interaction between the whale and the gear. Frequently, it is difficult to attribute a specific gear type to an entangled animal based on observed scars or portions of gear remaining attached to whales or their carcasses; however, gillnet gear has been identified on entangled North Atlantic right whales, humpback whales, fin whales, and minke whales. Minke whales have been observed to be taken in the Northeast bottom trawl fishery by fishery observers. The annual estimated mortality and serious injury to minke whales from this fishery was 3.5 (CV = 0.34) between 2005 and 2009 (Waring et al. 2012). At this time, there is no evidence suggesting that other large whale species interact with trawl gear fisheries.

A number of marine mammal management plans are in place along the U.S. east coast to reduce serious injuries and deaths of marine mammals due to interactions with commercial fishing gear. Multispecies fishing vessels are required to adhere to measures in the Atlantic Large Whale Take Reduction Plan (ALWTRP), which manages from Maine through Florida, to minimize potential impacts to certain cetaceans. The ALWTRP was developed to address entanglement risk to right, humpback, and fin whales, and to acknowledge benefits to minke whales in specific Category I or II commercial fishing efforts that utilize traps/pots and gillnets. This includes the Northeast sink gillnet and Mid-Atlantic gillnet fisheries. The ALWTRP calls for the use of gear markings, area restrictions, weak links, and sinking groundline. Fishing vessels would be required to comply with the ALWTRP in all areas where gillnets were used.

Fishing vessels would also be required to comply, where applicable, with the seasonal gillnet requirements of the Bottlenose Dolphin Take Reduction Plan (BDTRP), which manages coastal waters from New Jersey through Florida, and Harbor Porpoise Take Reduction Plan (HPTRP), which manages coastal and offshore waters from Maine through North Carolina. The BDTRP spatially and temporally restricts night time use of gillnets and requires net tending in the Mid-

Atlantic gillnet region. The HPTRP aims to reduce interactions between harbor porpoises and gillnets in the Gulf of Maine, southern New England, and Mid-Atlantic regions. In New England waters, the HPTRP implements seasonal area closures and the seasonal use of pingers (acoustic devices that emit a sound) to deter harbor porpoises from approaching the nets. In Mid-Atlantic waters, the HPTRP implements seasonal area closures and the seasonal use of gear modifications for large mesh (7-18 in) and small mesh (<5 to >7 in) gillnets to reduce harbor porpoise bycatch.

An Atlantic Trawl Gear Take Reduction Team was formed in 2006 to address the bycatch of white-sided and common dolphins and pilot whales in Northeast and Mid-Atlantic trawl gear fisheries. While a take reduction plan with regulatory measures was not implemented (bycatch levels were not exceeding allowable thresholds under the MMPA), a take reduction strategy was developed that recommends voluntary measures to be used to reduce the chances for interactions between trawl gear and these marine mammal species. The two voluntary measures that were recommended are: 1) reducing the number of turns made by the fishing vessel and tow times while fishing at night; and 2) increasing radio communications between vessels about the presence and/or incidental capture of a marine mammal to alert other fishermen of the potential for additional interactions in the area.

Sea Turtles

Sea turtles have been caught and injured or killed in multiple types of fishing gear, including gillnets, trawls, and hook and line gear. However, impact due to inadvertent interaction with trawl gear is almost twice as likely to occur when compared with other gear types (NMFS 2009d). Interaction with trawl gear is more detrimental to sea turtles as they can be caught within the trawl itself and will drown after extended periods underwater. A study conducted in the Mid-Atlantic region showed that bottom trawling accounts for an average annual take of 616 loggerhead sea turtles, although Kemp’s ridleys and leatherbacks were also caught during the study period (Murray 2006). Impacts to sea turtles would likely still occur under the Proposed Action even though sea turtles generally occur in more temperate waters than those in the Northeast Multispecies area.

Atlantic Sturgeon

Atlantic sturgeon are known to be captured in sink gillnet, drift gillnet, and otter trawl gear (Stein et al. 2004a, ASMFC TC 2007). Of these gear types, sink gillnet gear poses the greatest known risk of mortality for bycaught sturgeon (ASMFC TC 2007). Sturgeon deaths were rarely reported in the otter trawl observer dataset (ASMFC TC 2007). However, the level of mortality after release from the gear is unknown (Stein et al. 2004a). In a review of the Northeast Fishery Observer Program (NEFOP) database for the years 2001-2006, observed bycatch of Atlantic sturgeon was used to calculate bycatch rates that were then applied to commercial fishing effort to estimate overall bycatch of Atlantic sturgeon in commercial fisheries. This review indicated sturgeon bycatch occurred in statistical areas abutting the coast from Massachusetts (statistical area 514) to North Carolina (statistical area 635) (ASMFC TC 2007). Based on the available data, participants in an ASMFC bycatch workshop concluded that sturgeon encounters tended to occur in waters less than 50 m throughout the year, although seasonal patterns exist (ASMFC TC 2007). The ASMFC analysis determined that an average of 650 Atlantic sturgeon mortalities occurred per year (during the 2001 to 2006 timeframe) in sink gillnet fisheries. Stein et al. (2004a), based on a review of the NMFS Observer Database from 1989-2000, found clinal variation in the bycatch rate of sturgeon in sink gillnet gear with lowest rates occurring off of Maine and highest rates off of North Carolina for all months of the year.

The NEFSC prepared an estimate of the number of encounters of Atlantic sturgeon in fisheries authorized by Northeast FMPs. The analysis estimates that from 2006 through 2010, there were averages of 1,239 and 1,342 encounters per year in observed gillnet and trawl fisheries, respectively, with an average of 2,581 encounters combined annually. Mortality rates in gillnet gear were approximately 20%. Mortality rates in otter trawl gear observed are generally lower, at approximately 5%. The highest incidence of sturgeon bycatch in sink gillnets is associated with depths of <40 meters, larger mesh sizes, and the months April-May. Sturgeon bycatch in ocean fisheries is actually documented in all four seasons with higher numbers of interactions in November and December in addition to April and May. Mortality is also correlated to higher water temperatures, the use of tie-downs, and increased soak times (>24 hours). Most observed sturgeon deaths occur in sink gillnet fisheries. For otter trawl fisheries, Atlantic sturgeon bycatch incidence is highest in depths <30 meters and in the month of June.

The NE multispecies fishery is prosecuted with both bottom otter trawl and sink gillnet gear. These data support the conclusion from the earlier bycatch estimates that the NE multispecies fishery may interact with Atlantic sturgeon. However, the more recent, larger population estimate derived from NEAMAP data in the NESFC's draft report suggests that the level of interactions with the NE multispecies fishery is not likely to have a significant adverse impact on the overall Atlantic sturgeon population, or any of the DPSs. On February 6, 2012, NMFS issued two final rules (77 FR 5880-5912; 77 FR 5914-5982) listing five DPS's of Atlantic sturgeon as threatened or endangered. Four DPSs (New York Bight, Chesapeake Bay, Carolina and South Atlantic) are listed as endangered and one DPS (Gulf of Maine) is listed as threatened. The effective date of the listing is April 6, 2012. Formal consultation under Section 7 of the ESA has been reinitiated and is ongoing for the NE multispecies fishery. The previous October 2010 Biological Opinion (BO) for this fishery concluded that the actions considered would not jeopardize the continued existence of any listed species. This BO will be updated to describe any impacts of the NE multispecies fishery on Atlantic sturgeon DPSs and define any measures needed to reduce those impacts, if necessary. Although interactions between Atlantic sturgeon and the groundfish fishery are likely to occur during the reinitiation period, NMFS determined in an August 28, 2012 memorandum that the amount of interactions is not likely to cause an appreciable reduction in survival and recovery of any of the five DPSs and would not violate ESA sections 7(a)(2) and 7(d).

6.5 Human Communities/Social-Economic Environment

This EA considers and evaluates the effect management alternatives may have on people's way of life, traditions, and community. These social impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While it is possible that social impacts could be solely experienced by individual sector participants, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes.

The remainder of this section reviews the Northeast multispecies fishery and describes the human communities potentially impacted by the Proposed Action. This includes a description of the sector and common pool participants groundfish fishing as well as their homeports. Because some of the changes being considered for sector operation plans in 2013 could have an effect on the lobster fishery an overview of that fishery is included as well.

6.5.1 Overview of New England Groundfish Fishery

New England's fishery has been identified with groundfish fishing both economically and culturally for over 400 years. Broadly described, the Northeast Multispecies fishery includes the landing, processing, and distribution of commercially important fish that live on the sea bottom. In the early years, the Northeast Multispecies fishery related primarily to cod and haddock. Today, the Northeast Multispecies FMP (large-mesh and small-mesh) includes a total of 13 species of groundfish (Atlantic cod, haddock, pollock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, Atlantic halibut, redfish, ocean pout, white hake, and wolffish) harvested from three geographic areas (Gulf of Maine, Georges Bank, and southern New England/Mid-Atlantic Bight) representing 19 distinct stocks.

Prior to the industrial revolution, the groundfish fishery focused primarily on cod. The salt cod industry, which preserved fish by salting while still at sea, supported a hook and line fishery that included hundreds of sailing vessels and shore-side industries including salt mining, ice harvesting, and boat building. Late in the 19th century, the fleet also began to focus on Atlantic halibut with landings peaking in 1896 at around 4,900 tons (4,445 mt).

From 1900 to 1930, the fleet transitioned to steam powered trawlers and increasingly targeted haddock for delivery to the fresh and frozen fillet markets. With the transition to steam powered trawling, it became possible to exploit the groundfish stocks with increasing efficiency. This increased exploitation resulted in a series of boom and bust fisheries from 1930 to 1960 as the North American fleet targeted previously unexploited stocks, depleted the resource, and then transitioned to new stocks.

In the early 1960's, fishing pressure increased with the discovery of haddock, hake, and herring off of Georges Bank and the introduction of foreign factory trawlers. Early in this time period, landings of the principal groundfish (cod, haddock, pollock, hake, and redfish) peaked at about 650,000 tons (589,670 mt). However, by the 1970's, landings decreased sharply to between

200,000 and 300,000 tons (181,437 and 272,155 mt) as the previously virgin GB stocks were exploited (NOAA 2007).

The exclusion of the foreign fishermen by the Fisheries Conservation and Management Act in 1976, coupled with technological advances, government loan programs, and some strong classes of cod and haddock, caused a rapid increase in the number and efficiency of U.S. vessels participating in the Northeast groundfish fishery in the late 1970's. This shift resulted in a temporary increase in domestic groundfish landings; however, overall landings (domestic plus foreign) continued to trend downward from about 200,000 tons (181,437 mt) to about 100,000 tons (90,718 mt) through the mid 1980's (NOAA 2007).

In 1986, the NEFMC implemented the Northeast Multispecies FMP with the goal of rebuilding stocks. Since Amendment 5 in 1994, the multispecies fishery has been administered as a limited access fishery managed through a variety of effort control measures including DAS, area closures, trip limits, minimum size limits, and gear restrictions. Partially in response to those regulations, landings decreased throughout the latter part of the 1980's until reaching a more or less constant level of around 40,000 tons (36,287 mt) annually since the mid 1990's.

In 2004, the final rule implementing Amendment 13 to the Northeast Multispecies FMP allowed for self-selecting groups of limited access groundfish permit holders to form sectors. These sectors developed a legally binding operations plan and operated under an allocation of GB cod. While approved sectors were subject to general requirements specified in Amendment 13, sector members were exempt from DAS and some of the other effort control measures that tended to limit the flexibility of fishermen. The 2004 rule also authorized implementation of the first sector, the GB Cod Hook Sector. A second sector, the GB Cod Fixed Gear Sector, was authorized in 2006.

Through Amendment 16, the NEFMC sought to rewrite groundfish sector policies with a scheduled implementation date of May 1, 2009. When that implementation date was delayed until FY 2010, the NMFS Regional Administrator announced that, in addition to a previously stated 18 percent reduction in DAS, interim rules would be implemented to reduce fishing mortality during FY 2009. These interim measures generally reduced opportunity among groundfish vessels through:

- differential DAS counting, elimination of the SNE/MA winter flounder SAP
- elimination of the state waters winter flounder exemption
- revisions to incidental catch allocations, and
- a reduction in some groundfish allocations (NOAA 2009).

In 2007, the Northeast Multispecies fishery included 2,515 permits. Of these permits about 1,400 were limited access, and 658 vessels actively fished. Those vessels include a range of gear types including hook, bottom longline, gillnet, and trawlers (NEFMC 2009a). In FY 2009, between 40 and 50 of these vessels were members of the GB Cod Sectors. The passage of Amendment 16 prior to FY 2010 issued in a new era of sector management in the New England groundfish fishery. Over 50 percent of eligible northeast groundfish multispecies permits and over 95 percent of landings history were associated with sectors in FY 2010. Approximately 56 percent of the eligible northeast groundfish multispecies permits constituting between approximately 99.4

percent and 77.5 percent of the various species ACLs were included in sectors for FY 2011. The remaining vessels were common pool groundfish fishing vessels.

Amendment 16 to the Northeast Multispecies Fishery Management Plan (FMP) was implemented for the New England groundfish fishery starting on May 1st 2010, the start of the 2010 fishing year. The new management program contained two substantial changes meant to adhere to the catch limit requirements and stock rebuilding deadlines of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSA). The first change developed "hard quota" annual catch limits (ACLs) for all 20 stocks in the groundfish complex. The second change expanded the use of Sectors, which are allocated subdivisions of ACLs called Annual Catch Entitlements (ACE) based on each sector's collective catch history. Sectors received ACE for nine of 13 groundfish species (14 stocks + quotas for Eastern U.S./ Canada cod and haddock; 16 ACEs) in the FMP and became exempt from many of the effort controls previously used to manage the fishery.

During the first year of sector management seventeen sectors operated, each establishing its own rules for using its allocations. Vessels with limited access permits that joined sectors were allocated 98% of the total commercial groundfish sub-ACL, based on their collective level of historical activity in the groundfish fishery. Approximately half (46%) of the limited access groundfish permits opted to remain in the common pool. Common pool vessels act independently of one another, with each vessel constrained by the number of DAS it can fish, by trip limits, and by all of the time and area closures. These restrictions help ensure that the groundfish catch of common pool vessels does not exceed the common pool's portion of the commercial groundfish sub- ACL for all stocks (about 2% for 2010) before the end of the fishing year.

In the second year of sector management 58% of limited access permits participated in one of 16 sectors or one of 2 lease only sectors. From 2010 to 2011 the number of groundfish limited access eligibilities belonging to a sector increased by 66, while the number of these permits in the common pool decreased by 85. At the start of the 2011 fishing year, vessels operating within a sector were allocated about 98% of the total groundfish sub-ACL, based on historical catch levels. Those vessels that opted to remain in the common pool were given access to about 2% of the groundfish sub-ACL based on the historic catch. The same effort controls employed in 2010 were again used in 2011, to ensure the groundfish catch made by common pool vessels did not exceed the common pool's portion of the commercial groundfish sub-ACL. Although some trends in the fishery are a result of management changes made to the fishery in the years prior to Amendment 16, many of these trends are also a reflection of the current system of sector management.

6.5.1 Trends in the Number of Vessels

In 2010, the first year of sector management, the Northeast Multispecies fishery issued 1,382 permits, not including groundfish limited access eligibilities held as Confirmation of Permit History (CPH). Out of these permits, 753 vessels belonged to a sector and 640 remained in the Common Pool (**Table 24**). Not all permitted vessels were active and not all active vessels fished groundfish. Of the 740 sector vessels issued groundfish permits, only 440 were considered active, having revenue from any landed species, and only 303 of those had revenue from at least one groundfish trip. Among common pool vessels, 456 were considered active, and only 142 vessels had made at least one groundfish trip.

The overall trend since the start of sector management has been a decreasing number of vessels with a limited access groundfish permit. By 2011 the total number of vessels with a limited access groundfish permit decreased slightly to 1,279. The number of vessels belonging to a sector actually increased to 772 in 2011 while the number of vessels in the Common Pool decreased to 518. Of the 772 sector vessels issued a groundfish permit in 2011, 446 were considered active, and only 301 of those had revenue from at least one groundfish trip. Among common pool vessels, 366 were considered active, and only 121 vessels had made at least one groundfish trip.

Table 25 - Number of vessels by fishing year

				2010			2011		
	2007	2008	2009	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
Vessels with a limited access groundfish permit	1413	1410	1431	1382	753	640	1279	772	518
... those with revenue from any species	1082	1012	957	890	440	456	805	446	366
... those with revenue from at least one groundfish trip	658	611	570	445	303	142	420	301	121
... those with no landings	331 (32%)	398 (28%)	474 (33%)	492 (36%)	313 (42%)	184 (29%)	474 (37%)	326 (42%)	152 (30%)

* These numbers exclude groundfish limited access eligibilities held as Confirmation of Permit History (CPH). Starting in 2010, Amendment 16 authorized CPH owners to join Sectors and to lease DAS. For purposes of comparison, CPH vessels are not included in the 2010 and 2011 data for either sector or common pool.

A key aspect of Amendment 16, and catch share programs in general, is the ability to jointly decide how a sector will harvest its ACE through redistribution within a sector and the ability to transfer ACE between sectors. Because it is then not possible to identify the extent to which inactive vessels in a sector may benefit if other sector vessels harvest their allocation, changes in the number of inactive vessels may describe a transfer of allocation and not necessarily vessels exiting the fishery. In 2010, 492 vessels (36%) were inactive (no landings). Of these inactive vessels, 313 were sector vessels and 184 were common pool vessels. By 2011 the total number of inactive vessels had declined to 474 but because the number of vessels with a limited access groundfish permit declined, there was only a slight rise in the relative proportion of inactive vessels (37%). The number of inactive sector vessels increased to 326 in 2011, but again because the number of vessels with a limited access groundfish permit belonging to a sector also increased, the relative proportion of inactive sector vessels (42%) remained the same. 152 common pool vessels were inactive in 2011, which is about 30% of the Common Pool. The number of inactive vessels in 2011 can be compared to the number of inactive vessels in other years: 331 vessels (32%) in 2007, 398 vessels (28%) in 2008, and 474 vessels (33%) in 2009.

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6.5.2 Trends in Landings

Total groundfish landings on trips made by vessels possessing a limited access groundfish permit in 2011 were 61.7 million pounds, which is an increase from 2010 but a decline from a recent high of 72.2 million pounds in 2008. Because only 16 groundfish stocks are limited by sector allocations it is important to consider the landings of non-groundfish species and groundfish species separately as a means of describing any possible shift in effort to other fisheries. Non-groundfish landings made by limited access vessels increased from 178.1 million pounds in 2010 to 213.8 million pounds in 2011. Total landings of all species made by limited access vessels in the Northeast Multispecies fishery was about 275.5 million pounds in 2011. This compares to landings ranging from 259.5 million pounds to 277.1 million pounds in the 2007–2010 fishing years (**Table 25**). While sector vessels accounted for 69% of all landings made in 2011, sector vessels also made 99% of groundfish landings and 60% of non-groundfish landings.

Table 26 - Landings in Thousands of Pounds by Year

				2010			2011		
Landings	**2007**	**2008**	**2009**	**Total**	**Sector Vessels**	**Common Pool**	**Total**	**Sector Vessels**	**Common Pool**
Total Landings	259448	277118	258954	236695	155529	81166	275506	85147	5580
Total Groundfish Landings	64004	72162	69775	58622	57217	1404	61721	61038	471
Total Non-groundfish Landings	195444	204955	189180	178073	98312	79762	213785	24108	5109

Combined, 161 million (live) pounds of ACE was allotted to the sectors in 2011 but only 70 million (live) pounds were landed. Of the 16 ACEs allocated to sectors, the catch of 7 stocks approached (>80% conversion) the catch limit set by the total allocated ACE (**Table 26**). By comparison, the catch of only 5 stocks approached the catch limit set by the total allocated ACE in 2010. The catch of white hake in 2011 was particularly close to reaching the limit, with 98% of the white hake ACE being realized. As was the case in 2010, the majority of the unrealized landings in 2011 were caused by a failure to land Georges Bank haddock. Collectively, East and West GB haddock, accounted for 63 million pounds (62%) of the un-landed ACE in 2011.

Table 27 - Catch and ACE (live lbs)

	2010			2011		
	Allocated ACE	Catch	% caught	Allocated ACE*	Catch	% caught
Cod, GB East	717,441	562,610	*78%*	**431,334**	**357,578**	***83%***
Cod, GB West	**6,563,099**	**5,492,557**	***84%***	9,604,207	6,727,837	*70%*
Cod, GOM	**9,540,389**	**7,991,172**	***84%***	**11,242,220**	**9,561,153**	***85%***
Haddock, GB East	26,262,695	4,122,910	*16%*	21,122,565	2,336,964	*11%*
Haddock, GB West	62,331,182	13,982,173	*22%*	50,507,974	6,101,400	*12%*
Haddock, GOM	1,761,206	819,069	*47%*	1,796,740	1,061,841	*59%*
Plaice	6,058,149	3,305,950	*55%*	7,084,289	3,587,356	*51%*
Pollock	35,666,741	11,842,969	*33%*	32,350,451	16,297,273	*50%*
Redfish	14,894,618	4,647,978	*31%*	17,369,940	5,951,045	*34%*
White hake	**5,522,677**	**4,687,905**	***85%***	**6,708,641**	**6,598,273**	***98%***
Winter flounder, GB	4,018,496	3,036,352	*76%*	**4,679,039**	**4,241,177**	***91%***
Winter flounder, GOM	293,736	178,183	*61%*	750,606	343,152	*46%*
Witch flounder	**1,824,125**	**1,528,215**	***84%***	2,839,697	2,178,941	*77%*
Yellowtail flounder, CC/GOM	1,608,084	1,268,961	*79%*	**2,185,802**	**1,743,168**	***80%***
Yellowtail flounder, GB	**1,770,451**	**1,625,963**	***92%***	**2,474,662**	**2,176,921**	***88%***
Yellowtail flounder, SNE	517,372	340,662	*66%*	**963,033**	**795,267**	***83%***
Grand Total	179,350,461	65,433,630	*36%*	172,111,201	70,059,346	*41%*

*includes FY2010 carryover

Notes: stocks with > 80% ACE conversion highlighted in bold font

6.5.3 Trends in Revenue

During the first year of sector management, groundfish revenues from vessels with limited access groundfish permits in 2010, were $83 million (**Table 27**). This was lower than 2007 – 2009 nominal revenues which ranged from $84.1 million in 2009 to $90.1 million in 2008. By 2011 the groundfish revenues from vessels with limited access groundfish permits had risen to $90.1 million. During the same time Non-groundfish revenues in 2011 were $240.7 million. Non-groundfish revenues from 2007 – 2010 ranged from $186.1 million in 2009 to $211.5million in 2010. Revenues from all species for 2011 totaled $330.8 million, which compares to pervious revenues that ranged from a low of $271.1 million in 2009 to a high of $298.2 million in 2007. Sector vessels accounted for about 71% of all revenue earned by limited access permitted vessels in 2011. Sector vessels also earned 99% of revenue from groundfish landings and 60% of non-groundfish revenue.

Table 28 - Revenue in Thousands of Dollars by Year

					2010			2011	
Landings	2007	2008	2009	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
Total Landings	$298,246	$291,479	$266,765	$294,505	$196,625	$97,880	$330,885	$233,922	$96,962
Total Groundfish Landings	$89,055	$90,132	$84,112	$82,984	$80,750	$2,234	$90,115	$89,144	$971
Total Non-groundfish Landings	$209,191	$201,347	$182,653	$211,521	$115,875	$95,645	$240,769	$144,778	$95,991

6.5.4 Trends in ACE Leasing

Starting with allocations in 2010, each sector was given an initial annual catch entitlement (ACE) determined by the pooled potential sector contribution (PSC) from each vessel joining that sector. A vessel's PSC is a percentage share of the total allocation for each allocated groundfish stock based on that vessel's fishing history. Once a sector roster and associated PSC is set at the beginning of a fishing year each sector is then able to distribute its ACE among its members. By regulation ACE is pooled within sectors, however most sectors seem to follow the practice of assigning catch allowances to member vessels based on PSC allocations. This is an important assumption because vessels catching more than their allocation of PSC must have leased additional quota either as PSC from within the sector or as ACE from another sector.

During the first year of sector management, 281 Sector-affiliated vessels had catch that exceeded their individual PSC allocations for at least one stock. These vessels are then assumed to have leased in an additional 22 million pounds of ACE and/or PSC with an approximate value of $13.5 million. In 2011 256 Sector-affiliated vessels had catch that exceeded their individual PSC allocations. To account for the additional catch these vessels would have had to lease an additional 31 million pounds of quota, either as PSC from within the sector or as ACE from another sector. Although the number of vessels leasing ACE fell by 9% the estimated number of pounds leased was almost 41% greater in 2011 than in 2010.

6.5.5 Trends in Effort

Some of the proposed benefits of a catch share system of management are the potential efficiency gains associated with increasing operational flexibility. Being released from the former effort controls but being held by ACLs, sector vessels were expected to increase their catch per unit effort by decreasing effort. Between 2009 and 2010, the total number of groundfish fishing trips and total days absent on groundfish trips declined by 48% and 27%, respectively (26,056 trips in 2009 vs. 13,441 trips in 2010; 24,237 days absent in 2009 vs. 17,614 days absent in 2010) (**Table 28**). During the second year of sector management, 2011, the number of groundfish fishing trips and total days absent on groundfish trips increased by 19% and 18% respectively (13,441 trips in 2010 vs. 15,929 trips in 2011; 17,614 days absent in 2010 vs. 20,724 days absent in 2011) (Table 4.6.5-1). Note, in the following analysis, a groundfish trip is defined as a trip where the vessel owner or operator declared, either through the vessel monitoring system or through the interactive voice response system, that the vessel was making a groundfish trip. The following data is taken from different source materials (VMS, etc.) than the data presented earlier in Section 4.1, and for the reasons stated in Section 4.1, this data may be slightly different than what is presented elsewhere in the document. While the number of groundfish fishing trips and total days absent on groundfish trips increased during the second year of sector management the number of non-groundfish trips, and days absent on non-groundfish trips, has decreased in 2011 (41,753 trips in 2010 vs. 36,386 trips in 2011; 31,552 days absent in 2010 vs. 27,913 days absent in 2011) (**Table 28**). Average trip length on both groundfish and non-groundfish trips were not statistically different during the time series (**Table 28**).

Table 29 - Effort by Active Vessels

	2007	2008	2009	2010			2011		
				Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
Number of Groundfish Trips	27,004	26,468	26,056	13,441	11,159	2,282	15,929	13,642	2,287
Number of non-groundfish Trips	46,635	46,721	39,943	41,753	16,791	24,962	36,386	17,002	19,384
Number of days absent on groundfish trips	28,158	27,146	24,237	17,614	16,057	1,558	20,724	19,227	1,498
Number of days absent on non-groundfish trips	35,186	36,134	31,241	31,552	15,446	16,106	27,913	14,973	12,940
Average trip length on groundfish trips	7.63	7.82	0.94	1.31	1.44	0.69	1.30	1.41	0.66
(standard deviations)	(6.15)	(5.98)	(1.85)	(2.08)	(2.23)	(0.76)	(2.14)	(2.28)	(0.66)
Average trip length on non-groundfish trips	5.42	4.78	0.84	0.79	0.96	0.68	0.80	0.93	0.69
(standard deviation)	(5.95)	(5.67)	(1.57)	(1.47)	(1.69)	(1.30)	(1.45)	(1.65)	(1.24)

6.5.6 Trends in Fleet Characteristics

The groundfish fishery has traditionally been made up of a diverse fleet, comprised of a range of vessels sizes and gear types. Over the years, as vessels entered and exited the fishery, the "typical" characteristics defining the fleet changed as well. The groundfish fleet is divisible into four "vessel size categories," vessels less than 30 feet in length, vessels between 30 and 50 feet in length, vessels between 50 and 75 feet in length and vessels greater than 75 feet in length. As mentioned above, the number of active vessels in 2011 had declined compared to the previous three years and this decline occurred across all vessel size categories between 2009 and 2011. The number of vessels smaller than 30' has experienced the greatest decline of 32% between 2009 and 2011 (78 to 53 vessels; **Table 29**). The 30' to < 50' vessel size category, which has the largest number of active vessels, experienced a 16% decline (500 to 419 active vessels) during the past 3 years. Most (229) sector vessels fell into this 30' to 50' size category. The 50' to < 75' vessel size category, containing the second largest number of vessels, experienced an 11% reduction during 2009 to 2011 (247 to 220 active vessels). The 50' to < 75' size category also had the second largest number of sector vessels with 128. The number of active vessels in largest (75' and above) vessel size category declined by 9% between 2009 and 2011. The decline was relatively consistent across all four years in all vessel size categories.

Between the first two years of sector management, the numbers of vessels that joined a sector or stayed in the common pool were about evenly split within size categories with the exception of the largest and smallest categories. For active vessels larger than 75' total length, 67% belong to a sector in 2010 and 69% belong to a sector in 2011. Of active vessels in the smallest size category, those smaller than 30' in length, 84% remained in the common pool in 2010 while 89% of vessels smaller than 30' remained in the common pool in 2011. For active vessels in the 30' to 50' and 50' to 75' range there has been a growing proportion of vessels belonging to sectors. In 2010, active sector vessels comprised 47% and 54% of the 30' to 50' and 50' to 75' ranges respectively. By 2011, those proportions had increased to 55% and 58% of active sector vessels in the 30' to 50' and 50' to 75' ranges.

Table 30 - Vessel activity by size class

					2010			2011	
Vessel size	**2007**	**2008**	**2009**	**Total**	**Sector Vessels**	**Common Pool**	**Total**	**Sector Vessels**	**Common Pool**
Vessels with landings from any species									
Less than 30	83	77	78	70	11	59	53	6	47
30 to < 50	572	528	500	475	225	250	419	229	190
50 to < 75	289	267	247	231	125	106	220	128	92
75 and above	139	140	132	120	79	41	120	83	37
Total	1082	1012	957	896	440	456	812	446	366
Vessels with at least one groundfish trip									
Less than 30	29	26	33	23	2	21	19	1	18
30 to < 50	351	331	308	241	152	89	220	146	74
50 to < 75	194	175	156	117	88	29	115	92	23
75 and above	84	79	73	64	61	3	68	62	6
Total	658	611	570	445	303	142	422	301	121

Fishing effort, as described by either the number of trips taken or the total number of days absent, varies considerably by vessel size. In 2011 more than two thirds of groundfish trips were made by vessels ranging in size from 30 to 50 feet in total length (**Table 30**). Compared to 2010, 2011 saw increases in the numbers of groundfish trips and the total number of days absent on groundfish trips across almost all vessel size classes. In percentage terms, the largest increases in groundfish trips and days absent on groundfish trips occurred in the less than 30' vessel size category (100% and 69%, respectively). However, there were only a couple hundred trips per year in this vessel size category. In terms of magnitude, the 30' to < 50' vessel size category had the greatest increases in groundfish trips and days absent (1,874 more groundfish trips and 1,265 more days absent on groundfish trips from 2010 to 2011). The largest vessel class (75' and above) experienced a reduction of 5% in groundfish trips but an 11% increase in days absent on groundfish trips. The 50' to < 75' vessel size category had increases of about 19% in both groundfish trips and days absent on groundfish trips. From 2010- 2011, non-groundfish trips and the number of days absent on non-groundfish trips, has declined for all vessel size classes.

Table 31 - Vessel effort (as measured by number of trips and days absent) by vessel size category

				2010			2011		
Vessel Size	2007	2008	2009	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
Number of groundfish trips									
Less than 30	272	239	435	137	2	135	274	15	259
30 to < 50	18200	18453	19349	9240	7509	1731	11114	9401	1713
50 to < 75	7018	6356	4971	2829	2442	387	3368	3067	301
75 and above	1525	1424	1301	1235	1206	29	1173	1159	14
Total	27015	26472	26056	13441	11159	2282	15929	13642	2287
Number of non-groundfish trips									
Less than 30	2534	2249	1784	1703	370	1333	1372	258	1114
30 to < 50	28892	27586	23216	25204	9678	15526	21585	10443	11142
50 to < 75	11979	12825	12090	12321	5456	6865	10920	5036	5884
75 and above	3248	4073	2853	2523	1287	1236	2507	1264	1243
Total	46653	46733	39943	41751	16791	24960	36384	17001	19383
Number of days absent on groundfish trips									
Less than 30	101	82	160	61	1	60	103	7	96
30 to < 50	9580	9586	8794	5067	3958	1109	6332	5216	1116
50 to < 75	10701	9857	8278	5656	5305	351	6713	6447	266
75 and above	7750	7582	7006	6831	6792	38	7576	7558	19
Total	28132	27107	24237	17614	16057	1558	20724	19227	1498
Number of days absent on non-groundfish trips									
Less than 30	665	678	573	537	123	414	419	81	337
30 to < 50	11069	10455	8657	9540	3633	5906	8215	3683	4532
50 to < 75	13006	13557	12681	12545	6491	6053	11498	6414	5084
75 and above	10472	11483	9330	8930	5199	3731	7780	4795	2986
Total	35212	36173	31241	31551	15446	16105	27912	14972	12940

6.5.7 Fishing Communities

There are over 100 communities that are homeport to one or more Northeast groundfish fishing vessels. These ports occur throughout the coastal northeast and mid-Atlantic. Consideration of the social impacts on these communities from proposed fishery regulations is required as part of the National Environmental Policy Act (NEPA) of 1969 and the Magnuson Stevens Fishery Conservation and Management Act, 1976. Before any agency of the federal government may take "actions significantly affecting the quality of the human environment," that agency must prepare an Environmental Assessment (EA) that includes the integrated use of the social sciences (NEPA Section 102(2)(C)). National Standard 8 of the MSA stipulates that "conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities" (16 U.S.C. § 1851(a)(8)).

A "fishing community" is defined in the Magnuson-Stevens Act, as amended in 1996, as "a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community" (16 U.S.C. § 1802(17)). Determining which fishing communities are "substantially dependent" on, and "substantially engaged" in, the groundfish fishery can be difficult. In recent amendments to the fishery management plan the council has categorized communities dependent on the groundfish resource into primary and secondary port groups so that community data can be cross-referenced with other demographic information. Descriptions of 24 of the most important communities involved in the multispecies fishery and further descriptions of North East fishing communities in general can be found on North East Fisheries Science Center's website (http://www.nefsc.noaa.gov/read/socialsci/community_profiles/).

Although it is useful to narrow the focus to individual communities in the analysis of fishing dependence there are a number of potential issues with the confidential nature of the information. There are privacy concerns with presenting the data in such a way that proprietary information (landings, revenue, etc.) can be attributed to an individual vessel or a small group of vessels. This is particularly difficult when presenting information on small ports and communities that may only have a small number of vessels and that information can easily be attributed to a particular vessel or individual.

6.5.7.1 Vessel Activity

At the state level, Massachusetts has the highest number of active vessels with a limited access groundfish permit. From 2007 to 2011 the total number of active vessels with revenue from any species on all trips declined 26% (1,082 to 805). All states have shown a decline in the number of active vessels since 2007, but the largest percentage decline has occurred in Connecticut where the number of active vessels dropped 39% by 2011 (**Table 31**). Just over half of the active vessels belonging to a sector have a homeport in Massachusetts (262 vessels), while New Jersey and Connecticut are the two states in the North East with the fewest vessels belonging to a sector. At the level of home port, there is even greater variation between the ports with regard to the numbers of active vessels.

Table 32 - Number of Active Vessels with Revenue from any Species (all trips) by Home Port and State

				Year					
				2010			2011		
Home Port State/City	2007	2008	2009	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
CT	18	13	13	12	4	8	11	4	7
MA	544	502	482	444	264	183	396	262	134
BOSTON	80	69	67	57	41	16	53	41	12
CHATHAM	46	41	42	43	31	12	39	28	11
GLOUCESTER	124	116	115	109	70	39	95	68	27
NEW BEDFORD	93	91	87	69	48	22	70	53	17
ME	128	116	114	103	63	40	88	70	20
PORTLAND	22	18	17	17	15	2	16	15	1
NH	70	65	62	57	37	22	52	34	20
NJ	67	71	63	58	2	56	52	6	46
NY	98	100	97	95	15	80	92	16	76
RI	110	104	95	87	43	45	84	44	41
POINT JUDITH	58	54	50	46	33	14	45	34	12
All Other States	47	41	35	39	13	26	37	14	23
Grand Total	1,082	1,012	957	890	440	456	805	446	366

Massachusetts is also the state with the highest number of active vessels with revenue from at least one groundfish trip. From 2007 to 2011 the total number of active vessels with revenue from at least one groundfish trip declined 36% (658 to 420). While all states showed a decline in the number of vessels making groundfish trips the largest percentage decline (59%: 41 to 17 vessels) occurred in New Jersey (**Table 32**). Of the sector vessels making groundfish trips in 2011 almost two thirds of them have a homeport in Massachusetts (186 vessels). Again, New Jersey and Connecticut are the two states with the fewest sector vessels making groundfish trips.

Table 33 - Number of Vessels with Revenue from at Least One Groundfish Trip by Home Port and State

		Year								
					2010			2011		
Home Port State/City		2007	2008	2009	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
CT		9	8	8	7	3	4	5	2	3
MA		341	321	312	238	189	49	224	186	38
	BOSTON	54	49	46	35	33	2	34	34	0
	CHATHAM	26	27	28	26	23	3	26	23	3
	GLOUCESTER	95	88	98	74	59	15	70	55	15
	NEW BEDFORD	60	62	52	33	29	4	37	32	5
ME		78	69	65	43	38	5	47	43	4
	PORTLAND	20	16	15	15	14	1	15	15	0
NH		44	42	42	32	26	6	29	23	6
NJ		41	34	26	21	1	20	17	1	16
NY		52	56	47	40	8	32	43	9	34
RI		78	70	60	55	34	21	49	32	17
	POINT JUDITH	43	36	32	31	28	3	28	27	1
All Other States		15	11	12	10	5	5	8	5	3
Grand Total		658	611	570	445	303	142	420	301	121

6.5.7.2 Employment

Along with the restrictions associated with presenting confidential information there is also limited quantitative socio-economic data upon which to evaluate the community specific importance of the multispecies fishery. In addition to the direct employment of captains and crew, the industry is known to support ancillary businesses such as gear, tackle, and bait suppliers; fish processing and transportation; marine construction and repair; and restaurants. Regional economic models do exist that describe some of these inter-connections at that level (Olson and Clay 2001, Thunberg 2007, Thunberg 2008, NMFS 2010, and Clay et al. 2008).

Throughout the Northeast, many communities benefit indirectly from the multispecies fishery but these benefits are often difficult to attribute. The direct benefit from employment in the fishery can be estimated by the number of crew positions. However, crew positions do not equate to the number of jobs in the fishery and do not make the distinction between full and part-time positions. Crew positions are measured by summing the average crew size of all active vessels on all trips. In 2011 vessels with limited access groundfish permits provided 2,129 crew positions with about half coming from vessels with home ports in Massachusetts. Since 2007, the total number of crew positions provided by limited access groundfish vessels has declined by 21% (2,687 positions to 2129). Declines in crew positions vary across home port states with some states adding crew positions in 2011 (**Table 33**). Vessels with a home port in Connecticut and New Hampshire have experienced the largest percentage decline (20%: 52 to 41 crew positions in CT and 28%: 139 to 100 crew positions in NH), while vessels home ported in New York have shown an increase in crew positions (3%: 204 to 211 crew positions). All other home port states had crew position reductions ranging from 10 to 18% between 2007 and 2011 (**Table 33**).

Table 34 - Number of Crew Positions and Crew-Days on Active Vessels by Home Port and State

Home Port State		Year 2007	2008	2009	2010	2011
CT						
	Total CREW POSITIONS	52	39	38	39	41
	Total CREW-DAYS	4,261	3,779	3,317	3,614	3,067
MA						
	Total CREW POSITIONS	1,402	1,311	1,152	1,104	1,063
	Total CREW-DAYS	98,094	93,182	86,234	77,422	82,238
ME						
	Total CREW POSITIONS	276	250	216	220	204
	Total CREW-DAYS	17,872	15,882	14,414	14,427	14,148
NH						
	Total CREW POSITIONS	139	123	114	109	100
	Total CREW-DAYS	6,443	6,135	5,925	3,813	4,663
NJ						
	Total CREW POSITIONS	167	185	159	140	143
	Total CREW-DAYS	12,035	12,987	10,708	9,801	9,364
NY						
	Total CREW POSITIONS	204	214	205	201	211
	Total CREW-DAYS	16,656	15,975	15,479	15,020	15,439
RI						
	Total CREW POSITIONS	304	281	253	243	238
	Total CREW-DAYS	32,072	29,690	24,167	25,454	24,938
OTHER NORTHEAST	Total CREW POSITIONS	145	144	123	133	128
	Total CREW-DAYS	12,158	14,794	12,166	11,626	11,767
Total						
	Total CREW POSITIONS	2,687	2,545	2,260	2,190	2,129
	Total CREW-DAYS	199,593	192,423	172,410	161,178	165,624

A crew day is another measure of employment opportunity that incorporates information about the time spent at sea earning a share of the revenue. Similar to a "man-hour" this measure is calculated by multiplying a vessel's crew size by the days absent from port, and since the number of trips affects the crew-days indicator, the indicator is also a measure of work opportunity. Conversely, crew days can be viewed as an indicator of time invested in the pursuit of "crew share" (the share of trip revenues received at the end of a trip). The time spent at sea has an opportunity cost. For example if crew earnings remain constant, a decline in crew days would reveal a benefit to crew in that less time was forgone for the same amount of earnings.

In 2011 vessels with limited access groundfish permits used 165,624 crew days with close to half coming from vessels with home ports in Massachusetts. Since 2007 the total number of crew days used by limited access groundfish vessels has declined by 17% (199,593 to 165,624 crew days). Declines in crew days occurred across all home port states, but since 2010 some states have experienced some small increases in the number of crew days (**Table 33**). Vessels with a home port in New Hampshire experienced the largest percentage decline in crew days (28%: 6,443 to 4,663 crew days), while vessels home ported in states other than CT, MA, ME, NH, NJ, NY, and RI had the lowest percentage decline (3%: 12,158 to 11,767 crew days). All other home port states had crew position reductions ranging from 10% to 17% between 2007 and 2011 (**Table 33**).

The number of crew positions and crew days give some indication of the direct benefit to communities from the multispecies fishery through employment. But these measures, by themselves, do not show the benefit or lack thereof at the individual level. Many groundfish captains and crew are second- or third-generation fishermen who hope to pass the tradition on to their children. This occupational transfer is an important component of community continuity as fishing represents an important occupation in many of the smaller port areas.

6.5.7.3 Consolidation and Redirection

The multiple regulatory constraints placed on common pool groundfish fishers are intended to control their effort and catch per unit effort (CPUE) as a means to limit mortality. Exemptions to many of these controls, which have been granted to sectors in previous years, may increase the CPUE of sector participants. As a result, sector fishermen may have additional time that they could direct towards non-groundfish stocks that they otherwise would not have pursued, resulting in redirection of effort into other fisheries. Additionally, to maximize efficiency, fishermen within a single sector may be more likely to allocate fishing efforts such that some vessels do not fish at all; this is referred to as fleet consolidation.

Both redirection and consolidation have been observed when management regimes for fisheries outside the Northeast United States (U.S.) shifted toward a catch share management regime such as sectors. For example, research following the rationalization of the halibut and sablefish fisheries by the North Pacific Fishery Management Council found individuals who received enough quota shares were able to continue fishing with less competition, greater economic certainty, and over a longer fishing season (Matulich and Clark 2001). However, individuals who did not receive enough of a catch share either bought or leased catch shares from other fishermen or sold their quota. Similarly, one year after implementation of the Bering Sea-Aleutian Island crab fishery Individual Transferable Quota (ITQ), a study found that about half of the vessels that fished the 2004/2005 Bering Sea Snow Crab fishery did not fish the following year. However, research on the ITQ plan for the British Columbia halibut fishery found efficiency gains were greatest during the first round of consolidation, and little incentive to increase efficiency (or continue consolidation) existed afterward (Pinkerton and Edwards 2009).

The scope of consolidation and redirection of effort that may be expected to result from sector operations in FY 2013 is difficult to predict. Data is now available for the first two years of expanded sector operations, FY 2010 and FY 2011, which is discussed above. In addition, the activities of FY 2012 sectors and individual sector's predictions for expected consolidation in FY 2013 are discussed further in Section 1.1.3.

6.5.7.4 Overview of the Ports for FY 2013 Sectors

Sector fishermen would utilize ports throughout the Middle Atlantic and New England. The sector operations plans listed home ports and landing ports that the sectors plan to use in FY 2013. The following table (Table 34) summarizes these ports.

Table 35 - Home Ports and Landing Ports for Sector Fishermen in FY 2013 (As reported by sectors in their FY 2013 operations plans)

State	Primary Ports[a]		Other Ports[b]	
Connecticut:	N/A		New London, Stonington	
Massachusetts	Boston	New Bedford	Barnstable	Provincetown
	Chatham	Newburyport	Dennis	
	Gloucester	Plymouth	Hyannis	
	Harwich	Rockport	Nantucket	
	Marshfield	Sandwich		
	Menemsha	Situate		
Maine	Boothbay Harbor		Bar Harbor	Saco
	Harpswell		Five Islands	South Bristol
	(Cundy's Harbor)		Jonesport	Southwest Harbor
	Kennebunkport		Phippsburg (Sebasco	Stonington
	Port Clyde		Harbor)	Tenant's Harbor
	Portland		Rockland	Tremont (Bass Harbor)
				Winter Harbor
New Hampshire	Portsmouth		N/A	
	Rye			
	Seabrook			
New Jersey	N/A		Barnegut Light	
			Cape May	
			Point Pleasant	
New York	Montauk		Hampton Bays- Shinnecock	
			Greenport	
Rhode Island	Point Judith		N/A	
	Newport			
Virginia	N/A		Chincoteague, Greenbackville	

Notes:

[a] Listed by one or more sector as a primary port in their FY 2013 operations plans. A primary port refers to those ports used to land the majority of catch from active sector vessels or where the majority of sector vessels are home ported.

[b] Includes those ports listed by one or more sector as a secondary port but not a primary port. The other ports category includes all remaining ports that may be used by sector vessels.

6.5.7.5 FY 2011 Regulated Groundfish Stock Catches

The Northeast Multispecies FMP specifies Annual Catch Limits (ACLs) for twenty stocks. Exceeding the ACL results in the implementation of Accountability Measures (AMs) to prevent overfishing. The ACL is sub-divided into different components. Those components that are subject to AMs are referred to as sub-ACLs. There are also components of the fishery that are not subject to AMs. These include state waters catches that are outside of federal jurisdiction, and a category referred to as "other sub-components" that combines small catches from various fisheries.

Table 35 through Table 38 compare FY 2011 catches to ACLs. This reconciliation was provided by NERO, and includes imputation for missing dealer records. As shown in Table 36, catches exceed ACLs for only two stocks: GOM/GB windowpane flounder and SNE/MA windowpane flounder. ACLs for these two stocks were also exceeded in FY 2010. AMs for those stocks were modified in FW 47 but have not yet been implemented.

Table 37 summarizes catches by non-groundfish components of the ACLs. Assignment of catches to a specific FMP is difficult unless the FMP uses a specific gear (e.g. the scallop fishery) or has a trip activity declaration (e.g. groundfish and monkfish trips). For this reason the assignment of catch to FMP should be viewed with caution. Nevertheless, this table indicates that much of the catch of SNE/MAB windowpane flounder is taken outside the groundfish fishery. The squid/whiting fishery on GB also catches a substantial amount of GB yellowtail flounder, particularly when compared to possible future quotas.

Because of difficulty in assigning catch to a specific FMP, catches of SNE/MA windowpane flounder were allocated by trawl gear mesh size (Table 38 and **Table 39**). As can be seen from these tables, large mesh bottom trawls (mesh size 5 inches and larger) account for a large part of the non-groundfish catch.

Table 36 – FY2011 catches of regulated groundfish stocks (metric tons, live weight)

Stock	Components with ACLs and sub-ACLs; (with accountability measures (AMs))							sub-components: No AMs	
	Total Groundfish	Groundfish Fishery	Sector	Common Pool	Recreational*	Midwater Trawl Herring Fishery**	Scallop Fishery	State Water	Other
	A to G	A+B+C	A	B	C	D	E	F	G
GB cod	3,405.9	3,276.7	3,215.3	61.5				38.9	90.2
GOM cod	6,347.1	6,101.8	4,368.0	93.4	1,640.3			216.4	28.8
GB Haddock	4,252.0	3,840.5	3,828.8	11.7		101.8		3.9	305.8
GOM Haddock	737.6	724.1	483.7	1.9	238.5	0.2		4.9	8.4
GB Yellowtail Flounder	1,117.0	990.0	988.0	2.0			83.9	0.0	43.2
SNE/MA Yellowtail Flounder	514.9	376.2	364.0	12.2			110.9	1.1	26.7
CC/GOM Yellowtail Flounder	853.1	806.5	795.1	11.4				38.5	8.1
Plaice	1,660.7	1,636.1	1,631.6	4.5				12.1	12.6
Witch Flounder	1,186.0	997.1	992.9	4.2				22.5	166.4
GB Winter Flounder	1,984.8	1,925.4	1,924.2	1.1				0.0	59.4
GOM Winter Flounder	287.3	160.8	158.2	2.6				113.3	13.2
SNE/MA Winter Flounder	298.7	93.9	86.9	7.0				40.0	164.9
Redfish	2,720.6	2,706.7	2,703.2	3.6				3.6	10.2
White Hake	3,035.5	3,028.5	3,014.4	14.1				2.6	4.4
Pollock	9,064.0	7,612.4	7,543.1	69.2				694.0	757.6
Northern Windowpane	191.3	156.5	156.2	0.3				0.0	34.8
Southern Windowpane	504.1	111.5	83.0	28.5				16.6	376.0
Ocean Pout	90.2	60.7	56.3	4.4				0.0	29.5
Halibut	52.1	42.6	41.4	1.2				7.1	2.5
Wolffish	33.0	32.9	32.2	0.7				0.0	0.1

[1]Catch includes any FY 2010 carryover caught by sectors in FY 2011.

Any value for a non-allocated species may include landings of that stock;

*Recreational estimates based on Marine Recreational Information Program (MRIP) data.

**Landings extrapolated from observer data.

misreporting of species and/or stock area; and/or estimated landings (in lieu of missing reports) based on vessel histories.

Table **37 - FY 2011 catches as percent of ACL**

Stock	Components with ACLs and sub-ACLs; (with accountability measures (AMs))							sub-components: No AMs	
	Total Groundfish*	Groundfish Fishery*	Sector*	Common Pool	Recreational**	Midwater Trawl Herring Fishery	Scallop Fishery	State Water	Other
GB cod	68.0	68.8	68.9	66.1				81.1	47.2
GOM cod	69.2	74.1	83.4	89.9	58.1			36.3	9.6
GB Haddock	1.3	-	0.0	6.3		32.0		1.1	22.3
GOM Haddock	57.7	59.4	52.6	24.3	77.4	1.7		54.6	24.1
GB Yellowtail Flounder	78.9	86.7	88.1	10.1			41.8	NA	59.1
SNE Yellowtail Flounder	76.7	67.3	84.3	10.2			135.2	15.6	98.9
CC/GOM YTF	78.9	78.3	79.4	42.1				384.8	19.3
Plaice	42.3	43.8	44.7	6.4				35.5	9.1
Witch Flounder	84.8	74.1	75.3	16.8				161.0	302.5
GB Winter Flounder	85.1	86.9	87.4	8.2				NA	53.5
GOM Winter Flounder	52.4	45.0	46.5	16.5				69.5	41.3
SNE/MA Winter Flounder	35.5	12.9	NA	NA				55.6	366.4
Redfish	25.7	26.9	27.0	9.9				4.3	3.1
White Hake	88.9	93.5	93.9	50.4				7.9	3.3
Pollock	46.1	43.0	42.8	66.6				90.3	52.4
Northern Windowpane	118.8	142.2	NA	NA				0.5	71.0
Southern Windowpane	224.0	72.4	NA	NA				829.1	544.9
Ocean Pout	35.7	25.4	NA	NA				0.0	268.5
Halibut	68.6	129.1	NA	NA				18.1	61.6
Wolffish	42.8	45.1	NA	NA				0.0	2.4

* The percent of the FY 2011 catch limits caught does not include any FY 2010 carryover caught by sectors in FY 2011. FY 2010 carryover caught is not applied to the FY 2011 ACL.

** To evaluate whether recreational catches exceeded any of the recreational sub-ACLs, the 2-year average of FY 2010 and FY 2011 was used.

Table 38 – FY 2011 catches by non-groundfish FMPs

Stock	Total	SCALLOP[1]	FLUKE	HAGFISH	HERRING	'LOBSTER/ CRAB'	MENHADEN	MONKFISH	REDCRAB	RESEARCH
GB cod	90.2	5.7	0.6	0.0	0.3	0.7	0.1	0.1	0.0	12.3
GOM cod	28.8	-	0.6	0.0	2.9	0.1	0.0	0.0	-	8.7
GB Haddock	305.8	2.4	8.2	-	14.4**	2.3	-	0.1	-	18.1
GOM Haddock	8.4	-	0.0	0.0	2.6**	0.1	-	-	-	0.2
GB Yellowtail Flounder	43.2	-**	0.1	0.0	1.0	0.0	-	0.0	0.0	-
SNE Yellowtail Flounder	26.7	-**	8.5	-	0.1	0.0	0.0	0.1	0.0	3.4
CC/GOM Yellowtail Flounder	8.1	2.9	0.1	0.0	0.5	0.0	0.0	0.0	-	2.5
Plaice	12.6	0.0	1.3	0.0	1.4	0.5	0.3	0.0	0.0	1.5
Witch Flounder	166.4	18.0	19.5	0.0	7.2	1.5	0.4	0.2	0.0	1.1
GB Winter Flounder	59.4	38.4	0.3	-	0.4	0.0	-	-	-	-
GOM Winter Flounder	13.2	2.0	0.0	0.0	0.2	0.0	-	-	-	0.2
SNE Winter Flounder	164.9	60.3	16.4	0.0	2.6	0.6	0.0	0.2	0.0	3.5
Redfish	10.2	0.0	3.1	0.0	0.2	0.1	0.0	0.0	0.0	0.1
White Hake	4.4	2.0	0.4	0.0	0.0	0.1	0.0	0.6	0.0	0.0
Pollock	757.6	-	0.8	0.0	0.5	0.2	0.1	0.0	0.0	0.6
Northern Windowpane	34.8	33.0	0.0	0.0	0.2	0.0	-	0.0	0.0	0.0
Southern Windowpane	376.0	135.3	75.9	-	1.6	0.6	0.1	0.6	0.0	0.0
Ocean Pout	29.5	6.4	6.5	0.0	0.4	0.1	0.0	0.0	0.0	0.0
Halibut	2.5	0.8	0.1	-	0.1	0.4	-	0.0	-	0.0
Wolffish	0.1	-	0.0	-	-	-	-	-	-	-

Values in metric tons of live weight

[1]Based on scallop fishing year March, 2011 through February, 2012

*Estimates not applicable. Recreational amounts are not attributed to the ACL consistent with the assessments for these stocks used to set FY 2011 quotas.

Table 37 – FY 2011 catches by non-groundfish FMPs (cont.)

Stock	SCUP	SHRIMP	SQUID	'SQUID/ WHITING'	SURFCLAM	TILEFISH	'WHELK/CONCH'	WHITING	UNKNOWN	REC
GB cod	0.2	0.0	0.2	0.1	0.0	0.0	0.0	0.0	15.2	54.6
GOM cod	2.5	0.7	0.4	3.1	0.0	-	0.0	2.6	7.3	-**
GB Haddock	5.5	0.1	98.8	52.0	-	-	-	0.9	102.9	NA*
GOM Haddock	-	0.5	0.0	0.8	-	-	0.0	1.9	2.4	-**
GB Yellowtail Flounder	0.2	0.0	0.2	40.7	-	-	0.0	-	1.0	
SNE Yellowtail Flounder	4.5	0.0	1.2	1.2	0.0	0.0	0.0	0.0	7.7	
CC/GOM Yellowtail Flounder	0.3	0.1	0.0	0.4	0.0	-	0.0	0.3	0.9	
Plaice	0.8	0.0	2.1	1.3	0.0	0.0	0.0	0.0	3.2	
Witch Flounder	13.0	0.2	35.3	20.7	0.0	0.0	0.1	0.8	48.3	
GB Winter Flounder	1.2	0.0	0.2	16.7	-	-	-	0.1	2.2	
GOM Winter Flounder	-	0.0	0.0	0.1	-	-	0.0	0.2	0.2	10.3
SNE Winter Flounder	8.3	0.0	19.5	6.8	0.0	0.0	0.0	0.1	34.9	11.7
Redfish	2.1	0.0	0.9	0.8	0.0	0.0	0.0	0.0	2.9	
White Hake	0.4	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.6	
Pollock	0.5	0.0	0.1	0.1	0.0	0.0	0.0	0.0	6.1	748.5
Northern Windowpane	0.0	0.0	0.0	1.4	0.0	-	0.0	0.1	0.1	
Southern Windowpane	48.7	0.0	17.8	14.9	0.0	0.0	0.0	0.1	80.5	
Ocean Pout	4.4	0.0	2.7	2.1	0.0	0.0	0.0	0.1	6.9	
Halibut	0.1	0.0	0.3	0.2	-	-	-	0.0	0.5	
Wolffish	-	-	-	-	-	-	-	-	0.1	

Table 39 – FY 2010 SNE/MA windowpane flounder catch by trawl gear mesh size

SECGEARFISH	ROUNDED_MESH	SPPNM	Windowpane Discarded (mt)	TRIP_COUNT	Total and Top Three Species Landed (mt)
OTF	<=4.5	TOTAL	12.4	6,543	43,954.4
OTF	<=4.5	SQUID (ILLEX)	5.2	338	16,675.1
OTF	<=4.5	SQUID (LOLIGO)	2.6	4,612	8,884.4
OTF	<=4.5	HERRING, ATLANTIC	1.5	642	4,814.9
OTF	5	TOTAL	39.6	905	2,603.6
OTF	5	SCUP	22.8	809	1,510.5
OTF	5	MENHADEN	2.8	9	184.3
OTF	5	FLOUNDER, SUMMER	2.7	797	177.5
OTF	5.5	TOTAL	90.0	2,321	5,867.7
OTF	5.5	FLOUNDER, SUMMER	48.5	2,252	3,169.9
OTF	5.5	SCUP	13.5	849	879.3
OTF	5.5	SKATES	3.9	820	253.9
OTF	6	TOTAL	48.4	2,203	3,219.9
OTF	6	FLOUNDER, SUMMER	18.0	2,121	1,184.2
OTF	6	SKATES	10.0	773	660.4
OTF	6	SCUP	6.6	1,038	433.1
OTF	6.5	TOTAL	52.7	2,868	3,509.6
OTF	6.5	SKATES	28.8	1,364	1,907.8
OTF	6.5	FLOUNDER, SUMMER	12.9	2,626	841.0
OTF	6.5	SCUP	4.5	1,713	291.9
OTF	>6.5	TOTAL	1.2	81	75.6
OTF	>6.5	SQUID (LOLIGO)	0.3	19	19.3
OTF	>6.5	SKATES	0.2	30	16.1
OTF	>6.5	FLOUNDER, SUMMER	0.2	59	10.4
OTF	TOTAL	TOTAL	244.3	14,387	59,230.7
		TOTAL NON-SCALLOP	244.5		
		SCALLOP	177.8		
		GRAND TOTAL	422.3		

Table 40 – FY 2011 SNE/MA windowpane flounder catch by trawl gear mesh size

SECGEARFISH	ROUNDED_MESH	SPPNM	Windowpane Discarded (mt)	TRIP_ COUNT	Total and Top Three Species Landed (mt)
OTF	<=4.5	TOTAL	27.3	5,564	45,081.9
OTF	<=4.5	SQUID (ILLEX)	12.5	348	18,663.0
OTF	<=4.5	SQUID (LOLIGO)	5.1	4,281	7,796.0
OTF	<=4.5	HERRING, ATLANTIC	3.4	578	5,131.3
OTF	5	TOTAL	41.1	1,122	3,351.8
OTF	5	SCUP	26.5	1,015	2,152.5
OTF	5	HAKE, SILVER	3.2	742	263.1
OTF	5	FLOUNDER, SUMMER	2.4	1,037	197.2
OTF	5.5	TOTAL	65.7	2,606	5,364.0
OTF	5.5	FLOUNDER, SUMMER	30.3	2,503	2,464.8
OTF	5.5	SCUP	14.7	995	1,192.5
OTF	5.5	SKATES	3.7	1,117	302.0
OTF	6	TOTAL	31.8	2,158	2,618.9
OTF	6	FLOUNDER, SUMMER	11.1	2,120	904.8
OTF	6	SKATES	10.2	906	832.9
OTF	6	SCUP	4.1	965	346.0
OTF	6.5	TOTAL	50.0	3,074	4,120.2
OTF	6.5	SKATES	26.2	1,461	2,177.7
OTF	6.5	FLOUNDER, SUMMER	9.0	2,873	728.3
OTF	6.5	SCUP	5.5	1,835	443.4
OTF	>6.5	TOTAL	1.4	58	117.7
OTF	>6.5	SKATES	0.5	33	44.5
OTF	>6.5	SQUID (LOLIGO)	0.3	25	21.5
OTF	>6.5	CROAKER, ATLANTIC	0.3	5	21.2
OTF	TOTAL	TOTAL OTTER TRAWL	217.4	13,972	60,654.5
		TOTAL NON-SCALLOP	217.9	180,938	245,079.7
		SCALLOP	135.3		
		GRAND TOTAL	353.1		

6.5.8 Introduction to Sector Data

FY 2010 marked the first year that the sector program landed the overwhelming majority of the groundfish ACL. This document includes sector data from FY 2010 and FY 2011. Data from FY 2009 is also included for vessels that were sector members in FY 2010. This approach informs the analysis and provides a baseline for the public to better understand the operation of the sector fishery. Some differences in totals between the 2009-2010 analysis and the current analysis may be noted for 2009 and 2010. These are due to updates to the source data (VTR database and Data Matching and Imputation database (DMIS)) as well a minor modification to the sector membership algorithm. Sector membership is now based on MRI rather than vessel permit number. The reason for this is that the MRIs within a sector do not change during the fishing year, whereas a vessel permit may move into or out of a sector (although this is rare). Hence, MRI is a more reliable means of tracking sector membership.

For the purpose of this EA, and for the management of the sector fishery, the Northeast Regional Office defines a "groundfish trip," as a sector trip where groundfish is landed, and applied to a sector ACE. This definition differs from other methods of defining a groundfish trip. Other methodologies use a sector VMS declaration to define a groundfish trip regardless of whether groundfish was landed and applied to a sector ACE. Unless stated otherwise, NMFS compiled most of the gear and/or location-specific data presented in this section, and elsewhere in the document from vessel trip reports (VTR). The Northeast Regional Office used VTR data because it contains effort data, and gear and positional information. NMFS took some of the data in the document, such as that concerning protected resources, from the Northeast fisheries observer data set. It is important that the reader be informed that there are different sources of fishery data (i.e., observer, self-reported, dealer, etc.), and the data used in this EA may be different than data published from other sources, such as reports from the Northeast Fishery Science Center, and from data published for other uses.

The EA analysis uses complete data sources. As such, we excluded trips with undefined gear, missing land dates, missing sector membership, and trips that did not submit a VTR. Such records may be included in other groundfish trip analysis and reports, but detailed trip data is required for the purpose of this EA. Total trip counts and catch counts in the EA may differ when comparing to the sector data available to the public on the NMFS website. Reasons for this difference include the following:

- The EA analyses use VTR and observer data (rationale explained above). The data on the sector website is from VMS, VTR, and dealer data. Therefore, a trip that was reported by a dealer, but which has no corresponding VTR, is displayed on the website, but not in the EA. Likewise, a trip that is reported only on the VMS declaration will be counted on the website, but is not included in the EA. This is the major source of trip count differences.
- The EA uses data from two years. The primary purpose of quota monitoring is to determine the ACE as accurately as possible. Because of this difference in purpose, NMFS matches trips between multiple data sources to account for misreporting. The EA has two data sources but uses them in separate analyses, thus it does not need to perform trip matching. Trip matching can have small effects on trip counts.
- Catch weights will differ between the EA and other publically available sector data because the EA uses landed weight, as estimated by fishermen and reported on the VTR, whereas NMFS reports dealer live weight on their website.

6.5.8.1 Annual Catch Entitlement Comparison

Each sector receives a total amount (in pounds) of fish it can harvest for each stock. This amount is the sector's Annual Catch Entitlement (ACE). To determine the ACE, the sum of all of the sector members' potential sector contributions (PSCs) (a percentage of the ACL) are multiplied by the ACL to get the sector's ACE. Since the annual ACE is dependent on the amount of the ACL for a given fishing year, the ACE may be higher or lower from year to year even if the sector's membership remained the same. As seen in **Table 40**, there are substantial shifts in ACE for various stocks between FY 2009 and FY 2012. As seen in the below data, there has been a general decrease in trips, and catch for sector vessels. In addition, there has been a shift in effort out of the groundfish fishery into other fisheries. However, these changes may correlate to a certain extent with the decrease in ACL.

Table 41 - Commercial Groundfish Sub ACL FY 2009 to FY 2012

Groundfish Stock	FY 2009 target/hard TAC (lbs)	FY 2010 ACL (lbs)	% Change 2009 to 2010	FY 2011 ACL (lbs)	% Change 2010 to 2011	FY 2012 ACL (lbs)	% Change 2011 to 2012
Witch Flounder	2,489,019	1,878,338	-24.53%	2,724,914	45.07%	3,192,294	8.34%
White Hake	5,238,183	5,635,015	7.58%	6,556,548	16.35%	7,237,776	10.39%
SNE/MA Yellowtail Flounder	857,598	683,433	-20.31%	1,155,222	69.03%	1,675,513	45.04%
Redfish	18,990,619	15,092,846	-20.52%	16,625,059	10.15%	18,653,483	10.40
Pollock	13,990,535	36,493,118	160.84%	30,758,895	-15.71%	27,804,700	-9.60%
Plaice	7,085,657	6,278,765	-11.39%	6,851,967	9.13%	7,226,753	5.47%
GOM Winter Flounder	835,552	348,330	-58.31%	348,330	0.00%	1,576,305	352.53%
GOM Haddock	3,448,030	1,818,814	-47.25%	1,715,196	-5.70%	1,439,619	-16.07
GOM Cod	23,642,373	10,068,512	-57.41%	10,637,304	5.65%	4,310,037	-59.48%
GB Yellowtail Flounder	3,564,875	1,814,404	-49.10%	2,517,679	38.76%	479,946	80.94%
GB Winter Flounder	4,418,064	4,082,961	-7.58%	4,424,678	8.37%	7,467,057	68.76%
GB Haddock West	171,861,356	62,725,923	-63.50%	46,164,798	-26.40%	45,322,632	-1.82%
GB Haddock East	24,471,311	26,429,016	8.00%	21,252,562	-19.59%	15,167,804	-28.63%
GB Cod West	10,965,793	6,816,693	-37.84%	9,041,157	32.63%	9,795,138	8.34%
GB Cod East	1,161,836	745,162	-35.86%	440,925	-40.83%	357,149	-19.00%
CC/GOM Yellowtail Flounder	1,895,975	1,717,401	-9.42%	2,072,345	20.67%	2,306,035	11.28%
Totals	294,916,777	182,628,733	-38.07%	163,287,579	-10.59%	153,712,242	-5.86%

Table 42 - Overfishing Limit, Acceptable Biological Catch and sub-ACLs for multispecies

Stock	OFL	U.S. ABC	Components with ACLs and sub-ACLs; (with accountability measures (AMs))							sub-components: No AMs	
			Total ACL	Groundfish sub-ACL	Sector sub-ACL	Common Pool sub-ACL	Recreational sub-ACL	Midwater Trawl Herring Fishery sub-ACL	Scallop Fishery sub-ACL	State Water	Other
			A to G	A+B+C	A	B	C	D	E	F	G
GB cod	7,311	4,766	4,540	4,301	4,208	93				48	191
GOM cod	11,715	9,012	8,545	7,649	4,721	104	2,824			597	299
GB Haddock	59,948	34,244	32,611	30,580	30,393	187		318		342	1,370
GOM Haddock	1,536	1,206	1,141	1,086	770	8	308	11		9	35
GB YTF	3,495	1,458	1,416	1,142	1,122	20			200.8	0	73
SNE YTF	2,174	687	641	524	404	120			82	7	27
CC/GOM YTF	1,355	1,041	992	940	913	27				10	42
Plaice	4,483	3,444	3,280	3,108	3,038	70				34	138
Witch Flounder	1,792	1,369	1,304	1,236	1,211	25				14	55
GB WFL	2,886	2,224	2,118	2,007	1,993	14				0	111
GOM WFL	1,458	1,078	524	329	313	16				163	32
SNE/MA WFL	2,117	897	842	726	NA	726				72	45
Redfish	10,903	8,356	7,959	7,541	7,505	36				84	334
White Hake	4,805	3,295	3,138	2,974	2,946	28				33	132
Pollock	21,853	16,900	16,166	13,952	13,848	104				769	1,445
N. Windowpane	225	169	161	110	NA	110				2	49
S. Windowpane	317	237	225	154	NA	154				2	69
Ocean Pout	361	271	253	239	NA	239				3	11
Halibut	130	78	76	33	NA	33				39	4
Wolffish	92	83	77	73	NA	73				1	3

6.5.9 Common Pool Groundfish Fishing Activity

With the adoption of Amendment 16 in 2010, most groundfish fishing activity occurs under sector management regulations. There are, however, a few vessels that are not members of sectors and continue to fish under the effort control system. Collectively, this part of the fishery is referred to as the common pool. These vessels fish under both limited access and open access groundfish fishing permits. Common pool vessels accounted for only a small amount of groundfish catch in FY 2011 (**Table 35**). The largest common pool catch (GOM cod, 93 mt) was only 2 percent of the total groundfish fishery catch of this stock. Common pool vessels caught about 7 percent of the SNE/MA winter flounder groundfish catch, and 3 percent of the SNE/MA yellowtail flounder groundfish fishery catch.

Common pool vessels landed 1.4 million pounds (live weight) of regulated groundfish in FY 2010, worth about $2 million in ex-vessel revenues. Landings declined to 544 thousand pounds worth $814,000 in FY 2011. Most common pool vessel groundfish fishing activity takes place in the state of Massachusetts. From FY 2010 to FY 2011, the activity from Maine ports declined dramatically. The primary ports for this activity are Gloucester, Portland, and New Bedford (**Table 45**, **Table 46**, **Table 45**).

The primary groundfish stocks landed by common pool vessels include GOM cod, GB cod, and pollock (Table 48). GB haddock was an important component in FY 2010 but not in FY 2011. Vessels using HA and HB permits on groundfish trips primarily target GB and COM cod, GOM haddock, and pollock.

For the common pool permits that landed at least one pound of regulated groundfish in either FY 2010 or FY 2011, groundfish revenues were a major portion of revenues on groundfish fishing trips. Groundfish revenues were 80 percent or more of the trip revenues for 49 percent of these vessels; they were 60 percent of the revenues for 61.5 percent of these vessels. Dependence on groundfish was greatest for HA permitted vessels, with 70 percent of these vessels earning all revenues on these trips from regulated groundfish.

Table 42 – FY2011 Common Pool catches

Stock	Cumulative Kept (mt)	Cumulative Discard (mt)	Cumulative Catch (mt)	Sub-ACL (mt)	Percent Caught
GB Cod East	1.8	0.0	1.8	4	44.9
GB Cod	58.1	3.4	61.5	93	66.1
GOM Cod	69.8	23.7	93.4	104	89.9
GB Haddock East	0.0	0.0	0.0	59	0.0
GB Haddock	11.7	0.0	11.7	187	6.3
GOM Haddock	1.9	0.1	1.9	8	24.3
GB Yellowtail Flounder	1.8	0.2	2.0	20	10.1
SNE/MA Yellowtail Flounder	11.5	0.8	12.2	120	10.2
CC/GOM Yellowtail Flounder	8.6	2.7	11.4	27	42.1
Plaice	3.9	0.5	4.5	70	6.4
Witch Flounder	3.9	0.3	4.2	25	16.8
GB Winter Flounder	1.1	0.1	1.1	14	8.2
GOM Winter Flounder	2.6	0.1	2.6	16	16.5
SNE/MA Winter Flounder	0.3	6.7	7.0	726	1.0
Redfish	3.4	0.2	3.6	36	9.9
White Hake	13.1	1.1	14.1	28	50.4
Pollock	65.5	3.8	69.2	104	66.6
Northern Windowpane	0.0	0.3	0.3	110	0.3
Southern Windowpane	2.2	26.3	28.5	154	18.5
Ocean Pout	0.0	4.4	4.4	239	1.8
Halibut	1.0	0.1	1.2	33	3.5
Wolffish	0.0	0.7	0.7	73	1.0

Table 43 – Summary of common pool fishing activity (confidential data excluded)

		HB	A	C	D	HA	Total
2010	Permits Landing Groundfish	64	58	5	6	34	163
	Groundfish Pounds Landed	18,116	1,383,650	1,733	2,329	36,844	1,442,672
	Groundfish Revenues	$42,961	$1,930,439	$3,857	$3,626	$59,727	$2,040,610
2011	Permits Landing Groundfish	62	47	6	5	32	147
	Groundfish Pounds Landed	39,295	400,603	36,929	2,910	91,585	571,321
	Groundfish Revenues	$47,535	$530,738	$62,304	$6,201	$167,838	$814,616

Table 44 – Common pool groundfish landings by state of trip (pounds, live weight) (confidential data excluded)

	2010	2011
MA	903,121	408,562
MD		5
ME	397,257	55,486
NH	7,536	34,445
NJ	11,803	18,665
NY	96,487	36,864
RI	26,446	15,288
VA	5	95
Grand Total	1,442,656	569,411

Table 45 – Common pool groundfish landings by trip port (pounds, live weight)(c0nfidnetila data excluded)

	2010	2011	Total
GLOUCESTER	427,043	270,533	697,576
PORTLAND	388,279	46,017	434,296
NEW BEDFORD	305,389	32,161	337,550
PROVINCETOWN	103,239	76,973	180,212
MONTAUK	79,045	20,820	99,864
LITTLE COMPTON	20,886	8,490	29,376
POINT PLEASANT	7,695	16,775	24,470
HAMPTON BAYS	12,743	6,626	19,369

Table 46 – Common pool landings by permit category and stock

FY 2010 Landings	HB	A	C	D	HA	Grand Total
CODGBW	3,405	115,809	899	1,456	6,514	128,083
CODGMSS	1,328	405,599	761		18,747	426,434
FLDSNEMA		3,311				3,311
FLWGB		12,975				12,975
FLWGMSS	2,905	43,620				46,525
FLWSNEMA	67	3,349	50		23	3,489
HADGBW	233	201,681		11	172	202,098
HADGM	383	13,403	3		1,074	14,863
HALGMMA	3,484	157			293	3,934
HKWGMMA	882	87,785			145	88,812
OPTGMMA	134					134
PLAGMMA	243	46,874				47,117
POKGMASS	3,745	299,944	15	859	9,788	314,351
REDGMGBSS	2	13,410	5	3	88	13,508
WITGMMA		56,310				56,310
WOLGMMA	0					0
YELCCGM	1,306	33,143				34,449
YELGB		17,135				17,135
YELSNE		29,144				29,144
Grand Total	18,116	1,383,650	1,733	2,329	36,844	1,442,672
FY 2011 Landings						
CODGBE		3,907				3,907
CODGBW	5,796	97,183	3,506	175	17,382	124,041
CODGMSS	1,834	62,772	21,988	2,733	63,928	153,255
FLDSNEMA		4,802				4,802
FLWGB		2,411				2,411
FLWGMSS	39	5,257	373			5,669
FLWSNEMA	125	540	1	2		668
HADGBE		10				10
HADGBW		25,655			97	25,752
HADGM	898	2,216	182		858	4,153
HALGMMA	989	75			178	1,243
HKWGMMA	60	24,635	3,862		236	28,793
PLAGMMA	7	7,852	686			8,545
POKGMASS	29,284	100,631	5,257		8,759	143,931
REDGMGBSS	182	7,031	38		147	7,398
WITGMMA		7,543	970			8,513
YELCCGM	74	18,889	66			19,029
YELGB		3,944				3,944
YELSNE	7	25,250				25,257
Grand Total	39,295	400,603	36,929	2,910	91,585	571,321

6.5.10 Recreational Fishing Activity

Several groundfish stocks are targeted by the recreational fishery (including private anglers, party boat operators, and charter vessel operators). Key targets for recreational fishermen in the GOM include GOM cod, GOM haddock, pollock, and GOM winter flounder. GB cod and haddock are targeted as well, but to a lesser extent, and SNE/MA winter flounder is also a target species. Amendment 16 ((Section 6.2.5, NEFMC 2009) included a detailed overview of recreational fishing activity.

With respect to this action, there could be large reductions in the ACLs for GOM haddock and GOM cod. Recreational removals of GOM cod declined by 72 percent from FY 2011 to FY 2012, while catches of GOM haddock declined by 7.5 percent. The number of angler trips also declined by about 30 percent (Table 42). The number of active permits also seems to show a slight decline since 2005, though FY 2012 data are preliminary (Table 48).

Table 48 – Recent recreational fishing activity for GOM cod and GOM haddock. Note that FY 2012 catches are an estimate since not all data are available.

	FY 2011	FY 2012
Angler Trips	235,343	164,684
Cod Total Catch (numbers, a+b1+b2)	1,387,441	728,291
Cod Removals (numbers, a+b1+(0.3*b2)))	773,085	410,231
Cod Removals (weight)	2,116	596
Haddock Total Catch (numbers, a+b1+b2)	180,761	320,893
Haddock Total removals (numbers, a+b1)	142,410	144,145
Haddock Total Removal (weight)	227	211

Table 49 – Recreational for hire permits reporting catches of a groundfish species from the Gulf of Maine

	Active Permits		
Calendar Year	Party	Charter	Grand Total
1999	60	85	145
2000	53	93	146
2001	60	110	170
2002	46	125	171
2003	55	119	174
2004	63	125	188
2005	62	136	198
2006	65	128	193
2007	53	133	186
2008	56	129	185
2009	53	131	184
2010	61	134	195
2011	48	130	178
2012 (preliminary)	41	95	136

6.5.11 Overview of the Atlantic Sea Scallop Fishery

The Scallop FMP was implemented in 1982 and limited entry followed in 1994 (Amendment 4). In the fishing years 2002-2011, the landings from the northeast sea scallop fishery stayed above 50 million pounds, surpassing the levels observed historically (Figure 5). The recovery of the scallop resource and consequent increase in landings and revenues was striking given that average scallop landings per year were below 16 million pounds during the 1994-1998 fishing years, less than one-third of the present level of landings. This section provide background information in terms of landings, revenues, permits, vessels and various ports and coastal communities in the Northeast Sea Scallop Fishery based on the Appendix I to Framework 24. Unless otherwise indicated, all the Tables referred below are included in the same Appendix (Appx. I, FRW 24).

The limited access scallop fishery consists of 347 vessels. It is primarily full-time, with 250 full-time (FT) dredge, 52 FT small dredge vessels and 11 FT net boats (Table 7 and Table 8, Appx. I, FRW 24). Since 2001, there has been considerable growth in fishing effort and landings by vessels with general category permits, primarily as a result of resource recovery and higher scallop prices. Amendment 11 implemented a limited entry program for the general category fishery reducing the number of general category permits after 2007. In 2011, there were 288 LAGC IFQ permits, 103 NGOM and 279 incidental catch permits in the fishery totaling 670 permits (Table 13, Appx. I, FRW 24). Although not all vessels with general category permits were active in the years preceding 2008, there is no question that the number of vessels (and owners) that hold a limited access general category permit under the Amendment 11 regulations are less than the number of general category vessels that were active prior to 2008 (Table 11 and Table 12, Appx. I, FRW 24).

Figure 6 shows that total fleet revenues more than quadrupled from about $120 million in 1994 to almost $600 million in 2011 (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 main factor that led to the increase in revenue in the recent years compared to 1994-1998. 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.

There has been a steady decline in the total DAS used by the limited access scallop vessels from 1994 to 2011 fishing years as a result of the effort-reduction measures since Amendment 4 (1994) (Figure 7). The impact of the decline in effort below 30,000 days-at-sea since 2005 (with the exception of 2007) on scallop revenue per vessel was small, however, due to the increase in LPUE from about 1,600 pounds per day-at-sea in 2007 to over 2,300 pounds per day-at-sea in 2011.

The scallop fishery is facing a decline in 2013. Recruitment has been below average for several years on Georges Bank and overall biomass is lower than previous years. Most of the scallop access areas have lower biomass than years past, and several areas in the Mid-Atlantic will be closed in 2013 to protect smaller scallops for future access. Total catch in 2013 will be about 30% less than catch levels in 2012 and 2011. Catch is expected to increase again over 22,000 mt (about 50 million pounds) starting in 2016, if the high levels of recruitment in the Mid-Atlantic grow as projected (Figure 8).

Figure 5 – Scallop landings by permit category and fishing years 1994 – 2011 (dealer data)

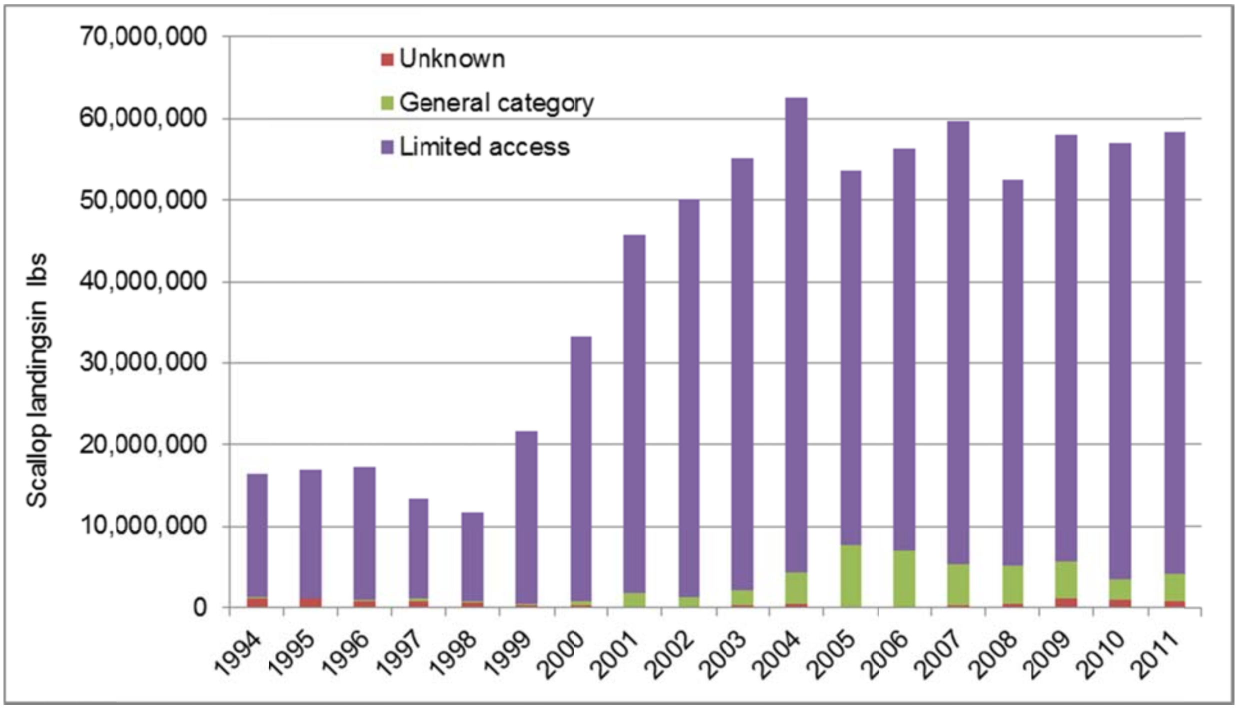


Figure 6 – Scallop revenue by permit category and fishing year in 2011 inflation adjusted prices (dealer data)

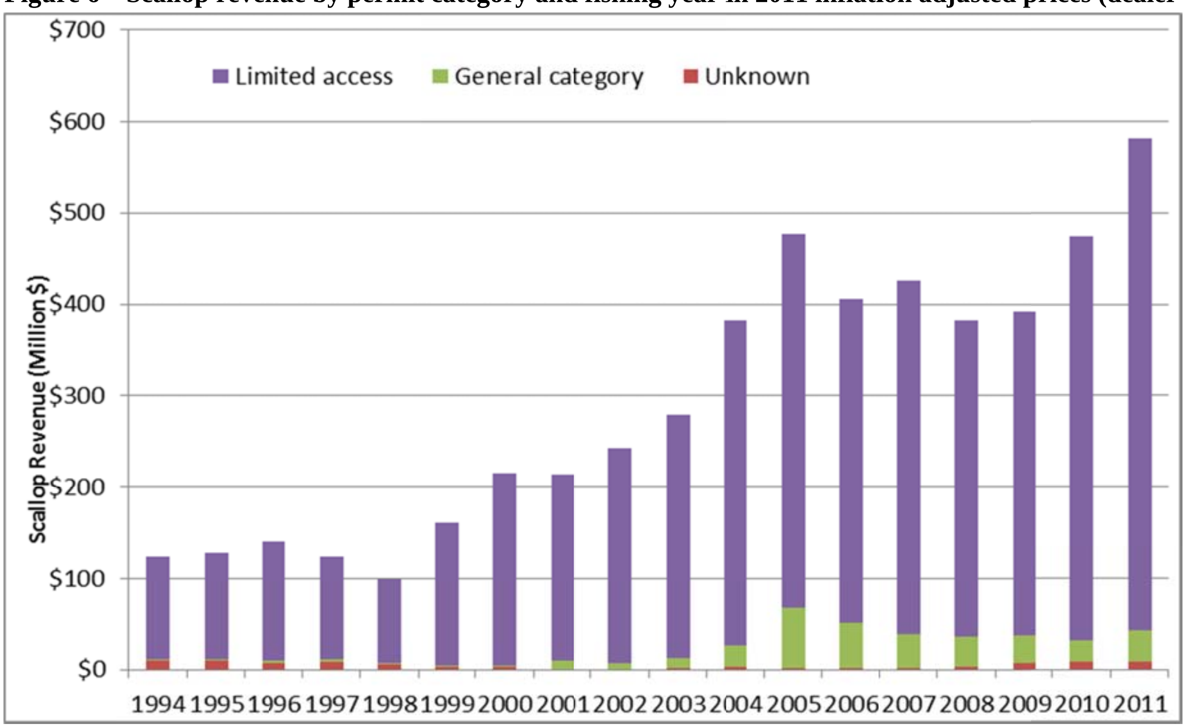


Figure 7 – Total DAS used (date landed – date sailed from VTR data) by all limited access vessels and LPUE

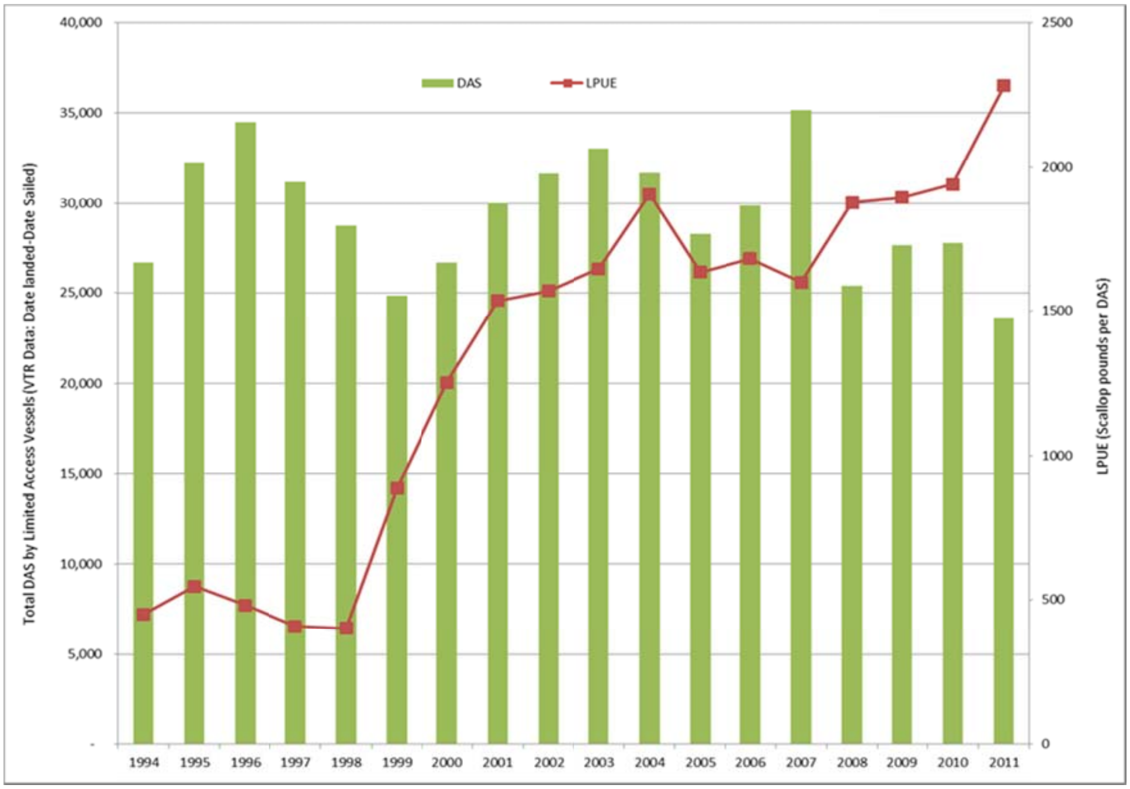
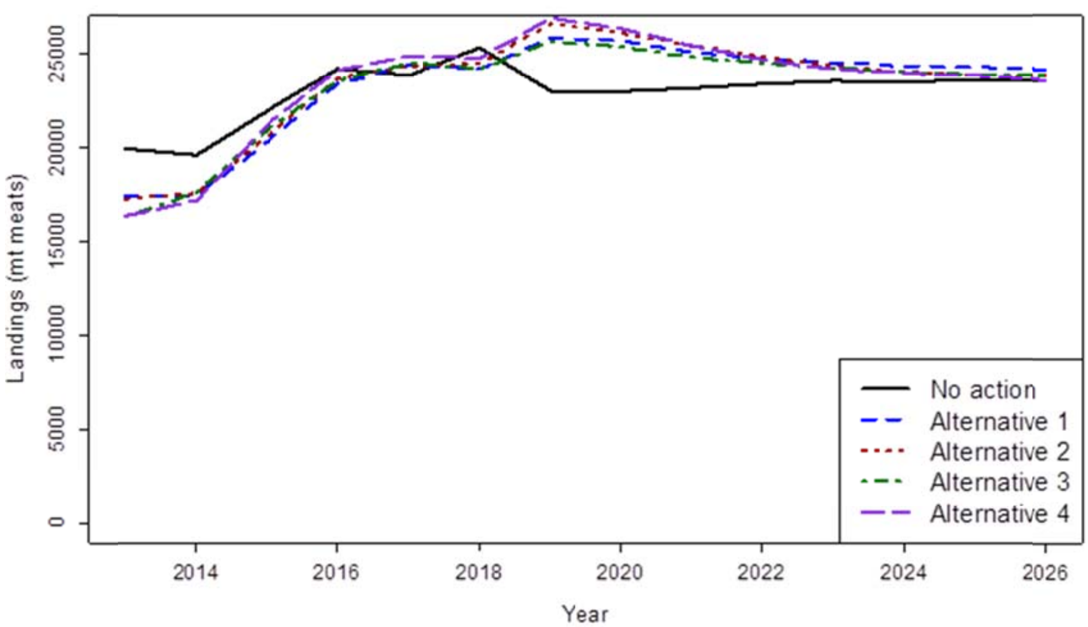


Figure 8 – Projection of future scallop catch under proposed FW25 specifications for FY 2013 (Alternative 2)



Most limited access category effort is from vessels using scallop dredges, including small dredges. The number of vessels using scallop trawl gear has decreased continuously and has been at 11 full-time trawl vessels since 2006 (Section 1.1.6 of Appx. I, FRW 24). Furthermore, according to the 2009-2010 VTR data, the majority of these vessels (10 out of 11 in 2010) landed scallops using dredge gear even though they had a trawl permit. Most general category effort is, and has been, from vessels using scallop dredge and other trawl gear. The percentages of scallop landings show that landings made with a scallop dredge in 2012 continue to be the highest compared to other general category gear types (Table 18 and Table 22, A Appx. I, FRW 24).

Both full-time and part-time limited access vessels had a high dependence on scallops as a source of their income. Full-time limited access vessels had a high dependence on scallops as a source of their income and the majority of the full-time vessels (94%) derived more than 90% of their revenue from the scallop fishery in 2011 (Table 37, Appx. I, FRW 24). Comparatively, part-time limited access vessels were less dependent on the scallop fishery in 2011, with only 37% of part-time vessels earning more than 90% of their revenue from scallops (Table 37, ibid).

Table 38 shows that general category permit holders (IFQ and NGOM) are less dependent on scallops compared to vessels with limited access permits. In 2011, less than half (43%) of IFQ permitted vessels earned greater than 50% of their revenue from scallops. Among active NGOM permitted vessels (that did not also have a limited access permit), 88% had no landings with scallops in 2011. Scallops still comprise the largest proportion of the revenue for IFQ general category vessels, accounting for 38.6% of these vessels revenue. Scallops still comprise the largest proportion of the revenue for IFQ general category vessels, accounting for 38.6% of these vessels revenue (Table 39 Appx I, FRW 24,). For NGOM vessels (that did not also have a limited access permit) scallop landings accounted for less than 1% of revenue in 2011. The composition of revenue for both the IFQ and NGOM general category vessels are shown in Table 39 (ibid).

The number of crew positions, measured by summing the average crew size of all active limited access vessels on all trips that included scallops, has increased slightly from 2,172 positions in 2007 to 2,262 positions in 2011 (a 4% increase) (Table 47, Appx. I, FRW 24). Broken out by home port state, the number of crew positions has stayed relatively constant during the past five years. Limited access vessels with a home port in Massachusetts and New Jersey experienced the largest percentage increase (5%: 969 to 1015 crew positions in MA and 15%: 490 to 564 crew positions in NJ). However, total crew effort in the limited access fishery, measured by crew days, declined from 207,088 to 160,355 (23%, Table 50, Appx I, FRW 24) from 2007 to 2011. The number of crew days on general category vessels followed a similar pattern as the general category crew positions and trips, with large declines in 2008 and 2010, but then an increase in days in 2011(Table 52, ibid.).

The landed value of scallops by port landing fluctuated from 1994 through 2011 for many ports. In 2011 New Bedford accounted for 53% of all scallop landings and it continues to be the number one port for scallop landings. Included in the top five scallop ports are: Cape May, NJ; Newport News, VA; Barnegat Light/Long Beach NJ; and Seaford, VA. It is also fair to describe the fishing activities in these ports as highly reliant on the ex-vessel revenue generated from scallop landings as scallop landings represent greater than 75% of all ex-vessel revenue for each of the ports (Table 59, Appx. I, FRW 24). There are also a number of ports with a comparatively small amount of ex-vessel revenue from scallops but where that scallop revenue represents a vast majority of the revenue from landings of all species (Table 60, ibid.). In 2011, in the ports of Newport News, VA and Seaford, VA; revenue from scallop landings accounted for 89.0% and 99.9% of all ex-vessel revenue respectively (Table 60, ibid.).

In terms of home state, the vessels from MA landed over 45% of scallops in 2010 and 2011 fishing years, followed by NJ with about 24.5% of all scallops landed by vessels homeported in this state (Appx. I, FRW 24). Scallops also comprise a significant proportion of revenue (and landings) from all species with over 90% of total revenue in VA, over 75% of total revenue in NC, over 60% of total revenue in MA and over 68% of total revenue in NJ (ibid.).

As in previous years, the largest numbers of permitted limited access scallop vessels have home ports of New Bedford, MA and Cape May, NJ, which represent 39% and 21% of all limited access vessels, respectively (Table 62, Appx. I, FRW 24). New Bedford also has the greatest number of general category scallop vessels, but while limited access vessels are mostly concentrated in the ports of New Bedford and Cape May, general category vessels are more evenly distributed throughout coastal New England. In addition to New Bedford, Point Judith, RI, Gloucester, MA, Boston, MA, Cape May, NJ and Barnegat Light, NJ, are all the homeport of at least 20 vessels with general category scallop permits (Table 63, ibid).

6.5.12 Overview of the American Lobster Fishery

Today, the commercial sector of the American lobster fishery and the communities involved in that fishery can be seen as the product of resource fluctuation, social and economic conditions as well as changes in management. These conditions impact, not only to the lobster fishery but other fisheries in the region as well. The numbers of fishermen entering or leaving the lobster fishery are often linked to the relative conditions of other fisheries. Also, because of the changes considered in the current sector operation plans could have an effect on the lobster fishery and its communities an overview of lobster fishery is included below.

The commercial lobster fishery is described as having started in the 1840s, concurrent with the development of the re-circulating seawater tank which allowed for an increased distribution of caught lobster (Acheson, 2010). Early in the fisheries history effort was managed by individual states with little interstate uniformity. It wasn't until 1972 that states along the Atlantic coast began cooperative management of the resource under a NMFS State-Federal Partnership Program. As part of this partnership program, the Northeast Maine Fisheries Board (NMFB) was formed to help research and expand management of the American lobster. Following implementation of the 1976 Fisheries Conservation and Management Act (FCMA), the NMFB developed a comprehensive management plan which was submitted to the newly created New England Fishery Management Council in 1978. This management plan would act as a precursor to the NEFMC's American Lobster Fishery Management Plan (ALFMP) that was eventually adopted in 1983. From 1983 to 1994 the lobster fishery was primarily managed through a standardized gear requirement, a minimum landed size and a prohibition on landing 'berried' females. The first real step in limiting effort in the fishery was not taken until 1994 when Amendment 5 to the FMP included a permit moratorium that restricted entry (Acheson, 1997).

Concurrent with the Federal management of the lobster fishery was the implementation of an Interstate Fishery Management Plan (ISFMP) developed by the ASMFC in 1978. The original plan's primary purpose was to establish regulatory uniformity across state and federal jurisdictions, but by 1995, it was becoming clear that maintaining separate management authority by the Atlantic States Marine Fisheries Commission (ASMFC) and its member states under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) and the NMFS under the FCMA was not accomplishing a unified approach to lobster management. Federal authority over the lobster fishery was eventually transferred to the ASMFC in 1999, by which point seven different lobster conservation areas had been identified (Acheson, 2004). Currently each Lobster Conservation Management Area (LCMA) has its own effort reduction needs which are developed by the respective management team. Amendment 3 to the ISFMP set default trap limits for four of the management areas and Addendum 1 set trap limits for the remaining three.

In 1976 there were an estimated 10,356 vessels participating in the inshore trap fishery and 117 vessels participating in the offshore lobster fishery (Acheson, 1997). Since Amendment 3 and the transfer of federal authority to the ASMFC in 1999, vessel operators have had to apply for an area specific trap permit to fish in one of the seven LCMAs. These permits are not mutually exclusive and owners may apply for any permit for an area that they wish to fish. There are also specific permit categories for non-trap and charter/party fishing as well. Typically the area specific trap permits are used by the directed trap fishery while the non-trap permits are used by the much smaller offshore mobile gear fishery or so that vessels using non-trap gear may land incidentally caught lobsters.

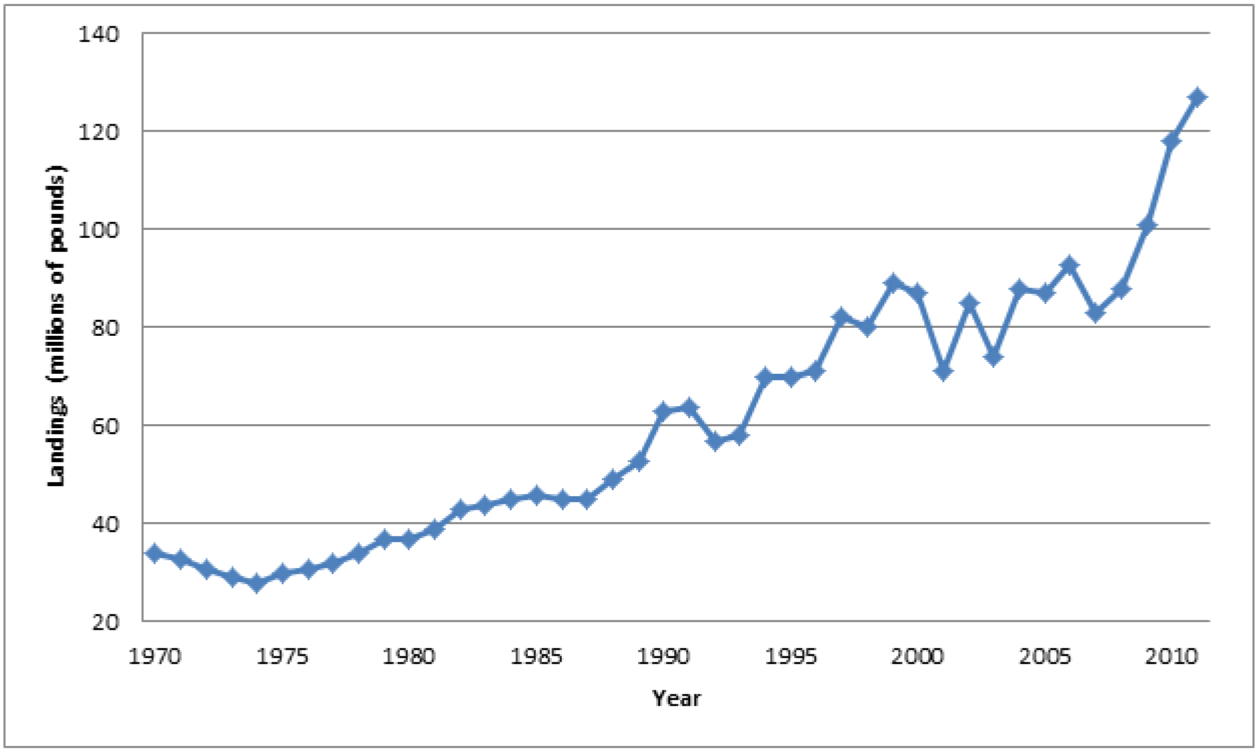
The total number of vessels with any type of lobster permit has stayed relatively constant since the change in management in 1999 (Table 49). The states of Maine and Massachusetts are home to the most vessels with a lobster permit, and combined they account for three quarters of permitted vessels (Table 49). There are some notable differences between the states with regard to the type of permits vessels have. Over the last twelve years, 96% - 99% of vessels with a homeport in Maine have had an area specific trap permit as opposed to only 4% - 8% having the non-trap permit. About half the vessels from other states possess a non-trap permit. For example, in 2011, 483 out of 908 vessels with a home port in Massachusetts have a non-trap permit while two thirds have an area specific trap permit.

Table 50 - Numbers of vessels by homeport state, lobster permit type and year

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	3233	3253	3297	3217	3357	3353	3394	3288	3213	3175	3139	3116
ME												
Any LO permit	1187	1210	1286	1335	1417	1462	1527	1455	1413	1424	1428	1452
Non-trap	61	51	57	66	106	116	117	113	107	104	97	93
Charter	2	1	1	2	2	2	1	1				
Any area trap	1160	1189	1268	1314	1376	1409	1469	1404	1368	1375	1381	1414
NH												
Any LO permit	89	97	93	95	116	117	118	115	117	109	111	111
Non-trap	40	46	46	49	56	56	61	61	59	56	60	53
Charter	2	1	1	2	2	2	2	2	2	2	2	2
Any area trap	66	74	72	71	91	89	83	83	85	85	83	85
MA												
Any LO permit	1215	1185	1169	1114	1106	1055	1022	1016	986	974	944	908
Non-trap	442	449	466	474	500	498	497	521	520	518	500	483
Charter	5	3	7	7	8	7	6	7	8	8	7	6
Any area trap	892	894	885	814	793	742	716	684	656	635	617	589
RI												
Any LO permit	257	265	256	243	243	240	240	234	228	217	213	209
Non-trap	73	83	82	88	84	91	90	91	89	83	78	75
Charter	1	1	1	1	1	1	1	2	2	2	2	2
Any area trap	212	222	220	198	203	198	198	191	183	177	176	172
CT												
Any LO permit	32	37	37	34	33	30	30	30	30	31	28	27
Non-trap	12	16	17	18	22	21	21	21	21	20	20	19
Charter					2	2	2	2	2	2	4	4
Any area trap	25	31	30	25	24	22	21	22	21	22	22	22
NY												
Any LO permit	162	153	147	127	138	134	141	128	124	124	118	120
Non-trap	90	86	83	87	91	83	90	79	81	80	77	78
Charter	4	3	3	5	7	7	6	5	5	5	2	1
Any area trap	94	91	93	66	82	85	86	79	73	74	71	71
NJ												
Any LO permit	166	180	184	152	184	186	193	192	202	190	194	192
Non-trap	78	95	95	117	122	134	138	136	144	136	138	139
Charter	13	10	10	10	13	12	11	11	11	11	11	11
Any area trap	105	115	118	50	86	82	83	84	91	88	89	82

Although the fishery has existed for almost two centuries, consistent and relievable landing statistics are not available prior to 1950. From about 1957 through 1974, landings from the lobster fishery remained relatively constant at an average of about 30 million pounds per year. Landings of lobster steadily increased from 28 million pounds in 1974 to 64 million pounds in 1991 before declining to 57 million pounds in 1992 (Figure 9). Landings then continued to rise to 89 million pounds in 1999, after which lobster landings would oscillate almost year to year by nearly 15 million pounds from 2000 to 2007. In the most recent years lobster landings have experienced an unprecedented high exceeding 100 million pounds since 2009, and nearly reaching 127 million pounds in 2011.

Figure 9 – Trend in landings of American lobster 1970 - 2011



Maine has always been the leading producer of lobsters, but its share of total landings has fluctuated over time. Throughout the 1970s Maine accounted for between 52% and 61% of total lobsters landed from Maine to New Jersey (Table 50). Expansion of lobster landings during the 1980s, particularly in Massachusetts, reduced the share of lobster Maine supplies to less than 50% until the mid-1990s. However, since 2000 the contribution of the Maine lobster fishery to total landings increased steadily to more than 80% of the domestic harvest in 2004 before declining slightly 2005 - 2008. The increasing proportion of Maine landings is due to a combination of increased landings in Maine and declining landings in just about every other state.

Table 51 - Annual share or 5-year average annual share of lobster landings by state, 1970–2011

Year(s)	ME	NH	MA	RI	CT	NY	NJ
1970 - 1974	55.1%	1.9%	19.8%	12.8%	1.9%	3.9%	4.5%
1975 - 1979	58.3%	1.6%	24.0%	9.7%	2.0%	1.9%	2.5%
1980 - 1984	52.5%	2.5%	29.3%	8.4%	3.2%	2.5%	1.7%
1985 - 1989	43.7%	2.5%	32.6%	11.1%	3.8%	3.3%	3.0%
1990 - 1994	49.5%	2.7%	25.7%	11.0%	3.9%	5.1%	2.1%
1995 - 1999	55.9%	1.9%	19.3%	7.6%	3.9%	10.4%	0.9%
2000	65.9%	2.0%	18.2%	8.0%	1.6%	3.3%	1.0%
2001	68.2%	2.8%	17.0%	6.2%	1.9%	2.9%	0.8%
2002	74.7%	2.4%	15.1%	4.5%	1.3%	1.7%	0.3%
2003	74.6%	2.7%	15.5%	4.7%	0.9%	1.3%	0.3%
2004	81.1%	0.2%	12.8%	3.5%	0.7%	1.1%	0.4%
2005	78.3%	2.9%	11.3%	4.9%	0.8%	1.3%	0.4%
2006	78.4%	2.9%	11.9%	4.1%	0.9%	1.3%	0.5%
2007	77.3%	3.7%	12.3%	3.9%	0.7%	1.2%	0.8%
2008	79.3%	2.9%	12.0%	3.2%	0.5%	1.4%	0.7%
2009	80.7%	3.0%	11.7%	2.8%	0.5%	1.0%	0.3%
2010	81.7%	3.1%	10.8%	2.5%	0.3%	1.0%	0.6%
2011	83.0%	3.1%	10.6%	2.2%	0.1%	0.5%	0.6%

From 1970 up to the present, the American lobster fishery has been either the most or second most valuable fishery in the Northeast region. Nominal dockside revenue from American lobster has increased steadily from $33 million in 1970 to $314 million in 2000. Since 2000, revenues from lobster have fluctuated but most recently they have exceeded $400 million in 2010 and 2011 (Table 51). As with landings, Maine has consistently had the highest revenues from lobster of any NE state.

Table 52 - Lobster revenue (in thousands of dollars) by state and year 2000-2011

	ME	NH	MA	RI	CT	NJ	NY	Total
2000	$187,715	$7,081	$70,128	$28,103	$5,501	$3,694	$11,555	$314,070
2001	$153,982	$8,072	$53,469	$18,747	$5,453	$2,471	$7,357	$249,840
2002	$210,950	$8,164	$56,582	$15,875	$4,226	$1,139	$5,131	$302,200
2003	$205,715	$8,556	$52,373	$16,731	$3,170	$1,028	$4,426	$292,189
2004	$289,079	$925	$51,643	$14,593	$3,166	$1,800	$3,722	$365,186
2005	$317,948	$14,377	$48,793	$23,010	$3,821	$1,999	$4,396	$414,677
2006	$296,855	$13,915	$52,593	$18,408	$4,031	$2,533	$6,289	$394,918
2007	$280,645	$16,410	$51,268	$17,237	$3,222	$4,055	$5,288	$378,456
2008	$245,186	$12,268	$45,426	$12,994	$2,106	$3,215	$5,498	$326,962
2009	$237,379	$11,919	$42,561	$11,201	$1,914	$1,146	$3,932	$310,293
2010	$318,234	$14,835	$50,261	$12,371	$1,757	$2,910	$4,485	$405,058
2011	$334,974	$16,346	$53,334	$12,728	$816	$3,086	$2,533	$424,087

With respect to the influence of events occurring in other fisheries on the lobster fishery; prior to 1994 most fisheries in the Northeast region had been open access. The relative ease with which one could move between fisheries allowed vessel owners and operators participating in the lobster fishery to pursue other fisheries without having to qualify for any specific permit. At the same time, landings in the lobster fishery were increasing rapidly during the 1980s and early 1990s, drawing in additional effort that had previously been engaged in other fisheries. Once limited entry was introduced in the groundfish and scallop fisheries in 1994 many part-time lobster participants were excluded from those permit allocations as they failed to have the necessary landings to qualify. Because of resource depletion and the increasingly stringent regulations found in other fisheries, there has been a contraction of the lobster fishing industry that has increased dependence on lobster fishing (Thunberg, 2007). In the groundfish fishery there maybe contraction as well; lobster landings made by vessels in the groundfish fishery decreased by 1.4 million pounds between the first two years of sector management.

6.5.13 Small-Mesh Bottom Trawl Fishing on Georges Bank

This action considers two measures that could affect fisheries that use small-mesh bottom trawls on Georges Bank. It may adopt a requirement that these fisheries use selective trawl gear to reduce catches of GB yellowtail flounder, and it may adopt a sub-ACL for GB yellowtail flounder for small mesh fisheries. The two primary fisheries that use small-mesh on GB are the loligo squid and whiting fisheries. Often vessels make trips that land both species, so it is not always possible to assign a trip to one fishery or the other. This section provides a brief overview of fishing activity for those two fisheries.

Loligo squid and whiting are primarily caught by bottom otter trawls. The following analyses focus on normal bottom otter trawls, separator trawls, Ruhle trawls, and beam trawls that target these species on Georges Bank. There is also a small percentage of landings that cannot be attributed to gear that is included in the summaries. All weights are converted to live weights. Data are reported for calendar years, consistent with the way the loligo squid fishery is monitored. All data was extracted from the NMFS/NERO DMIS database.

A small number of vessels landed squid or whiting from the GB yellowtail flounder stock area in 2010 and 2011 (Table 52). Most loligo squid landings in 2010 and 2011 were taken in the SNE/MA area, with less than ten percent of the landings taken in the GB yellowtail flounder stock area (Table 53). Over 95% of the loligo squid caught in the GB yellowtail flounder stock area is caught in SAs 525 and 562 (Table 55). With respect to whiting, however, the GB yellowtail flounder stock area provided between 44% and 48% of total whiting landings (Table 54). Whiting is more broadly distributed in the GB yellowtail flounder stock area, with 25-30% taken in each of the SAs 522 and 525, and most of the remainder in SA 562 (Table 56).

Squid and whiting revenues from the GB yellowtail flounder stock area accounted for 24 percent of the revenues from these species on 2010, and 17 percent in 2011. For the trips that caught whiting or squid in the GB yellowtail flounder stock area, revenues from these two species accounted for over sixty percent of trip revenues. Whiting revenues were larger than squid revenues on these trips – squid accounted for 24-33 percent of the revenues from these two species (Table 57). Most of the landings from this area were in Massachusetts, with 57 percent of the revenues in 2010 and 72 percent of the revenues in 2011 from that state. Connecticut, Rhode Island, and New York were the primary other states with revenues from this area (Table 58).

Both loligo and whiting landings have a distinct seasonal component (Figure 10). Loligo landings are high in the fall and winter (first and fourth calendar year quarters) and decline in the spring and summer. Whiting landings reflect the opposite pattern.

Table 53 – Number of vessels landing whiting or loligo squid in 2010 and 2011 by broad stock areas

STOCK_AREAS	2010	2011
GOM	32	34
521	8	7
GBYTFAREA	34	30
SNEMA	320	296
OTHER	30	47
Grand Total	424	414

Table 54 – Landings of loligo squid by broad stock area, 2010 and 2011 (pounds, live weight)

STOCK_AREAS	2010	2011
GOM	38,806	17,112
521	4,154	647
GBYTFAREA	1,385,159	1,315,051
SNEMA	15,700,205	20,888,013
OTHER	60,315	117,520
Grand Total	17,188,639	22,338,343
GB YTF Area as %	8%	6%

Table 55 – Landings of whiting (silver and offshore hake) by broad stock area, 2010 and 2011 (pounds, live weight)

STOCK_AREAS	2010	2011
GOM	1,664,758	1,549,340
521	74,296	96,190
GBYTFAREA	8,747,531	7,717,515
SNEMA	7,684,438	7,979,919
OTHER	183,539	220,894
Grand Total	18,354,562	17,563,858
GB YTF Area as %	48%	44%

Table 56 – Percent of loligo squid landings from each statistical area in the GB yellowtail flounder stock area

AREA	2010	2011	Total
522	4%	1%	3%
525	57%	74%	66%
543	0%	0%	0%
561	0%	0%	0%
562	39%	24%	32%
Grand Total	100%	100%	100%

Table 57 – Percent of whiting landings from each statistical area in the GB yellowtail flounder stock area

AREA	2010	2011	Total
522	26.06%	26.62%	26.33%
525	25.73%	39.68%	32.27%
543	0.30%	0.39%	0.34%
561	0.01%	0.01%	0.01%
562	47.90%	33.29%	41.05%
Grand Total	100.00%	100.00%	100.00%

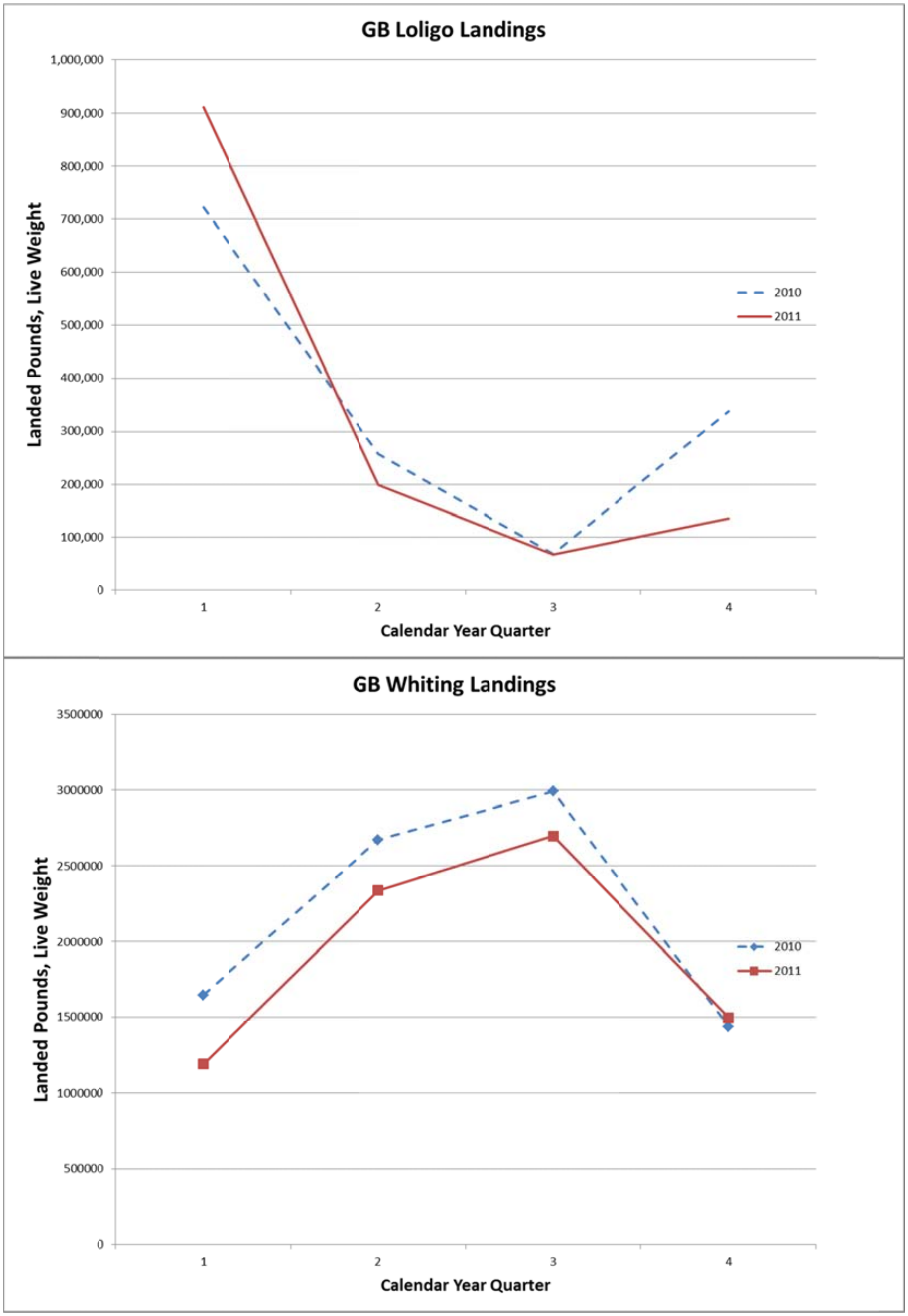
Table 58 – Revenues on squid and/or whiting trips by broad stock areas

YEAR	STOCK_AREAS	SQUID_DOLLARS	WHITING_DOLLARS	TOTAL_DOLLARS
2010	GOM	$42,269	$1,078,620	$6,849,033
	521	$6,770	$32,410	$1,369,161
	GBYTFAREA	$1,638,859	$5,275,521	$10,172,184
	SNEMA	$16,286,126	$4,780,527	$49,141,364
	OTHER	$58,925	$93,645	$600,828
2010 Total		$18,032,950	$11,260,722	$68,132,570
2011	GOM	$17,318	$999,571	$10,533,557
	521	$952	$77,317	$1,877,336
	GBYTFAREA	$1,636,814	$4,725,911	$9,930,530
	SNEMA	$24,443,913	$5,302,990	$70,296,182
	OTHER	$155,012	$110,631	$1,104,848
2011 Total		$26,254,009	$11,216,421	$93,742,453
Grand Total		$44,286,959	$22,477,143	$161,875,022

Table 59 – Revenues from squid and whiting trips by broad stock area

YEAR	DLR_STATE	SQUID_DOLLARS	WHITING_DOLLARS	TOTAL_DOLLARS
2010		$5,646	$109,616	$124,367
	CT	$167,228	$846,720	$1,169,255
	MA	$600,953	$3,021,961	$5,846,492
	ME	$0	$239	$53,647
	NY	$347,032	$910,419	$1,399,220
	RI	$517,999	$386,567	$1,579,202
2010 Total		$1,638,859	$5,275,521	$10,172,184
2011		$5,078	$43,050	$55,195
	CT	$82,915	$429,308	$588,666
	MA	$875,376	$3,805,886	$7,136,582
	ME	$0	$10	$10,443
	NJ	$1,134	$49	$1,433
	NY	$347,829	$276,891	$664,824
	RI	$324,482	$170,718	$1,473,387
2011 Total		$1,636,814	$4,725,911	$9,930,530
Grand Total		$3,275,672	$10,001,432	$20,102,714

Figure 10 – Seasonal pattern of loligo and whiting landings from Georges Bank (calendar years)



7.0 Environmental Consequences – Analysis of Impacts

7.1 Biological Impacts

Biological impacts discussed below focus on expected changes in fishing mortality for regulated multispecies stocks. Changes in fishing mortality may result in changes in stock size. Impacts on essential fish habitat and endangered or threatened species are discussed in separate sections. Impacts are discussed in relation to impacts on regulated multispecies and other species.

Throughout this section, impacts are often evaluated using an analytic technique that projects future stock size based on a recent age-based assessment. These projections are known to capture only part of the uncertainties that are associated with the assessments projections. There is evidence that in the case of multispecies stocks the projections tend to be optimistic when they extend beyond a short-term period (1-3 years). This means that the projections tend to over-estimate future stock sizes and under-estimate future fishing mortality. Attempts to find a way to make the projections more accurate have so far proven unsuccessful. These factors should be considered when reviewing impacts that use this tool.

7.1.1 Formal Rebuilding Programs and Annual Catch Limits

7.1.1.1 SNE/MA Winter Flounder Rebuilding Strategy

7.1.1.1.1 Option 1: No Action

Impacts on regulated groundfish

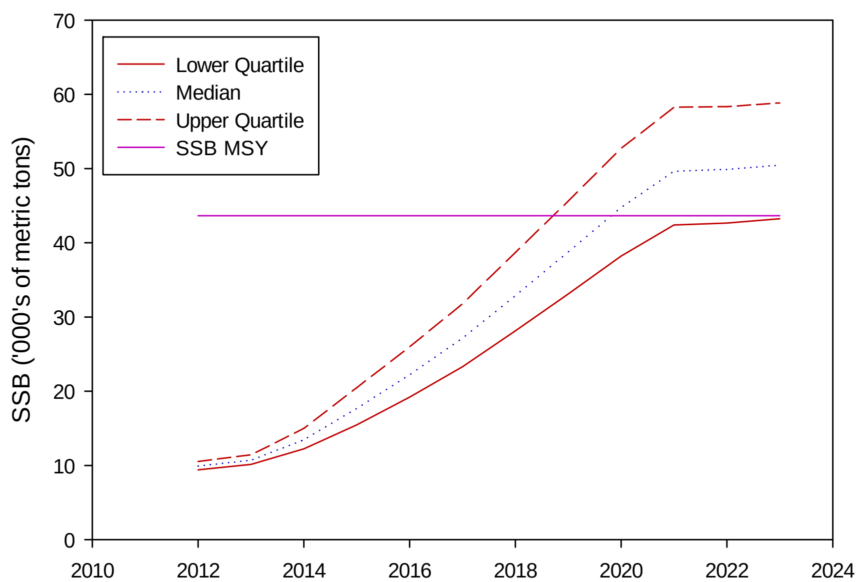
This option would keep the current rebuilding strategy for SNE/MA winter flounder, which targets rebuilding by 2014 with a median probability of success. The direct biological impacts of this measure would be on SNE/MA winter flounder. Because the stock cannot rebuild by that date in the absence of all fishing mortality, the current management strategy targets as low a fishing mortality rate as possible. The two-year (2010/2011) average resulting from this strategy was about F=0.07. This fishing mortality would be lower than that in Option 2, which would be expected to result in more rapid rebuilding of the stock. The stock would be expected to rebuild by 2019 with a median probability, three years earlier than the rebuilding date expected under Option 2. The rebuilding trajectory for this option is compared to the trajectory for F=0 (used to determine the maximum permissible rebuilding period) and Frebuild (Option 2) in Figure 12. Under No Action, the stock would not rebuild by 2014 but would rebuild by 2019 (Figure 11).

This option could also have indirect effects on other regulated groundfish stocks, since SNE/MA winter flounder is only part of a complex fishery. For example, during some times of the year, SNE/MA winter flounder and SNE/MA yellowtail flounder are caught on the same fishing trips. Limiting SNE/MA winter flounder catches may reduce catches of SNE/MA yellowtail flounder because it may deter some groundfish fishing trips (as compared to Option 2).

Impacts on other species

When compared to Option 2, this option may indirectly reduce interactions between the groundfish fishery and other species that are caught as bycatch on groundfish fishing trips because it may lead to fewer groundfish fishing trips in the SNE/MA winter flounder stock area. Counter to this possibility is the chance that vessels that would fish for SNE/MA winter flounder under Option 2 may target other species as a substitute. It is not clear how these two different behaviors would interact and whether the net result would be more or less catches of other species. ACL and AM systems for other stock, however, should prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 11 - Projected SNE/MA winter flounder stock size under Option 1



7.1.1.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

Impacts on regulated groundfish

This option would adopt a new rebuilding strategy for SNE/MA winter flounder and would target rebuilding by 2023 with a median probability of success. The assumption is that this change would lead to an additional change in management measures that would allow fishermen to land this stock. The direct impacts of this measure would be on SNE/MA winter flounder. The current estimate of the constant fishing mortality necessary to rebuild by 2023 is 0.175, which is higher than would be expected under

Option 1/No Action based on the mortality realized in 2010 and 2011. This would be expected to result in slower rebuilding of the stock. Under Option 2, the stock would rebuild by 2023 (Figure 12). The rebuilding trajectory for this option is compared to the trajectory for F=0 and No Action (Option 1) in Figure 13.The stock would rebuild three years later than the rebuilding date expected under Option 1/No Action.

This option could also have indirect effects on other regulated groundfish stocks, since SNE/MA winter flounder is only part of a complex fishery. During some times of the year, SNE/MA winter flounder and SNE/MA yellowtail flounder are caught on the same fishing trips. Increasing SNE/MA winter flounder catches (as compared to Option 1/No Action) may increase catches of SNE/MA yellowtail flounder because it may encourage more groundfish fishing trips. Since this stock is managed with ACLs and AMs, fishing mortality targets would not be expected to be exceeded.

One provision of this measure may help increase the pace of rebuilding. This measure would allow short term catch advice to be based on a fishing mortality that is less than Frebuild in order to take account of the uncertainty in stock projections. Setting catches in this manner – if that choice is made – may result in reducing fishing mortality below Frebuild and would be expected to expedite rebuilding. This option, however, would probably not rebuild as quickly as Option 1/No Action even if this is the case.

Since the stock could rebuild by 2019 in the absence of all fishing mortality, the maximum rebuilding period is ten years from the implementation date of the program. The rebuilding period is extended to the maximum period in order to minimize the impacts on fishing communities, as described in Section 7.4.1.1.2.

Impacts on other species

When compared to Option 1/No Action, this option may indirectly increase interactions between the groundfish fishery and other species that are caught as bycatch on groundfish fishing trips if it leads to more groundfish fishing trips. Counter to this possibility is the chance that vessels that would fish for other species under Option /No Action may target SNE/MA winter flounder as a substitute. It is not clear how these two different behaviors would interact and whether the net result would be more or less catches of other species. ACL and AM systems for other stock, however, would prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 12 - Projected SNE/MA winter flounder stock size under Option 2

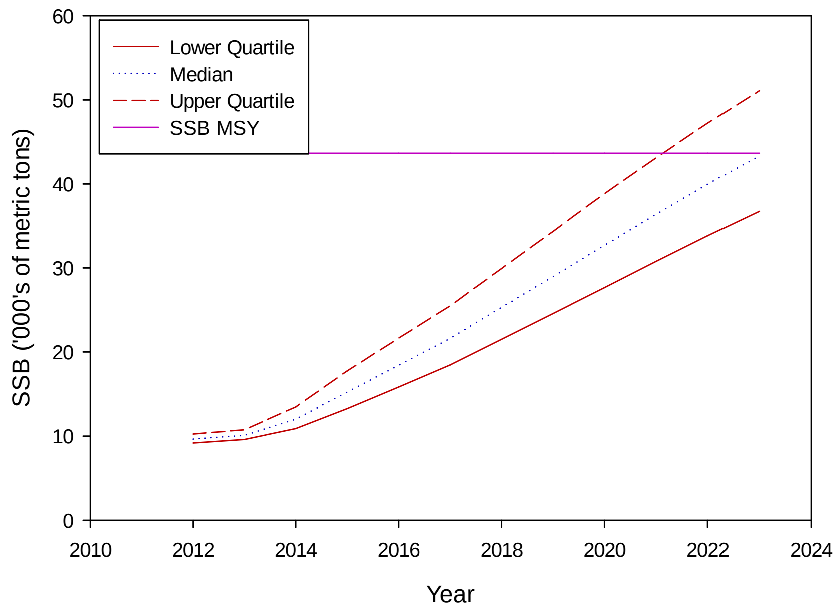
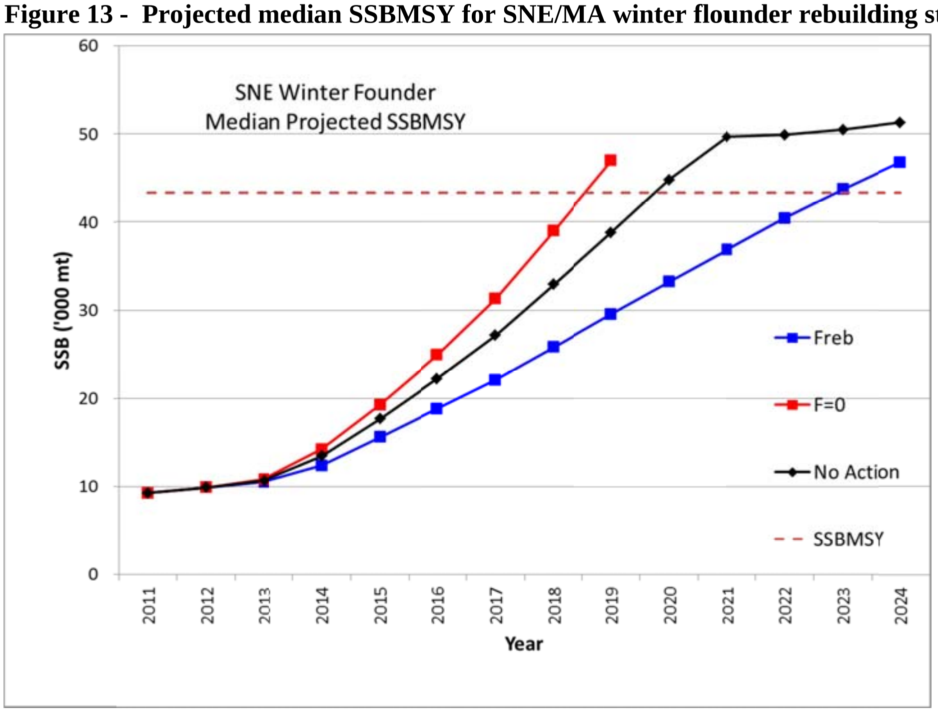


Figure 13 - Projected median SSBMSY for SNE/MA winter flounder rebuilding strategies



7.1.1.2 Annual Catch Limit Specifications

7.1.1.2.1 Option 1: No Action

Impacts on regulated groundfish

A number of groundfish stocks do not have FY 2013 specifications defined in previous actions. This option would not set specifications for these stocks in FY 2013; stocks with FY 2013 specifications from previous actions would be maintained and are not discussed further. The distribution of Annual Catch Limits (ACLs) to other fishery sub-components would be maintained.

No Overfishing Level (OFL), Acceptable Biological Catch (ABC) or ACLs would be defined for certain stocks in the multispecies fishery. Without specification of an ACL, a catch would not be allocated to the groundfish fishery (sectors or common pool vessels) and targeted groundfish fishing activity would not occur for these stocks. Catches would not be eliminated because there would probably be incidental catches or bycatch from other fisheries. The lack of an OFL makes it difficult to determine whether overfishing is likely to occur, however, with limited fishing activity the probability of overfishing would be low. Accountability Measures (AMs) would be maintained but are expected to have a low probability of being triggered without allocations.

In addition to the lack of targeted groundfish fishing activity on stocks without an ACL, certain provisions of the sector management system make it likely that fishing activity could be constrained even for stocks with an ACL that is specified. Current management measures require that a sector stop fishing in a stock area if it does not have ACE for a stock. Fishing can continue on stocks for which the sector continues to have ACE only if the sector can demonstrate it will not catch the ACE-limited stock. What these provisions mean is that in most cases there will be little opportunity for sector vessels to fish on stocks that have an ACL under this option because of this requirement. Since there would be no allocations for GOM cod, GOM haddock, GB cod, GB haddock, GB yellowtail flounder, witch flounder, white hake, plaice, CC/GOM yellowtail flounder from 2013-2015, the only area that most groundfish fishing activity could occur is the SNE area. As a result, in general this option would be expected to result in dramatically lower fishing mortality and more rapid stock rebuilding than would be the case for Option 2.

For stocks that have an age-based assessment, an age-based projection model was used to estimate the short-term impacts on stock size of setting the ABCs. These project the estimated median stock sizes expected to result by limiting catches to the ABC. Recent experience suggests that the projections tend to be biased high, predicting stocks sizes that are larger than realized and fishing mortality rates that are higher than expected (Groundfish Plan Development Team, pers. comm.). The effect of no groundfish allocations was explored in stock projections for the following stocks:

- Georges Bank Cod
- Gulf of Maine Cod
- Georges Bank Haddock
- Gulf of Maine Haddock

- Georges Bank Yellowtail Flounder
- Southern New England/Mid Atlantic Yellowtail Flounder
- Cape Cod/Gulf of Maine Yellowtail Flounder
- American Plaice
- Witch Flounder
- Redfish

Since there may be catches of these stocks in other fisheries the projections used an estimate of other sub-components catches to approximate the catches that might occur.

GB cod

Under Option 1, Georges Bank cod projections indicate an increase in SSB but it remains below the SSB_{MSY} from the updated assessment in 2012 (Figure 14). Option 1 does not differ greatly from the low or high catch projections from Option 2, however, increases in SSB are lower under Option 2. An additional projection based on the benchmark assessment shows a similar increase in SSB compared to the projection from the 2012 Assessment Update; SSB_{MSY} differs between the assessments but the SSB remains well below the SSB_{MSY} (Figure 15).

GOM cod

Under Option 1, Gulf of Maine cod projections indicate an increase in SSB occurs but it remains below the SSB_{MSY} from SAW 53 (Figure 16). Option 1 does not differ greatly from the low or high catch projections from Option 2, however, increases in SSB are lower under Option 2. Two additional projections based on the 2012 benchmark assessment base case and Mramp scenarios show a similar increase in SSB compared to the projection from the 2012 Assessment Update; SSB_{MSY} differs between the assessments and between the SAW 55 models but the SSB remains well below the SSB_{MSY} in all cases (Figure 17 and Figure 18).

GB Haddock

Georges Bank haddock SSB was estimated to be above the SSBMSY in 2010; projections indicate a further increase in SSB above the SSB_{MSY} under Option 1 (Figure 19). Option 1 would allow the SSB to increase to a higher level than under Option 2, with no apparent decline occurring in 2015.

GOM Haddock

Under Option 1, Gulf of Maine haddock projections indicate that SSB will increase after 2013 and there is some indication that the stock may increase above the SSB_{MSY} (Figure 20). Option 1 would allow for greater increases in SSB than Option 2.

GB Yellowtail Flounder

Under Option 1, Georges Bank yellowtail flounder biomass is projected to increase slightly but it remains well below the SSB_{MSY} (Figure 21). Option 1 would allow for greater increases in SSB than Option 2.

SNE/MA Yellowtail Flounder

Following a recent change in the recruitment assumption for SNEMA yellowtail flounder, the stock is fully rebuilt. Some increases in SSB are estimated under Option 1 (Figure 22). Option 1 results in continued increases in the stock over time. The SSB is projected to be larger under Option 1 than under Option 2.

CC/GOM Yellowtail Flounder

Under Option 1, Cape Cod/Gulf of Maine yellowtail flounder projections indicate that SSB will increase after 2013 and there is some indication that the stock may increase above the SSB_{MSY} (Figure 23). The SSB is projected to be larger under Option 1 than under Option 2.

Plaice

American plaice projections indicate an increase in SSB but it doesn't appear to increase the stock above the SSB_{MSY} from the updated assessment in 2012 (Figure 24). Under Option 1 there is a slight increase in stock size before 2013, followed by larger increases up to 2015. Larger increases in SSB occur under Option 1 than under Option 2.

Witch Flounder

Under Option 1, witch flounder projections indicate that SSB will increase after 2013 and there is some indication that the stock may increase above the SSB_{MSY} (Figure 25). Larger increases in SSB occur under Option 1 than under Option 2.

Redfish

Under Option 1, redfish SSB projections indicate a further increase in SSB above the SSB_{MSY} (Figure 26). The SSB also increases under Option 2 but it is lower than in Option 1.

Figure 14 - Projected GB Cod stock size

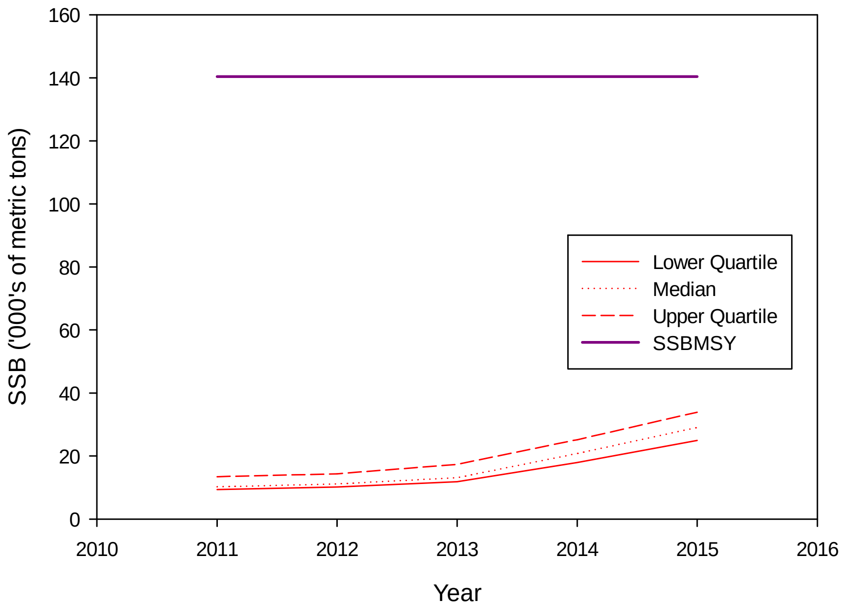


Figure 15 – Projected GB Cod stock size based on results of SARC 55

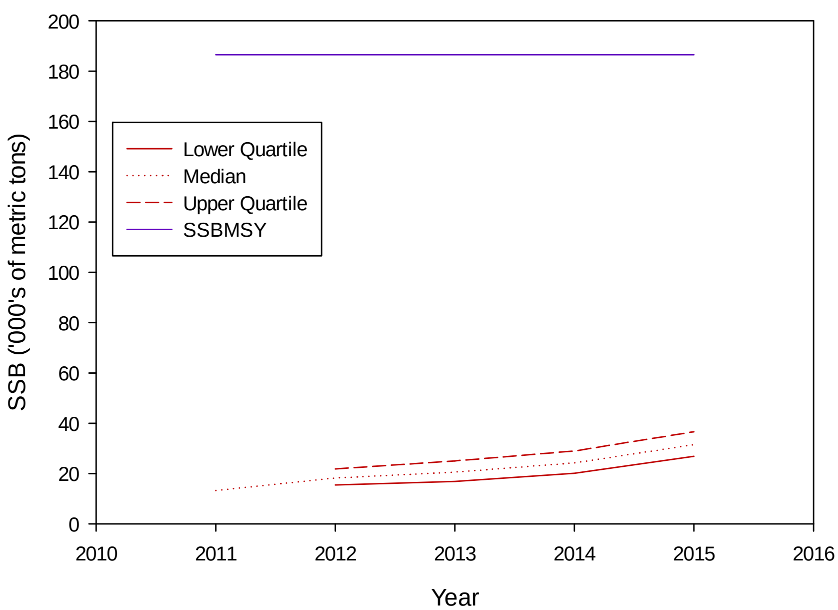


Figure 16 - Projected GOM Cod stock size

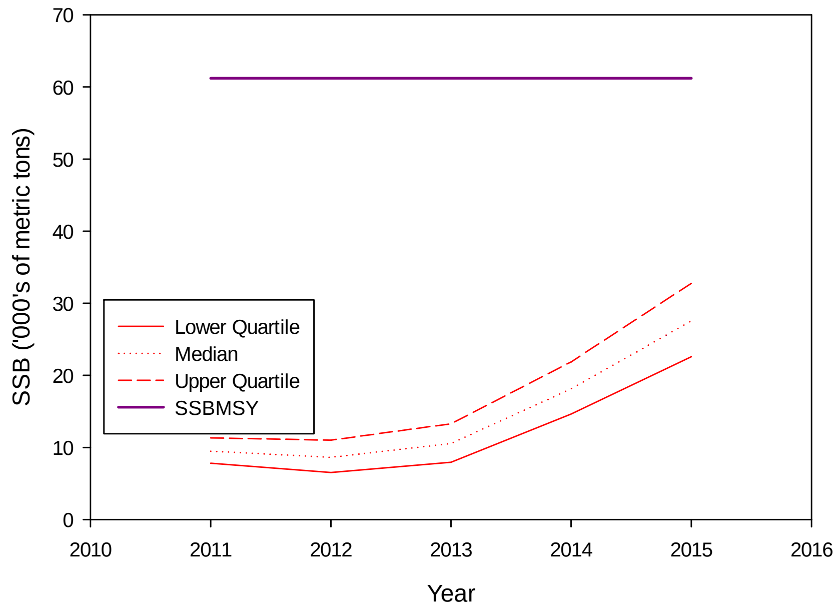


Figure 17 – Projected GOM Cod stock size based on SARC 55 base case scenario

Figure 18 – Projected GOM Cod stock size based on SARC 55 Mramp scenario

Figure 19 - Projected GB Haddock stock size

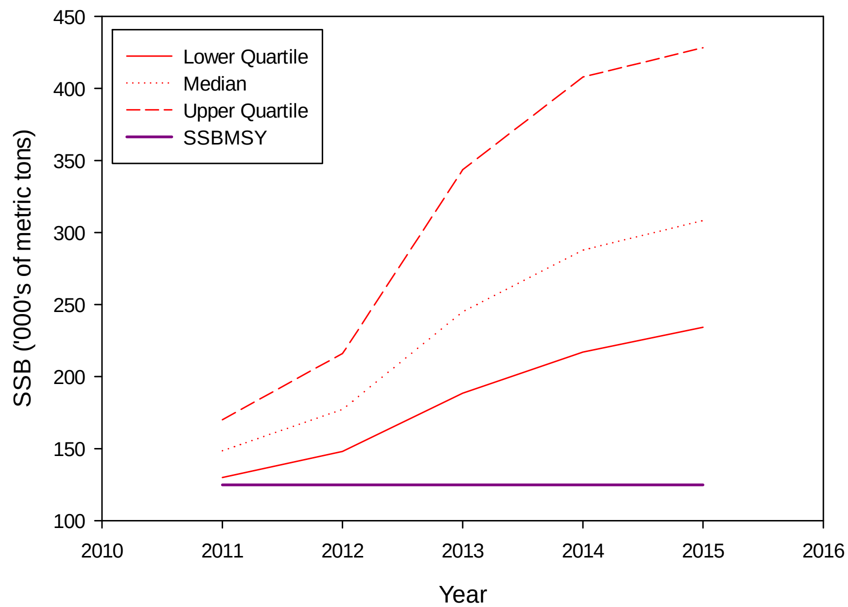


Figure 20 - Projected GOM Haddock stock size

Figure 21 - Projected GB Yellowtail Flounder stock size

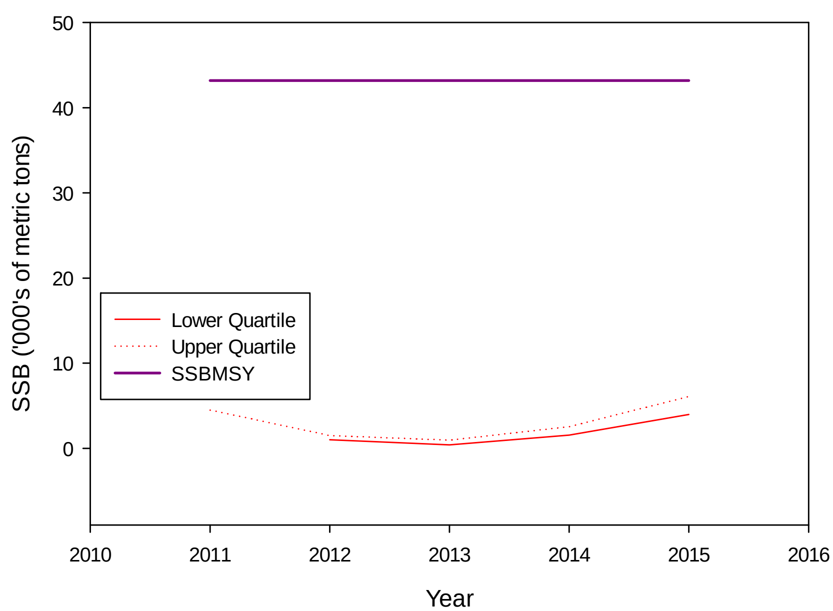


Figure 22 - Projected SNEMA Yellowtail Flounder stock size

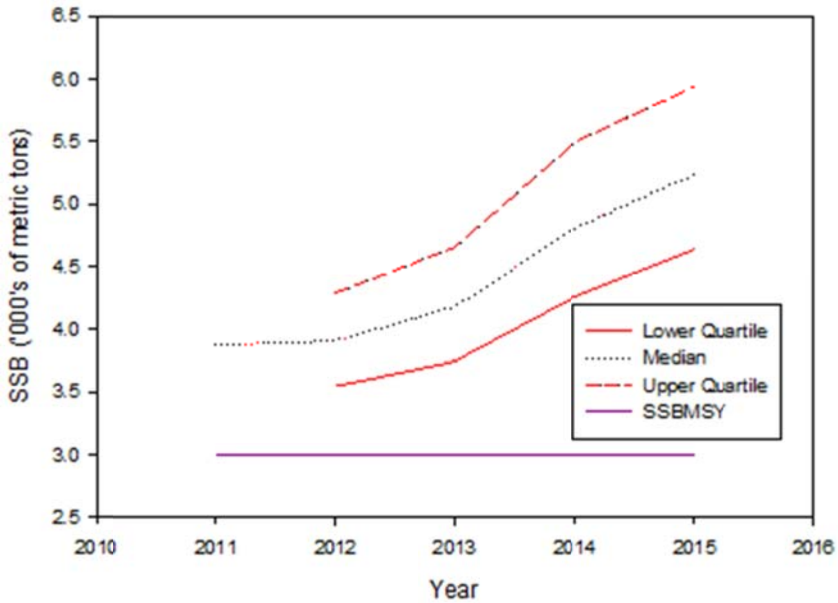


Figure 23 - Projected CC/GOM Yellowtail Flounder stock size

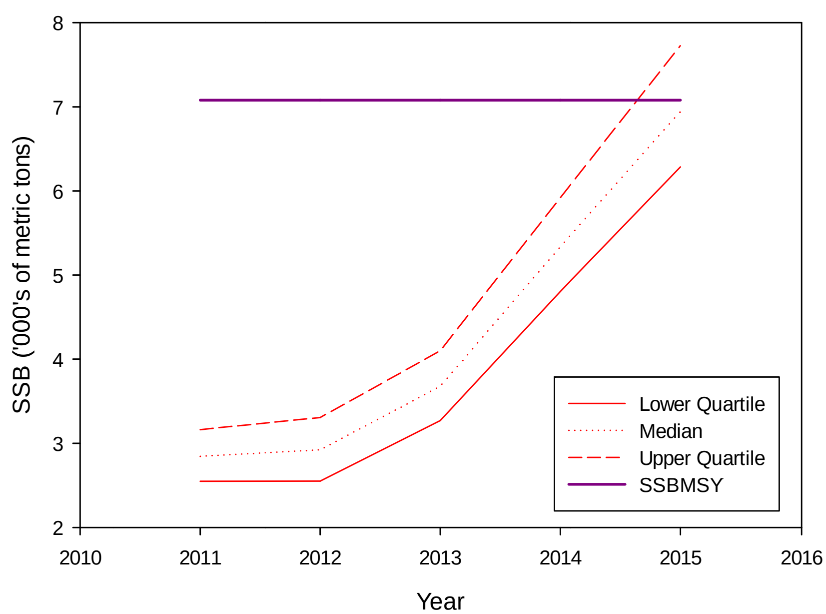


Figure 24 - Projected American Plaice stock size

Figure 25 - Projected Witch Flounder stock size

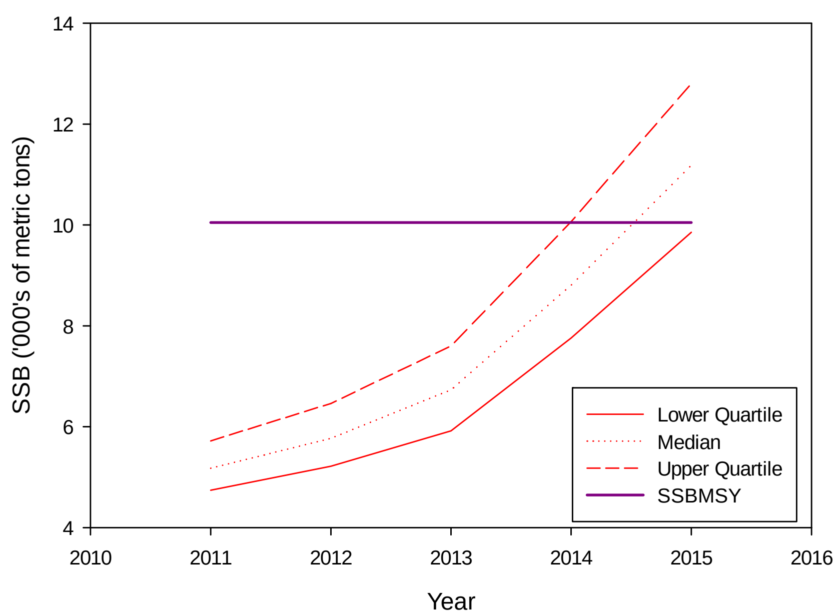
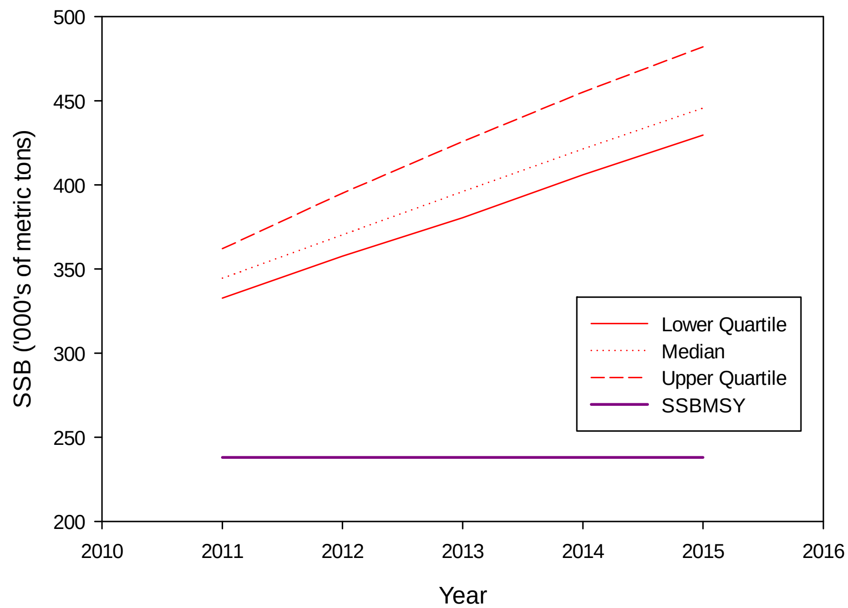


Figure 26 - Projected Redfish stock size



It is not possible to project stock sizes for the following stocks:

- Atlantic Halibut
- White Hake
- Northern Windowpane
- Southern Windowpane
- Ocean Pout
- Atlantic Wolffish

For index-assessed stocks an estimate of the probability of overfishing cannot be determined but the proposed ABC is based on the default control rule applied to the most recent estimate of stock size. As a result, if stock size does not decline then the proposed ABC would not be expected to result in overfishing. This is an unrealistic assumption – stock size could increase or decrease but is unlikely to remain constant - but past efforts to use the index projection model with these stocks have proven unreliable.

Table 60 – Review of ABC control rule performance for three stocks assessed with a survey index

Stock/Year	Catch	Realized Exploitation Index	OFL	Updated FMSY Proxy	F/FMSY	Catch/Projected Catch	Difference
S WINP							
2008	321	1.58	317	2.10	0.75	1.01	0.35
2009	463	1.86	317	2.10	0.89	1.46	0.65
2010	490	1.4	317	2.10	0.67	1.55	1.32
N WINP							
2008	376	0.841	225	0.44	1.91	1.67	-0.13
2009	440	0.998	225	0.44	2.27	1.96	-0.14
2010	236	0.515	225	0.44	1.17	1.05	-0.10
Ocean Pout							
2008	127	0.261	361	0.76	0.34	0.35	0.02
2009	168	0.373	361	0.76	0.49	0.47	-0.05
2010	127	0.311	361	0.76	0.41	0.35	-0.14

Impacts on other species

Adopting the Option 1/No Action specifications is not expected to have direct impacts on non-groundfish species. Indirect effects are generally likely to be beneficial given the expected reduced groundfish fishing activity. Catches of other species that occur on groundfish trips would decline as a result. There are only limited opportunities for groundfish vessels to target other stocks in other fisheries, so the shifting of effort into other fisheries is not likely to occur on a large scale. These other fisheries will also have ACLs and AMs so while such effort shifts may have economic effects the biological impacts should not be negative. Considering the differences between the ACLs of Option 1/No Action and Option 2, the fishing mortality on other stocks would probably be lower under Option 1/No Action.

7.1.1.2.2 Option 2: OFLs, ABCs, ACLs and other ACL sub-components for FY 2013 – FY 2015 (Preferred Alternative)

Option 2 would adopt new ABCs consistent with the best available science for GB cod, GOM cod, GB haddock, GOM haddock, GB yellowtail flounder, SNE/MA yellowtail flounder, CC/GOM yellowtail flounder, American plaice, witch flounder, redfish, Atlantic halibut, white hake, northern windowpane, southern windowpane, ocean pout and Atlantic wolffish. The ABCs for other stocks were set in previous actions and not discussed here. Generally, increases in SSB are lower than those under Option 1.

Because this option would adopt FY 2013 - 2015 ABCs for the stocks listed above, and all the stocks have recent assessment updates or are currently undergoing a benchmark assessment, short-term projections can be used to estimate the probability of overfishing and short-term changes in stock size. These projections use catches equal to the ABCs that would be adopted if this option is selected. Since the management goal is to keep catches at or below ACLs, and ACLs are always less than the ABC, the projection results would be expected to slightly over-estimate the risk of overfishing and under-estimate future stock size. There is one factor that could modify this conclusion. Sectors are allowed to carry-over up to ten percent of their original ACE allocation to the following year if it is not caught for all stocks except those managed under the Understanding. This possibility and its effect on stock status is discussed later in this section.

Projected stock sizes are shown in Figure 27 through Figure 41 for these stocks and the probability of overfishing is listed in Table 60. These tables allow a comparison of projected future stock size to both 2012 and 2011. A comparison of probability of overfishing between the two options is difficult as Option 1/No Action has no OFLs defined for many stocks.

With respect to GB yellowtail flounder there is additional uncertainty in the short-term projection because the most recent assessment shows a retrospective pattern that over-estimates stock size and under-estimates fishing mortality in the terminal year of the assessment. An OFL has been declared undeterminable for this stock because of the large uncertainty about the assessment (Science and Statistical Committee, pers. Comm.). It is unknown whether the proposed ABC will cause overfishing as a result.

This option would adopt an ABC for GB cod of 2,506 mt. The ABC was selected to be consistent with current stock status and rebuilding requirements.

This option would adopt an ABC for GOM cod of 1550 mt and that is consistent with the results of the assessment that was completed in December 2012 and released in January 2013.

GB cod

The recent benchmark assessment indicates this stock is below the SSB_{MSY}. Under Option 1, the SSB is projected to increase marginally after 2013 but the SSB_{MSY} is still well above the projected SSB size. Option 1 does not differ greatly from Option 2, however, SSB increases are lower under Option 2 (Figure 27).

GOM cod

The recent benchmark assessment for this stock indicates that it is below the SSB_{MSY}. Under Option 2, the projections indicate an increase in SSB after 2013. Under Option 1, the SSB is projected to increase marginally after 2013 but the SSB_{MSY} is still well above the projected SSB size. For Option 2, two potential final numbers for GOM cod were analyzed, 1249 and 1550 mt. Under the 1249 mt catch, two scenarios were run dependent on the natural mortality assumption, base and ramp; both show an increase in SSB after 2013 but it remains well below SSB_{MSY} (Figure 28 and Figure 29). Under the 1550 mt catch, the projections were run dependent on the base and ramp natural mortality assumptions; SSB increases after 2013 but again is below SSB_{MSY} (Figure 30 and Figure 31). Option 1 does not differ greatly from the projections from Option 2, however, SSB increases are lower under Option 2.

GB Haddock

This stock is already over the SSB_{MSY}. Some increase in projected SSB size occurs under Option 2 but a decline is suggested to occur in 2015 (Figure 32). Option 2 would result in a near-doubling of stock size through 2015 and then a slow decline in the SSB and results in a smaller SSB size than Option 1. Impacts on GB haddock are complicated by uncertainty about the size of the 2010 year class. The 2012 Assessment Update indicated that this year class may be the largest estimated. Initial estimates of GB haddock large year class strengths tend to be larger than later estimates, so the projection shown here reduces the size of the 2010 year class to account for this experience.

GOM Haddock

This stock is below the SSB_{MSY}. A short term decrease in SSB is suggested prior to 2013 (Figure 33). Option 2 allows for lower SSB increases than Option 1.

GB Yellowtail Flounder

This stock is well below the SSB_{MSY}. Marginal increases in SSB occur under Option 2 catch of 1150 mt (Figure 36). Slightly greater increases in SSB occur under Option 2 than Option 1. Projections for the TMGC recommended catch showed an increase in SSB after 2013 for both the rho-adjusted and not rho-adjusted models. The increase in SSB was similar between the 1150 mt catch and the 500 mt catch not rho-adjusted model (Figure 34), which both indicated a slightly great increase in SSB when compared to Option 1. The rho-adjusted 500 mt catch model (Figure 35) indicated a lower increase in SSB compared to the 1150 mt catch and the not rho-adjusted 500 mt catch model but was similar to the increase in SSB under Option 1.

SNE/MA Yellowtail Flounder

This stock is above the SSB_{MSY}. Marginal increases in SSB occur under Option 2 (Figure 37). Option 1 allows for greater increases in SSB than Option 2.

CC/GOM Yellowtail Flounder

This stock is below the SSB_{MSY}. Under Option 2 some increases in SSB is projected (Figure 38). The SSB increases more under Option 1 than Option 2.

Plaice

This stock is below the SSB_{MSY}. Under Option 2 the SSB isn't projected to increase; it fluctuates around the current SSB size (Figure 39). Option 2 would result in lower SSB sizes than under Option 2.

Witch Flounder

This stock is currently below the SSB_{MSY} but projections suggest it may approach the SSBMSY by 2015 (Figure 40). Increases in SSB are lower under Option 2 than under Option 1.

Redfish

Redfish SSB projections indicate a further increase in SSB above the SSB_{MSY} under this scenario (Figure 41).The stock is above the SSB_{MSY} and is expected to increase during the projected years under Option 1. The SSB also increases under Option 2 but it is lower than in Option 1.

Figure 27 - Projection GB cod stock size under Option 2

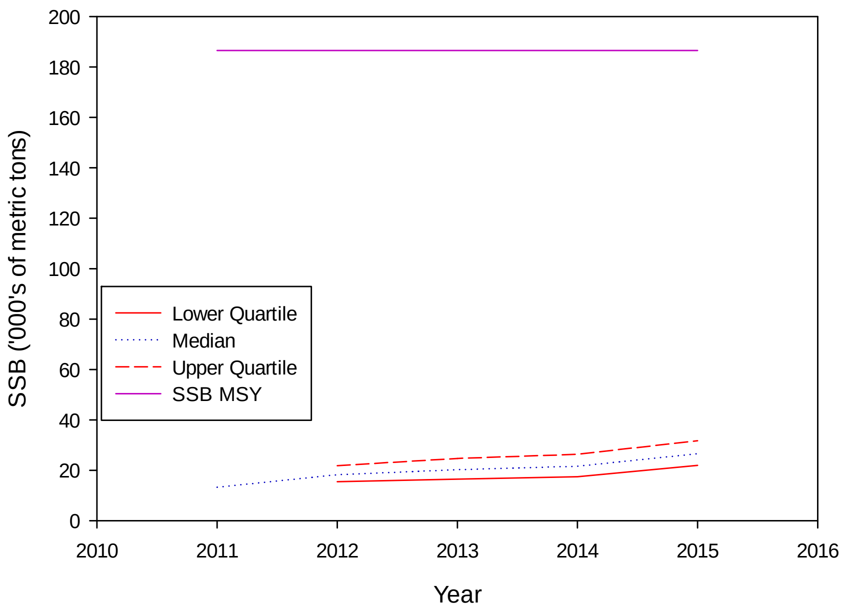


Figure 28 – Projected GOM cod stock size under Option 2 (1249 mt) base case scenario

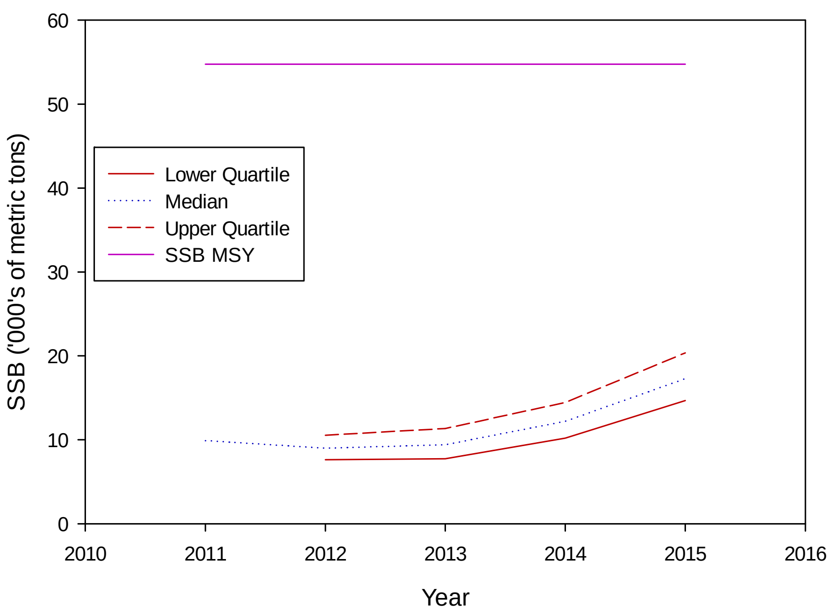


Figure 29 – Projected GOM Cod stock size under Option 2 (1249 mt) ramp scenario

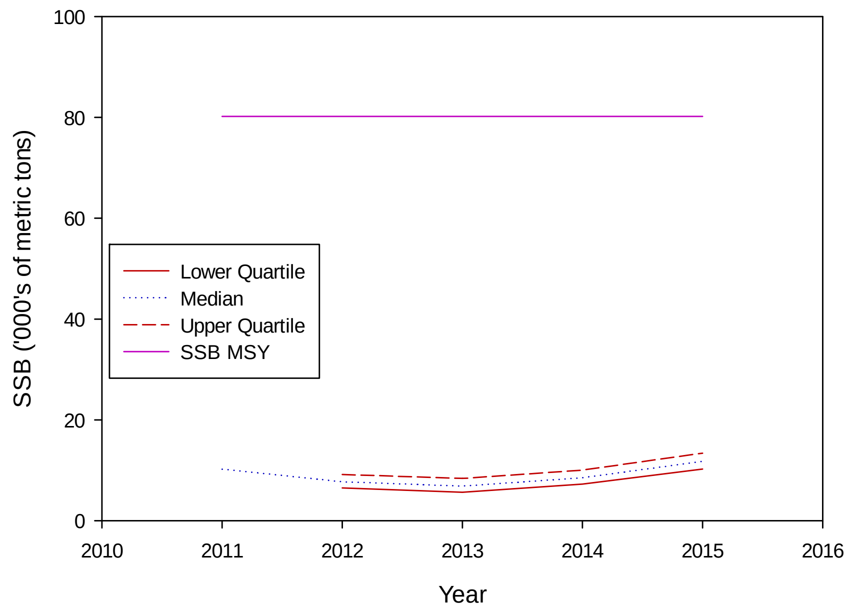


Figure 30 - Projected GOM cod stock size under Option 2 (1550 mt) base case scenario

Figure 31 - Projected GOM cod stock size under Option 2 (1550) ramp scenario

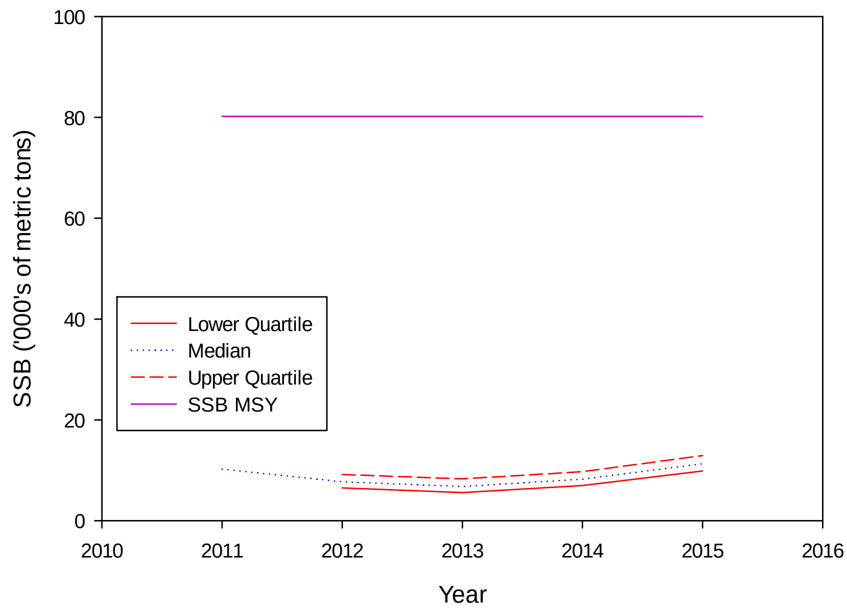


Figure 32 - Projected GB haddock stock size under option 2

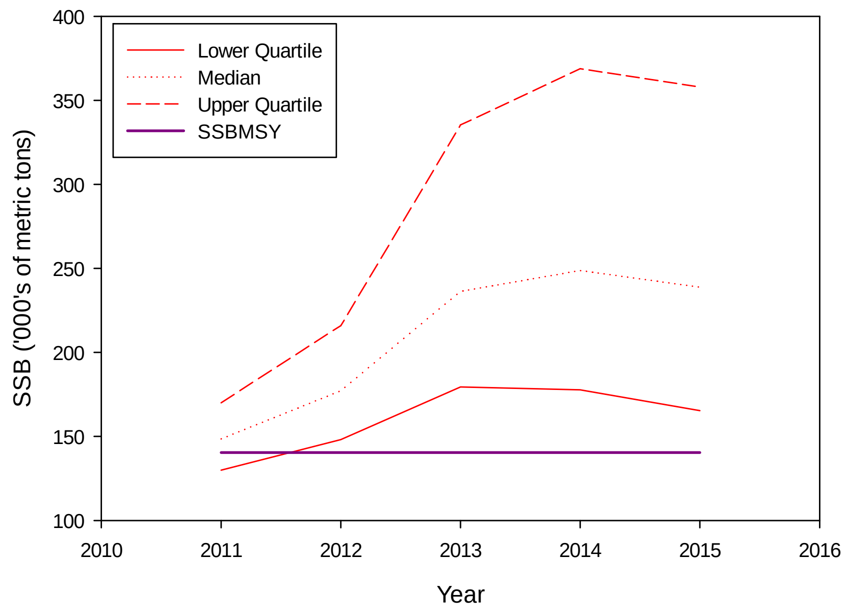


Figure 33 - Projected GOM haddock stock size under option 2

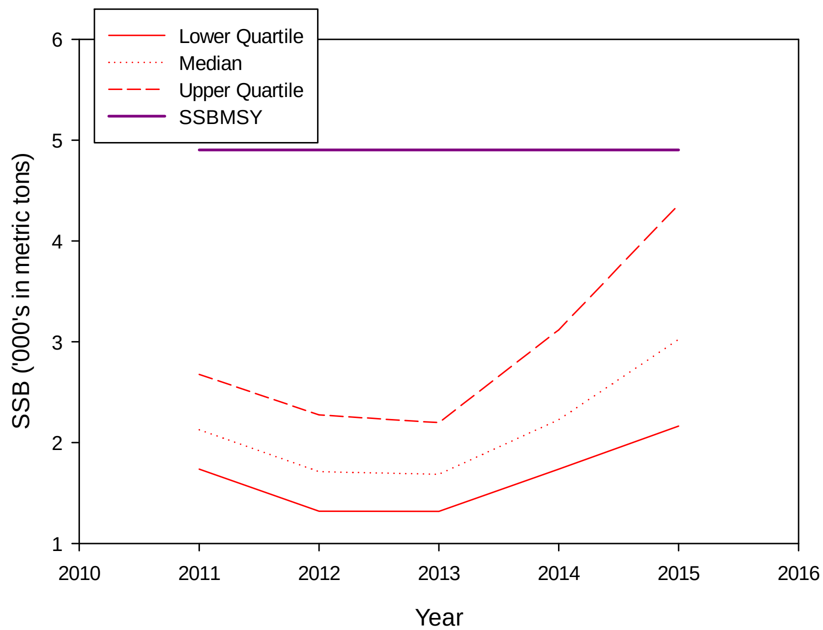


Figure 34 – Projected GB yellowtail flounder stock size under Option 2 (catch of 500 mt not rho-adjusted)

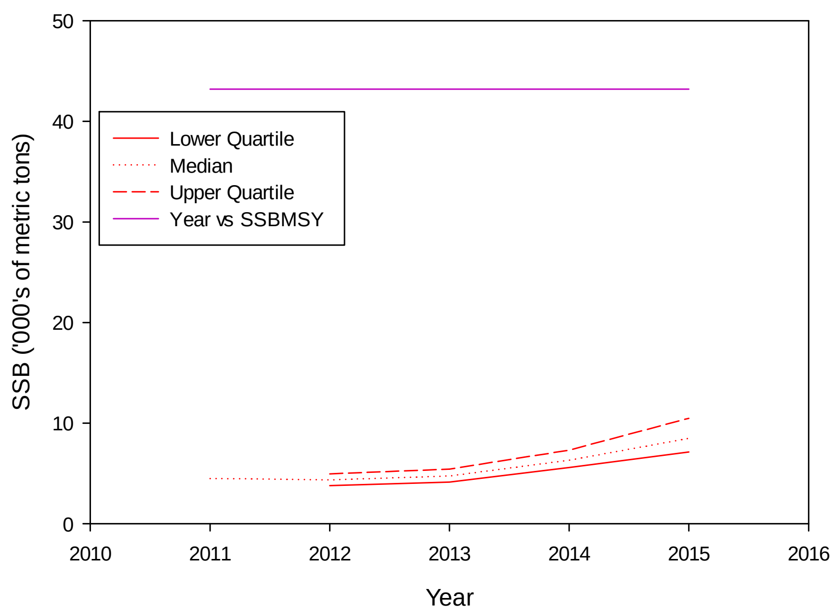


Figure 35 – Projected GB yellowtail flounder stock size under Option 2 (catch of 500 mt rho-adjusted)

Figure 36 - Projected GB yellowtail flounder stock size under Option 2 (catch of 1150 mt)

Figure 37 - Projected SNEMA yellowtail flounder stock size under option 2

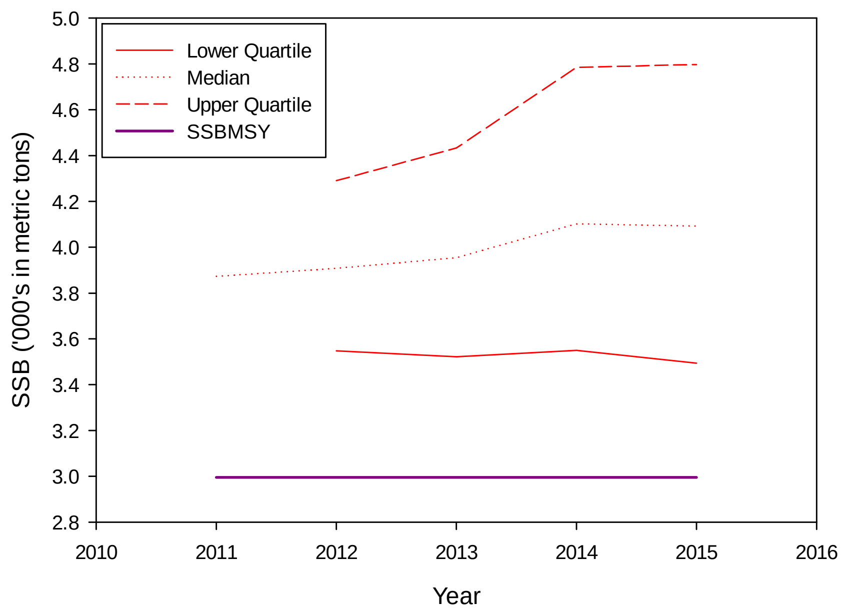


Figure 38 - Projected Cape Cod Gulf of Maine yellowtail flounder stock size under option 2

Figure 39 - Projected American Plaice stock size under option 2

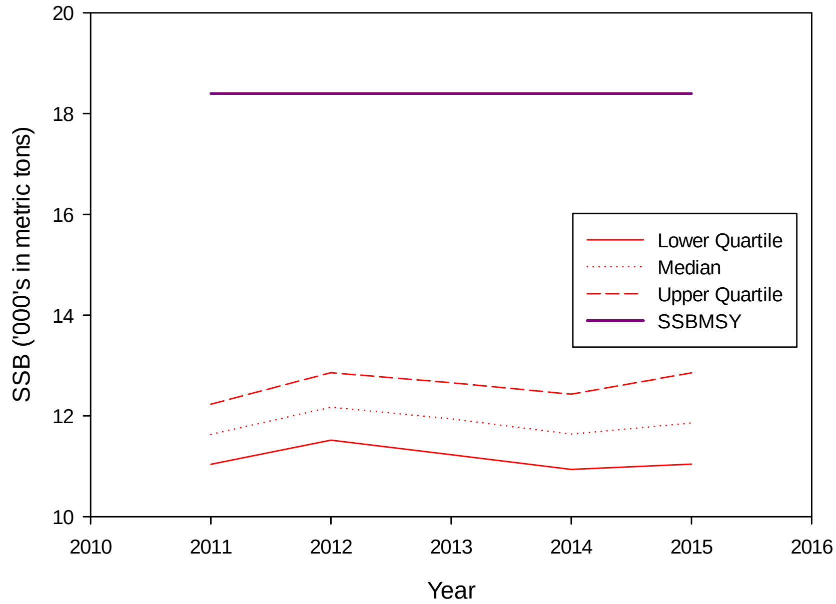


Figure 40 - Projected witch flounder stock size under option 2

Figure 41 - Projected redfish stock size under option 2

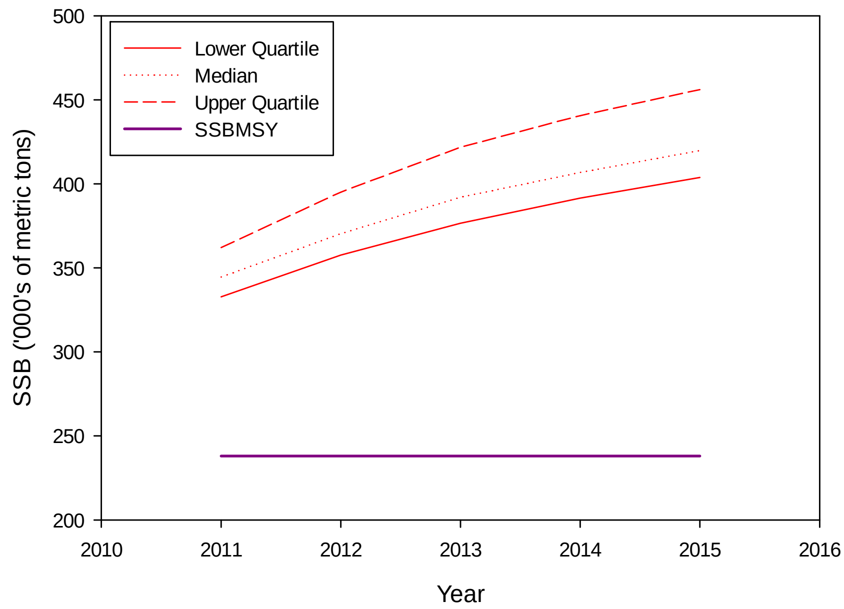


Table 61 - Estimated probability of overfishing if catch is equal to ABC

Species	Stock	2013	2014	2015
Cod	GB			
Cod	GOM			
Haddock	GB	0.000	0.000	0.01
Haddock	GOM	0.000	0.000	0.000
Yellowtail Flounder	GB	NE	NE	NE
Yellowtail Flounder	SNE/MA			
Yellowtail Flounder	CC/GOM	0.000	0.000	0.000
American Plaice		0.000	0.000	0.000
Witch Flounder				
Acadian Redfish		0.000	0.000	0.000

NE = Not Estimated

Impacts of Sector Carry-Over on Biological Impacts[7]

As mentioned, sector management rules allow sectors to carry-over up to 10 percent of the initial ACE allocation from one year into the next. This effectively increases the amount of catch that a sector could take in the second year if not all of the ACE is caught the first year. This could affect the biological impacts of the proposed ABCs/ACLs if all of this allocated catch is caught in the second year. When ABCs and ACLs do not change much from one year to the next, the biological effects of carry-over are of lesser concern. When there are substantial declines in the ABC, however, the effects could be important. Evaluation of the impacts is difficult because the catches in each year are unknown and must either be estimated or assumed. A second complicating factor is that projections calculate ABCs based on a calendar year, but they are allocated for a fishing year that starts on May 1. This makes it more difficult to predict the biological effects because the timing of the additional catch can be important. Stock size and fishing mortality are based on calendar years and it makes no difference in a calendar year estimate if catch is taken in May rather than April of the same year, but it does make a difference if catch is taken in April of the following year. Third, if carry-over exists, that indicates that the entire sector sub-ACL was not caught in the previous year. This may mean that less catch was taken than assumed in the projection, with the result that the stock would be expected to grow more than projected, and more catch could presumably be harvested without overfishing. While this is not a 1 to 1 transfer from one year to the next, and does not result in an automatic adjustment to the ABC/ACL, it can change the catch that would result in overfishing that is used as the basis for setting the ABCs/ACLs. The FMP does not include an automatic adjustment to the OFL/ABC/ACL in year 2 if the ABC is not caught in year 1, so in effect if there is a catch underage then the OFL/ABC/ACL may be slightly mis-specified.

Many of the ABCs/ACLs proposed in this option are reductions from the values for 2012. For this reason, the effect of carry-over on possible catches in 2013 was examined to determine the stocks where carry-over might have an effect on the biological impacts previously described. Conceptually, if the carry-over amount is greater than the difference between the 2013 ABC and the 2013 ACL, fishing mortality may be higher, and future stock size lower, than described in the preceding section. The maximum possible carry-over was compared to the 2013 ACLs that would be adopted in this action to identify the stocks where carry-over might lead to a noticeable difference in the biological impacts. Table 61 summarizes the results; the percentage shown in the table indicates the relative difference between the 2013 ABC and the 2013 ACL plus carry-over. A positive value indicates that carry-over results in a larger available catch (ACL plus carry-over) than the 2013 ABC. Exploratory analyses indicated that available catches that are less than 10 percent greater than the ABC will not lead to biological impacts that differ substantially from those described above. There are six instances where carry-over results in available catches being more than 10 percent larger than the FY 2013 ABC. There is one instance (GOM cod) where the full 10 percent carry-over would result in available catches larger than the OFL. For all of these stocks, the projection used an estimate of 2012 catch in the projection; in all cases the estimated 2012 catch is low enough that a full 10 percent of the initial ACE can be carried over.

[7] The section has been modified by NMFS since the Council submitted FW50 on March 22, 2012. These changes reflect analysis of the Secretarial emergency action to reduce the amount of GOM cod carryover available to 1.85 percent of a sector's unused ACE. The additions to this section that were made after the Council submitted FW50 are underlined for ease of identification.

Table 62 – Impact of maximum carryover on FY 2013 available catches

Stock	Difference from ABC	Comments/2012 harvest scenario used in projection
GB Cod	**17%**	**Estimated 2012 catch**
GOM Cod	**18%**	**Estimated 2012 catch**
GB Haddock	2%	Estimated 2012 catch
GOM Haddock	**17%**	**Estimated 2012 catch**
GB Yellowtail Flounder	NA	Carryover not authorized
SNEMA Yellowtail Flounder	4%	Estimated 2012 catch
CCGOM Yellowtail Flounder	**14%**	**Estimated 2012 catch**
Plaice	**16%**	**Estimated 2012 catch**
Witch	**14%**	**Estimated 2012 catch**
GB Winter Flounder	6%	Projection assumed 2012 catch equals ABC
GOM Winter Flounder	3%	Projection assumed 2012 catch equals ABC
Redfish	3%	Estimated 2012 catch
White Hake	4%	Projection assumed 2012 catch equals ABC
Pollock	4%	Projection assumed 2012 catch equals ABC

There are six instances that need to be further examined to determine if the biological impacts as a result of carry-over differ substantially from those described. For this analysis it is assumed that the entire amount available is caught in FY 2013 (ACL plus carry-over). For these stocks this is a worst-case scenario, as in recent years the entire available catch of these stocks has not been harvested (this will be discussed below). In only one instance would it be expected that carry-over would lead to overfishing, though this is explored in more detail below.

Table 62 compares the projected median stock size and fishing mortality for the period 2013-2015, with and without the maximum carry-over from FY 2012 to FY 2013. The projections assume no adjustments to the 2014 and 2015 ABCs are made as a result of the carry-over, and the entire ABC (not the ACL) is assumed to be caught in FY 2014 and FY 2015. This comparison ignores the differences between fishing year and calendar year. The analysis for GOM cod is complicated by the recent GOM cod benchmark assessment. The assessment did not settle on one assessment model so results for both models are shown.

For all six stocks, the maximum carry-over from FY 2012 to FY 2013, if caught, would be expected to reduce the FY 2013 median SSB by one percent or less when compared to the value projected if there is no carry-over. The difference in projected SSB increases to 2-3 percent by FY 2014 for all six stocks, but is 2 percent or less in FY 2015. With respect to fishing mortality, the FY 2013 fishing mortality would be expected to be 15-20 percent higher in FY 2013 if the maximum carry-over is caught. By FY 2014 the difference in fishing mortality is four percent or less, and the difference is less in FY 2015.

For GOM cod, if the full carry-over is caught in FY 2013 then under either assessment/projection model the fishing mortality would be expected to exceed the F_{MSY} proxy of 0.18. Overfishing would end in FY 2014 under the base case model, but fishing mortality would be expected to exceed 0.18 until FY 2015 in the Mramp model. However, as announced by NMFS in February 2013, and further outlined in Appendix

V, the maximum allowable carryover amount for GOM cod is being reduced by NMFS to 1.85 percent. The purpose of reducing the maximum GOM carryover amount is to ensure that the worst case scenario analyzied here, i.e., the entire ABC and revised maximum carryover amount if taken in FY 2013, will not result in overfishing.

These results, however, do not take into account whether the entire available catch of these stocks is likely to be harvested in 2013. With two years under the ACL system, the entire available catch has not been harvested for any allocated regulated groundfish stock (catches have exceeded the ACL for windowpane flounder stocks). This is primarily due to groundfish fishery catches being less than allocated, though other components of the fishery have also harvested less than their allocations in many instances (see **Table 36**). Indeed, many sectors intentionally withhold a percentage of the their available ACE to reduce the possibility of unexpected overages. A detailed accounting for FY 2011 is shown in Table 63 below. Carryover from FY 2010 to FY 2011 increased the possible catch of each sector to over 100 percent of the sub-ACL that was initially allocated to sectors. But the actual sector catch exceeded 90 percent of the available catch only for white hake. Another factor that suggests that catches will fall short of ACLs can be found in the economic analyses that indicate not all of the available ACE will be harvested because of interactions between stocks (see Section 7.4.1.2.2).

The overall conclusion from these analyses is that even if the FY 2013 available catch includes the maximum carry-over from FY 2012 to FY 2013, and all of that available catch is caught in FY 2013, the impacts on stock size and fishing mortality are minor and are small compared to the other assessment and projection uncertainties. With respect to status determination criteria, under these circumstances (i.e., full 10 percent carryover) there is only one stock (GOM cod) where fishing mortality would exceed the F_{MSY} proxy. However, under the NMFS-revised GOM cod alternative, fishing mortality would not exceed F_{MSY}. If the total available catch is not harvested, as has been the case in the recent past, then the biolgocial impacts of carry-over would even be less than shown here. Additional discussion and analysis of carryover impacts for all stocks, including the impacts of the NMFS-revised GOM cod carryover allowance, is provided in Appendix V.

Because these analyses rely on the projection model that is used to calculate future catches, the earlier cautions about the errors in that model should be considered when reviewing these results.

f projected stock size and fishing mortality for six stocks under two different carry-over scenarios

Carryover	Median Projected SSB			Median Projected Fishing Mortality		
	2013	2014	2015	2013	2014	2015
No	20,190	21,550	26,530	0.135	0.123	0.104
Yes	20,126	21,212	26,208	0.156	0.125	0.106
No	9,340	11,860	16,630	0.17	0.143	0.104
Yes	9,269	11,623	16,332	0.204	0.147	0.106
No	6,770	8,210	11,260	0.267	0.252	0.178
Yes	6,698	7,996	11,102	0.322	0.262	0.182
No	1,689	2,284	3,096	0.346	0.342	0.334
Yes	1,675	2,240	3,054	0.413	0.342	0.342
No	3,459	4,603	5,746	0.195	0.145	0.112
Yes	3,425	4,526	5,674	0.225	0.148	0.114
No	11,939	11,638	11,865	0.135	0.135	0.135
Yes	11,874	11,398	11,628	0.158	0.138	0.138
No	6,616	8,028	9,684	0.170	0.133	0.108
Yes	6,598	7,926	9,578	0.196	0.135	0.109

Table 64 – FY 2011 Sector carry-over catch accounting

Stock	FY 2011 Available Annual Catch Entitlement (ACE)				FY11 Carryover*	FY 11 Sector Catch	FY 11 Sector Catch as Percent of Total Available
	FY11 Initial ACE	FY10 Carryover*	Total Available	Total Available as a Percent of Initial ACE			
	A	B	A + B	C	D	E	F
GB Cod	4,208	317	4,525	107.5	418	3,215	71%
GOM Cod	4,721	431	5,152	109.1	467	4,368	85%
GB Haddock	30,393	4,019	34,412	113.2	3,039	3,829	11%
GOM Haddock	770	79	849	110.2	77	484	57%
GB Yellowtail Flounder	1,122	NA	1,122	100.0	NA	988	88%
SNE Yellowtail Flounder	404	23	427	105.8	39	364	85%
CC/GOM Yellowtail Flounder	913	71	984	107.7	90	795	81%
American Plaice	3,038	275	3,313	109.0	302	1,632	49%
Witch Flounder	1,211	81	1,292	106.7	121	993	77%
GB Winter Flounder	1,993	182	2,175	109.1	149	1,924	88%
GOM Winter Flounder	313	13	326	104.1	31	158	49%
SNE Winter Flounder	NA	NA	NA	NA	NA	87	NA
Redfish	7,505	676	8,181	109.0	750	2,703	33%
White Hake	2,946	247	3,193	108.4	158	3,014	94%
Pollock	13,848	1,618	15,466	111.7	1,382	7,543	49%

Impacts on other species

In general, the specification of groundfish ABCs and ACLs by this option would not be expected to have direct impacts on most other species. Other species are caught on groundfish fishing trips and the ABCs/ACLs could indirectly affect species if they result in changes in groundfish fishing activity. When compared to Option 1/No Action, this option would be expected to result in more groundfish fishing effort and as a result catches of other species would be expected to be higher. This would be expected to result in higher fishing mortality rates for those species when compared to the No Action alternative. Species such as monkfish, skates, and spiny dogfish are among those most likely to be affected. All of these species are subject to management controls, and it is not likely that fishing mortality will exceed targets. Indeed, when compared to recent years, the reduction in groundfish ABCs/ACLs as proposed in this action would be expected to result in reduced catches of other species.

An additional species that could be affected by this option would be Atlantic sea scallops. The ABCs and ACLs that are proposed include specification of sub-ACLs of GB yellowtail flounder and SNE/MA yellowtail flounder for the sea scallop fishery. These sub-ACLs are designed to limit the incidental catch of yellowtail flounder by the scallop fishery, and exceeding the allocations results in triggering AMs in subsequent years. The sub-ACLs can affect fishing mortality and stock size of sea scallops through this mechanism.

The sea scallop GB yellowtail flounder sub-ACL proposed in this option is based on a proposed decision to allocate a fixed percentage of this stock to the fishery. In FY 2013, this percentage is based on 40 percent of the U.S. ABC. This amount exceeds the estimated catch of yellowtail flounder by the fishery in 2013 by a factor of more than 2. As a result, it is not likely that AMs will be triggered and there is unlikely to be any biological effects on sea scallops in 2013 or beyond as a result of this allocation.

For SNE/MA yellowtail flounder, this option proposes to allocate an amount that is based on 90 percent of the expected catch by the scallop fishery. The allocation is based on the high estimate of a range of estimates. There is a possibility that the fishery may exceed the sub-ACL, which would lead to implementation of an AM in a later year. If the AM restricts scallop fishing in the SNE area, it could shift scallop effort into other areas. The impacts of this AM on the fishing mortality and stock size of scallops are difficult to predict because future scallop management measures have not been defined.

7.1.2 Commercial and Recreational Fishery Measures

7.1.2.1 SNE/MA Winter Flounder Landing Restrictions

7.1.2.1.1 Option 1: No Action

Impact on Regulated Groundfish

This option would continue the prohibition on landing SNE/MA winter flounder. This measure has deterred fishing on this stock by both commercial and recreational fishermen in federal waters. As a result, fishing mortality for this stock was estimated to be well-below F_{MSY} in 2009 and 2010, with a two-year average of F=0.07. If this measure is adopted, fishing mortality would be expected to continue to be low and would probably be lower than under Option 2. As a result, the stock would probably rebuild more quickly than would be the case if Option 2 is adopted.

With respect to other regulated groundfish stocks, because this option would result in fewer groundfish fishing trips than Option 2, catches for other stocks would also probably be lower.

Impact on Other Species

This option would be expected to have little direct impact on other species. It is possible that because SNE/MA winter flounder cannot be landed, some fishermen may target other species to make up for the lost revenue. Management measures for those other fisheries would be expected to keep fishing mortality on those other species within acceptable limits. There would likely be little difference between the impacts on other species under this option and those under Option 2.

7.1.2.1.2 Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

Impacts on Regulated Groundfish

This option is likely to be adopted only if the SNE/MA winter flounder rebuilding strategy is modified (see Section 4.1.1.2). Because this option would permit the landing of SNE/MA winter flounder, it would be expected that commercial and recreational fishermen would target this stock more frequently than would be the case under Option 1/No Action. The expectation is that this would lead to increased catches and fishing mortality for this stock when compared to Option 1/No Action. Increasing fishing mortality would be expected to lead to a slower rebuilding trajectory for this stock. Assuming that catches are as high as the ABC, the rebuilding target would be reached in 2023 rather than the 2019 date expected under Option 1 /No Action (see Figure 12 and Figure 13). This would be the primary impact of this measure. It may also have indirect effects on other groundfish species, particularly SNE/MA yellowtail flounder. These two species are sometimes caught on the same groundfish fishing trips. If more trips occur because of increased targeting of SNE/MA winter flounder, then catches of other groundfish species would also be expected to increase.

Impacts on Other Species

This option would be expected to have little direct impact on other species. It is possible that because SNE/MA winter flounder could be landed, there may be less targeting of other species since fishermen may choose to target SNE/MA winter flounder. But it is more likely that SNE/MA winter flounder trips will be taken in addition to trips targeting other species, not in place of those trips. Management measures for those other fisheries would be expected to keep fishing mortality on those other species within acceptable limits. There would likely be little difference between the impacts on other species under this option and those under Option 1/No Action.

7.1.2.2 Commercial Fishery Accountability Measures

7.1.2.2.1 Option 1: No Action

Impacts on regulated groundfish

This option would not change existing AMs for the groundfish fishery – specifically, those AMs that are designed for SNE/MA winter flounder. The current AM for that stock bans possession by all commercial and recreational fishing vessels. FW 48 proposed an area-based AM but that has not yet been adopted.

The AM for SNE/MA winter flounder would remain a proactive prohibition on possession. While this requirement has resulted in catches that are well below the ACLs for these stocks, there isn't an additional measure that would be implemented if the ACL is exceeded. As a result, should that occur, this option is less likely to end overfishing than Option 2.

Impacts on other species

This option would not be expected to have any direct biological impacts on other species, and would be unlikely to differ from Option 2 in that regard.

7.1.2.2.2 Option 2: Revised Accountability Measures for SNE/MA Winter Flounder (Preferred Alternative)

Impacts on regulated groundfish

This option would adopt different AMs for sector and common pool vessels that would be applied if the sub-ACL for SNE/MA winter flounder was exceeded. Sector vessels would be allocated the stock, would be required to land legal-sized fish, and would be required to cease fishing in the stock area if the sector catch is expected to exceed its ACE. Controlling sector catches through a firm limit would be expected to result in more certain controls on catches than would be the case under Option 1/No Action.

This AM would impose area-based restrictions on common pool vessels if the common-pool sub-ACL for SNE/MA winter flounder is exceeded. The restrictions are designed to apply at certain times and in certain areas. If an AM is triggered selective gear is required in an area. Details are provided in section 4.2.2.2. It is important to note that this AM affects only common pool groundfish fishing activity, unlike Option 1/No Action. Since Option 1/No Action only prohibits possession and does not restrict fishing activity in any other way, this option would be expected to be more likely to limit common pool catches to the sub-ACL. In addition, other measures – such as the ability to adjust trip limits in-season – are also effectively a pro-active AM that would help limit common pool catches.

The technique used to identify the areas is described in detail in Appendix II but the following general overview will aid in understanding the biological impacts of the measure. Observer data and landings data were combined to determine where these stocks were being caught. SNE/MA winter flounder landings and discard data were examined. An estimate of catches in each ten minute square was developed for each stock and for the appropriate gear types (generally just trawl gear for SNE/MA winter flounder). There are limitations to the data that are described in the appendix that create uncertainties in this approach. While observer data can be accurately binned to relatively small areas, VTRs are the only source of landings data and there are known to be errors in the accuracy of the information reported by fishermen (see Palmer and Wigley 2009). The results should not be viewed as being precise estimates because of these limitations.

Once the catch data were binned by ten-minute square, a geostatistical test was applied to identify areas with statistically significant higher catches than the immediate area and the stock area as whole. These areas were used to select the AM areas where appropriate restrictions would be adopted. The size of the areas was selected based on the amount of catches that need to be affected. In addition, qualitative consideration was given to the data limitation previously described, the probability that effort may be displaced into other areas, and the likelihood that the measures may not be perfectly effective (see FW 47 for a discussion of compliance with Amendment 16 restricted gear areas, which suggests that area-based gear restrictions are not always complied with). In addition, this measure would only apply to common pool vessels fishing on groundfish fishing trips.

In general, the proposed AM areas, if implemented, would be expected to reduce trawl catches of the targeted stocks by requiring common pool vessels to use selective gear. These gears have been shown to reduce catches of flatfish, the major target of these AMs, in several experiments. It is likely that there would be some effort displacement that would reduce the effectiveness of the measures: rather than use selective gear in the AM area, some fishermen may continue to use non-selective trawls and shift their effort into other areas to target the species they would lose when using the selective gear. For sink gillnet and longline gear the proposed measure would prohibit fishing in the defined AM areas. While this would make the AM more effective in these areas for these gears, it is more probable that effort would be displaced into other areas.

As compared to Option 1/No Action, this measure would be expected to lead to more control on common-pool groundfish fishery catches of SNE/MA winter flounder because fishing effort is constrained. Because of the increased controls on catches it is more probably that this option will help to achieve mortality targets.

Impacts on other species

Option 2, if adopted, and if the AMs are triggered, may result in reduced fishing mortality for non-groundfish species that are caught on groundfish fishing trips. This is because the AMs either require use of selective trawl gear or close areas to goundfish fishing by sector vessels. The selective trawl gear would be expected to reduce catches of skates and monkfish in the AM areas. Mortality of these stocks under this measure would be expected to be lower than under any of the other options, including Option 1/No Action. These differences would only occur if the AMs are triggered because an ACL is exceeded.

7.1.2.3 Recreational Management Measures

The 2013 GOM haddock recreational management measures are implemented by NMFS under Regional Administrator authority provided by FW48. These measures are not part of FW50. FW48 adopted a proactive AM for the recreational fishery that allows the Regional Administrator to adjust management measures prior to the fishing year to ensure that the recreational fishery catches, but does not exceed, its sub-ACL.

7.1.2.3.1 Option 1: No Action

Under the no action alternative, there would be no change to the recreational minimum fish size or possession limit for GOM haddock. The no action measures are outlined in section 4.2.3.1. The sub-ACL for GOM haddock, based on the overall ACL contained in section 4.1.2.2., are substantial reductions compared to FY 2012 levels.

Analyses conducted by the Northeast Fisheries Science Center (NEFSC) Social Sciences Branch (SSB) using a Bioeconomic Length-structured Angler Simulation Tool indicates that the no action haddock measures would provide only an 11-percent probability that the haddock sub-ACL would not be exceeded. A 50-percent probablity threshold for acceptable performance has been established at a minimum probability of success, in this instance effectively constraining catch to levels below the recreational sub-ACLs. Because the likelihood that the no action haddock measures would not restrain catch to a level below the 74 mt sub-ACL, the no action measures are expected to have a slight to substantial negative biological impact on the stock. Catch in excess of the sub-ACL alone does not ensure negative biological impacts as there are several other fishery components (e.g., commercial sectors) that also have established catch limits. If these catch limits are collectively exceeded by ineffective measures, the likelihood that the fishing mortality could approach or exceed the overfishing limit is greater. Overfishing the stock would constitute a substantial negative impact.

7.1.2.3.3 Option 2: Revised GOM Haddock Recreational Measures (NMFS Preferred)

BLAST Analysis results indicate that the 2 inch increase in minium fish size, paired with an unlimited bag limit, year round season, and the no action GOM cod measures, would provide a 63 percent probability of constraining catch below the FY 2013 GOM haddock sub-ACL. Increasing the haddock minimum size results in less haddock being retained. This results in lower mortality because all recreational discarded haddock are presumed to live of discarded haddock are dead. The RAP expressed some concern that a zero percent discard mortality assumption may not be appropriate and the BLAST analysis is sensitive to the assumed discard rate. If the discard mortality is actually higher than 10 percent, the 2-inch increase in minimum size would not be expected to effectively constrain catch; however, the discard mortality assumption is drawn from the most recent stock assessment and represents the best available scientific information.

Simiar to the description for GOM cod, few FY 2012 angler-trips encounter lots of haddock. Approximately 90 percent of party/charter and private angler trips encountered 5 or fewer legal-sized haddock in FY 2012. The RAP discussed concerns that an unlimited possession limit may not be appropriate, particularly in light of the sensitivity of the BLAST analysis to assumed discard rate. Ultimately, to create any effective reduction in catch, the bag limit would need to be set at a very low level given the angler encounter rate. The RAP preferred not to have a 5 or fewer possession limit; thus, no change in possesson limit was recommended. Effort was also low in FY2012 in comparison to FY2011. It is expected that this will continue in FY2013, which contributes to the likelihood that the miniminum fish size will be effective. The size distribution of the GOM haddock population is projected to be such that anglers will not encounter substantial number of 21 inch or larger fish, thus; angler success will likely be low with these measures.

By constraining recreational catch within the established sub-ACL, a sub component of the FY2013 fishery level ACL and overall ABC designed to ensure overfishing does not occur, the no action alternative is expected to have positive biological impacts on the GOM haddock resource. The impacts are, however, contingent on other components of the fishery similarly staying within their respective sub-ACLs. Should another sector grossly exceed its sub-ACL, it is possible that negative biological impacts on GOM haddock could result from overfishing even if the recreational fishery catch remains below its sub-ACL.

7.2 Essential Fish Habitat Impacts

The Essential Fish Habitat impacts discussions below focus on changes in the amount or location of fishing that might occur as a result of implementing the various alternatives. This approach to evaluating adverse effects to EFH is based on two principles: (1) seabed habitat vulnerability to fishing effects varies spatially, due to variations in seabed substrates, energy regimes, living and non-living seabed structural features, etc., between areas and (2) the magnitude of habitat impacts is based on the amount of time that fishing gear spends in contact with the seabed. This seabed area swept (seabed contact time) is grossly related to the amount of time spent fishing, although it will of course vary depending on catch efficiency, gear type used, and other factors.

The area that is potentially affected by the proposed TACs has been identified to include EFH for species managed under the following Fishery Management Plans: NE Multispecies; Atlantic Sea Scallop; Monkfish; Atlantic Herring; Summer Flounder, Scup and Black Sea Bass; Squid, Atlantic Mackerel, and Butterfish; Spiny Dogfish; Tilefish; Deep-Sea Red Crab; Atlantic Surfclam and Ocean Quahog; Atlantic Bluefish; Northeast Skates; and Atlantic Highly Migratory Species.

7.2.1 Formal Rebuilding Programs, and Annual Catch Limits

7.2.1.1 SNE/MA Winter Flounder Rebuilding Strategy

7.2.1.1.1 Option 1: No Action

This option would maintain the current rebuilding strategy which has a target end date of 2014. Projections indicate that rebuilding will not occur within this timeframe. Continuing the No Action rebuilding strategy would result in continued zero possession limits for SNE/MA winter flounder and would likely result in less groundfish fishing activity in the SNE area when compared to Option 2.

7.2.1.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

This option would revise the rebuilding strategy to a target date of 2023 with a median probability of success. This approach would allow for a slightly higher fishing mortality rate and therefore would likely lead to an ACL allocation that would allow the stock to be landed. Thus, indirectly, this measure would probably lead to increased fishing effort and therefore impacts to EFH in Southern New England when compared to Option 1/No Action. However, targeting fishing effort will be limited by ACLs for associated species, such as SNE/MA yellowtail flounder, which has a lower proposed 2013 ACL as compared to 2012. Thus, it is difficult to estimate how much a change in the rebuilding plan would indirectly contribute to increased fishing effort in southern New England.

7.2.1.2 Annual Catch Limit Specifications

7.2.1.2.1 Option 1: No Action

Under No Action, stocks with FY 2013 specifications from previous actions would be maintained at that level. However, a number of groundfish stocks do not have FY 2013 specifications defined in previous actions, specifically GOM cod, GOM haddock, GB cod, GB haddock, GB yellowtail flounder, witch flounder, white hake, plaice, and CC/GOM yellowtail flounder. This option would not set specifications for these stocks in FY 2013. Without specification of an ACL, a catch would not be allocated to the groundfish fishery and targeted groundfish fishing activity would not occur for these stocks. In addition, certain provisions of the sector management system make it likely that fishing activity could be constrained even for stocks with an ACL. Current management measures require that a sector stop fishing in a stock area if it does not have ACE for a stock. Fishing can continue on stocks for which the sector continues to have ACE only if the sector can demonstrate it would not catch the ACE-limited stock. What these provisions mean is that in most cases there would be little opportunity for sector vessels to fish on stocks that have an ACL under no action, and the only area that most groundfish fishing activity could occur is the SNE area. As a result, in general this option would be expected to result in dramatically lower fishing mortality and dramatically lower impacts to EFH and benthic habitats as compared to the alternative specifications (Option 2).

7.2.1.2.2 Option 2: Revised Annual Catch Limit Specifications (Preferred Alternative)

Option 2 would adopt new ACLs for GB cod, GOM cod, GB haddock, GOM haddock, GB yellowtail flounder, SNE/MA yellowtail flounder, CC/GOM yellowtail flounder, American plaice, witch flounder, redfish, Atlantic halibut, white hake, northern windowpane, southern windowpane, ocean pout and Atlantic wolffish (total ACLs summarized in Table 64). The ACLs for other stocks were set in previous actions.

The ACLs for stocks not allocated to sectors, i.e. Atlantic halibut, northern windowpane, southern windowpane, ocean pout and Atlantic wolffish are similar to the 2012 ACLs (Table 64), with the exception of the southern windowpane ACL, which is about half the 2012 value. Because there are no directed fisheries for these species, the level at which these ACLs are set is not expected to have a large influence on the magnitude of EFH impacts in the groundfish fishery.

For the stocks with updated ACLs allocated in this action that are allocated to sectors, most of the 2013 ACLs are lower than those allocated in 2012, in some cases substantially lower. The exceptions to this are redfish, where the ACL is roughly 20% higher, and GB haddock, where the ACL is slightly higher. The fishery has not come close to catching the redfish and haddock ACLs recently for various reasons, so the ACL changes alone are not likely to result in increased fishing effort and increased impacts to EFH. The lower catch limits for the various other stocks are likely to decrease fishing, and therefore EFH impacts, across the groundfish fishery as a whole in comparison to 2012 levels. However, compared to Option 1/No Action, the alternative specifications below will likely have greater impacts to EFH since many stocks are not allocated under no action. It is difficult to predict how fishing effort may change in later years of this framework, i.e. fishing years 2014 and 2015, because ACLs for some key stocks (GB cod, haddock, and yellowtail) have not yet been determined. Effort would be expected to be higher than if Option 1/No Action is adopted, but will probably be lower than the status quo.

Table 65 – Comparison between 2012 and 2013 total ACLs for groundfish stocks. Only those stocks being updated via this framework are listed.

	Stock	2012 total ACL (mt)	2013 total ACL (mt) (2014-2015 ACLs below)
Allocated to sectors	GB cod	5,109	1,907 (Committee preferred) (TBD – transboundary)
	GOM cod	8,551	1,470 (Committee preferred) (TBD)
	GB haddock	27,637	27,936 (TBD – transboundary)
	GOM haddock	959	274 (323 in 2014, 412 in 2015)
	GB yellowtail flounder	1,045	480 (TBD – transboundary)
	SNE/MA yellowtail flounder	936	665 (same in 2014-2015)
	CC/GOM yellowtail flounder	1,104	523 (same in 2014-2015)
	American plaice	3,459	1482 (1442 in 2014, 1470 in 2015)
	Witch flounder	1,561	751 (same in 2014-2015)
	Acadian redfish	8,786	10,462 (10,909 in 2014, 11,393 in 2015)
	White hake	3,465	3,974
Not allocated to sectors	Atlantic halibut	83	96 (106 in 2014, 116 in 2015)
	Northern windowpane	225	144 (same in 2014-2015)
	Southern windowpane	225	540 (same in 2014-2015)
	Ocean pout	253	220 (same in 2014-2015)
	Atlantic wolffish	77	65 (same in 2014-2015)

7.2.2 Commercial and Recreational Fishery Measures

7.2.2.1 SNE/MA Winter Flounder Landing Restrictions

7.2.2.1.1 Option 1: No Action

This option would continue to prohibit retention of SNE/MA winter flounder. This would likely lead to fewer groundfish fishing trips than under Option 2, and thus may lead to lower fishing effort in the SNE/MA winter flounder stock area and reduced impacts to EFH.

FW 48 includes a preferred alternative that may modify the AM for SNE/MA winter flounder prior to implementation of this action. FW 48 would adopt an area-based AM that would require the use of selective trawl fishing gear in defined areas should the ACL be exceeded. This is not likely to lead to substantive changes in fishing effort when compared to Option 2 and any differences in impacts on EFH would likely be undetectable.

7.2.2.1.2 Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

This option would allow the landing of SNE/MA winter flounder by commercial and recreational groundfish fishing vessels. Sectors would be required to land all legal-sized SNE/MA winter flounder, and common pool vessels would be allowed to land legal-sized fish, subject to any trip limits or other in-season restrictions. In combination with the change in rebuilding strategy and the higher ACLs that result, permitting landing of this species will likely result in some increases in fishing effort and impacts to EFH in Southern New England when compared to Option 1/No Action.

7.2.2.1 Commercial Fishery Accountability Measures

7.2.2.1.1 Option 1: No Action

This option would maintain current AMs, specifically fishing restrictions in stock-areas if ACLs are exceeded, and pound-for-pound penalties in the following year. Currently, SNE/MA winter flounder cannot be possessed or landed by vessels issued a limited access NE multispecies permit, an open access NE multispecies Handgear B permit, or a limited access monkfish permit and fishing under the monkfish Category C or D permit provisions. As a result, this option might result in marginally less fishing effort and impacts to EFH than would be the case if Option 2 is adopted.

7.2.2.1.2 Option 2: Revised AM for SNE/MA Winter Flounder (Preferred Alternative)

This option would revise the AM for SNEMA winter flounder for sector and common pool vessels. This measure is linked to several other options that may be adopted: the revision to the SNE/MA winter flounder rebuilding plan (Section 4.1.1.2) and the removal of the landing prohibition (Section 4.2.1.2). If adopted this option would (1) treat SNEMA winter flounder as a stock allocated to sectors and subject to sector management provisions, (2) require the use of selective trawl gear in specified trawl SNE/MA winter flounder areas for common pool vessels if the common pool sub-ACL is exceeded. If the AM is triggered for either component, it may reduce fishing effort in the area and is expected to have marginal impact on EFH when compared to Option 1/No Action.

7.2.2.2 Recreational Management Measures

The 2013 GOM haddock recreational management measures are implemented by NMFS under Regional Administrator authority provided by FW48. These measures are not part of FW50. FW48 adopted a proactive AM for the recreational fishery that allows the Regional Administrator to adjust management measures prior to the fishing year to ensure that the recreational fishery catches, but does not exceed, its sub-ACL.

7.2.2.2.1 Option 1: No Action

Under the no action alternative, there would be no change to the recreational minimum fish size or possession limit for GOM haddock. Hook and line gear, in this case with rod and reels, does not impact EFH to the same degree as other gear used to harvest groundfish. Hook and line gear would be expected to have less impact than other fixed gear (such as bottom longline) which have medium to low impacts, because hook and line gear does not use anchors or lead lines. Under the no action alternative, recreational fishing effort would not be expected to change and, consequently, associated impacts to EFH would be expected to be negligible.

7.2.2.2.2 Option 2: Revised Recreational Management Measures for GOM Haddock (NMFS preferred)

Under the proposed action, the GOM haddock recreational minimum fish size would be increased from 18 to 21 in. This would be expected to result in an overall reduction in mortality of GOM haddock resulting from the recreational fishery. These measures may also result in a slight increase in effort, however, when compared to the no action alternative. Because rod and reel gear has minimal interaction with habitat, however, impacts to EFH resulting from the proposed action would be expected to be negligible.

7.2.3 Summary of Essential Fish Habitat Impacts of the Preferred Alternatives

Because No Action does not set ACLs for many stocks, the allocations in this framework would result in increased EFH impacts vs. No Action. However, a more meaningful comparison examines current year vs. future habitat impacts. Due to the overall reductions in ACLs across multiple stocks, the combined alternative measures in this framework action are expected to result in reduced impacts to EFH and benthic habitat overall as compared to current (2012) fishing levels. In combination, the measures for SNE/MA winter flounder, specifically extending the rebuilding strategy, allowing landings, and revising the accountability measures, would likely lead to localized increases in habitat impacts because currently there is zero possession for this stock. However, the magnitude of the change in impacts to EFH as a result of the SNE/MA winter flounder measures is likely minimal in comparison to the reduction in impacts that will result from the other ACL reductions.

Table 66 – Expected EFH Impacts of the Preferred Alternatives relative to the other alternatives

Proposed Measure	Expected Relative Habitat Impacts	Rationale
Revised rebuilding strategy for SNE/MA winter flounder	Slight increase vs. No Action and Status Quo	Would allow stock to be targeted as compared to current zero possession
Annual Catch Limits	Increase vs. No Action; Large decrease vs. 2012 catch limits (Status Quo)	Increase compared to No Action because No Action does not allocate most stocks. Practically speaking, a decrease, because overall ACLs are lower, in some cases much lower, than 2012 levels.
Allow landing of SNE/MA winter flounder	Slight increase vs. No Action and Status Quo	Would allow stock to be targeted as compared to current zero possession
Revise AMs for SNE/MA winter flounder – require retention for sector vessels	Marginal impact vs. No Action and Status Quo	
Recreational management measures for GOM haddock	Neglible under both no action and action alternatives	Recreational fishing gear has only minor potential impact on habitat.

7.3 Impacts on Endangered and Other Protected Species

7.3.1 Formal Rebuilding Programs, and Annual Catch Limits

7.3.1.1 SNEMA Winter Flounder Rebuilding Strategy

7.3.1.1.1 Option 1: No Action

This measure would maintain the current rebuilding strategy ending in 2014 that is unlikely to meet the rebuilding objective for SNEMA winter flounder. This management alternative would reduce fishing mortality to as close to zero as possible which would benefit protected species in the area. However, displaced fishing effort may impact protected species in other areas.

7.3.1.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

This measure would alter the rebuilding strategy for SNEMA winter flounder with an end date of 2023. It would allow some catch but the short-term catch levels would be low and unlikely to greatly impact protected species. Fishing effort from other areas may be reduced if fishermen stop avoiding this species. Overall, this alternative would have neutral to beneficial impacts on protected species.

7.3.1.2 Annual Catch Limit Specifications

7.3.1.2.1 Option 1: No Action

For many stocks, there would be no groundfish sub-ACL under this option. This would reduce interactions with protected species as fishing activity would be expected to decrease. Option 1 may have more positive impacts on protected species than Option 2.

7.3.1.2.2 Option 2: Revised Annual Catch Limits for Modified Stocks (Preferred Alternative)

This option proposes to adopt new specifications and ACLs for FY 2013 -2015 for GB cod, GOM cod, GB haddock, GOM haddock, SNE/MA yellowtail flounder, CC/COM yellowtail flounder, GB yellowtail flounder, American plaice, witch flounder, redfish, Atlantic halibut, white hake, northern windowpane, southern windowpane, ocean pout and Atlantic wolffish. This measure includes the identification of ACLs, OFLs, and ABCs as required by the M-S Act and as implemented by Amendment 16. It also incorporates adoption of the incidental catch TACs for the special management programs that use Category B DAS.

As was mentioned in the analysis of the previous options, the greater the fishing effort, the more possibility that interactions with protected species may occur. The TACs, and therefore the total ABC for GB Cod and GB haddock for Option 2 do not differ from that for the No Action alternative. As a result, the impacts of the TACs to protected species under this option are not expected to differ from that described under the No Action alternative. The reduced cod TAC for the U.S./Canada area may result in a shift of available catch from the eastern area to the western area. The quantitative consequences of these changes are unknown, but could be positive if effort is reduced in seasonal high use areas and the reduction overlaps with the distribution of protected resources.

The majority of the ABCs in Option 2 Section 4.1.2.2 represent a decrease on the previous year, resulting in potentially reduced impacts on protected species through fishery interaction. For the stocks that have increasing ABCs, the increased amount is not expected to cause large changes to fishing behavior and is also not expected to increase impacts on protected species. The combination of the changes in ABCs may result in some shifts in fishing area but the overall impact is not expected to be great. There would not likely be much difference whether the 1,150 mt (the preferred alternative) or 500 mt GB yellowtail flounder ABC was adopted, because this affects only a small part of the fishery. The No Action alternative would be expected to have a lower impact on protected species as it would result in greatly reduced fishing activity.

It is important to note that all of the options which could cause increases or decreases in interactions with the fishery the overall impact to protected species is likely to be negligible, and the impacts are uncertain as quantitative analysis has not been performed. Catches in the fishery will still be constrained by other limitations placed on the fishery, such as those relating to the catch of other co-managed species and bycatch, thereby mitigating the impacts of the potential changes. Option 2 would have more negative impacts on protected species than Option 1/No Action. In comparison to FY 2012, however, Option 2 would have less impact on protected species because of the decline in ABCs/ACLs and the likely resultant decline in groundfish fishing activity.

7.3.2 Commercial and Recreational Fishery Measures

7.3.2.1 SNE/MA Winter Flounder Landing Restrictions

7.3.2.1.1 Option 1: No Action

This measure would continue to prohibit possession of SNEMA winter flounder; targeting of this species would not be expected to occur. This would not be expected to alter fishing effort in this region; therefore the impacts on protected species should not change. This may result in continued displacement of fishing effort to areas outside SNE/MA winter flounder range but the zero possession limit may not have resulted in great impacts to fishing behavior. Overall protected species would be expected to benefit from reduced fishing effort when compared to Option 2.

7.3.2.1.2 Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

This measure would allow the retention of SNEMA winter flounder; it would result in higher landings of SNE/MA winter flounder but is not expected to greatly increase fishing effort and therefore no increased interactions with protected species would be expected. Allowing landings of this species may shift some fishing effort into the species’ range but this is not expected to impact protected species when compared to Option 1/ No Action. It may reduce fishing effort in other areas if fishermen stop trying to avoid them.

7.3.2.2 Commercial Fishery Accountability Measures

7.3.2.2.1 Option 1: No Action

This would not change the AM timing and would delay any impacts on protected species. Option 1 would have similar impacts on protected species as Option 2 but impacts would occur at a later period due to delayed timeline for AM implementation.

7.3.2.2.2 Option 2: Revised Accountability Measures for SNE/MA Winter Flounder (Preferred Alternative)

This option would revise the area-based AM for SNE/MA winter flounder that was proposed in FW48. The AM, if triggered, would require common pool vessels to use approved selective trawl gear to reduce the catch of flounders. The gear restrictions under the AM would decrease impacts on protected species. Any unforeseen shift in fishing effort to areas outside the AM areas, may increase fishing activity and impacts on protected species. For sector vessels, this option would treat SNE/MA winter flounder like other stocks allocated to sectors. If a sector exceeded its ACE of this stock, it would be required to cease fishing in the stock area. When compared to Option 1/No Action, if this AM is triggered it would be expected to result in reduced fishing activity and would be beneficial to protected or endangered species in the stock area.

7.3.2.3 Recreational management measures

The 2013 GOM haddock recreational management measures are implemented by NMFS under Regional Administrator authority provided by FW48. These measures are not part of FW50. FW48 adopted a proactive AM for the recreational fishery that allows the Regional Administrator to adjust management measures prior to the fishing year to ensure that the recreational fishery catches, but does not exceed, its sub-ACL.

7.3.2.3.1 Option 1: No Action

Under the no action alternative, there would be no change to the recreational minimum fish size or possession limit for GOM haddock. The commercial Northeast/Mid-Atlantic bottom longline/hook-and-line fishery is classified in the 2011 List of Fisheries as a Category III gear, which has a remote likelihood of, or no known incidental mortality and serious injury of marine mammals. As this available information indicates, interactions between the recreational hook and line fishery and protected resources are rare. Given that recreational fishery effort would not be expected to change under the no action alternative, impacts to protected resources would be expected to be negligible.

7.3.2.3.2 Option 2: Revised Recreational Management Measures for GOM Haddock (NMFS preferred)

Under the proposed action, the GOM haddock recreational minimum fish size would be increased from 18 to 21 in. This measure would be expected to result in an overall reduction in mortality of GOM haddock resulting from the recreational fishery. In comparison to the no action alternative, this measure is expected to result in lower recreational effort. Irrespective of effort, interactions between the recreational fishery and protected resources are rare. Thus, it would be expected that the increase in minimum haddock size would have negligible impacts to protected resources.

7.4 Economic Impacts

7.4.1 Introduction

Consideration of the economic impacts of the changes made in this framework is required pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976. NEPA requires that before any agency of the federal government may take "actions significantly affecting the quality of the human environment," that agency must prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that includes the integrated use of the social sciences (NEPA Section 102(2)(C)). The Magnuson-Stevens Act stipulates that the social and economic impacts to all fishery stakeholders should be analyzed for each proposed fishery management measure in order to provide advice to the Council when making regulatory decisions (Magnuson-Stevens Section 1010627, 109-47).

The National Marine Fisheries Service (NMFS) provides a series of guidelines to be used when performing economic reviews of regulatory actions. The key dimensions for this analysis are expected changes in net benefits to fishery stakeholders, the distribution of benefits and costs within the industry, and changes in income and employment (Guidelines for Economic Review of National Marine Fisheries Services Regulatory Actions, 2007). Where possible, cumulative effects of regulation will be identified and discussed. Other social concerns will be discussed in the subsequent social impacts section of this environmental assessment. The economic impacts presented here consists of both qualitative and quantitative analyses dependent on available data, resources, and the measurability of predicted outcomes. In general the regulations proposed in Framework 48 will impact revenue through changes to ACLs and fishery measures and will impact operating costs through the modification of accountability measures, sub-ACLs, and monitoring requirements/cost responsibilities. It is assumed throughout this analysis that changes in revenues will have downstream impacts on income levels and employment, however, these are only mentioned if directly quantifiable.

7.4.2 Formal Rebuilding Programs and Annual Catch Limits

7.4.2.1 SNE/MA Winter Flounder Rebuilding Strategy

7.4.2.1.1 Option 1: No Action

If this option would be adopted, the rebuilding strategy for SNE/MA winter flounder would continue to target an ending date of 2014 with a median probability of success. Since the stock is unlikely to rebuild by that date in the absence of all fishing mortality, the management objective would be to reduce fishing mortality to as close to 0 as possible until the stock is rebuilt. Relative to the scenarios considered in Option 2, this option provides the smallest discounted net economic benefit.

7.4.2.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

This option would adopt a new strategy that would target rebuilding of SNE/MA winter flounder by 2023 with a median probability of success. Short-term catch advice during the rebuilding period may be reduced below the projected rebuilding catch in order to account for uncertainty in stock projections.

The current estimate of the rebuilding fishing mortality is F=0.175. This estimate would be revised during the course of the rebuilding program.

In addition to the No Action option and F=0, five rebuilding scenarios are analyzed. Fishing at F_{MSY} would provide the largest discounted net economic benefit over the ten year rebuilding timeline. However, this and the 75% F_{MSY} options fail to achieve the biomass rebuilding target in sufficient time to meet MSA requirements. Of the three F_{REB} scenarios that do achieve rebuilding targets, the scenario rebuilding the stock by 2023 (F_{REB} 2023) provides the largest discounted net economic benefit, 26% higher than the No Action option and 18% higher than the F_{REB} option that rebuilds in 2021 assuming a 3% discount rate.

Net Present Value (NPV) calculations

Comparison of alternative benefit streams over time requires discounting future benefits to convert all benefit streams to a present value. For this purpose, a discount rate of 3% was selected as recommended by NOAA to reflect the social rate of time preference (NOAA 1999). The Executive Branch Office of Management and Budget recommends a discount rate of 7% to estimate the rate of return on average investments. Both rates are included here for the sake of comparison. Net present values are calculated through 2023, the approximate terminal rebuilding date for this stock.

The NPV analysis translates the potential landing streams into future revenues, discounted as appropriate, by applying an average price to potential southern New England/mid-Atlantic winter flounder landings. Implicitly, this analysis assumes that all allocated fish are caught and a 10% discard rate is applied in all years to estimate landings. NPVs are of SNE/MA winter flounder landings alone and do not take into account potential revenue losses or gains from the sale of other stocks of groundfish. A simple linear regression was used to calculate an average price based on price and quantity relationships for winter flounder from 1996 – 2011.

Figure 42 Price and quantity relationship for winter flounder

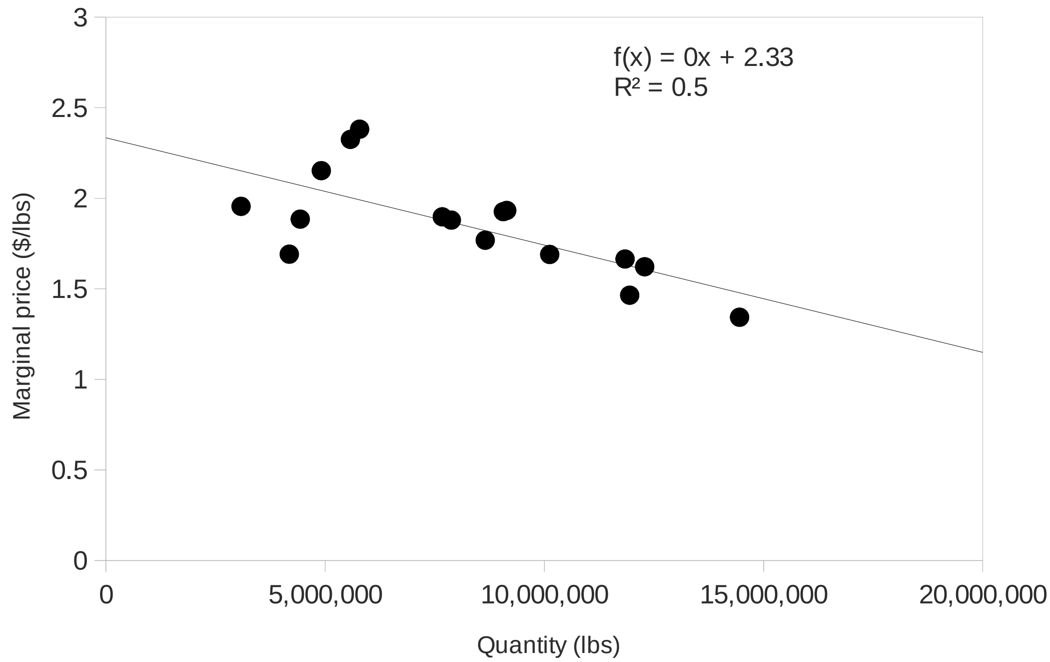


Table 67 – Average prices applied to landings in calculating NPV

	Fmsy	75Fmsy	Freb 2023	Freb 2022	Freb 2021	No Action	F=0
2013	$1.96	$2.04	$2.09	$2.13	$2.18	$2.22	$2.33
2014	$1.87	$1.95	$2.01	$2.07	$2.13	$2.19	$2.33
2015	$1.79	$1.88	$1.94	$2.00	$2.08	$2.15	$2.33
2016	$1.72	$1.81	$1.88	$1.94	$2.03	$2.11	$2.33
2017	$1.66	$1.74	$1.81	$1.88	$1.98	$2.07	$2.33
2018	$1.59	$1.67	$1.74	$1.82	$1.93	$2.03	$2.33
2019	$1.53	$1.60	$1.68	$1.76	$1.87	$1.98	$1.11
2020	$1.46	$1.53	$1.61	$1.69	$1.82	$1.18	$1.13
2021	$1.40	$1.47	$1.55	$1.63	$1.16	$1.17	$1.12
2022	$1.35	$1.41	$1.49	$1.19	$1.15	$1.16	$1.10
2023	$1.35	$1.41	$1.49	$1.19	$1.15	$1.16	$1.10

Table 68 – Anticipated landings under seven scenarios (mt)

	Fmsy	75Fmsy	Freb 2023	Freb 2022	Freb 2021	No Action	F=0
2013	2.732	2.105	1.716	0	0	0	0
2014	3.171	2.532	2.108	1.739	0	0	0
2015	3.95	3.23	2.729	2.278	1.71	0	0
2016	4.605	3.857	3.309	2.8	2.132	1.566	0
2017	5.187	4.448	3.871	3.318	2.562	1.901	0
2018	5.745	5.03	4.434	3.829	2.994	2.243	0
2019	6.317	5.627	5.014	4.364	3.447	2.602	0
2020	6.872	6.219	5.593	4.911	3.912	2.978	10.407
2021	7.418	6.798	6.158	5.449	4.374	9.843	10.257
2022	7.927	7.346	6.699	5.957	10.012	9.87	10.301
2023	8.392	7.843	7.191	9.699	10.046	10.003	10.462

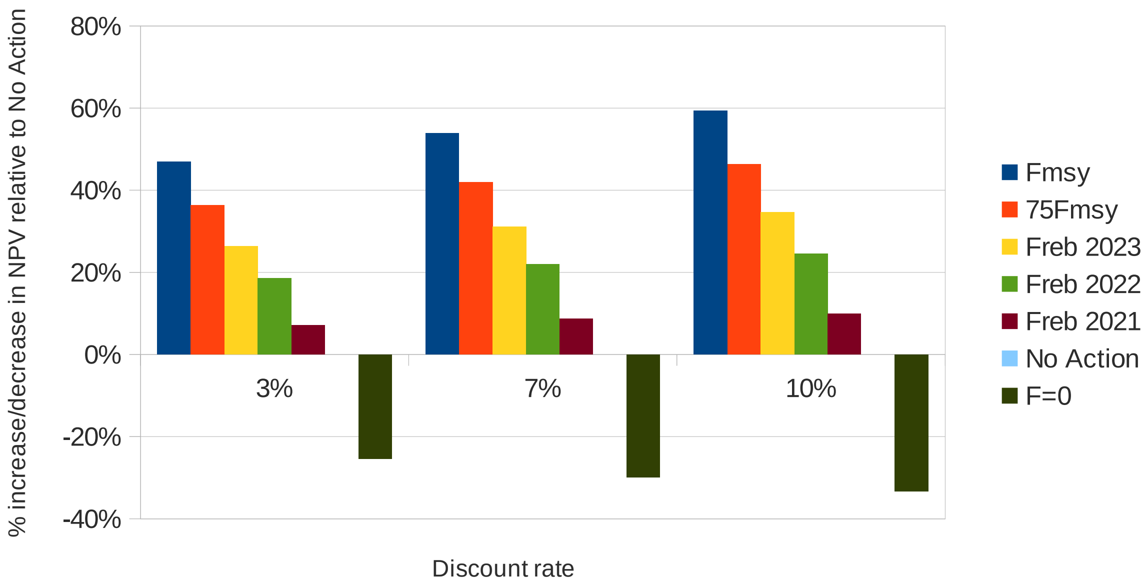
Table 69 – NPV of seven rebuilding options under three discount rate scenarios ($ millions)

discount rate	Fmsy	75Fmsy	Freb 2023	Freb 2022	Freb 2021	No Action	F=0
3%	173.3	160.8	149.1	132.8	120.9	108.9	88.0
7%	137.5	126.9	117.1	102.1	91.9	80.8	62.7
10%	117.3	107.8	99.2	85.0	75.9	65.5	49.1

Table 70 – relative change in NPV from No Action rebuilding strategy

discount rate	Fmsy	75Fmsy	Freb 2023	Freb 2022	Freb 2021	No Action	F=0
3%	59%	48%	37%	22%	11%	0%	-19%
7%	70%	57%	45%	26%	14%	0%	-22%
10%	79%	65%	51%	30%	16%	0%	-25%

Figure 43 NPV of seven rebuilding options under three discount rate scenarios



7.4.2.2 Annual Catch Limit Specifications

These analyses focus on vessels enrolled in the sector allocation system, which constitute nearly 99% of the landings of the commercial groundfish fishery. Two primary options and, under Option 2, four sub-Options are analyzed.

7.4.2.2.1 Option 1: No Action

By selecting Option 1, ACLs will be based on FW47 specifications for the years 2013-2014, which have missing values for many species (Table 70). Since many critical stocks will have no ACL specified at all, fishing would not be permitted for the species with undefined ACLs, nor would fishing be allowed in these species' broad stock areas.

Table 71 – No Action Sector sub-ACLs (lbs)

SPECIES	STOCK	Sector sub-ACL
	American plaice	-
Cod	GB East	-
	GB West	-
	GOM	-
Haddock	GB East	-
	GB West	-
	GOM	-
	Halibut	-
	Ocean pout	
	Pollock	28,240,926
	Redfish	22,246,619
	White hake	-
Windowpane	North	-
	South	-
Winter flounder	GB	7,733,736
	GOM	1,521,835
	SNE/MA	742,950
	Witch flounder	-
	Wolffish	-
Yellowtail flounder	CC/GOM	-
	GB	-
	SNE	-

Between November 1, 2011 and October 31, 2012, 14,480 unique sector trips landed groundfish under the sector allocation system. Of these, no trips were able to catch (land or discard) any of the non-zero sub-ACL stocks. Consequently, the No Action option is unlikely to provide for any fishing opportunities or generate any revenue from groundfish fishing for Sector or Common Pool vessels. Even if catch of non-allocated stocks could be reduced to zero through the use of selective gear, new targeting practices for non-groundfish species, or market timing, and market prices increased due to reduced supply, it is unlikely gross revenues would surpass $10 million.

Since Option 1/No Action does not specify an ABC or ACL for GOM cod and GOM haddock, and this would stop all recreational fishing activity, Option 2 would provide more economic benefits to the recreational component of the fishery.

The precise impacts of this option on the scallop fishery are unclear. This option does not identify scallop fishery sub-ACLs for several groundfish stocks. While this would not prevent the scallop fishery from fishing in FY 2013, it is not clear if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this would be the case, then any catches of these stocks would lead to scallop fishery AMs in FY 2014 and/or later years. As a result, this option would result in large reductions in scallop fishery revenues when compared to Option 2. But if this is not the case and the scallop fishery catches of these stocks do not trigger AMs, then this option might allow for greater scallop fishery revenues than would be the case if AMs are triggered using the ACLs of Option 2.

7.4.2.2.2 Option 2: Revised Annual Catch Limit Specifications (Preferred Alternative)[8]

Option 2 would adopt new ABCs for GB cod, GOM cod, GB haddock, GOM haddock, GB yellowtail flounder, SNE/MA yellowtail flounder, CC/GOM yellowtail flounder, American plaice, witch flounder, redfish, Atlantic halibut, white hake, northern windowpane, southern windowpane, ocean pout and Atlantic wolffish.

Substantial reductions in available fishable quota are expected for several stocks, most notably GOM and GB cod, GOM haddock, American plaice, witch flounder, CC/GOM yellowtail flounder and GB yellowtail flounder. As in Framework 47, the Quota Change Model (QCM) is used to predict the potential impact of these non-marginal changes in quota.

The QCM is a simulation model that selects trips from existing catch records that are representative of those trips most likely to take place under the new quota conditions. A pool of 100,000 actual trips is selected based on each trip's utilization of allocated ACE, using twelve months of fishery-dependent data from Nov 1, 2011 through Oct 31, 2012. The more efficiently a trip utilized its ACE, the more likely that trip is to be drawn into the pool, and, potentially, the more times that trip will be replicated within the pool. ACE efficiency is determined by the ratio of ACE expended to net revenues on a trip for each of the 16 allocated stocks. Net revenues are calculated as gross revenues minus trip costs minus quota leasing costs, where trip costs are based on observer data and quota leasing costs are estimated from an inter-sector lease value model based on FY 2011 and partial-year FY 2012 values (Murphy et. al, 2012). Trips that were particularly ACE-inefficient are not drawn into the pool at all. The model pulls trips from the pool at random, summing the ACE expended for the 16 allocated stocks as trips are drawn. When one stock's ACE reaches the allocated limit, no trips from that broad stock area are selected and the model continues selecting trips until quota limits are achieved in all three broad stock areas or for one of the unit stocks.

By running simulations based on actual trips, the model implicitly assumes that stock conditions existing during the data period (Nov 2011 – Oct 2012) are representative and that trips are repeatable. Use of existing trip net revenues requires an assumption of constant trip costs and constant quota costs. These assumptions will surely not hold—fisherman will continue to develop their technology and fishing practices to increase their efficiency, market conditions will induce additional behavior changes, and fishery stock conditions are highly dynamic. Fuel and other costs may rise due to larger economic shifts or shoreside industry consolidation. Quota lease prices will certainly increase under more restrictive allocations, though it is impossible to estimate the magnitude of these increases. In general, the model will under-predict true landings and/or revenues if stock conditions improve, if prices rise in response to lower quantities landed, and if fisherman become yet more efficient at maximizing the value of their ACE. Conversely, the model will over-predict true landing and/or revenues if stock conditions decline,

[8] This section has been modified by NMFS since the Council submitted the document on March 22, 2013. NMFS is implementing an emergency action to set the FY 2013 ABCs for GB yellowtail flounder (500 mt) and white hake (4,177 mt), and NMFS has added the necessary analysis of these emergency rules to this section.

markets deteriorate or fishing costs increase substantially. The model will over-predict landings if stock conditions for a highly constraining stock are such that catchability increases substantially and/or fisherman are unable to avoid the stock - in this circumstance, better than expected stock conditions may lead to worse than anticipated fishery performance. Minor differences between tables are due to summarizing the data in different categories.

Table 72 – Sector sub-ACLs (mt) for 2010-2013, including LOW and HIGH options

SPECIES	STOCK	2010	2011	2012	2013 - LOW	2013 - HIGH	2013 - LOW, incl. carryover	2013 - HIGH, incl. carryover
American plaice		2,748	3,108	3,223	1,718	1,718	1,890	1,890
Cod	GB East	325	423	445	96	96	96	96
	GB West	2,977	3,878	4,079	1,679	2,737	2,131	3,098
	GOM	4,327	4,825	3,619	657	814	1,018	1,176
Haddock	GB East	11,913	9,065	8,111	3,952	3,952	3,952	3,952
	GB West	28,273	21,515	19,252	22,172	22,172	24,908	24,908
	GOM	799	778	648	186	186	251	251
Halibut		-	-	-	-	-	-	-
Ocean pout		-	-	-	-	-	-	-
Pollock		16,178	13,952	12,530	12,810	12,810	14,063	14,063
Redfish		6,756	7,541	8,291	10,091	10,091	10,920	10,920
White hake		2,505	2,974	3,257	3,818	3,818	4,138	4,138
Windowpane	North	-	-	-	-	-	-	-
	South	-	-	-	-	-	-	-
Winter flounder	GB	1,823	2,007	3,367	3,508	3,508	3,859	3,859
	GOM	133	329	690	690	690	759	759
	SNE/MA	-	-	-	-	-	-	-
Witch flounder		827	1,236	1,426	601	601	744	744
Wolffish		-	-	-	-	-	-	-
Yellowtail flounder	CC/GOM	729	940	1,021	467	467	569	569
	GB	803	1,142	364	220	351	220	351
	SNE	235	524	607	455	455	516	516

Option 2, Scenario 1 (*GOM cod ABC = 1,249mt, GB ytf ABC = 500mt*)

This scenario is based on a GOM cod ABC of 1,249mt and a GB ytf ABC of 500mt, with all other allocations identical for other stocks. Full 10% carryover for authorized stocks is assumed. Under this scenario, gross groundfish revenues are predicted to be just over $58 million and all gross revenues on groundfish trips are predicted to be just over $77.5 million (Table 72). This represents approximately a 30% reduction in gross revenues relative to FY11 and a 20% reduction in revenues relative to predicted FY12 (Table 73). On a home-port state level, Connecticut is expected to have the largest percentage decline (64%) in gross revenue from FY11, followed by New Hampshire with a 42% predicted reduction. Maine is expected to be the least affected by these ACLs. As for major home-ports, Chatham, MA is expected to have the largest percentage decline (65%) in gross revenue and Portland, ME is expected to be the least affected (Table 73). The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the less than 30 foot category experiencing the largest drop in gross revenue compared to FY11 (80% reduction) (Table 74). Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft) predicted to see less than a 20% decline in gross revenues. This result is not surprising since, relative to larger vessels, small vessels have less scalability in terms of landings and have a smaller geographic range. Net revenues, as opposed to gross revenues, are expected to decline much less substantially as lower allocations force fisherman to fish as efficiently as possible (Table 75). The relatively large decline in predicted trip costs (fuel, ice, food, etc.) reflects an anticipated actual reduction, but most likely over-estimates the efficiency gains that will be possible in FY13. For example, predicted trip costs for FY12 are substantially lower than actual costs in FY11 despite a similar number of trips, days absent, etc. This is in large part a function of the optimization component of the QCM, which selects the most profitable trips (often the lowest-cost trips) disproportionately. Similarly, crew-days, days absent and total Sector trips are all predicted to decline substantially relative to FY 2011, as the model predicts only the most efficient trips will occur under such highly restrictive quota allocations (Table 75). This represents fewer earning opportunities for crew members.

Table 73 – Predicted catch and gross revenue by stock from simulation model under Scenario 1 (*100 realizations*)

			Limit	Catch	Utilization	Ex-vsl value
am_plaice	**all**		4,166,981	3,037,007	73%	$4,032,130
cod	**gb_east**		211,642	147,763	70%	$197,328
cod	**gb_west**		4,698,579	3,988,314	85%	$7,983,819
cod	**gom**		2,245,221	2,212,439	99%	$5,229,224
haddock	**gb_east**		8,712,579	1,144,822	13%	$1,755,205
haddock	**gb_west**		54,912,838	2,172,338	4%	$3,638,522
haddock	**gom**		552,914	484,170	88%	$1,021,277
halibut	**all**		114,639	86,039	75%	$174,036
non_gfish	**all**		0	26,392,427	.	$18,950,117
ocean_pout	**all**		434,306	94,127	22%	$0
pollock	**all**		31,003,290	15,024,105	48%	$12,247,536
redfish	**all**		24,074,452	7,089,259	29%	$3,958,968
wh_hake	**all**		8,050,538	5,420,309	67%	$5,888,347
windowpane	**north**		216,051	206,547	96%	$14
windowpane	**south**		224,869	221,272	98%	$202
winter_fl	**gb**		8,507,110	3,411,995	40%	$6,672,491
winter_fl	**gom**		1,673,953	256,207	15%	$512,726
winter_fl	**sne_ma**		742,950	276,280	37%	$19,848
witch_fl	**all**		1,639,341	1,423,200	87%	$2,478,778
wolffish	**all**		136,685	54,935	40%	$0
yt_flounder	**cc_gom**		1,254,638	795,315	63%	$1,015,178
yt_flounder	**gb**		220,460	217,325	99%	$280,701
yt_flounder	**sne**		1,136,912	1,044,047	92%	$1,451,216
		Total:	**154,930,947**	**75,200,241**	**49%**	**$77,507,662**
	Total Groundfish:			**48,807,814**		**$58,653,156**

Table 74 – Predicted groundfish catch and gross revenue by homeport state and port under Scenario 1

	FY 2010	FY 2011	FY 2012 (predicted)		FY 2013 (predicted)		
	Ex-vessel value	Ex-vessel value	*Catch (lbs)*	Ex-vessel value	*Catch (lbs)*	Ex-vessel value	% change FY_11
Connecticut	**$ 35,081**	**$ 46,646**	-	$ -	-	$ -	
Massachusetts	**$ 58,006,800**	**$ 64,605,304**	***37,745,896***	**$ 52,731,815**	***31,067,074***	**$ 39,816,244**	***-38%***
Boston	*$14,251,495*	*$17,458,607*	*9,400,935*	*$12,688,230*	*8,942,389*	*$11,451,032*	*-34%*
Chatham	*$ 2,482,876*	*$ 2,582,201*	*533,255*	*$ 871,214*	*862,133*	*$ 1,231,053*	*-52%*
Gloucester	*$16,224,983*	*$16,807,126*	*12,103,185*	*$15,696,738*	*9,214,330*	*$10,202,252*	*-39%*
New Bedford	*$18,149,740*	*$20,387,478*	*11,020,427*	*$16,061,394*	*9,834,674*	*$13,905,760*	*-32%*
Maine	**$ 14,470,489**	**$ 14,599,316**	***17,064,192***	**$ 17,246,295**	***12,935,991***	**$ 12,804,321**	***-12%***
Portland	*$10,269,562*	*$ 9,683,130*	*12,024,665*	*$10,888,071*	*9,838,967*	*$ 8,981,195*	*-7%*
New Hampshire	**$ 3,347,576**	**$ 4,673,318**	***4,009,801***	**$ 5,245,415**	***2,527,307***	**$ 2,883,624**	***-38%***
New Jersey	**$ 97,897**	**$ 66,667**	-	$ -	-	$ -	
New York	**$ 909,309**	**$ 1,262,452**	***489,937***	**$ 840,959**	***371,338***	**$ 611,607**	***-52%***
Rhode Island	**$ 3,123,923**	**$ 3,144,732**	***648,535***	**$ 1,177,741**	***1,817,849***	**$ 2,307,475**	***-27%***
Point Judith	*$ 2,412,589*	*$ 2,284,227*	*430,807*	*$ 767,716*	*1,515,952*	*$ 1,854,129*	*-19%*
Other Northeast	**$ 511,277**	**$ 365,959**	***102,526***	**$ 161,131**	***72,697***	**$ 127,133**	***-65%***
TOTAL	**$ 80,502,351**	**$ 88,764,394**	***60,062,999***	**$ 77,405,622**	***48,806,337***	**$ 58,566,451**	***-34%***

Table 75 – Predicted groundfish catch and gross revenue by vessel length class under Scenario 1

Length class	FY 2010	FY 2011	FY 2012 (predicted)	FY 2013 (predicted)
<30'	$ 16,485,506	$ 496,779	$ 227,095	$ 22,913
30'to<50'	$ 24,689,727	$ 18,835,175	$ 21,245,400	$ 10,631,192
50'to<75'	$ 39,225,644	$ 28,294,806	$ 25,304,566	$ 18,953,300
75'+	$ 107,682	$ 41,142,431	$ 30,751,684	$ 28,950,139
TOTAL	**$ 80,508,560**	**$ 88,769,191**	**$ 77,528,744**	**$ 58,557,544**

Table 76 – Predicted outcomes under Scenario 1 based on 100 model realizations ($ millions)

		Gross revenue	Gross groundfish revenue	Net revenue	Total variable cost	*Trip cost*	*Quota cost*	*Sector cost*	Crew days	Days Absent	Number trips
	FY 2010	**$ 95.8**	**$ 80.5**	**$ 53.3**	**$ 42.5**	**$ 20.7**	**$ 21.8**		**55,992**	**16,023**	**9,738**
	FY 2011	**$ 109.8**	**$ 109.8**	**$ 88.8**	**$ 53.5**	**$ 56.6**	**$ 29.2**	**unknown**	**65,450**	**18,773**	**11,741**
	FY 2012 (predicted)	**$ 94.5**	**$ 94.5**	**$ 77.5**	**$ 57.0**	**$ 37.7**	**$ 17.1**		**58,125**	**17,563**	**12,536**
FY 2013 (predicted)	MIN	$ 63.2	$ 48.1	$ 39.7	$ 11.6	*$ 23.8*	*$ 10.6*	*$ 1.5*	40,483	11,668	6,679
	MAX	$ 84.1	$ 64.7	$ 51.7	$ 16.6	*$ 32.7*	*$ 14.1*	*$ 2.0*	53,528	15,233	8,020
	MEAN	**$ 77.5**	**$ 58.6**	**$ 47.9**	**$ 15.1**	***$ 29.8***	***$ 12.8***	***$ 1.8***	**49,609**	**14,093**	**7,378**
	STD	$ 3.9	$ 3.0	$ 2.4	$ 0.9	*$ 1.6*	*$ 0.7*	*$ 0.1*	2,465	710	333
	% change FY10	*-19%*	*-27%*	*-10%*	*-64%*	*44%*	*-41%*		*-11%*	*-12%*	*-24%*
	% change FY11	*-29%*	*-34%*	*-10%*	*-73%*	*2%*	*-53%*	*n/a*	*-24%*	*-25%*	*-37%*
	% change FY12(p)	*-18%*	*-24%*	*-16%*	*-60%*	*74%*	*-38%*		*-15%*	*-20%*	*-41%*

Option 2, Scenario 2 (*GOM cod ABC = 1,550mt, GB ytf = 1,150mt*)(Council Preferred Alternative)
This scenario is based on a GOM cod ABC of 1,550mt and a GB ytf ABC of 1,150mt, with all other allocations identical for other stocks. Full 10% carryover for authorized stocks is assumed. Under this scenario, gross groundfish revenues are predicted to be just over $64 million and all gross revenues on groundfish trips are predicted to be just over $84.5 million (Table 76). This represents approximately a 28% reduction in gross revenues relative to FY 2011 and an 18% reduction in revenues relative to predicted FY 2012 (Table 77). On a home-port state level, Connecticut is expected to have the largest percentage decline (60%) in gross revenue from FY 2011, followed by New Hampshire with a 37% predicted reduction. Maine is expected to be the least affected by these ACLs. As for major home-ports, Chatham, MA is expected to have the largest percentage decline (61%) in gross revenue and Portland, ME is expected to be the least affected (Table 77). The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the less than 30 foot category experiencing the largest drop in gross revenue compared to FY 2011 (75% reduction) (Table 78). Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft) predicted to see less than a 16% decline in gross revenues. This result is not surprising since, relative to larger vessels, small vessels have less scalability in terms of landings and have a smaller geographic range. Net revenues, as opposed to gross revenues, are expected to decline much less substantially as lower allocations force fisherman to fish as efficiently as possible (Table 79). The relatively large decline in predicted trip costs (fuel, ice, food, etc.) reflects an anticipated actual reduction, but most likely over-estimates the efficiency gains that will be possible in FY 2013. For example, predicted trip costs for FY 2012 are substantially lower than actual costs in FY 2011 despite a similar number of trips, days absent, etc. This is in large part a function of the optimization component of the QCM, which selects the most profitable trips (often the lowest-cost trips) disproportionately. Similarly, crew-days, days absent and total sector trips are all predicted to decline substantially relative to FY 2011, as the model predicts only the most efficient trips will occur under such highly restrictive quota allocations (Table 79). This represents fewer earning opportunities for crew members.

Table 77 - Predicted catch and gross revenue by stock from simulation model under Scenario 2 (*100 realizations*)

		limit	catch	utilization	ex-vsl value
am_plaice	all	4,166,981	3,266,977	78%	$4,310,439
cod	gb_east	211,642	157,374	74%	$204,951
cod	gb_west	4,698,579	4,276,786	91%	$8,481,758
cod	gom	2,592,591	2,555,886	99%	$6,064,299
haddock	gb_east	8,712,579	1,247,856	14%	$1,907,272
haddock	gb_west	54,912,838	2,611,394	5%	$4,276,574
haddock	gom	552,914	492,920	89%	$1,035,824
halibut	all	114,038	91,754	80%	$181,511
non_gfish	all	0	27,321,206	.	$20,076,153
ocean_pout	all	433,634	94,148	22%	$0
pollock	all	31,003,290	15,726,463	51%	$12,804,245
redfish	all	24,074,452	7,410,777	31%	$4,146,881
wh_hake	all	8,050,538	5,665,542	70%	$6,151,051
windowpane	north	216,714	258,360	119%	$17
windowpane	south	224,710	205,715	92%	$194
winter_fl	gb	8,507,110	3,924,328	46%	$7,709,032
winter_fl	gom	1,673,953	262,644	16%	$524,138
winter_fl	sne_ma	742,950	276,585	37%	$20,168
witch_fl	all	1,639,341	1,529,818	93%	$2,651,999
wolffish	all	136,343	58,809	43%	$0
yt_flounder	cc_gom	1,254,638	932,316	74%	$1,184,261
yt_flounder	gb	774,338	749,541	97%	$994,474
yt_flounder	sne	1,136,912	1,003,257	88%	$1,385,226
	TOTAL	**155,831,085**	**80,120,454**	**51%**	**$84,110,466**
	TOTAL GROUNDFISH		**52,799,248**		**$64,034,313**

Table 78 - Predicted groundfish catch and gross revenue by homeport state and port under Scenario 2

	FY 2010	FY 2011	FY 2012 (predicted)		FY 2013 (predicted)		
	Ex-vessel value	Ex-vessel value	*Catch (lbs)*	Ex-vessel value	*Catch (lbs)*	Ex-vessel value	% change FY11
Connecticut	**$ 35,081**	**$ 46,646**	-	$ -	***14,855***	**$ 17,265**	
Massachusetts	**$ 58,006,800**	**$ 64,605,304**	***37,745,896***	**$ 52,731,815**	***34,006,776***	**$ 44,034,809**	***-32%***
Boston	*$14,251,495*	*$17,458,607*	*9,400,935*	*$12,688,230*	*9,577,484*	*$12,280,124*	*-30%*
Chatham	*$ 2,482,876*	*$ 2,582,201*	*533,255*	*$ 871,214*	*732,808*	*$ 1,080,915*	*-58%*
Gloucester	*$16,224,983*	*$16,807,126*	*12,103,185*	*$15,696,738*	*9,675,167*	*$10,823,327*	*-36%*
New Bedford	*$18,149,740*	*$20,387,478*	*11,020,427*	*$16,061,394*	*11,433,084*	*$16,223,497*	*-20%*
Maine	**$ 14,470,489**	**$ 14,599,316**	***17,064,192***	**$ 17,246,295**	***13,593,139***	**$ 13,398,801**	***-8%***
Portland	*$10,269,562*	*$ 9,683,130*	*12,024,665*	*$10,888,071*	*10,371,142*	*$ 9,429,024*	*-3%*
New Hampshire	**$ 3,347,576**	**$ 4,673,318**	***4,009,801***	**$ 5,245,415**	***2,724,814***	**$ 3,174,342**	***-32%***
New Jersey	**$ 97,897**	**$ 66,667**	-	$ -	-	$ -	
New York	**$ 909,309**	**$ 1,262,452**	***489,937***	**$ 840,959**	***443,006***	**$ 715,857**	***-43%***
Rhode Island	**$ 3,123,923**	**$ 3,144,732**	***648,535***	**$ 1,177,741**	***1,944,524***	**$ 2,578,325**	***-18%***
Point Judith	*$ 2,412,589*	*$ 2,284,227*	*430,807*	*$ 767,716*	*1,552,275*	*$ 1,968,547*	*-14%*
Other Northeast	**$ 511,277**	**$ 365,959**	***102,526***	**$ 161,131**	***70,662***	**$ 120,975**	***-67%***
TOTAL	**$ 80,502,351**	**$ 88,764,394**	***60,062,999***	**$ 77,405,622**	***52,797,776***	**$ 64,040,375**	***-28%***

Table 79 - Predicted groundfish catch and gross revenue by vessel length class under Scenario 2

Length class	FY 2010	FY 2011	FY 2012 (predicted)	FY 2013 (predicted)
<30'	$ 16,485,506	$ 496,779	$ 227,095	$ 26,943
30'to<50'	$ 24,689,727	$ 18,835,175	$ 21,245,400	$ 11,076,572
50'to<75'	$ 39,225,644	$ 28,294,806	$ 25,304,566	$ 20,505,866
75'+	$ 107,682	$ 41,142,431	$ 30,751,684	$ 32,424,932
TOTAL	**$ 80,508,560**	**$ 88,769,191**	**$ 77,528,744**	**$ 64,034,313**

Table 80- Predicted outcomes under Scenario 2 based on 100 model realizations ($ millions)

		Gross revenue	Gross groundfish revenue	Net revenue	Variable cost	Trip cost	Quota cost	*Sector cost*	Crew days	Days Absent	Number trips
	FY 2010	**$ 95.8**	**$ 80.5**	**$ 53.3**	**$ 42.5**	**$ 20.7**	**$ 21.8**		**55,992**	**16,023**	**9,738**
	FY 2011	**$ 109.8**	**$ 109.8**	**$ 88.8**	**$ 53.5**	**$ 56.6**	**$ 29.2**		**65,450**	**65,450**	**18,773**
	FY 2012 (predicted)	**$ 94.5**	**$ 94.5**	**$ 77.5**	**$ 57.0**	**$ 37.7**	**$ 17.1**		**58,125**	**58,125**	**17,563**
FY 2013 (predicted)	MIN	$ 74.7	$ 56.4	$ 45.1	$ 14.9	$ 29.3	$ 12.7	$ 1.7	47,405	13,450	6,992
FY 2013 (predicted)	MAX	$ 91.4	$ 68.5	$ 55.7	$ 18.6	$ 35.9	$ 15.3	$ 2.1	57,954	16,336	8,372
FY 2013 (predicted)	**MEAN**	**$ 84.1**	**$ 64.0**	**$ 51.3**	**$ 16.8**	**$ 33.0**	**$ 14.2**	**$ 1.9**	**54,022**	**15,228**	**7,766**
FY 2013 (predicted)	STD	$ 3.3	$ 2.5	$ 2.0	$ 0.8	$ 1.3	$ 0.5	$ 0.1	1,982	553	285
	% change FY10	*-12%*	*-20%*	*-4%*	*-60%*	*59%*	*-35%*		*-4%*	*-5%*	*-20%*
	% change FY11	*-23%*	*-28%*	*-4%*	*-70%*	*13%*	*-48%*	*N/A*	*-17%*	*-19%*	*-34%*
	% change FY12(p)	*-11%*	*-17%*	*-10%*	*-55%*	*93%*	*-31%*		*-7%*	*-13%*	*-38%*

Option 2, Scenario 3(*GOM cod ABC = 1,550mt, GB ytf = 500mt, White hake= 4,177 mt*) (NMFS Preferred)

If the NMFS Preferred option is selected, just over one million lbs of additional white hake would be allocated to Sectors. The economic benefits of this additional quota are uncertain, though it is clear that in the short term additional quota is at worst neutral in terms of gross revenues and, at best, may provide additional opportunities to target white hake.

QCM results imply that between 65 and 70% of the white hake quota could be caught in FY 2013 due to restrictive allocations of other stocks, particularly GOM cod, limiting the ability of fisherman to target white hake. The QCM was used to compare a base case white hake Sector sub-ACL to NMFS Preferred sub-ACL and the results showed a slight gross revenue increase of about $400K under NMFS Preferred sub-ACL. This represents less than 1% of the total base case gross revenues. For clarity, the base case contains the Council preferred white hake sub-ACL of 8,050,538 lb, the Council and NMFS preferred GOM cod sub-ACL of 2,592,591 lb, and the NMFS preferred GB yellowtail flounder sub-ACL of 1,102,311 lb. The base case and NMFS preferred white hake sub-ACL scenarios contain 10 percent unused sector ACE carryover for eligible stocks except GOM cod. The carryover for GOM cod is 1.85 percent of the FY 2012 sector ACE in both scenarios.

Realized gross revenues may be higher than those indicated by the QCM if vessels are able to more selectively target white hake than they have in the past. Trips targeting white hake (defined here as those trips landing more than 30% of their catch as white hake) have caught between 1.2 and 2.1 pounds of white hake for every pound of GOM cod caught, on average, for FY's 2010, 2011 and the first six months of FY 2012. The ratio of Sector sub-ACL's for white hake and GOM cod under NMFS Preferred option is 4.7 lb of white hake for every pound of GOM cod. For the two and a half years since the start of the sector program, over half of all trips catching more than 1,000 lbs of white hake have achieved white hake: GOM cod ratios at or higher than 4.7. This implies that under then-contemporary stock conditions it was possible to target white hake with sufficient efficiency to capture a higher percentage of NMFS Preferred white hake sub-ACL than the QCM may show, but only if the conditions enabling those trips are replicable in FY2013.

The upper bound gross revenue increase attributable to NMFS' Preferred option would be represented by the additional quota multiplied by the dockside price for white hake. Using the mean FY 2011 price of $1.02/pound, this implies an upper bound gross revenue increase of $1.1 million dollars (1,080,789 lbs * $1.02). The QCM, which takes into account the ability to catch stocks of fish under constraints imposed by the joint catch of other stocks, predicts approximately a $400K gross revenue increase relative to the base case. The lower bound estimate would, of course, be zero dollars.

Table 81 - Predicted gross revenue by stock from simulation model under Scenario 3

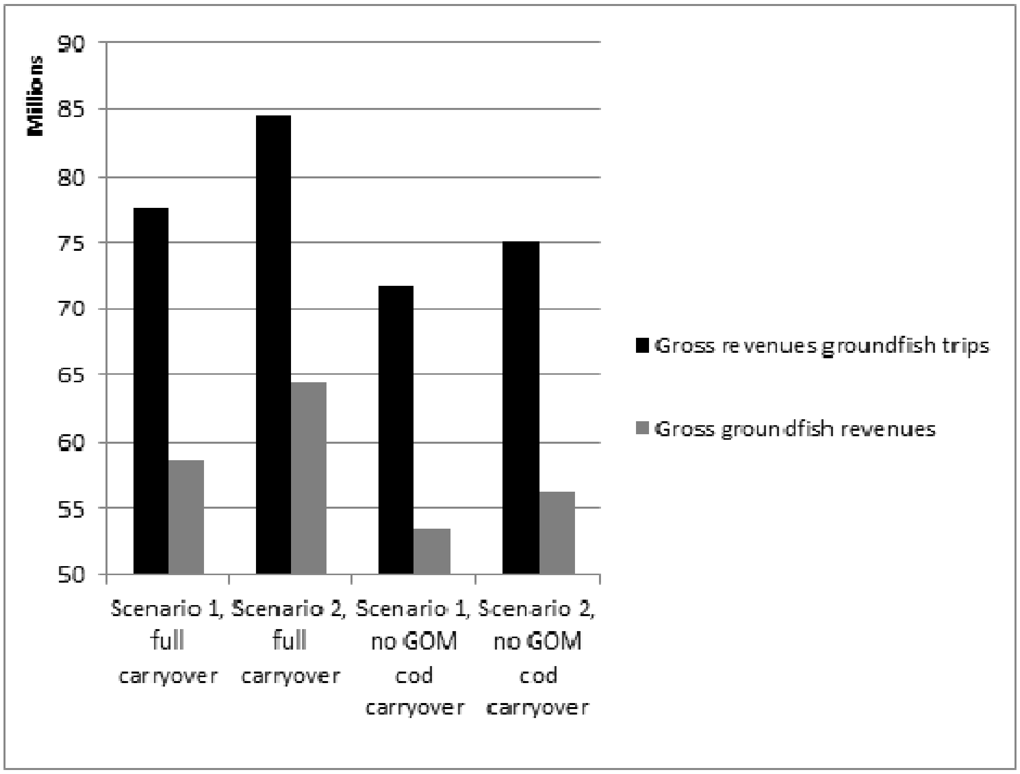
Species	Stock	Base case	NMFS preferred
am_plaice	all	$3,980,222	$4,002,863
cod	gb_east	$154,960	$156,289
cod	gb_west	$7,352,916	$7,443,012
cod	gom	$4,614,814	$4,612,879
haddock	gb_east	$1,649,960	$1,660,148
haddock	gb_west	$3,484,192	$3,528,126
haddock	gom	$938,930	$943,917
halibut	all	$166,342	$168,074
non_gfish	all	$17,996,127	$18,096,205
ocean_pout	all	$0	$0
pollock	all	$11,669,883	$11,678,540
redfish	all	$3,876,735	$3,894,390
wh_hake	all	$5,849,026	$5,836,294
windowpane	north	$14	$15
windowpane	south	$175	$180
winter_fl	gb	$6,506,163	$6,585,515
winter_fl	gom	$501,630	$498,945
winter_fl	sne_ma	$17,230	$17,632
witch_fl	all	$2,398,063	$2,411,872
wolffish	all	$0	$0
yt_flounder	cc_gom	$998,701	$1,003,207
yt_flounder	gb	$286,350	$285,910
yt_flounder	sne	$1,133,487	$1,150,351
	TOTAL	**$73,575,923**	**73,974,366**
	Difference		**$398,443 (0.54%)**

***Carry-over from FY 2012*[9]**

Sector management rules allow sectors to carry-over up to 10 percent of the initial allocation from one year into the next. This effectively increases the amount of catch that a sector could take in the second year. All catch and revenue estimates presented in the preceding sections are based on Sectors being able to utilize their carryover. However, as previously indicated, NMFS intends to reduce the available carryover from 10 to 1.85 percent of a sector's FY 2012 ACE. As an exercise, the QCM was run with full carryover allowed for all authorized stocks except GOM cod. The results show that under both scenarios, eliminating carry-over for GOM cod reduces predicted gross revenues by approximately $4 million for Scenario 1 or $2.5 million for Scenario 2.

[9] This section has been modified by NMFS since the Council submitted FW50 on March 22, 2013. The revision, which is underlined, reflects the Secretarial emergency action to reduce the maximum GOM cod carryover available to sectors to 1.85 percent of a sector's unused ACE from FY 2012 to FY 2013..

Figure 44 – Predicted gross revenues with full authorized carryover, and with full carryover less GOM cod



Impacts on Recreational Fishing Activity

Recreational fishermen target GOM haddock, GOM cod, pollock, and GOM winter flounder, with GOM cod and GOM haddock a particularly important part of the catch (see Amendment 16 for a description of the recreational fishery in the GOM). As shown in Section 6.5.1, there have been recent declines in recreational groundfish fishing activity. These declines are likely to continue given the low allocations for GOM cod and GOM haddock for FY 2013.

The Preferred Alternative would directly affect recreational anglers and have an indirect impact on charter/party operators through a potential change in passenger demand for charter/party fishing trips. While the exact measures that will be in place are unclear, the reductions in ACLs are likely to lead to a reduction in recreational fishing trips. Based on unpublished data, the measures needed to restrict recreational fishery removals to the GOM haddock ACL are likely to result in about 137,000 angler trips (Scott Steinback, pers. comm.). This would be a reduction of about 40 percent from the number of angler trips in FY 2011.

Since Option 1/No Action does not specify an ABC or ACL for GOM cod and GOM haddock, and this would stop all recreational fishing activity, Option 2 will provide more economic benefits to this component of the fishery. However, the reductions from FY 2012 ABCs/ACLs will likely lead to reduced revenues for these vessels.

Impacts on Scallop Fishing

The distribution of ACLs that is included in this option adopts allocations to the Atlantic sea scallop fishery for GB yellowtail flounder, SNE/MA yellowtail flounder, and SNE/MAB windowpane flounder. FW 48 considered several alternatives for these allocations, and that document analyzed the impacts of the different alternatives. FW 48 is currently under review. The following summary repeats the information from that document that applies to the specific allocations that are based on the FW 48 Preferred Alternatives. Option 1/No Action does not identify sea scallop sub-ACLs, because they have not been specified beyond FY 2012. In all cases, there are no management measures that would restrict scallop fishing activity in FY 2013 in the absence of a groundfish sub-ACL. It is unclear, however, how catches of those stocks in FY 2013 would be considered when determining whether AMs would be implemented in subsequent years. For this reason it is difficult compare Option 2 to Option 1/No Action.

FW 48 would establish a fixed percentage of the GB yellowtail flounder ABC that would be allocated to the scallop fishery. The percentage would be defined as 40 percent of the U.S. ABC in FY 2013, and 16 percent in subsequent years (FY 2014 and beyond). The 40 percent of U.S. ABC is equal to the medium estimate for yellowtail bycatch in the scallop fishery (85.3 mt), assuming the U.S. ABC would equal to 215 mt. The preferred alternative, however, adopts a U.S. ABC of 495 mt and the scallop sub-ACL that results would be 191.2 mt. This is more than double the medium estimate for scallop fishery catches in FY 2013 and the risks of exceeding the yellowtail sub-ACL for the scallop fishery in 2013 would be expected to be minor. Indeed, this value is 39 mt higher than the highest estimate of scallop fishery catches, or 152.8 mt.

Should the sub-ACL be exceeded, under the worst case AM scenario (no 2014 CAII trips), the estimated scallop revenue impact would be $16.2 million in 2014, assuming that this area was allocated the same number of trips if preferred alternative (Alt 2) was implemented in 2014 as well (109 FT limited access trips at 13,000 pounds per trip). Framework 24 is a one year action and the next framework may revise the open area DAS and access area trip allocations. However, these amounts represent the potential loss under the worst case scenario of a total CAII closure in 2014, since without such an AM trigger, the vessels would optimally be given the opportunity to fish in that area (if the resource conditions were similar to what is predicted at this point in time).

If the yellowtail sub-ACL was exceeded by less than 56%, however, CAII would still be open to fishing during some months depending on the overage amount. However, shifting landings to the other seasons would reduce the flexibility for vessel owners to choose where and when to fish with a possible increase in fishing costs. On the other hand, shifting effort to other seasons when the meat weights are highest (i.e. May and June) could possibly increase long-term landings and revenues to some extent, offsetting some of the negative effects of the effort shifts.

With respect to SNE./MA yellowtail flounder, this action proposes to allocate 90 percent of the high estimate of scallop fishery catches of this stock in each of the next three years, or 61 to 66 mt. This makes it less likely that the scallop fishery will exceed its ACL and be subject to AMs in subsequent years.

For SNE/MAB windowpane flounder, this preferred alternative allocates 36 percent of the ABC to the scallop fishery, based on the Preferred Alternative in FW 48. At present, there are no AMs that apply to this stock so this will not have any impacts on the scallop fishery. When AMs are developed in the next scallop action, however, the existence of this sub-ACL may constrain scallop fishing activity should the sub-ACL be exceeded.

7.4.3 Commercial and Recreational Fishery Measures

7.4.3.1 SNE/MA Winter Flounder Landing Restrictions

7.4.3.1.1 Option 1: No Action

This option would continue the prohibition on landing SNE/MA winter flounder. When compared to Option 2, this option would result in reduced fishing vessel revenues. Assuming the entire expected allocation of SNE/MA winter flounder to sectors and the common pool is landed, and an average ex-vessel price of $2.03 per pound, this option would be expected to result in a reduction in revenues of $5.4 million when compared to Option 2. This does not take into account that revenues of other stocks may be reduced as well since there may be fewer groundfish fishing trips as a result of the inability to land SNE/MA winter flounder.

7.4.3.1.2 Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

This option would result in an additional $5.4 million of groundfish ex-vessel revenues when compared to Option 1/No Action. This is based on the ACL that is the preferred alternative in Section 4.2.1. Most - $4.3 million – would be expected to accrue to sector vessels, while the remainder would accrue to common pool vessels. It is not possible to include this change in the QCM used to analyze the economic impacts of the revised ABCs/ACLs. The QCM uses recent fishing activity to create a simulation model, and because landing of this stock has been prohibited, there are not enough trips in the data to characterize future fishing activity.

7.4.3.2 Commercial Fishery Accountability Measures

7.4.3.2.1 Option 1: No Action

Option 1 would retain the current commercial fishery AMs for SNE/MA winter flounder as defined in Amendment 16 and modified by subsequent management actions. The current AM prohibits landing of this stock, but FW 48 submitted a preferred alternative that would eliminate this AM and adopt area-based restrictions if the ACL is exceeded.

The No Action AM - prohibition on landing – prevents any direct economic benefit from catching SNE/MA winter flounder. Unlike most AMs which are only triggered if an ACL is exceeded, this AM is always in place as a pro-active measure. While it has resulted in a low fishing mortality rate, any direct economic benefits will not be realized until the future and only if the AM is eliminated. When compared to Option 2, this AM would result in reduced economic benefits because landing is not allowed. A rough approximation of the lost revenues is $5.4 million, the amount of revenue generated from landing SNE/MA winter flounder if possession is allowed (Section 7.4.2.1.2).

Should the change in the AM that is included in FW 48 be adopted prior to the implementation of this action, then there would be no difference between the economic impacts of Option 1/No Action and Option 2 for common pool vessels because the AM would be the same. For sector vessels, the economic impacts would depend on whether landing of SNE/MA winter flounder is allowed or not, which is a different measure. If landing is not allowed, then the area-based AM would be applied to sectors and may result in reduced fishing opportunities for other stocks if the ACL is exceeded but would not close an entire stock area as would be the case in this situation if Option 2 would be adopted. As a result, the economic impacts of Option 1/No Action in this scenario would be less than Option 2, but cannot be readily quantified.

7.4.3.2.2 Option 2: Revised Accountability Measures SNE/MA Winter Flounder (Preferred Alternative)

This option would apply sector rules to sector catches of SNE/MA winter flounder, replacing the prohibition on landing. It would only be adopted if landing was allowed (see Section 7.4.2.1.2). This AM would allow economic benefits to accrue to the fishery from these catches, but if sectors approach their ACE they must stop fishing in the entire SNE/MA winter flounder stock area. Since this area extends north along the eastern side of Cape Cod, if sectors cannot constrain catches below the ACE then this AM could result in reduced catches of other stocks such as SNE/MAS yellowtail flounder. This would only occur if the AM is triggered. When compared to the no possession AM that is currently in place (Option 1/No Action), this AM would provide opportunities for revenues from SNE/MA winter flounder. If the area-based AM is adopted prior to implementation, this AM would again allow for increased revenues but may also lead to a closure of the area if fishing vessels cannot and sectors cannot manage their catches, reducing revenues from other stocks. This is not believed likely to occur, as the decision to allow landing hinges on a sufficiently large ACL to provide sectors a reasonable opportunity to manage their catches.

For common pool vessels, this AM would adopt the area-based AM that was included in FW 48. This AM will have less economic impact on common–pool vessels than the ban on possession because it may allow them to land approximately $1.1 million dollars of SNE/MA winter flounder.

7.4.3.3 Recreational Management Measures

GOM haddock and cod are often caught together, so changes in regulations for either species could have an impact on landings of both species. The simulation model used to assess the effectiveness of measures incorporates this joint-catchability with status quo GOM cod measures in place for FY2013. Estimated losses in direct sales were estimated by multiplying the projected declines in recreational fishing trips by for-hire and private boat anglers by the average trip expenditure estimates from the 2011 expenditure survey. The loss in sales due to a decline in angler expenditures is $1.66 million for for-hire anglers and $509.8 thousand for private boat anglers. Thus, the total loss in direct sales associated with an increase in the haddock minimum size limit to 21 inches in FY2013 is estimated to be $2.17 million. Additional losses in sales could accrue to indirectly affected businesses. Although the magnitude of the indirect losses are uncertain, typical indirect sales multipliers range from 1.5 - 2.0. This means that total direct and indirect sales losses from the proposed action could approach $3.26 - $4.34 million in FY2013.

7.5 Social Impacts

7.5.1 Introduction

The consideration of the social impacts of the changes made in this framework is required pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976. NEPA requires that before any agency of the federal government may take “actions significantly affecting the quality of the human environment,” that agency must prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that includes the integrated use of the social sciences (NEPA Section 102(2)(C)). Social science analysis is required by multiple sections of the MSA. Section 303(b)(6) on limited entry requires examination of "(A) present participation in the fishery, (B) historical fishing practices in, and dependence on, the fishery, (C) the economics of the fishery, (D) the capability of fishing vessels used in the fishery to engage in other fisheries, (E) the cultural and social framework relevant to the fishery and any affected fishing communities, and (F) any other relevant considerations." Section 303A provides guidelines for implementing social and economic components of Limited Access Privilege Programs (LAPPs). Section 303(a)(9) on preparation of Fishery Impact Statements notes they "shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on--(A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants." National Standard 8 stipulates that “conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities” (16 U.S.C. § 1851 *et seq*.). A fishing community is then defined as being “substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community” (16 U.S.C. § 1802 (17)).

The need to measure, understand and mitigate the social impacts of fisheries policy is an essential part of the management process. Managers have an obligation to consider how policy changes affect the human context of the fishery, including the direct and indirect impacts on the safety, wellbeing, quality of life, fishery dependence, culture and social structure of communities. These impacts can be felt at the individual, family and community level which can make measuring and considering them difficult as the impact variables are typically differentially distributed. There is general consensus however, as to the types of impact to be considered; the section of the human environment where the impacts may be felt; likely social impacts; and the steps to enhance positive impacts while mitigating negative ones (ICPGSIA, 2003).

Broadly defined, social impacts that need to be considered are the "social and cultural consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society" (Burdge and Vanclay 1995). Identifying possible social impact variables is a topic of much debate but the development of standard definitions for a set of the most common and consequential social impacts are underway. The current National Marine Fisheries Service "Guidelines for Social Impact Assessment," provides some assistance in defining relevant social factors/variables. It is suggested that the following five social factors/variables should be considered when comparing the preferred management alternative to the alternatives not selected:

1. The *Size and Demographic Characteristics* of the fishery-related work force residing in the area; these determine demographic, income, and employment effects in relation to the work force as a whole, by community and region.
2. The *Attitudes, Beliefs and Values* of fishermen, fishery-related workers, other stakeholders and their communities; these are central to understanding behavior of fishermen on the fishing grounds and in their communities.
3. The effects of proposed actions on *Social Structure and Organization*; that is, changes in the fishery's ability to provide necessary social support and services to families and communities.
4. The *Non-Economic Social Aspects* of the proposed action or policy; these include life-style issues, health and safety issues, and the non-consumptive and recreational uses of living marine resources and their habitats.
5. The *Historical Dependence on and Participation* in the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution and rights. (NMFS, 2007)

Longitudinal data describing these social factors region-wide and in comparable terms is limited, though the new surveys currently being implemented will begin to alleviate this. For this framework the "guidelines" document provides a range of variables to consider when predicting potential social impacts. It should also be noted that the academic literature on the subject has provided multiple lists of potential social variables, but it also cautions that such lists should not be considered "exhaustive" or "a checklist" (ICGPSIA, 1994; Vanclay, 2002; Burdge, 2004). Ultimately judgment must be used in choosing which variables are salient in any particular case.

Social factors specific to the Northeast (NE) Multispecies fishery and used in the SIA of Amendment 13 to the FMP were previously developed using a participatory process during a series of ten "social impact informational meetings." Based on comments provided by local stakeholders during these meetings five social impact factors were developed to describe the level of impact felt by fishing communities and families because of management changes: 1) regulatory discarding; 2) safety; 3) disruption in daily living; 4) changes in occupational opportunities and community infrastructure; and 5) formation of attitudes. These factors, while broad, overlap with those variables suggested by NMFS guidelines and have the added benefit of reflecting specific concerns of fishermen in the multispecies fishery.

In the preparation of this document, qualitative and quantitative methods have been used to assess the relative impact of the proposed management measures. Ports most closely involved with the multispecies fishery, and likely to be affected by the proposed measure, have been identified previously during the Amendment 13 social impact informational meetings, as well as more recently with the sector year end reports. While some management measures tend to produce certain types of social impacts it is not always possible to predict precise effects when there are multiple overlaying management measures such as in this proposed action. Also changes to the human environment often occur in small, incremental amounts and the character of a particular impact can be hidden by the gradual nature with which it occurs. Such impacts will be noted where they are possible to discern or where the potential for cumulative impacts seems likely. Therefore the discussion of social impacts for alternatives will indicate the likely directional impacts of specific measures e.g., positive, negative, or neutral.

7.5.2 Formal Rebuilding Programs and Annual Catch Limits

7.5.2.1 SNE/MA Winter Flounder Rebuilding Strategy

7.5.2.1.1 Option 1: No Action

Adopting Option 1, the No Action alternative, would retain the target rebuilding end date of 2014 for SNE/MA winter flounder. Given the current status of the stock it is unlikely that SNE/MA winter flounder will be rebuilt by 2014. Therefore the management objective under Option 1 will be to reduce fishing mortality to as close to zero as possible in an attempt to hasten rebuilding of the stock.

Social impacts associated with adopting Option 1 will depend largely on the management measures used to regulate fishing mortality and rebuild the SNE/MA winter flounder stock (see section 4.2.1). However, retaining the target rebuilding year of 2014 under Option 1 of this alternative would preclude many of the management options that might allow limited harvesting, in favor of the one measure most likely to offer the quickest rebuilding of the stock. Because Option 1 would dictate the necessary management measures to speed the rebuilding of the SNE/MA winter flounder stock, it could have a small negative social impact on the *Attitudes, Beliefs and Values* of the fishermen regarding management. To many vessel owners and operators in the NE Groundfish fishery, the rules that limit fishing are thought of as inflexible and as being based on poorly understood science (Acheson & Gardner, 2011). Option 1 could perpetuate this negative view of management and government when it comes to the flexibility of rebuilding targets.

7.5.2.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

If Option 2 of the alternative is adopted, a revised rebuilding strategy would be implemented for the SNE/MA winter flounder stock with a target rebuilding year of 2023. By delaying the target rebuilding year this option could allow for some level of fishing effort to be directed on the SNE/MA winter flounder stock. Like Option 1/No Action, the most apparent social impacts related to this option will be dependent on the management measures used to regulate fishing mortality and rebuild the SNE/MA winter flounder stock. However, there may also be a small positive social impact to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of management because Option 2 would not require the most rapid stock rebuilding measures.

7.5.2.2 Annual Catch Limit Specifications

7.5.2.2.1 Option 1: No Action

Adopting Option 1, the No Action alternative, would maintain the specifications for FY 2013 – FY 2014 adopted by FW 47. For a number of stocks there would be no specifications for these years. There would be no allocations made for the US/CA Resource Sharing Understanding quotas for FY 2013 and there would also be no specific allocations to the scallop fishery beyond FY 2012.

If Option 1 is adopted it will have a large negative social impact on the individuals and communities involved with the groundfish fishery. Because the groundfish ACLs for FY 2013 will be zero for most stocks, sectors will not be able to fish in most or all stock areas, which would essentially preclude all fishing for groundfish. With such a severe limitation on fishing opportunity, many fishermen may leave the fishery entirely or at least seek temporary opportunities in another fishery. Both possibilities would cause a change in the *Size and Demographics* of the groundfish fishery by reducing the number of vessels and fishermen involved. There is already a perception among many fishermen that there is a diminishing return on investment in the groundfish fishery that makes it hard to earn a living from fishing. In a 2010 telephone survey of multispecies permit holders 62% indicated that based on their fishing income at the time they could only remain in business for 1-2 years (Holland et. al. 2010). Option 1, would further limit the income potential of many groundfish fishermen, forcing some to leave the fishery.

For those fishermen that remain in the fishery there may be an incentive to adopt risky behavior such as deferring boat maintenance and replacement in an attempt to make ends meet (Lord, 2011). Other impacts to the *Life-style/Non-Economic Social Aspects* of the fishery could include reduced job satisfaction caused by the restrictions on catches and uncertainty about the future. Option 1 would also cause distrust in management because the lack of specifications and allocations would be seen as a failure on the part of management which would have a negative impact on the formation of *Attitudes and Beliefs*.

7.5.2.2.2 Option 2: Revised Annual Catch Limit Specifications (Preferred Alternative)

If Option 2 is adopted the specifications for FY 2013 through FY 2015 would be as specified in Table 8 (Section 4.1.2.2). Option 2 would adopt specifications for the U.S./CA Resource Sharing Understanding quotas and would also provide specific allocations to the scallop fishery for FY 2013. The social impacts of adopting Option 2, while negative, are much less severe than those caused by Option 1, the no action alternative.

Although, the adoption of the ACL specifications in Option 2 are less severe compared to the No Action alternative, they would still represent substantial reductions to the catch limits for many key species. Compared to the catch limits specified in previous frameworks for the years immediately prior to 2013, the reduction in catch limits specified under Option 2 would be expected to have some large negative social impacts. In an attempt to avoid quota limited stocks with low annual catch limits, vessel operators in the groundfish fishery would be forced to modify where and how they fish having a negative impact on the *Historic and Present Participation* in the fishery. These reduced catch limits set by Option 2, would also have a negative social impact on the *Size and Demographics* of the groundfish fishery because of a probable reduction in fishing opportunity, revenue and employment.

Another potential social impact, that is important to consider, is how the annual catch limit specifications proposed in Option 2 will affect the formation of *Attitudes and Beliefs* among fishermen, with regard to the science and management of the fishery. Acheson (2010) points out that groundfish fishermen in New England have an inherently different view of the ocean and its fisheries, than the views held by federal ocean/fisheries scientists. A fisherman's view is based largely on personal experience and their own proximal environment, which can be at odds with the larger environment described by fisheries scientists. It is in part because these differing views cannot always be reconciled that fishermen's opinion of federal fisheries science is so low in New England (Acheson, 2010; Acheson & Gardner, 2011; Holland et. al. 2010). Furthermore, fishermen tend to identify fishing effort as only one factor affecting the size of stocks, and that it may not be the most important one. Management controlling fishing pressure, as in the revised annual catch limit specifications set by Option 2, may not be perceived to be the most effective control of fish stocks size (Acheson, 2011). The reductions in catch limits included in Option 2, which are based on science that many NE fishermen consider flawed, could further erode the faith fishermen have in the quality of federal science. This continued lack of faith in the science used to direct management decisions could undermine the perceived legitimacy of future management actions and have a negative social impact on the formation of *Attitudes and Beliefs* about management.

U.S./Canada TACs

The U.S./Canada TACs for EGB cod, EGB Haddock and EGB yellowtail, specified under Option 2 of this measure are described in Table 4 (Section 4.1.2.1). The Council is considering two alternatives for EGB yellowtail flounder; the TMGC recommendation of 500 mt TAC for 2013, or an 1150 mt ABC to be considered in combination with a bycatch only fishery. A comparison of the proposed FY 2013 U.S. TACs and the FY 2012 U.S. TACs shown in Table 5 (Section 4.1.2.2) shows the percent change in U.S. allocations between the two years. For two of the three stocks the 2013 U.S. allocations will be substantially less than the allocations in 2012; the exception being the preferred alternative for GB yellowtail flounder..

If the U.S./Canada TACs specified under Option 2 are adopted it is expected that there would be some negative social impacts. Compared to Option 1 the No Action alternative, Option 2 would also have a negative impact on the *Size and Demographics* of the groundfish fishery but this impact would be less severe. The U.S. TACs for EGB cod, EGB haddock, and EGB yellowtail flounder, would be reduced by 41%, 43% and 62%/12% respectively under Option 2 which would reduce fishing opportunity in the Eastern Georges Bank stock area. The limitations imposed by the lowered TACs in the EGB could force fishermen to move to alternative fishing grounds or in some cases relocate their vessels to a different port as they adjust their fishing practices (Tuler et. al. 2008). Vessel operators, families and communities that are particularly reliant on the groundfish fishing opportunities in EGB will suffer the greatest social impacts.

Scallop Fishery Sub-ACLs

The scallop fishery sub-ACLs for GB yellowtail flounder, SNE/MA yellowtail flounder and possibly SNE/MA windowpane flounder, allocated under Option 2 of this measure are described in Table 6, Table 7 and Table 8 (Section 4.1.2.2). The specific allocations for yellowtail and windowpane flounder will be dependent on the method of specification adopted for yellowtail and whether a windowpane sub-ACL is established in this framework. The scallop fishery sub-ACLs allocated under Option 2 of this measure may cause a range of social impacts, differentially distributed, on the multispecies and scallop fleets.

Communities and individuals that have a greater dependence on the scallop fishery, compared to the multispecies fishery, may experience some small but negative social impacts associated with Option 2 of this measure. Scallop specific, sub-ACLs and AMs could be seen as overly restrictive and may affect the *Historic and Present Participation* negatively by changing the way people fish to avoid triggering an AM. Table 6 (Section 4.1.2.2) shows that of the possible Scallop FW 24 management alternatives and the estimated GB yellowtail flounder catch, most alternatives would be expected to exceed a GB yellowtail sub-ACL based on 16 percent of the GB YTF ABC. Only alternative 4 would be expected to catch less than the GB YTF sub-ACL, and only if the sub-ACL is based on the ABC for a yellowtail flounder bycatch only fishery. All of the GB YTF sub-ACLs being considered in this action would be considered restrictive and most would be considered unattainable.

Table 7 (Section 4.1.2.2) shows the possible Scallop FW 24 management alternatives and the estimated SNE/MA yellowtail flounder catch. The council must select an allocation for the scallop fishery but a SNE/MA yellowtail flounder sub-ACL based on 90 percent of the estimated catch would be seen as moderately restrictive by the scallop fishery and may affect the *Historic and Present Participation* negatively. The new SNE/MA windowpane flounder sub-ACL specific to the scallop fishery shown in Table 8 (Section 4.1.2.2) is a redistribution of the "other sub-component" sub-ACL that is no more restrictive than in previous years. It is unlikely that a new SNE/MA windowpane flounder sub-ACL specific to the scallop fishery set at a level commensurate with historic catches would cause any substantial changes in fishing behavior or social impacts. If a scallop specific AM is triggered due to any scallop sub-ACL overage, the *Size and Demographics* of the scallop fishery could be negatively affected as the AM could limit future fishing opportunity.

Compared to Option 1/No Action alternative, it is likely that Option 2 will provide some positive social benefits for individuals and communities involved in the multispecies fishery. The allocation of scallop specific sub-ACLs will have a positive influence on the *Attitudes and Beliefs* among groundfish fishermen because the distribution of both fishing rights and responsibility will be seen as more equitable. Compared to Option 1, the No Action alternative, the scallop specific sub-ACLs in Option 2 would provide some measure of security to the multispecies fishery that each total ACL would be less likely to be exceeded, or at least that the AM associated with the scallop sub-ACLs provides some deterrent. The additional perceived security provided by the scallop sub-ACL and the associated AM could reduce uncertainty in an individual's future planning of fishery operations which would have a positive effect on the *Life-style/Non-economic social aspects* of the fishery. Option 2 could exacerbate existing conflict between the scallop and groundfish fisheries over the issue of the scallop fisheries' groundfish takes, negatively affecting the *Social Structures and Organizations* of a community.

7.5.3 Commercial and Recreational Fishery Measures

7.5.3.1 SNE/MA Winter Flounder Landing Restrictions

7.5.3.1.1 Option 1: No Action

If Option 1, the No Action alternative is adopted the landing of SNE/MA winter flounder would continue to be prohibited to groundfish fishing vessels. In an attempt to discourage the targeting of SNE/MA winter flounder and hasten the rebuilding of the stock, current management prohibits the retention of all SNE/MA winter flounder caught by groundfish fishing vessels. Option 1 of this alternative would uphold this prohibition and it would likely cause a continuation of the practice of regulatory discarding which has a negative social impact on the fishery. Identified during the social impact informational meetings, prior to Amendment 13, regulatory discarding is a multidimensional social issue that has both a direct and an indirect impact on fishermen and their families. Regulatory discarding of marketable fish causes a loss of potential revenue which can have a negative effect on the *Size and Demographic Characteristics* of the fishery. It can also cause a demoralizing sense of waste among those forced to discard marketable fish, impacting the *Non-Economic Social Aspects* of the fishery. In this particular case, these social impacts would be expected to remain localized to the states and communities with vessels operating in the SNE/MA winter flounder stock area.

7.5.3.1.2 Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

Adopting Option 2 of this alternative would allow the landing of SNE/MA winter flounder by groundfish fishing vessels. Compared to Option 1/No Action, Option 2 would reduce the regulatory discarding of SNE/MA winter flounder, thereby reducing the negative social impacts commonly associated with the forced discard of marketable fish. Reduced regulatory discarding would have a positive social impact on the *Size and Demographic Characteristics* of fishery from increased landings as well as having a positive impact on the *Non-Economic Social Aspects* of the fishery.

7.5.3.2 Commercial Fishery Accountability Measures

7.5.3.2.1 Option 1: No Action

If Option 1, the No Action alternative is adopted, AMs for this fishery would remain as adopted by Amendment 16 and modified by subsequent framework actions. Analysis is complicated because the current AM is a simple ban on landing this stock, but FW 48 proposed an area-based AM.

The existing AM prohibits landing this stock. If the FW 48 AM is approved, under Option 1 an AM would be triggered if the total ACL for the stock is exceeded by more than the allowance for management uncertainty buffer. If triggered, the AM would require sector and common pool groundfish vessels to use selective trawl gear when fishing in the four selected management areas outlined in Section 4.2.2.2 of this framework. This area-based AM would not apply to vessels using longline or gillnet gears but would be in addition to a pound-for-pound penalty applied to the following year's ACE for sector vessels.

This option would maintain the most current groundfish fishery AMs and it is not expected to have any direct social impacts on the fishery, however, if a particular AM is triggered it is likely that there would be some negative social impacts. If an area-based AM is triggered by exceeding the total ACL of a particular species it would cause a disruption in fishing practices. As it is intended, this AM would change where and how the groundfish fishery fishes which would have an impact on the *Historic and Present Participation* in the fishery.

7.5.3.2.2 Option 2: Revised AM for SNE/MA Winter Flounder (Preferred Alternative)

This option is linked to a change to the SNE/MA winter flounder rebuilding plan (Section 4.1.1.2) and the removal of the SNE/MA winter flounder landing prohibition (Section 4.2.1.2). All three of these measures are preferred alternatives and together revise the management approach for SNE/MA winter flounder.

Adopting Option 2 of this alternative would revise the area-based gear restriction AM for SNE/MA winter flounder so that, if triggered, it would only apply to vessels in the common pool. Common pool vessels would be required to use selective trawl gear when fishing in the four selected management areas outlined in Section 4.2.2.2 of this framework.

Like Option 1, Option 2 is not expected to cause any substantial social impacts from maintaining a particular AM but if an AM is triggered it would be expected to cause a disruption in fishing practices of some vessels which would have an impact on their *Historic and Present Participation* in the fishery. Because the primary control of sector vessel effort is the availability of a given sector's ACE, and because sectors are penalized pound-for-pound for any overage in a fishing year, the additional area based gear restriction could be seen as a redundant or excessive form of control. Option 2 would apply the area-based gear restriction to only common pool vessels which are not subject to a pound-for-pound penalty as these vessels are not regulated by catch entitlements. Compared to the No Action alternative, Option 2 could have an additional positive social impact on the formation of *Attitudes, Beliefs and Values* of sector fishermen with regard to management, by eliminating excessive control in the AM.

7.6 Cumulative Effects Analysis

7.6.1 Introduction

A cumulative effects assessment (CEA) is a required part of an EIS or EA according to the Council on Environmental Quality (CEQ) (40 CFR part 1508.7) and NOAA's agency policy and procedures for NEPA, found in NOAA Administrative Order 216-6. The purpose of the CEA is to integrate into the impact analyses, the combined effects of many actions over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective but rather, the intent is to focus on those effects that are truly meaningful. This section serves to examine the potential direct and indirect effects of the alternatives in Framework 48 together with past, present, and reasonably foreseeable future actions that affect the groundfish environment. It should also be noted that the predictions of potential synergistic effects from multiple actions, past, present and/or future will generally be qualitative in nature.

<u>Valued Ecosystem Components (VEC)</u>
As noted in Section 6.0 (Description of the Affected Environment), the VECs that exist within the groundfish fishery are identified and the basis for their selection is established. Those VECs were identified as follows:

1. Regulated groundfish stocks (target and non-target);
2. Non-groundfish species (incidental catch and bycatch);
3. Endangered and other protected species;
4. Habitat, including non-fishing effects; and
5. Human Communities (includes economic and social effects on the fishery and fishing communities).

<u>Temporal Scope of the VECs</u>
While the effects of historical fisheries are considered, the temporal scope of past and present actions for regulated groundfish stocks, non-groundfish species, habitat and the human environment is primarily focused on actions that have taken place since implementation of the initial NE Multispecies FMP in 1977. An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the Council process and through U.S. prosecution of the fishery, rather than foreign fleets. For endangered and other protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ. In terms of future actions, this analysis examines the period between the expected implementation of this framework (May 1, 2013) and 2018.

<u>Geographic Scope of the VECs</u>
The geographic scope of the analysis of impacts to regulated groundfish stocks, non-groundfish species and habitat for this action is the total range of these VECs in the Western Atlantic Ocean, as described in the Affected Environment section of the document (Section 6.0). However, the analyses of impacts presented in this framework focuses primarily on actions related to the harvest of the managed resources. The result is a more limited geographic area used to define the core geographic scope within which the majority of harvest effort for the managed resources occurs. For endangered and protected species, the geographic range is the total range of each species (Section 6.4).

Because the potential exists for far-reaching sociological or economic impacts on U.S. citizens who may not be directly involved in fishing for the managed resources, the overall geographic scope for human communities is defined as all U.S. human communities. Limitations on the availability of information needed to measure sociological and economic impacts at such a broad level necessitate the delineation of core boundaries for the human communities. Therefore, the geographic range for the human environment is defined as those primary and secondary ports bordering the range of the groundfish fishery (Section 6.5) from the U.S.-Canada border to, and including, North Carolina.

Analysis of Total Cumulative Effects

A cumulative effects assessment ideally makes effect determinations based on the culmination of the following: (1) impacts from past, present and reasonably foreseeable future actions; PLUS (2) the baseline condition for resources and human communities (note – the baseline condition consists of the present condition of the VECs plus the combined effects of past, present and reasonably foreseeable future actions); PLUS (3) impacts from the Preferred Alternative and other alternatives.

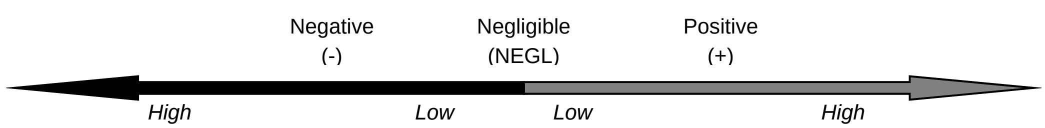
A description of past, present and reasonably foreseeable future actions is presented in Table 88. The baseline conditions of the resources and human community are subsequently summarized although it is important to note that beyond the stocks managed under this FMP and protected species, quantitative metrics for the baseline conditions are not available. Finally, a brief summary of the impacts from the alternatives contained in this framework is included. The culmination of all these factors is considered when making the cumulative effects assessment.

Impact Definitions for the tables in this section are as summarized in Table 87..

Table 82 – Impact definitions for cumulative effects analyses

VEC	Direction		
	Positive (+)	**Negative (-)**	**Negligible/Neutral**
Allocated target species, other landed species, and protected resources	Actions that increase stock/population size	Actions that decrease stock/population size	Actions that have little or no positive or negative impacts to stocks/populations
Physical Environment/ Habitat/EFH	Actions that improve the quality or reduce disturbance of habitat	Actions that degrade the quality or increase disturbance of habitat	Actions that have no positive or negative impact on habitat quality
Human Communities	Actions that increase revenue and social well-being of fishermen and/or associated businesses	Actions that decrease revenue and social well-being of fishermen and/or associated businesses	Actions that have no positive or negative impact on revenue and social well-being of fishermen and/or associated businesses

Impact Qualifiers:	
All VECs: Mixed	**both positive and negative**
Low (L, as in low positive or low negative)	To a lesser degree
High (H; as in high positive or high negative)	To a substantial degree
Likely	Some degree of uncertainty associated with the impact



7.6.2 Past, Present and Reasonably Foreseeable Future Actions

The following is a synopsis of the most applicable past, present, and reasonably foreseeable future actions (PPRFFA) that have the potential to interact with the current action. For a complete historical list of PPRFFAs, please see Amendment 16 – the last EIS developed for the NE Multispecies FMP.

Table 83 - Summary of Effects on VECs from Past, Present, and Reasonably Foreseeable Future FMP and Other Fishery Related Actions

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
Past and Present Fishing Actions					
Amendment 13 (2004) – Implemented requirements for stock rebuilding plans and dramatically cut fishing effort on groundfish stocks. Implemented the process for creating sectors and established the GB Cod Hook Gear Sector	L+	H+	+ .	L+ .	Mixed
FW 40A (2004) – allowed additional fishing on GB haddock for sector and non-sector hook gear vessels, created the GB haddock Special Access Pilot Program, and created flexibility by allowing vessels to fish inside and outside the U.S./Canada Area on the same trip	Negl	L-	L-	Negl	+

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
FW40B (2005) – Allowed Hook Sector members to use GB cod landings caught while using a different gear during the landings history qualification period to count toward the share of GB cod that will be allocated to the sector, revised DAS leasing and transfer programs, modified provisions for the Closed Area II yellowtail flounder SAP, established a DAS credit for vessels standing by an entangled whale, implemented new notification requirements for Category I herring vessels, and removed the net limit for trip gillnet vessels.	**Negl to L+**	**L-**	**L-**	**Negl**	**L+**
FW41 (2005) – Allowed for participation in the Hook Gear Haddock SAP by non-sector vessels	**Negl**	**Negl**	**Negl to L -**	**Negl**	**+**
FW42 (2006) – Implemented further reductions in fishing effort based upon stock assessment data and stock rebuilding needs, implemented GB Cod Fixed Gear Sector	**L+**	**+**	**+**	**L+**	**Mixed**
Atlantic Large Whale Take Reduction Plan	**Negl to L-**	**Negl**	**Negl**	**+**	**L-**
Monkfish Fishery Management Plan and Amendment 5 (2011) **Implemented ACLs and AMs; set the specifications of DAS and trip limits; and make other adjustments to measures in the Monkfish FMP.**	**L+**	**+**	**+**	**+**	**Mixed**
Spiny Dogfish Fishery Management Plan	**Negl**	**Negl**	**+**	**Negl**	**L+**

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
Amendment 16 to the Northeast Multispecies FMP (2009) **Implemented DAS reductions and gear restrictions for the common pool, approved formation of additional 17 sectors**	+	+	+	+	Mixed
Skate Fishery Management Plan and Amendment 3 (2010) **Amendment 3 implemented final specifications for the 2010 and 2011 FYs, implemented ACLs and AMs, implemented a rebuilding plan for smooth skate and established an ACL and annual catch target for the skate complex, total allowable landings for the skate wing and bait fisheries, seasonal quotas for the bait fishery, new possession limits, in season possession limit triggers.**	+	+	+	+	-
FW 44 to the Northeast Multispecies FMP (2010) **Set ACLs, established TACs for transboundary U.S./CA stocks, and made adjustments to trip limits/DAS measures**	+	+	+	+	Mixed

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
FW 45 to the Northeast Multispecies FMP (2011) **Revised the biological reference points and stock status for pollock, updated ACLs for several stocks for FYs 2011–2012, adjusted the rebuilding program for GB yellowtail flounder, increased scallop vessel access to the Great South Channel Exemption Area, modified the existing dockside and at-sea monitoring requirements, established a GOM Cod Spawning Protection Area, authorized new sectors and adjusted TACs for stocks harvested in the US/ CA area for FY 2011.**	L+	L+	L+	L+	Mixed
FW 46 to the Northeast Multispecies FMP (2011) **Increased the haddock catch cap for the herring fishery to 1% of the haddock ABC for each stock of haddock.**	Negl	Negl	Negl	Negl	L-
Harbor Porpoise Take Reduction Plan (2010) **Plan was amended to expand seasonal and temporal requirements within the HPTRP management areas; incorporate additional management areas; and create areas that would be closed to gillnet fisheries if certain levels of harbor porpoise bycatch occurs.**	Likely +	Likely +	Likely +	Likely +	Likely -

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
Scallop Amendment 15 (2011) **Implemented ACLs and AMs to prevent overfishing of scallops and yellowtail flounder; addressed excess capacity in the LA scallop fishery; and adjusted several aspects of the overall program to make the Scallop FMP more effective, including making the EFH closed areas consistent under both the scallop and groundfish FMPs for scallop vessels.**	**Negl**	**L+**	**Negl**	**Negl**	**L+**
Amendment 17 to the Northeast Multispecies FMP **This amendment looks to streamline the administration process whereby NOAA-sponsored, state-operated permit banks can operate in the sector allocation management program**	**Negl**	**Negl**	**Negl**	**Negl**	**Negl**

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
FW 47 to the Northeast Multispecies FMP (2012) **FW 47 measures include revisions to the status determination for winter flounder, revising the rebuilding strategy for GB yellowtail flounder, Measures to adopt ACLs, including relevant sub-ACLs and incidental catch TACs; adopting TACs for U.S/Canada area, as well as modifying management measures for SNE/MA winter flounder, restrictions on catch of yellowtail flounder in GB access areas and accountability measures for certain stocks**	Negl	+	+	Negl	-
Reasonably Foreseeable Future Fishing Actions					
Omnibus Essential Fish Habitat Amendment **Phase 2 of the Omnibus EFH Amendment would consider the effects of fishing gear on EFH and move to minimize, mitigate or avoid those impacts that are more than minimal and temporary in nature. Further, Phase 2 would reconsider closures put in place to protect EFH and groundfish mortality in the Northeast Region.**	Likely +	Likely +	Likely +	ND	ND
Harbor Porpoise Take Reduction Plan (Potential Future Actions) **Future changes to the plan in response to additional information and data about abundance and bycatch rates.**	Likely L+	Likely +	Likely +	Likely +	Likely -

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
Amendment 3 to the Spiny Dogfish FMP **This amendment considers the establishment of a research set aside program, updates to EFH definitions, year-end rollover of management measures and revisions to the quota allocation scheme.**	Likely Negl	Likely Negl	Likely L+	Likely Negl	Likely L+
Framework 24 to the Atlantic Sea Scallop FMP (Framework 49 to the Northeast Multispecies FMP) **This framework sets specifications for scallop FY 2013 and 2014. It is also considering measures to refine the management of yellowtail flounder bycatch in the scallop fishery**	Likely Negl	Likely Negl to L+	Likely Negl to L+	Likely Negl	Likely - to +
FW 48 to the Northeast Multispecies FMP **This FW would modify the ACL components for several stocks, adjust AMs for commercial and recreational vessels, modify catch monitoring provisions, and allow sectors to request access to parts of groundfish closed areas.**	Mixed	+	+	+	Mixed

Noted: ND= Not determined

Table 88 summarizes the combined effects of past, present and reasonably foreseeable future actions that affect the VECs, i.e., actions other than those alternatives under development in this document.

Note that most of the actions affecting this framework and considered in Table 88 come from fishery-related activities (e.g., federal fishery management actions – many of which are identified above in Table 81). As expected, these activities have fairly straightforward effects on environmental conditions, and were, are, or will be taken, in large part, to improve those conditions. The reason for this is the statutory basis for federal fisheries management: the reauthorized Magnuson-Stevens Act. That legislation was enacted to promote long-term positive impacts on the environment in the context of fisheries activities. More specifically, the act stipulates that management comply with a set of National Standards that collectively serve to optimize the conditions of the human environment. 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. Nevertheless, 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. However, these impacts are usually necessary to bring about long-term sustainability of a given resource and as such should, in the long-term, promote positive effects on human communities, especially those that are economically dependent upon the managed resource.

Non-fishing activities were also considered when determining the combined effects from past, present and reasonably foreseeable future actions. Activities that have meaningful effects on the VECs include the introduction of chemical pollutants, sewage, changes in water temperature, salinity, dissolved oxygen, and suspended sediment into the marine environment. These activities pose a risk to the all of the identified VECs in the long term. Human induced non-fishing activities that affect the VECs under consideration in this document are those that tend to be concentrated in near shore areas. Examples of these activities include, but are not limited to agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and, as such, may indirectly constrain the sustainability of the managed resources, non-target species, and protected resources. Decreased habitat suitability would tend to reduce the tolerance of these VECs to the impacts of fishing effort. Mitigation of this outcome through regulations that would reduce fishing effort could then negatively impact human communities.

Table 84 – Summary effects of past, present and reasonably foreseeable future actions on the VECs identified for Framework 50

VEC	Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Combined Effects of Past, Present, Future Actions
Regulated Groundfish Stocks	**Mixed** Combined effects of past actions have decreased effort, improved habitat protection, and implemented rebuilding plans when necessary. However, some stocks remain overfished	**Positive** Current regulations continue to manage for sustainable stocks	**Positive** Future actions are anticipated to continue rebuilding and strive to maintain sustainable stocks	**Short-term Negative** Several stocks are currently overfished, have overfishing occurring, or both **Long-Term Positive** Stocks are being managed to attain rebuilt status
Non-Groundfish Species	**Positive** Combined effects of past actions have decreased effort and improved habitat protection	**Positive** Current regulations continue to manage for sustainable stocks, thus controlling effort on direct and discard/bycatch species	**Positive** Future actions are anticipated to continue rebuilding and target healthy stocks, thus limiting the take of discards/bycatch	**Positive** Continued management of directed stocks will also control incidental catch/bycatch
Endangered and Other Protected Species	**Positive** Combined effects of past fishery actions have reduced effort and thus interactions with protected resources	**Positive** Current regulations continue to control effort, thus reducing opportunities for interactions	**Mixed** Future regulations will likely control effort and thus protected species interactions, but as stocks improve, effort will likely increase, possibly increasing interactions	**Positive** Continued effort controls along with past regulations will likely help stabilize protected species interactions
Habitat	**Mixed** Combined effects of effort reductions and better control of non-fishing activities have been positive but fishing activities and non-fishing activities continue to reduce habitat quality	**Mixed** Effort reductions and better control of non-fishing activities have been positive but fishing activities and non-fishing activities continue to reduce habitat quality	**Mixed** Future regulations will likely control effort and thus habitat impacts but as stocks improve, effort will likely increase along with additional non-fishing activities	**Mixed** Continued fisheries management will likely control effort and thus fishery related habitat impacts but fishery and non-fishery related activities will continue to reduce habitat quality
Human Communities	**Mixed** Fishery resources have supported profitable industries and communities but increasing effort and catch limit controls have curtailed fishing opportunities	**Mixed** Fishery resources continue to support communities but increasing effort and catch limit controls combined with non-fishing impacts such as high fuel costs have had a negative economic impact	**Short-term Negative** As effort controls are maintained or strengthened, economic impacts will be negative **Long-term Positive** As stocks improve, effort will likely increase which would have a positive impact	**Short-term Negative** Revenues would likely decline dramatically in the short term and may remain low until stocks are fully rebuilt **Long-term Positive** Sustainable resources should support viable communities and economies

<u>Impact Definitions:</u>
-Regulated Groundfish Stocks, Non-groundfish species, Endangered and Other Protected Species: positive=actions that increase stock size and negative=actions that decrease stock size
-Habitat: positive=actions that improve or reduce disturbance of habitat and negative=actions that degrade or increase disturbance of habitat
-Human Communities: positive=actions that increase revenue and well-being of fishermen and/or associated businesses and negative=actions that decrease revenue and well-being of fishermen and/or associated businesses

7.6.3 Baseline Conditions for Resources and Human Communities

For the purposes of a cumulative effects assessment, the baseline conditions for resources and human communities is considered the present condition of the VECs plus the combined effects of the past, present, and reasonably foreseeable future actions. The following table (Table 90) summarizes the added effects of the condition of the VECs (i.e., status/trends from Section 7.6.2) and the sum effect of the past, present and reasonably foreseeable future actions (from Table 89 above). The resulting CEA baseline for each VEC is exhibited in the last column (shaded). In general, straightforward quantitative metrics of the baseline conditions are only available for the managed resources, non-target species, and protected resources. The conditions of the habitat and human communities VECs are complex and varied. As such, the reader should refer to the characterizations given in Sections 7.2 and 7.6.1, respectively. As mentioned above, this cumulative effects baseline is then used to assess cumulative effects of the proposed management actions in Table 90.

Table 85 – Cumulative effects assessment baseline conditions of the VECs

VEC		Status/Trends, Overfishing	Status/Trends, Overfished	Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 82)	Combined CEA Baseline Conditions
Regulated Groundfish Stocks	GB Cod	***Yes***	***Yes***	**Negative** – short term: Several stocks are currently overfished, have overfishing occurring, or both; **Positive** – long term: Stocks are being managed to attain rebuilt status	**Negative** – short term: Overharvesting in the past contributed to several stocks being overfished or where overfishing is occurring; **Positive –** long term: Regulatory actions taken over time have reduced fishing effort and with the addition of Amendment 16, stocks are expected to rebuild in the future
	GOM Cod	***Yes***	***Yes***		
	GB Haddock	No	No		
	GOM Haddock	***Yes***	No		
	GB Yellowtail Flounder	***Yes***	***Yes***		
	SNE/MA Yellowtail Flounder	No	No		
	CC/GOM Yellowtail Flounder	***Yes***	***Yes***		
	American Plaice	No	No		
	Witch Flounder	***Yes***	***Yes***		
	GB Winter Flounder	No	No		
	GOM Winter Flounder	No	***Yes***		
	SNE/MA Winter Flounder	No	***Yes***		
	Acadian Redfish	No	No		
	White Hake	No	No		
	Pollock	No	No		
	Northern (GOM-GB) Windowpane Flounder	***Yes***	***Yes***		
	Southern (SNE-MA) Windowpane Flounder	No	No		
	Ocean Pout	No	***Yes***		
	Atlantic Halibut	No	***Yes***		
	Atlantic Wolffish	n/a	***Yes***		

Table 85 **cont'd.**

<table>
<tr><th colspan="2">VEC</th><th>Status/Trends</th><th>Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 82)</th><th>Combined CEA Baseline Conditions</th></tr>
<tr><td rowspan="3">Non-groundfish Species (principal species listed in section 6.3)</td><td>Monkfish</td><td>Not overfished and overfishing is not occurring.</td><td rowspan="3">Positive – Continued management of directed stocks will also control incidental catch/bycatch.</td><td rowspan="3">Positive – Although prior groundfish management measures likely contributed to redirecting effort onto non-groundfish species, as groundfish rebuild this pressure should lessen and all of these species are also managed through their own FMP.</td></tr>
<tr><td>Dogfish</td><td>Not overfished and overfishing is not occurring.</td></tr>
<tr><td>Skates</td><td>Thorny skate is overfished but overfishing is not occurring. All other skate species are not overfished and overfishing is not occurring.</td></tr>
<tr><td colspan="2">Habitat</td><td>Fishing impacts are complex and variable and typically adverse (see section 6.1); Non-fishing activities had historically negative but site-specific effects on habitat quality.</td><td>Mixed – Future regulations will likely control effort and thus habitat impacts but as stocks improve, effort will likely increase along with additional non-fishing activities. An omnibus amendment to the FMP with mitigating habitat measures is under development.</td><td>Mixed - reduced habitat disturbance by fishing gear but impacts from non-fishing actions, such as global warming, could increase and have a negative impact.</td></tr>
<tr><td rowspan="4">Protected Resources</td><td>Sea Turtles</td><td>Leatherback, Kemp's ridley and green sea turtles are classified as endangered under the ESA and loggerhead sea turtles are classified as threatened.</td><td rowspan="4">Positive – reduced gear encounters through effort reductions and management actions taken under the ESA and MMPA have had a positive impact</td><td rowspan="4">Positive – reduced gear encounters through effort reductions and additional management actions taken under the ESA and MMPA.</td></tr>
<tr><td>Large Cetaceans</td><td>Of the baleen whales (right, humpback, fin, blue, sei and minke whales) and sperm whales, all are protected under the MSA and with the exception of minke whales, all are listed as endangered under the ESA.</td></tr>
<tr><td>Small Cetaceans</td><td>Pilot whales, dolphins and harbor porpoise are all protected under the MSA, the HPTRP and the Large Whale Take Reduction Plan Amendment</td></tr>
<tr><td>Pinnipeds</td><td>ESA classification: Endangered, number of nesting females below sustainable level; taken by Loligo trawl</td></tr>
</table>

Table 85 **cont'd.**

VEC	Status/Trends	Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 82)	Combined CEA Baseline Conditions
Human Communities	Complex and variable (see Section 6.5). Although there are exceptions, generally groundfish landings have decreased for most New England states since 2001. Declines in groundfish revenues since 2001 have also generally occurred.	**Negative** – Although future sustainable resources should support viable communities and economies, continued effort reductions over the past several years have had negative impacts on communities	**Negative –** short term: lower revenues would continue until stocks are sustainable **Positive** – long term: sustainable resources should support viable communities and economies

7.6.4 Summary Effects of Framework 50 Actions

The alternatives contained in Framework 50 can be divided into two broad categories, as seen in Table 84 (summary of impacts from action – for a complete discussion of impacts please see Section 7.0 of document). First, this action adjusts the SNE/MA winter flounder rebuilding strategy and modifies OFLs/ABCs/ACLs. Second, the action adopts commercial and recreational fishing measures including measures to allow the retention of SNE/MA winter flounder and changes to the AM for SNE/MA winter flounder.

Amendment 16 defined the fishing mortality targets needed to rebuild groundfish stocks and end overfishing, and adopted a complex suite of measures designed to achieve these mortality objectives. This action further builds upon the specifications adopted in Frameworks 44, 45, 46, 47 and 48 that used available data to translate those mortality targets into specific amounts of fish. These quantities must be defined in order to implement the ACLs and AMs called for in the amendment. The ACLs identified in FW 50 (implemented concurrently with FW48) are thus consistent with the amendment. The proposed revision to the SNE/MA winter flounder rebuilding plan is needed to continue the rebuilding of that stock that was started in Amendment 13, but not completed by 2014 as originally planned.

The second broad category of measures adopted by this action are measures that affect the prosecution of the commercial and recreational fishery. The changes proposed are all designed to modify management measures to accommodate the landing of SNE/MA winter flounder, which was prohibited by Amendment 16. Commercial and recreational vessels would be permitted to land this stock. AMs are also modified to prevent the sub-ACL from being exceeded.

In general, the adoption of all of these measures will benefit groundfish stocks because collectively they make it more likely that mortality targets are reasonable and will not be exceeded. The measures that constitute the Proposed Action (if based on the Preferred Alternatives) are designed to achieve the rebuilding objectives for the Northeast Multispecies fishery. The most important biological impact of the proposed measures is that they would control fishing mortality on Northeast Multispecies stocks in order to prevent (or end) overfishing and rebuild overfished stocks. The adoption of additional sub-ACLs for GB yellowtail flounder and SNE/MAB windowpane flounder are the measures most likely to have positive biological impacts. These sub-ACLs, and the AMs that will be adopted as a result, will impose tighter controls on fishing mortality for these stocks. The preferred alternative changes to AMs would also contribute to achieving these objectives by providing better control of fishery catches. For example, the preferred alternative would modify recreational AMs so that measures can be changed in advance of an overage, making it less likely that an overage will occur. The measures are not likely to impact non-groundfish stocks, protected species, or habitat to any great extent when compared to the No Action alternative, since these proposed specifications differ only slightly from the No Action alternative. The measures are likely to have negligible impacts on communities. The revisions to the AMs may cause short-term economic losses if they are triggered but over the long-term the industry should benefit from keeping catches under target levels. Changes to the administration of the scallop fishery sub-ACLs, the establishment of SNE/MA windowpane flounder sub-ACLs, the revisions to the AMs would be expected to benefit the groundfish fishery in the long-term by making more likely that mortality targets will be achieved. The effects of revisions to the at sea monitoring program have the capacity to cause negative impacts to the fishery, however, some benefits would also occur, reducing negative impacts and potentially providing some long-term benefits overall. Sector exemption requests can provide benefits to the fishery, particularly if haddock catch can increase and provide additional revenue. Although the benefits and costs are highly uncertain, there is the potential for negative impacts on future productivity and interactions with protected species from fishing the closed areas, depending on what specific exemptions are requested and subsequently proposed in future sector operations plan rule(s).

Table 86 – Summary of Impacts expected on the VECs

Management Measure		**VECs**				
		Managed Resources	**Non-target Species**	**Protected Resources**	**Habitat Including EFH**	**Human Communities**
UPDATES TO STATUS DETERMINATION CRITERIA, FORMAL REBUILDING PROGRAMS, AND ANNUAL CATCH LIMITS	**REVISED SNE/MA WINTER FLOUNDER REBUILDING PLAN**	**Mixed** – Continues rebuilding of this stock, but progress may be slower than the No Action alternative	**No Impact/ Neutral** – Provided rebuilding continues, additional impacts to non-target species are not anticipated	**No Impact/ Neutral** – Provided rebuilding continues, additional impacts to protected species are not anticipated	**No Impact/ Neutral** – Provided rebuilding continues, additional impacts to habitat are not anticipated	**Positive** – Overall revenues will increase as stock rebuilds; revised plan allows for some landings from this stock
	REVISED OFL/ABCs/ ACLs	**Positive** –. These ABCs, ACLs, and sub-ACLs, and the AMs will impose tighter controls on fishing mortality for these stocks using the best available science. This, combined with past management efforts, should contribute to stock rebuilding and provide positive cumulative impacts	**No Impact/ Neutral –** Provided rebuilding continues, additional impacts to non-target species are not anticipated	**No Impact/ Neutral –** Provided rebuilding continues, additional impacts to protected species are not anticipated	**No Impact/ Neutral –** Provided rebuilding continues, additional impacts to habitat are not anticipated	**Mixed** – While the Preferred Alternative produces more revenues than No Action, reduced ACLs (as compared to recent years) will result in large reductions in fishing revenues in the short term. Overall revenues will increase as stocks.

Table 86 cont'd.

Management Measure		VECs				
		Managed Resources	**Non-target Species**	**Protected Resources**	**Habitat Including EFH**	**Human Communities**
COMMERCIAL and REC FISHERY MEASURES	**SNE/MA WINTER FLOUNDER LANDING RESTRIC-TIONS**	**Negative** – will lead to higher fishing mortality and slower stock rebuilding, but progress should still meet legal require-ments	**No impact** –measures are not expected to create additional impacts to non-target species	**No impact** –measures are not expected to create additional impacts to non-target species	**No impact** –measures are not expected to create additional impacts to non-target species	**Positive** – Landings will provide additional commercial fishing revenues and recreational opportuni-ties
	ACCOUNTABILITY MEASURES	**Positive** – More effective accountability measures will reduce risk of exceeding mortality targets on these stocks and promote rebuilding	**No impact** –measures are not expected to create additional impacts to non-target species	**No impact** –measures are not expected to create additional impacts to non-target species	**No impact** –measures are not expected to create additional impacts to non-target species	**Mixed** – Overall revenues will increase as stocks rebuild, however restrictions may constrain fishing

	RECREATIONAL MANAGEMENT MEASURES	**Positive—** Will help ensure target fishing mortality is less likely to be exceeded because rec. catch will be constrained within sub-ACL	**Positive—** Continued management of directed stocks will also control incidental catch/bycatch	**No impact—** Recreational fisheries have minimal interaction with and impact on protected resources	**No impact** –measures are not expected to create additional impacts to habitat. Recreational gear has minimial interaction or impact with habitat	**Mixed— Short term negative—** Low catch limits with corresponding managmenet measures will have negative economic and angler satisfaction impacts; **long term positive—** Rebuild stocks may support larger catch limits and more liberal management measures

7.6.5 Cumulative Effects Summary

The regulatory atmosphere within which Federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of resources, habitat, and human communities. Consistent with NEPA, the M-S Act requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs (except short-term impacts to human communities) from past, present and reasonably foreseeable future actions, when combined with baseline conditions, have generally been positive and are expected to continue in that manner for the foreseeable future. This is not to say that some aspects of the various VECs are not experiencing negative impacts, but rather that when taken as a whole and compared to the level of unsustainable effort that existed prior to and just after the fishery came under management control, the overall long-term trend is positive.

Table 91 provides as a summary of likely cumulative effects found in the various groups of management alternatives contained in Framework 50. The CEA baseline that, as described above in Table 90, represents the sum of the past, present, and reasonably foreseeable future (identified hereafter as "other") actions and conditions of each VEC. When an alternative has a positive effect on a VEC, for example, reduced fishing mortality on a managed species, it has a positive cumulative effect on the stock size of the species when combined with the "other" actions that were also designed to increase stock size. In contrast, when an alternative has a negative effect on a VEC, such as increased mortality, the cumulative effect on the VEC would be negative and tend to reduce the positive effects of the "other" actions. The resultant positive and negative cumulative effects are described below for each VEC.

<u>Managed Resources</u>

As noted in Table 88, the combined impacts of past federal fishery management actions have led to short-term impacts that result in overfishing and/or overfished status for several stocks. However, management measures, in particular modifications implemented through Amendment 16 to the FMP, are expected to yield rebuilt sustainable groundfish stocks in the future. The actions proposed by Framework 50 are expected to continue this trend. The adoption of a revised rebuilding plan for SNE/MA winter flounder and the revised ABCs/ACLs will have the largest biological impacts. The revised rebuilding strategy will continue to rebuild SNE/MA winter flounder, but at a slower pace than the No Action alternative. The revised ABCs/ACLs are designed to meet fishing mortality targets and to promote stock rebuilding. The two other measures – allowing landings of SNE/MA winter flounder, and changing the SNE/MA winter flounder AMs – are linked to the revised rebuilding strategy and will have similar effects. The past and present impacts, combined with the Preferred Alternative and future actions which are expected to continue rebuilding and strive to maintain sustainable stocks, should yield positive non-significant impacts to managed resources in the long term.

<u>Non-Target Species</u>

As noted in Table 88, the combined impacts of past federal fishery management actions have decreased fishing effort and improved habitat protection for non-target species. Current management measures, including those implemented through Amendment 16 to the FMP, are expected to continue to control effort, and decrease bycatch and discards. The actions proposed by Framework 50 are expected to continue this trend. The primary mechanism is through the reduced ABCs/ACLs (reduced from recent years). The modifications in management measures for SNE/MA winter flounder are not expected to affect non-target species. The past and present impacts, combined with the Preferred Alternative and future actions which are expected to continue rebuilding and strive to maintain sustainable stocks, should yield positive non-significant impacts to non-target species.

Protected Resources

As noted in Table 88, the combined impacts of past federal fishery management actions have reduced fishing effort, and therefore reduced interactions with protected resources. Current management measures, including those implemented through Amendment 16 to the FMP, are expected to continue to control effort and catch, and therefore continue to lessen interactions with protected resources. The actions proposed by Framework 50 are expected to continue this trend; however, as stocks rebuild to sustainable levels, future actions may lead to increased effort, which may increase potential interactions with protected species. The reductions in ABCs/ACLs may provide short-term benefits to protected resources as groundfish fishing effort will decline, but as stocks rebuild effort may increase. Changes to management measures for SNE/MA winter flounder are not expected to affect protected species. Overall, the combination of past, present, and future actions is expected to stabilize protected species interactions and lead to positive impacts to protected species.

Habitat, Including EFH

As noted in Table 88, the combined impacts of past federal fishery management actions have reduced fishing effort, and therefore have been positive for habitat protection. In addition, better control of non-fishing activities has also been positive for habitat protection. However, both fishing and non-fishing activities continue to decrease habitat quality. None of the fishery specifications measures are expected to have substantial impacts on habitat or EFH. The reduced ABCs/ACLs may result in reduced groundfish fishing activity and provide some minor short-term benefits to habitat. Overall, the combination of past, present, and future actions is expected to reduce fishing effort and hence reduce damage to habitat; however, it is likely that fishing and non-fishing activities will continue to degrade habitat quality.

Human Communities

As noted in Table 88 the combined impacts of past federal fishery management actions have reduced effort, and therefore have curtailed fishing opportunities. Past and current management measures, including those implemented through Amendment 16 to the FMP, will maintain effort and catch limit controls, which together with non-fishing impacts such as rising fuel costs have had significant negative short term economic impacts on human communities. The specifications for FY 2013 (FW50) are expected to have long-term positive impacts on human communities as they promote stock rebuilding, but in the short-term, impacts are likely to be negative and significant. Reductions in ACLs for GOM and GB cod will likely cause a short term significant negative impact on human communities. Modifying the SNE/MA winter flounder rebuilding plan, and allowing landings from this stock, will provide some benefits to fishing communities but will not outweigh the negative effects of the other reduced ABCs/ACLs. However, this action alone is not expected to have significant socioeconomic impacts beyond what was anticipated in Amendment 16. Overall, the combination of past, present, and future actions is expected to enable a long term sustainable harvest of groundfish stocks, which should lead to a long term positive impact on fishing communities and economies.

8.0 Applicable Law

8.1 Magnuson-Stevens Fishery Conservation and Management Act

8.1.1 Consistency with National Standards

Section 301 of the Magnuson-Stevens Act requires that regulations implementing any fishery management plan or amendment be consistent with the ten national standards listed below.

Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
Amendment 16 to the Northeast Multispecies FMP adopted measures designed to end overfishing on the groundfish stocks that were subject to excessive fishing pressure at the time of its development. This action adjusts those measures in a way that is designed to maximize optimum yield while preventing overfishing and continuing rebuilding plans. For overfished fisheries, the Magnuson-Stevens Act defines optimum yield as the amount of fish which provides for rebuilding to a level consistent with producing the maximum sustainable yield from the fishery. The measures are designed to achieve the fishing mortality rates, and yields, necessary to rebuild the overfished stocks as well as to keep fishing mortality below overfishing levels for stocks that are not in a rebuilding program. The measures in Section 4.1 that modify the SNE/MA winter flounder rebuilding plan and adjust ACLs set controls on catch to ensure that the appropriate fishing mortality rates are implemented. Changes to commercial and recreational fishery measures in Section 4.2 implement and adjust programs to achieve the desired mortality levels and to facilitate realizing benefits from harvesting SNE/MA winter flounder.

Conservation and management measures shall be based on the best scientific information available.
The Preferred Alternatives are based on the most recent estimates of stock status available for each of twenty stocks included in the management unit. These estimates are mostly in the form of information provided by the Northeast Fisheries Science Center in the GARM III proceedings and subsequent assessments. In the case of Atlantic wolffish, stock status was estimated by the NEFSC in the proceedings of the Data Poor Working Group (DPWG). The most recent (2012) TRAC proceedings, SARC 50 for pollock, the SARC 52 for winter flounders, SARC 54 for SNE/MA yellowtail flounder, 2012 Groundfish Assessment Updates, and the SARC 55 for GOM and GB cod were also used to update stock status. Additionally, the proposed mortality limits were determined based on the scientific advice of the SSC, which recommends ABCs to the Council.

With respect to bycatch information, the action uses bycatch information from the most recent assessments. Bycatch data from observer reports, vessel logbooks, or other sources must be rigorously reviewed before conclusions can be drawn on the extent and amount of bycatch. While additional observer data has been collected since the most recent assessments were completed, it has not been analyzed or reviewed through the stock assessment process and thus cannot be used.

The economic analyses in this document are based primarily on landings, revenue, and effort information collected through the NMFS data collection systems used for this fishery.

To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The Preferred Alternatives manage each individual groundfish stock as a unit throughout its range. Management measures specifically designed for one stock, including ACLs, are applied to the entire range of the stock. In addition, the groundfish complex as a whole is managed in close coordination. Management measures are designed and evaluated for their impact on the fishery as a whole.

Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The Preferred Alternatives do not discriminate between residents of different states. They are applied equally to all permit holders, regardless of homeport or location. While the measures do not discriminate between permit holders, they do have different impacts on different participants. This is because of the differences in the distribution of fish and the varying stock levels in the complex. For example, potentially low ACLs on GOM cod could differentially impact fishermen in the northern states who rely more heavily on that particular stock. Some of these impacts may be localized, as often communities near the stock may have developed small boat fisheries that target it. These distributive impacts are difficult to avoid given the requirement to rebuild overfished stocks. Even if the measures are designed to treat all permit holders the same, the fact that fish stocks are not distributed evenly, and that individual vessels may target specific stocks, means that distributive impacts cannot be avoided.

Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The Preferred Alternatives are not expected to significantly reduce the efficiency of fishing vessels. These measures are considered practicable since they allow rebuilding of depleted groundfish stocks and have considered efficiency to the greatest extent possible. Some of the Preferred Alternatives in fact increase efficiency, including the removal of restrictions on yellowtail flounder catch in scallop fishery access areas and removal of restricted gear areas, and allowing the landing of SNE/MA winter flounder. None of the measures in this action have economic allocation as their sole purpose – all are designed to contribute to the control of fishing mortality.

Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The primary controls used in this management plan - effort controls and sectors - allow each vessel operator to fish when and how it best suits his or her business. Vessels can make short or long trips, and can fish in any open area at any time of the year. The measures allow for the use of different gear, vessel size, and fishing practices. The specific measures adopted in this action do not reduce this flexibility.

Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

While some of the measures used in the management plan, and proposed by this action, tend to increase costs, those measures are necessary for achieving the plan's objectives. As an example, measures that reduce the efficiency of fishing vessels, including specific gear requirements such as are proposed in the AMs for common pool vessels, tend to increase the costs of fishing vessels since fishing catches are reduced. These measures accomplish other goals, however, by allowing groundfish stocks to rebuild. The measures do not duplicate other regulatory efforts. Management of multispecies stocks in federal waters is not subject to coordinated regulation by any other management body. Absent Council action, a coordinated rebuilding effort to restore the health of the overfished stocks would not occur.

The Council considered the costs and benefits of a range of alternatives to achieve the goals and objectives of this FMP. It considered the costs to the industry of taking no action relative to adopting the measures herein. The expected benefits are greater in the long-term if stocks are rebuilt, though it is clear there are substantial short-term declines in revenue and possible increases in costs that can be expected.

Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse impacts on such communities.

Consistent with the requirements of the Magnuson-Stevens Act to prevent overfishing and rebuild overfished stocks, the Preferred Alternatives may restrict fishing activity through the implementation of low ACLs on certain stocks in order to achieve rebuilding targets. Analyses of the impacts of these measures show that landings and revenues are likely to decline for many participants in upcoming years due to the rebuilding programs in place for many stocks. In the short term, these declines will probably have negative impacts on fishing communities throughout the region, but particularly on those ports that rely heavily on groundfish. These declines are unavoidable given the M-S Act requirements to rebuild overfished stocks. The need to control fishing mortality means that catches cannot be as high as would likely occur with less stringent management measures.

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.

Many measures adopted in Amendment 16 were designed to limit the discards of both groundfish and some other species, including the sector management program, and this action is expected to continue those benefits with no substantial changes. This action will remove a prohibition on landing SNE/MA winter flounder, which will reduce discards of that stock.

Conservation and management measures shall, to the extent practicable, promote safety of human life at sea.

Measures adopted in Amendment 16 were designed to improve safety in spite of low ACLs anticipated by subsequent actions in the near future. The flexibility inherent in sector management and the ability to use common pool DAS at any time are key elements of the measures that promoted safety. The Preferred Alternatives, in conjunction with Amendment 16 measures, are the best option for achieving the necessary mortality reductions while having the least impact on vessel safety.

8.1.2 Other M-SFCMA requirements

Section 303 (a) of FCMA contains 14 required provisions for FMPs. These are discussed below. It should be emphasized that the requirement is imposed on the FMP. In some cases noted below, the M-S Act requirements are met by information in the Northeast Multispecies FMP, as amended. Any fishery management plan that is prepared by any Council, or by the Secretary, with respect to any fishery, shall—

contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are-- (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery; (B) described in this subsection or subsection (b), or both; and (C) consistent with the National Standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

Foreign fishing is not allowed under this management plan or this action and so specific measures are not included to specify and control allowable foreign catch. The measures in this management plan are designed to prevent overfishing and rebuild overfished stocks. There is one international agreement that is germane to multispecies management. On December 20, 2010, the International Fisheries Clarification Act stipulated that the U.S./Canada Resource Sharing Understanding, implemented through Amendment 13, can be considered an international agreement for the purposes of setting ACLs. The proposed measures (including U.S./Canada TACs) are consistent with that Understanding with one exception. The Preferred Alternative for GB yellowtail flounder would adopt a quota that is higher than that recommended by the Transboundary Management Guidance Committee.

contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

Amendment 16 included a thorough description of the multispecies fishery from 2001 through 2008, including the gears used, number of vessels, landings and revenues, and effort used in the fishery. This action provides a summary of that information and additional relevant information about the fishery in Section 6.5.

assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

The present biological status of the fishery is described in Section 6.2.1. Likely future conditions of the resource are described 7.6.5. Impacts resulting from other measures in the management plan other than the specifications included here can be found in Amendment 16. The maximum sustainable yield for each stock in the fishery is defined in Amendment 16 and optimum yield for the fishery is defined in Amendment 9.

assess and specify-- (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3); (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing; and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

U.S. fishing vessels are capable of, and expected to, harvest the optimum yield from this fishery as specified in Amendment 16. U.S. processors are also expected to process the harvest of U.S. fishing vessels. None of the optimum yield from this fishery can be made available to foreign fishing.

specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

Current reporting requirements for this fishery have been in effect since 1994 and were originally specified in Amendment 5. They were slightly modified in Amendments 13 and 16, and VMS requirements were adopted in FW 42. The requirements include Vessel Trip Reports (VTRs) that are submitted by each fishing vessel. Dealers are also required to submit reports on the purchases of regulated groundfish from permitted vessels. Current reporting requirements are detailed in 50 CFR 648.7.

consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;

Provisions in accordance with this requirement were implemented in earlier actions, and continue with this action. For common pool vessels, the carry-over of a small number of DAS is allowed from one fishing year to the next. If a fisherman is unable to use all of his DAS because of weather or other conditions, this measure allows his available fishing time to be used in the subsequent fishing year. Sectors will also be allowed to carry forward a small amount of ACE into the next fishing year. This will help sectors react should adverse weather interfere with harvesting the entire ACE before the end of the year. Neither of these practices requires consultation with the Coast Guard.

describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;

Essential fish habitat was defined for Atlantic wolffish in Amendment 16, and for all stocks in an earlier action. A summary of the EFH can be found in Section 6.1.

in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

Scientific and research needs are not required for a framework adjustment. Current research needs are identified in Amendment 16.

include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on-- (A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

Impacts of this framework on fishing communities directly affected by this action and adjacent areas can be found in Section 7.5.

specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

Objective and measurable Status Determination Criteria for all species in the management plan were presented in Amendment 16, and have been updated in subsequent frameworks, most recently FW 48.

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;

A Standardized Bycatch Reporting Methodology omnibus amendment was adopted by the Council in June 2007. The SBRM was subsequently dismissed by a court ruling and a revised SBRM is under development. None of the measures in this framework are expected to increase bycatch beyond what was considered in Amendment 16.

assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

This management plan does not include a catch and release recreational fishery management program and thus does not address this requirement.

include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

As noted above, the description of the commercial, recreational, and charter fishing sectors was fully developed in Amendment 16, and the commercial sector is updated and summarized in this document (Section 6.5).

to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.

This preferred alternative does not allocate harvest restrictions or stock benefits to the fishery. Such allocations were adopted in Amendment 16 and subsequent frameworks, while this action adjusts catch limits for some stocks within the existing allocation structure.

establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

The mechanism for establishing annual catch limits was adopted by Amendment 16. This action uses that mechanism to specify ACLs for future fishing years.

8.1.3 EFH Assessment

This essential fish habitat (EFH) assessment is provided pursuant to 50 CFR 600.920(e) of the EFH Final Rule to initiate EFH consultation with the National Marine Fisheries Service.

8.1.3.1 Description of Action

The purpose of the Framework 50 (Northeast Multispecies FMP) Preferred Alternatives is to adopt modifications to management measures that will incorporate new information relative to effective program administration and setting catch levels that are necessary to achieve the fishing mortality targets required by Amendment 16.

In general, the activity described by this action, fishing for groundfish species, occurs off the New England and Mid-Atlantic coasts within the U.S. EEZ. Thus, the range of this activity occurs across the designated EFH of all Council-managed species (see Amendment 11 to the Northeast Multispecies FMP for a list of species for which EFH was designated, the maps of the distribution of EFH, and descriptions of the characteristics that comprise the EFH). EFH designated for species managed under the Secretarial Highly Migratory Species FMPs are not affected by this action, nor is any EFH designated for species managed by the South Atlantic Council as all of the relevant species are pelagic and not directly affected by benthic habitat impacts.

The Preferred Alternatives are described in Section 4.0. The alternatives include the following general measures:

- A revised rebuilding strategy for SNE/MA winter flounder
- Updated TACs for stocks managed consistent with the U.S./Canada Resource Sharing Understanding
- Revisions to the administration of scallop fishery groundfish sub-ACLs
- Revised ACL specifications for FY 2012 – FY 2014
- Removal of the prohibition on landing SNE/MA winter flounder
- Recreational management measure change for GOM haddock
- Revisions to AMs for SNE/MA winter flounder

8.1.3.2 Assessing the Potential Adverse Impacts

Refer to the Habitat Impacts of the Alternatives (Section 7.2, summarized in Section 7.2.3) for a tabular look at the summary impacts of the Preferred Alternatives. Nearly all measures are expected to have neutral impacts on habitat.

Measures with Potential Negative Effects on EFH

Extending the SNE/MA winter flounder rebuilding plan, and allowing that stock to be landed may result in a small increase in the number of groundfish fishing trips in the SNE/MA winter flounder stock area when compared to No Action. This increase in effort may result in a small increase in the adverse effects of fishing on EFH in this area. It is not expected that these effects will be measureable and they are likely to be outweighed by the effects of the revised ACLs that are discussed in the following paragraph.

Measures with Potential Positive Effects on EFH

The revised ACLs that are the preferred alternative may benefit EFH by reducing fishing effort in a broad area when compared to recent fishing activity. As shown by the economic analysis, the number of days fished is expected to decline when compared to either FY 2011 or FY 2012. These reduced effects on EFH would be expected to continue for several years, but as stocks rebuild fishing effort may increase.

Table 87 – Summary of possible effects to EFH as a result of the Preferred Alternatives

	Preferred Alternative
Possible negative impacts	Revised rebuilding strategy for SNE/MA winter flounder
	Allow landings of SNE/MA winter flounder
Neutral Impacts	Revised AMs for SNE/MA winter flounder; GOM haddock recreational management measures
Possible Positive Impacts	Annual Catch Limits
Uncertain Impacts	N/A

8.1.3.3 Minimizing or Mitigating Adverse Impacts

Section 7.2, (habitat impacts of the alternatives) demonstrates that the overall habitat impacts of all the measures combined in this action have neutral impacts relative to the baseline habitat protections established under Amendment 13 to the Northeast Multispecies FMP. As such, additional measures to mitigate or minimize adverse effects of the multispecies fishery on EFH beyond those established under Amendment 13 are not necessary.

8.1.3.4 Conclusions

The Preferred Alternatives are unlikely to have noticeable impacts on EFH; there may be slight positive benefits when compared to the other alternatives.

8.2 National Environmental Policy Act (NEPA)

NEPA provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. This document is designed to meet the requirements of both the M-S Act and NEPA. The Council on Environmental Quality (CEQ) has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508), as has NOAA in its agency policy and procedures for NEPA in NAO 216-6 §5.04b.1. All of those requirements are addressed in this document, as referenced below.

8.2.1 Environmental Assessment

The required elements of an Environmental Assessment (EA) are specified in 40 CFR 1508.9(b) and NAO 216-6 §5.04b.1. They are included in this document as follows:

- The need for this action are described in Section 3.2;
- The alternatives that were considered are described in Section 4.0;
- The environmental impacts of alternatives are described in Section 7.0;
- The agencies and persons consulted on this action are listed in Section 8.2.4.

This document includes the following additional sections that are based on requirements for an Environmental Impact Statement (EIS).

- An Executive Summary can be found in Section 1.0.
- A Table of Contents can be found in Section 2.0.
- Background and purpose are described in Section 2.0.
- A summary of the document can be found in Section 1.0.
- A brief description of the affected environment is in Section 6.0.
- Cumulative impacts of the Preferred Alternatives are described in Section 7.6.
- A determination of significance is in Section 8.2.2.
- A list of preparers is in Section 8.2.3.
- The index is in Section 9.3

8.2.2 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Order (NAO) 216-6 (revised May 20, 1999) provides sixteen criteria for determining the significance of the impacts of a final fishery management action. These criteria are discussed below:

(1) *Can the Preferred Alternatives reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?*

Response: The Preferred Alternatives cannot reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action. With respect to the target species in the Northeast Multispecies fishery the Preferred Alternatives adopt catch limits or management measures that are consistent with target fishing mortality rates that promote rebuilding and/or sustaining stock sizes.

(2) *Can the Preferred Alternatives reasonably be expected to jeopardize the sustainability of any non-target species?*

Response: For fishery resources that are caught incidental to groundfish fishing activity, there is no indication in the analyses that the alternatives will threaten sustainability. The Preferred Alternatives will probably result in declines in overall groundfish fishing effort because of the reductions in many ACLs from FY 2012 levels. Since the fishery does not currently jeopardize non-target species it is not likely that these alternatives will change that status.

(3) *Can the Preferred Alternatives 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 Preferred Alternatives cannot reasonably be expected to cause substantial damage to the oceans and coastal habitats and/or essential fish habitat. Analyses described in section 7.2 indicate that only minor impacts are expected when compared to the No Action.

(4) *Can the Preferred Alternatives be reasonably expected to have a substantial adverse impact on public health or safety?*

Response: Nothing in the Proposed Action can be reasonably expected to have a substantial adverse impact on public health or safety. Measures adopted in Amendment 16 were designed to improve safety in spite of low ACLs anticipated by subsequent actions in the near term future. The flexibility inherent in sector management and the ability to use common pool DAS at any time are key elements of the measures that promoted safety. The Preferred Alternatives, in conjunction with Amendment 16 measures, are the best option for achieving the necessary mortality reductions while having the least impact on vessel safety.

(5) *Can the Preferred Alternatives reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?*

Response: The Preferred Alternatives cannot be reasonably expected to adversely affect endangered or threatened species or critical habitat for these species. While there may be some adverse impacts by maintaining fishing effort through the proposed action, that impact is not expected to be significant. As discussed in Section 7.3, these species are expected to have very minimal impacts from the measures that are proposed. In addition, measures in place to protect endangered or threatened species, marine mammals, and critical habitat for these species would remain in place.

Furthermore, for the reasons described in Section 7.3, NMFS has determined that the continued operation of the NE Multispecies FMP is not likely to jeopardize the continued existence of any listed species including any of the five Atlantic sturgeon DPS's. The NE multispecies fishery may interact with Atlantic sturgeon. However, the more recent, larger population estimate derived from NEAMAP data in the a recent NEFSC report suggests that the level of interactions with the NE multispecies fishery is not likely to have a significant adverse impact on the overall Atlantic sturgeon population, or any of the DPSs Kocik et al. 2013). Since the decision to list the Atlantic sturgeon DPSs as endangered and threatened under the ESA, the ESA Section 7 consultation for the NE multispecies fishery has been reinitiated and is ongoing. It is expected that an updated Biological Opinion will be issued during the 2013 NE multispecies fishing year that will contain additional evaluation to describe any impacts of the fisheries on Atlantic sturgeon and other listed species and define any measures needed to mitigate those impacts, if necessary.

(6) *Can the Preferred Alternatives 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 are not expected to have a substantial impact on biodiversity and/or ecosystem function with the affected area. The use of ACLs will tightly control catches of target and incidental regulated groundfish stocks. Catches of target and incidental catch species under this program will be consistent with the mortality targets of Amendment 16, and thus will not have a substantial impact on predator-prey relationships or biodiversity. Particular measures within this action will have no more than minimal adverse impacts to EFH. It is therefore reasonable to expect that there will not be substantial impact on biodiversity or ecosystem function.

(7) *Are significant social or economic impacts interrelated with natural or physical environmental effects*?

Response: The Preferred Alternatives are designed to continue the groundfish rebuilding programs that were first adopted in Amendment 13 to the Northeast Multispecies Fishery Management Plan and modified in subsequent actions, including Amendment 16. The environmental assessment documents that no significant natural or physical effects will result from the implementation of the Preferred Alternatives. As described in Section 7.1.1, the catch limits in this action are designed to continue rebuilding. The action cannot be reasonably expected to have significant impacts on habitat or protected species, as the impacts are expected to fall within the range of those resulting from Amendments 13 and 16. The action's potential economic and social impacts are also addressed in the environmental assessment (Sections 7.4 and 7.5), as well as in the Executive Order 12866 review (Section 8.11) and the Initial Regulatory Flexibility Act review (Section 8.11.2). The proposed catch limits are expected to result in short-term reductions in total groundfish revenues on groundfish fishing trips of $24.8 million when compared to FY 2011, and $13.5 million when compared to FY 2012. These impacts will not be evenly distributed. Smaller vessels and those vessels that fish in the inshore Gulf of Maine are likely to have greater adverse effects on fishing revenue than offshore vessels, specifically due to the reductions in ACLs for GOM cod, CC/GOM yellowtail flounder, witch flounder, and GOM haddock.

While these declines in revenues are substantial, because they are less than $100 million they are not considered significant under the criteria used for E.O. 12866. The Preferred Alternatives, however, may place small entities (defined as those generating less than $500K in annual sales) at a competitive disadvantage relative to large entities, particularly for vessels participating in the commercial groundfish fishery (8.11.2).

NMFS has determined that despite the potential socio-economic impacts resulting from this action, there is no need to prepare an EIS. The purpose of NEPA is to protect the environment by requiring Federal agencies to consider the impacts of their proposed actions on the human environment, defined as " the natural and physical environment and the relationship of the people with that environment." The EA for FW 50 describes and analyzes the preferred alternatives and concludes that there will be no significant impacts to the natural and physical environment. While some fishermen, shore-side businesses, and others may experience impacts to their livelihood, these impacts, in and of themselves, do not require the preparation of an EIS, as supported by NEPA's implementing regulations at 40 C.F.R. 1508.14.

Consequently, because the EA demonstrates that the action's potential natural and physical impacts are not significant, the execution of a FONSI remains appropriate under this criteria.

(8) *Are the effects on the quality of the human environment likely to be highly controversial*?

Response: Some aspects concerning the science used to formulate the preferred alternatives on the quality of human environment are expected to be controversial. There is controversy over the scientific evaluation of current stock status that is used to determine future catches. This is particularly the case for GOM cod.

The GOM cod stock has been assessed three times since 2008: in 2008 (GARM III), in 2011 (SARC 53) and in 2012 (SARC 55). The SARC 53 assessment found that stock size was over-estimated at GARM III and concluded that the stock was overfished and overfishing was occurring, when the expectation after GARM III was that the stock would be rebuilt by 2012. In addition, in order to end overfishing, the assessment concluded that large catch reductions were needed in 2012. This assessment result was unexpected and led to a decision to repeat the assessment in 2012. Several specific criticisms were leveled at the 2011 assessment. These were considered by the Council's Scientific and Statistical Committee, which identified four issues that they felt needed to be addressed: cod stock structure, recreational catch estimates due to changes in the reporting system, discard mortality assumptions, and the applicability of catch per unit effort (CPUE) as an assessment input. A plan was developed to investigate these four issues as part of a new assessment.

In December 2012, a new assessment of GOM cod was performed. Three of the four issues identified by the SSC were addressed. Based on a review and fishermen's inputs, discard mortality assumptions were modified. CPUE was explored as an input but was not incorporated based on evidence that it was not a reliable indicator of abundance. Finally, new recreational catch estimates were used in the assessment. The issue of cod stock structure is still under review and results of that review are not yet available for use. The 2012 GOM cod assessment thus addressed most of the issues related to the scientific controversy over the 2011 GOM cod assessment.

The 2012 GOM cod assessment review panel, however, forwarded two assessment models for use in developing management advice. The two models differ in their assumption on natural mortality. One model is based on a fixed natural mortality rate while the other reflects an increase in natural mortality in recent years. Under either model, overfishing is occurring and the stock is overfished. There remains some question about the choice of reference points (fishing mortality and biomass) for the model that is based on an increase in natural mortality. While the status of the stock probably would not change, different reference points may lead to different short-term catch advice.

Based on the consistency of the results from the two GOM cod assessments, there seems little substance to the argument that catches for GOM cod should be significantly higher. Indeed, there have been a few comments that both the GOM and GB cod quotas are too high and should be reduced further. Issues related to reference points do warrant further attention and the SSC has recommended that these be investigated further.

Another concern raised over the assessments used to set the ABCs/ACLs in this action is that for many stocks the most recent data used in the assessments was from 2010. This is the case for all of the stocks last assessed in the 2012 Groundfish Assessment Updates, and includes several stocks important to inshore fishermen such as GOM haddock, witch flounder, plaice, CC/GOM yellowtail flounder, pollock, and GOM winter flounder. Arguments have been made that since 2010 there is evidence of increased recruitment for some of these stocks that is not reflected in the proposed ABCs/ACLs. Until this is confirmed, however, the ABCs/ACLs cannot be increased without an increased probability of overfishing.

Another area of controversy is the concern that the economic impact analyses understate the true negative impacts of the low ACLs that are the preferred alternative. Many of the complaints focus on the analyses of fishing costs and the effects of costs associated with sectors on the profitability of individual fishing businesses. This may be the case, but there are data limitations and data confidentiality restrictions that inhibit the ability to analyze and describe impacts in more detail. For example, within sectors there is often a redistribution of ACE from one vessel to another, but there is no data on the costs associated with those exchanges – only leases of ACE between sectors are reported. In any case, the economic impact analyses do indicate that the consequences for fishermen and communities are likely to be severe because of declines in revenues as a result of the reduced ACLs.

(9) *Can the Preferred Alternatives 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: No, the Preferred Alternatives cannot be reasonably expected to result in substantial impacts to unique areas or ecological critical areas. The only designated HAPC in the areas affected by this action is protected by an existing closed area that would not be affected by this action. In addition, vessel operations around the unique historical and cultural resources encompassed by the Stellwagen Bank National Marine Sanctuary would not likely be altered by this action. As a result, no substantial impacts are expected from this action.

(10) *Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?*

Response: The Preferred Alternatives are not expected to result in highly uncertain effects on the human environment or involve unique or unknown risks. The measures used in this action are similar to those adopted in past management actions, and these prior actions have reduced fishing mortality on many stocks and initiated stock rebuilding. While there is a degree of uncertainty over how fishermen will react to the proposed measures, the analytic tools used to evaluate the measures attempt to take that uncertainty into account and reflect the likely results as a range of possible outcomes. For example, the economic analysis in Section 7.4 illustrates the distribution of results that are expected rather than provide only a point estimate. Overall, the impacts of the Preferred Alternatives can be, and are, described with a relative amount of certainty. The economic impacts will clearly be negative and may affect the ability of many fishermen to remain in business.

(11) *Is the Preferred Alternative related to other actions with individually insignificant, but cumulatively significant impacts?*

Response: The Proposed Action is not related to other actions with individually insignificant but cumulatively significant impacts. Recent management actions in this fishery include FW 42, FW 43, Amendment 16, FW 44, FW 45, FW 46, FW 47, FW 48, and FW 49. FW 42 developed specific measures implementing programs adopted by Amendment 13; each was determined to be insignificant. FW 43 adopted limits on groundfish bycatch by mid-water trawl herring vessels and was not determined to have a significant effect on either the groundfish or herring fisheries. Amendment 16 had significant impacts and thus required the preparation of an EIS, while Frameworks 44 and 46 set specifications as required under Amendment 16 and made relatively minor adjustments to the sector administration program. Framework 46 modified the amount of haddock that may be caught by the midwater herring fishery. Framework 47 adjusted several ABCs/ACLs for FY 2012, FW 48 modified many of the ABC/ACL provisions, AMS, and monitoring provisions, and FW 49 adjusted the timing of scallop vessel access to access areas on GB. The measures in this action were anticipated by Amendment 16 and thus cannot be said to have different cumulative impacts that were not foreseen and addressed in the amendment. Therefore, the Preferred Alternatives, when assessed in conjunction with the actions noted above, would not have significant impacts on the natural or physical environment.

(12) *Are the Preferred Alternatives likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural or historical resources?*

<u>Response</u>: The Preferred Alternatives are not likely to affect objects listed in the National Register of Historic Places or cause significant impact to scientific, cultural, or historical resources. The only objects in the fishery area that are listed in the National Register of Historic Places are ship wrecks, including several in the Stellwagen Bank National Marine Sanctuary. The current regulations allow fishing within the Stellwagen Bank National Marine Sanctuary. The Preferred Alternatives would not regulate current fishing practices within the sanctuary. However, vessels typically avoid fishing near wrecks to avoid tangling gear. Therefore, this action would not result in any adverse effects to wrecks.

(13) *Can the Preferred Alternatives reasonably be expected to result in the introduction or spread of a non-indigenous species?*

<u>Response:</u> This action would not result in the introduction or spread of any non-indigenous species, as it would not result in any vessel activity outside of the Northeast region.

(14) *Are the Preferred Alternatives likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?*

<u>Response:</u> No, the Preferred Alternatives are not likely to establish precedent for future actions with significant effects. The Preferred Alternatives adopt measures that are designed to react to the necessity to reduce fishing mortality for several groundfish stocks in order to achieve the fishing mortality targets adopted by Amendment 16 and subsequent framework actions. As such, these measures are designed to address a specific problem and are not intended to represent a decision about future management actions that may adopt different measures.

(15) *Can the Preferred Alternatives reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?*

<u>Response:</u> The Preferred Alternatives are intended to implement measures that would offer further protection of marine resources and would not threaten a violation of Federal, state, or local law or requirements to protect the environment.

(16) *Can the Preferred Alternatives reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?*

Response: As specified in the responses to the first two criteria of this section, the Preferred Alternatives are not expected to result in cumulative adverse effects that would have a substantial effect on target or non-target species. This action would maintain fishing mortality within M-S Act requirements for several groundfish stocks, with no expected increase in mortality for non-target and non-groundfish stocks.

FONSI STATEMENT: In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for Framework Adjustment 50 to the Northeast Multispecies Fishery Management Plan, it is hereby determined that Framework Adjustment 50 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 required.

for John Bullard — 22 APRIL 2013

John K. Bullard
Northeast Regional Administrator, NOAA — Date:

8.2.3 List of Preparers; Point of Contact

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8.2.4 Agencies Consulted

The following agencies were consulted in the preparation of this document:

Mid-Atlantic Fishery Management Council
New England Fishery Management Council, which includes representatives from the following additional organizations:
- Connecticut Department of Environmental Protection
- Rhode Island Department of Environmental Management
- Massachusetts Division of Marine Fisheries
- New Hampshire Fish and Game
- Maine Department of Marine Resources

National Marine Fisheries Service, NOAA, Department of Commerce
United States Coast Guard, Department of Homeland Security

8.2.5 Opportunity for Public Comment

Some of the elements of this action were first considered as part of FW 48, and so the meetings for that action are also listed below. The Preferred Alternatives were developed during the period January 2012 through January 2013 and were discussed at the following meetings. Opportunities for public comment were provided at each of these meetings.

Date	Meeting Type	Location
2012		
6/19-21/2012	Council Meeting	Holiday Inn by Bay, Portland, ME
8/2/12	Oversight Committee	Sheraton Harborside, Portsmouth, NH
8/24/12	Science and Statistical Committee	Boston, MA
9/11/12	GF PDT	MA DMF, New Bedford, MA
10/1/12	GF PDT Conference Call	
10/11/12	Oversight Committee	Ashworth By the Sea, Hampton, NH
10/2/12	GF PDT	Holiday Inn, Mansfield, MA
10/3/12	Recreational Advisory Panel	Holiday Inn, Peabody, MA
10/4/12	Groundfish Advisory Panel	Holiday Inn, Peabody, MA
11/5/12	Groundfish OS Mtg	Holiday Inn By the Bay, Portland, ME
11/13-11/15/12	Council Meeting	Newport Marriott, Newport, RI
11/19/12	Science and Statistical Committee	Boston, MA
11/28/12	Groundfish PDT Conference Call	
12/19/2011	Groundfish OS Meeting	Wakefield, MA

Date	Meeting Type	Location
12/12/2012	Council Meeting	Wakefield, Ma
1/8/2013	GF PDT Conference Call	
1/11/2013	GF PDT Conference Call	
1/18/2013	GF PDT Meeting	Milford, MA
1/23/2013	Scientific and Statistical Committee	Boston, MA
1/24-1/25/2013	Groundfish Oversight Committee Meeting	Portland, ME
1/30/2013	Council Meeting	Portsmouth, NH

8.3 Endangered Species Act

Section 7 of the Endangered Species Act 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. On February 6, 2012, NMFS published final rules listing the GOM DPS of Atlantic sturgeon as threatened, and listing the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon as endangered, effective April 6, 2012. Preliminary analysis indicates that multiple Atlantic sturgeon DPSs may be affected by the continued operation of the NE multispecies fishery. Formal consultation under Section 7 of the ESA has been reinitiated and is ongoing for the NE multispecies fishery. The previous BO for the NE multispecies fishery completed in October 2010 concluded that the actions considered would not jeopardize the continued existence of any listed species. This BO will be updated and additional evaluation will be included to describe any impacts of the NE multispecies fishery on Atlantic sturgeon DPSs and define any measures needed to mitigate those impacts, if necessary. It is anticipated that any measures, terms and conditions included in an updated BO will further reduce impacts to the species. While it is likely that there will be interactions between Atlantic sturgeon and gear used in the groundfish fisheries, the amount of interactions attributable to this fishery that will occur between now and the time a final BO will be published is not likely to cause an appreciable reduction in survival and recovery of any of the five DPSs. NMFS determined in an August 28, 2012, memorandum that allowing the NE multispecies fishery to continue during the reinitiation period will not violate ESA sections 7(a)(2) and 7(d). This determination may be revised if an updated Biological Opinion is received.

Thus, NMFS has concluded, at this writing, that the proposed framework adjustment and the prosecution of the multispecies fishery is not likely to jeopardize any ESA-listed species or alter or modify any critical habitat, based on the discussion of impacts in this document and on the assessment of impacts in the Amendment 16 Environmental Impact Statement. NMFS does acknowledge that endangered and threatened species may be affected by the measures proposed, but impacts should be minimal especially when compared to the prosecution of the fishery prior to implementation of Amendment 16. For further information on the potential impacts of the fishery and the proposed management action on listed species, see Section 7.3 of this document.

8.4 Marine Mammal Protection Act

The NEFMC has reviewed the impacts of the Preferred Alternatives on marine mammals and has concluded that the management actions proposed are consistent with the provisions of the MMPA. Although they are likely to affect species inhabiting the multispecies management unit, the measures will not alter the effectiveness of existing MMPA measures, such as take reduction plans, to protect those species based on overall reductions in fishing effort that have been implemented through the FMP

For further information on the potential impacts of the fishery and the proposed management action on marine mammals, see Section 7.3 of this document.

8.5 Coastal Zone Management Act

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. Pursuant to Section 930.36(c) of the regulations implementing the Coastal Zone Management Act, NMFS made a general consistency determination that the Northeast Multispecies Fishery Management Plan (FMP), including Amendment 16, and Framework Adjustment 50, is consistent to the maximum extent practicable with the enforceable policies of the approved coastal management program of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina. This general consistency determination applies to the current NE Multispecies Fishery Management Plan (FMP), and all subsequent routine federal actions carried out in accordance with the FMP such as Framework Adjustments and specifications. A general consistency determination is warranted because Framework Adjustments to the FMP are repeated activities that adjust the use of management tools previously implemented in the FMP. A general consistency determination avoids the necessity of issuing separate consistency determinations for each incremental action. This determination was submitted to the above states on October 21, 2009. To date, the states of North Carolina, Rhode Island, Virginia, Connecticut, New Hampshire, and Pennsylvania have concurred with the General Consistency Determination. Consistency was inferred for those states that did not respond.

8.6 Administrative Procedure Act

This action was developed in compliance with the requirements of the Administrative Procedure Act, and these requirements will continue to be followed when the proposed regulation is published. Section 553 of the Administrative Procedure Act 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 Council is not requesting any abridgement of the rulemaking process for this action.

8.7 Data Quality Act

Pursuant to NOAA guidelines implementing section 515 of Public Law 106-554 (the Data 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.

8.7.1 Utility of Information Product

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 Preferred Alternatives on, 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 its 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 Council to propose this action are the result of a multi-stage public process. Thus, the information pertaining to management measures contained in this document has been improved based on comments from the public, the fishing industry, members of the Council, and NOAA Fisheries Service.

This document is available in several formats, including printed publication, CD-ROM, and online through the Council's web page in PDF format. The Federal Register notice that announces the proposed rule and the final rule and implementing regulations will be made available in printed publication, on the website for the Northeast Regional Office, and through the Regulations.gov website. The Federal Register documents will provide metric conversions for all measurements.

8.7.2 Integrity of Information Product

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 NOAA Fisheries Service 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.

8.7.3 Objectivity of Information Product

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 Essential Fish Habitat Guidelines; 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 Northeast Fisheries Science Center. These update assessments were reviewed by the SAW 50 (NEFSC 2010), the Groundfish Assessment Review Meeting III (GARM III; NEFSC 2008), the Northeast Data Poor Stocks Working Group (DPWG 2009), and SAW 52 (NEFSC 2011) which all included participation by independent stock assessment scientists. Landing and revenue information is based on information collected through the Vessel Trip Report and Commercial Dealer databases. Information on catch composition, by tow, is based on reports collected by the NOAA Fisheries Service 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 Groundfish Plan Development Team/Monitoring Committee.

Despite current data limitations, the conservation and management measures proposed for this action were selected based upon the best scientific information available. The analyses conducted in support of the Preferred Alternatives were conducted using information from the most recent complete calendar years, through 2010, and in some cases includes information that was collected during the first eight months of calendar year 2011. Complete data were not available for calendar year 2010. The data used in the analyses provide the best available information on the number of harvesters in the fishery, the catch (including landings and discards) by those harvesters, the sales and revenue of those landings to dealers, the type of permits held by vessels, the number of DAS used by those vessels, the catch of recreational fishermen and the location of those catches, and the catches and revenues from various special management programs. 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 groundfish fishery.

The policy choices are clearly articulated, in Section 4.0 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 Section 7.0 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 Council, the Northeast Fisheries Science Center, the Northeast Regional Office, and NOAA Fisheries Service 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 is conducted by staff at NOAA Fisheries Service Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

8.8 Executive Order 13132 (Federalism)

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 proposed in FW 50. 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 Council (all affected states are represented as voting members of at least one Regional Fishery Management Council). No comments were received from any state officials relative to any federalism implications that may be associated with this action.

8.9 Executive Order 13158 (Marine Protected Areas)

The Executive Order on Marine Protected Areas requires each federal agency whose actions affect the natural or cultural resources that are protected by an MPA to identify such actions, and, to the extent permitted by law and to the maximum extent practicable, in taking such actions, avoid harm to the natural and cultural resources that are protected by an MPA. The E.O. directs federal agencies to refer to the MPAs identified in a list of MPAs that meet the definition of MPA for the purposes of the Order. The E.O. requires that the Departments of Commerce and the Interior jointly publish and maintain such a list of MPAs. As of the date of submission of this FMP, the list of MPA sites has not been developed by the departments. No further guidance related to this Executive Order is available at this time.

8.10 Paperwork Reduction Act

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 authority to manage information and recordkeeping requirements is vested with the Director of the Office of Management and Budget (OMB). This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

FW 47 does not modify existing collection of information requirements implemented by previous amendments to the FMP that are subject to the PRA, including:

- Reporting requirements for SAPs and the Category B (regular) DAS Program
- Mandatory use of a Vessel Monitoring System (VMS) by all vessels using a groundfish DAS
- Changes to possession limits, which will change the requirements to notify NMFS of plans to fish in certain areas
- Provisions to allow vessel operators to notify NMFS of plans to fish both inside and outside the Eastern U.S./CA area on the same fishing trip

8.11 Regulatory Impact Review

8.11.1 Executive Order 12866

The purpose of E.O 12866 is to enhance planning and coordination with respect to new and existing regulations. This E.O. requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." Section 8.11 of this document represents the RIR, which includes an assessment of the costs and benefits of the Proposed Action in accordance with the guidelines established by E.O. 12866. The analysis included in the RIR shows that this action is not a "significant regulatory action" because it will not affect in a material way the economy or a sector of the economy.

E.O. 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a significant action is any regulatory action that may:

- 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, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

8.11.1.1Objectives

The goals and objectives of Framework Adjustment 50 are the same as those detailed in Amendment 16 to the Northeast Multispecies Fishery FMP and are as follows:

Goal 1: Consistent with the National Standards and other required provisions of the Magnuson-Stevens Fishery Conservation and Management Act and other applicable law, manage the northeast multispecies complex at sustainable levels.

Goal 2: Create a management system so that fleet capacity will be commensurate with resource status so as to achieve goals of economic efficiency and biological conservation and that encourages diversity within the fishery.

Goal 3: Maintain a directed commercial and recreational fishery for northeast multispecies.

Goal 4: Minimize, to the extent practicable, adverse impacts on fishing communities and shoreside infrastructure.

Goal 5: Provide reasonable and regulated access to the groundfish species covered in this plan to all members of the public of the United States for seafood consumption and recreational purposes during the stock rebuilding period without compromising the Amendment 13 objectives or timetable. If necessary, management measures could be modified in the future to insure that the overall plan objectives are met.

Goal 6: To promote stewardship within the fishery.

Objective 1: Achieve, on a continuing basis, optimum yield (OY) for the U.S. fishing industry.

Objective 2: Clarify the status determination criteria (biological reference points and control rules) for groundfish stocks so they are consistent with the National Standard guidelines and applicable law.

Objective 3: Adopt fishery management measures that constrain fishing mortality to levels that are compliant with the Sustainable Fisheries Act.

Objective 4: Implement rebuilding schedules for overfished stocks, and prevent overfishing.

Objective 5: Adopt measures as appropriate to support international transboundary management of resources.

Objective 6: Promote research and improve the collection of information to better understand groundfish population dynamics, biology and ecology, and to improve assessment procedures in cooperation with the industry.

Objective 7: To the extent possible, maintain a diverse groundfish fishery, including different gear types, vessel sizes, geographic locations, and levels of participation.

Objective 8: Develop biological, economic and social measures of success for the groundfish fishery and resource that insure accountability in achieving fishery management objectives.

Objective 9: Adopt measures consistent with the habitat provisions of the M-S Act, including identification of EFH and minimizing impacts on habitat to the extent practicable.

Objective 10: Identify and minimize bycatch, which include regulatory discards, to the extent practicable, and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

8.11.1.2 Description

A description of the entities affected by this Framework Adjustment, specifically the stakeholders of the New England Groundfish Fishery, is provided in Section 6.5.1 of this document.

8.11.1.3 Problem Statement

The need and purpose of the actions proposed in this Framework Adjustment are set forth in Section 3.2 of this document and are incorporated herein by reference.

8.11.1.4 Analysis of Alternatives

This section provides an analysis of each proposed alternative of FW50 as mandated by EO 12866. The focus will be on the expected changes 1) in net benefits and costs to stakeholders of the New England Groundfish Fishery, 2) changes to the distribution of benefits and costs within the industry, 3) changes in income and employment, 4) cumulative impacts of the regulation, and 5) changes in other social concerns. Much of this information is captured already in the detailed economic impacts and social impacts analyses of Sections 7.4 and 7.5 of this document. This RIR will summarize and highlight the major findings of the economic impacts analysis provided in section 7.4 of this document, as mandated by EO 12866. For social impacts of each alternative, see Section 7.5.

When assessing net benefits and costs of the regulations, it is important to note that the analysis will focus on producer surplus only, namely the impacted fishing businesses. Consumer surplus is not expected to be affected by any of the regulatory changes proposed in FW50, given the large supply of domestic and foreign seafood imports.

8.11.1.4.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

SNE/MA Winter Flounder Rebuilding Strategy

A detailed description of this alternative can be found in Section 4.1.1 of this document.

Option 1: No Action

If this option would be adopted, the rebuilding strategy for SNE/MA winter flounder would continue to target an ending date of 2014 with a median probability of success. Since the stock is unlikely to rebuild by that date in the absence of all fishing mortality, the management objective would be to reduce fishing mortality to as close to 0 as possible until the stock is rebuilt. Relative to the scenarios considered in Option 2, this option provides the smallest discounted net economic benefit.

Option 2: Revised Rebuilding Strategy (Preferred Alternative)

A detailed net present value (NPV) analysis of estimated future landings under different target mortality rates for SNE/MA winter flounder is presented in Section 7.4.1.1.2 of this document. The Magnusson-Stevens Act (MSA) stipulates that rebuilding plans for fisheries deemed to be overfished are not to exceed 10 years unless biological, environmental, or international management constraints are prohibitive of such a timeframe (Section 304(e)(4)(A)(ii)). In summary, of the three fishing mortality rates which would satisfy the MSA time requirements for stock rebuilding, Freb 2023 provides the largest discounted net economic benefit using discount rates of 3%, 7%, and 10%. Under a 3% discount rate, Freb 2023 represents a $40.2 million (37%) increase in NPV from the No Action option. Depending on actual stock growth rates and associated management adjustments to the mortality rate during the rebuild phase, this figure may overestimate or underestimate the true impact.

Annual Catch Limit Specifications

A detailed description of this alternative can be found in Section 4.1.2 of this document.

Option 1: No Action

Under Option 1, ACLs will be based on FW47 specifications for the years 2013-2014, which have missing values for many species (Table 70). Since many critical stocks will have no ACL specified at all, fishing would not be permitted for the species with undefined ACLs, nor would fishing be allowed in these species' broad stock areas. In FY 2011 there were no trips able to target pollock or winter flounder without catching other, zero-allocation stocks. Consequently it is highly likely that commercial fishing for groundfish would not be permitted for Sector or Common Pool vessels under this option. Even if catch of non-allocated stocks could be reduced to zero through the use of selective gear, new targeting practices for non-groundfish species, or market timing, and market prices increased due to reduced supply, it is unlikely gross revenues would surpass $10 million. Under such circumstances, extreme industry consolidation would be expected, leading to the loss of many groundfish fishing jobs and a reduction in household income for fishing families. Shore-side infrastructure, including service and gear providers, as well as wholesalers, could become unprofitable due to the reduced business and may be forced to shut down, further impacting market prices and local communities.

Option 2: Revised Annual Catch Limit Specifications

Option 2 would specify new ABCs for GB cod, GOM cod, GB haddock, GOM haddock, GB yellowtail flounder, SNE/MA yellowtail flounder, CC/GOM yellowtail flounder, American plaice, witch flounder, redfish, Atlantic halibut, white hake, northern windowpane, southern windowpane, ocean pout and Atlantic wolffish. The new ABCs will be based on latest benchmark stock assessment information and many would be substantially lower than FY 2012 ABCs. Section 7.4.1.2.2 of this document presents the results of a quota change model (QCM) simulation to predict sector trips that would likely occur under the new ACLs in FY2013 and the associated economic impacts. The QCM was run for two different scenarios using low (Scenario 1) and high (Scenario 2) ACL estimates for GOM cod and GB yellowtail flounder with static ACL estimates for all other species[10] (Table 71). Both scenarios have similar estimated economic impacts, though Scenario 1 has a slightly larger negative impact. Expected groundfish gross revenues for FY2013 are expected to be 28-30% less than in FY2011 and 18-20% less than those predicted for FY 2012 (Table 72 and Table 76). Expected gross revenues for all species on groundfish trips for FY2013 are expected to be 23-25% less than in FY2011 and 11-13% less than predicted FY2012 values (Table 75,Table 79). These estimated revenue reductions could increase if the assumption of full 10% carryover is removed.

The home port states of Connecticut, New Hampshire, and New Jersey are expected to have the largest percentage declines in landings value since FY2011. In terms of magnitude, Massachusetts is predicted to see the largest overall decline in gross revenue since FY2011 with a decrease of approximately $21 million. Of all major home ports in the Northeast, Chatham, MA is expected to have the largest percentage decline in landings value since FY2011, though all ports will be negatively affected (Table 77).

It is clear from the simulation that the impacts will be non-uniformly distributed across vessel length classes. The economic impact is expected to fall heaviest on the smallest vessel length class (less than 30 feet) and is expected to taper off as vessel length increases up to the largest vessel length class (greater than 75 feet). This result is not surprising since, relative to larger vessels, small vessels have less scalability in terms of landings and have a smaller geographic range.

[10] The ACLs used for the QCM simulation assume the preferred values associated with this option for the US/Canada Management area TACs as well as the scallop fishery yellowtail flounder sub-ACLs (see Section 4.1.2.2).

Under both scenarios, net revenues are expected to decline much less substantially than gross revenues. Gross revenues on sector trips in FY2013 are expected to decline by a range of $26 million to $27 million (23% to 25%) from FY2011 and net revenues are expected to decline by a range of only $2 to $3 million (4% to 6%). This is due in part to limitations of the QCM trip selection process which underestimates actual trip costs and in part to efficiency gains that are predicted to occur. Maintaining net revenues would most likely occur at the expense of smaller vessels operating at a low profit margin that would be forced to lease their quota or sell their permits. The QCM also predicts that crew-days, days absent and total Sector trips would decline substantially relative to FY 2011, since only the most efficient trips are expected to occur under such highly restrictive quota allocations. Fewer operating vessels and days absent would translate into a reduction in earning opportunities for crew members.

8.11.1.4.2 Commercial and Recreational Fishery Measures

SNE/MA Winter Flounder Landing Restrictions

A detailed description of this alternative can be found in Section 4.2.1 of this document.

Option 1: No Action

This option would continue the prohibition on landing SNE/MA winter flounder. When compared to Option 2, this option would result in reduced fishing vessel revenues. Assuming the entire projected allocation of SNE/MA winter flounder to sectors and the common pool is landed, and an average ex-vessel price of $2.03 per pound, this option would be expected to result in a reduction in revenues of $5.4 million when compared to Option 2. This does not take into account that revenues of other stocks may be reduced as well since there may be fewer groundfish fishing trips as a result of the inability to land SNE/MA winter flounder.

Option 2: Landing of SNE/MA Winter Flounder Permitted (Preferred Alternative)

This option would result in an additional $5.4 million of groundfish ex-vessel revenues when compared to Option 1/No Action. This is based on the ACL that is the preferred alternative in Section 4.2.1. Most of the increase, $4.3 million, would be expected to accrue to sector vessels, while the remainder would accrue to common pool vessels. It is not possible to include this change in the QCM used to analyze the economic impacts of the revised ABCs/ACLs. The QCM uses recent fishing activity to create a simulation model, and because landing of this stock has been prohibited, there are not enough trips in the data to characterize future fishing activity.

Commercial Fishery Accountability Measures

A detailed description of this alternative can be found in Section 4.2.2 of this document.

Option 1: No Action

Option 1 would retain the current commercial fishery AMs for SNE/MA winter flounder as defined in Amendment 16 and modified by subsequent management actions. The current AM prohibits landing of this stock, but FW 48 submitted a preferred alternative that would eliminate this AM and adopt area-based restrictions if the ACL is exceeded. The impacts of this option depend on whether or not the area-based AM measure from FW48 is adopted prior to the implementation of this action and whether or not the separate landing restriction measure discussed in Section 4.2.1 is lifted. If possession is allowed and the FW48 area-based AM measure has not yet been adopted, then there would be approximately $5.4 million in foregone revenue from selecting Option 1 as opposed to Option 2 since the current AM prohibits landing SNE/MA winter. If possession is allowed and the FW48 AM has also been adopted, this option would have the same impacts for common pool vessels as Option 2 since Option 2 has the same rules for common pool vessels as the AM described in FW48 which would remain in place under Option 1. As for sector vessels, the impact will depend on the value of the landed SNE/MA winter flounder stock versus the cost and likelihood of broad stock area closures upon ACE exhaustion. This is not readily quantifiable. Since Option 2 would only be selected if landing of SNE/MA winter flounder is permitted, Option 1 is the only alternative in the no possession scenario and the impacts are the same as those corresponding to the SNE/MA winter flounder AM that persists at the time, either no possession or the FW48 area-based AM. For a more detailed discussion refer to section 7.4.2.1.2 of this document.

Option 2: Revised AM for SNE/MA Winter Flounder (Preferred Alternative)

This option would apply sector rules to sector catches of SNE/MA winter flounder, replacing the prohibition on landing or the area-based AM from FW48, whichever is currently in place. If the AM that prohibits landing is still active, then this option would allow common pool and sector vessels to produce revenues from the species that would not otherwise be possible under Option 1. As discussed in section 7.4.2.2.2 a rough approximation of the value of the proposed allocation for this stock is $5.4 million dollars, $1.1 million of which would accrue to common pool vessels and the rest to sectors. There is a risk however for sector vessels, that they exhaust their ACE prematurely within the fishing year and are no longer able to fish in the broad SNE/MA stock area. This could have negative economic impacts in terms of lost revenue from the catch of other species or increased costs from having to fish outside of the area. If on the other hand, the FW48 area-based AM has been adopted prior to this action, then the impacts to common pool vessels would be consistent across both this option and Option 1, but for sector vessels the impacts are not so clear cut between the two options. That's because under either option, sector vessels would be able to generate revenues from SNE/MA species up to the estimated value of their full allocation, approximately $4.3 million. The difference lies in the likelihood and costs associated with overages to the overall ACL and groundfish sub-ACL that trigger the area-based AM from FW48, or the likelihood and costs associated with sector-level closure of the broad SNE/MA winter flounder stock area resulting from exceeding sector ACE. Given the high number of unknowns associated with such a comparison it is not possible to quantify at this time. If as discussed in section 7.4.1.1.2, it is unlikely that sectors will exceed their ACE, then this option would likely have greater economic benefits than Option 1 since it gives sectors greater flexibility in how they land their allocation, potentially translating into higher revenues or lower costs.

Recreational Fishery Management Measures

Preliminary data from MRIP show that recreational landings of GOM haddock in FY2012 will likely approach 216 mt (477 thousand lbs). The FY2013 harvest limit has been set at 74 mt (163 thousand lbs), approximately 3 times lower than estimated FY2012 landings. Therefore, more stringent regulations are necessary to constrain recreational landings in FY2013.

In FY2012, recreational anglers were allowed to keep GOM haddock that were 18 inches or greater, with no possession limits or closed seasons. Due to changing stock conditions though, the simulation model projects that recreational angler encounters of haddock 18 inches or greater will decline in FY2013. The median value of haddock landings in FY2013 is estimated to be 153 mt (337.7 thousand lbs) after completing 100 model simulations using status quo management measures for both GOM haddock and cod (Table 88).[11] The decline is due to lower projected encounter rates of legal-sized haddock in FY2013, which translates into lower expected fishing effort and landings. The projected decline in haddock landings is not likely sufficient to restrain landings below then recreational sub-ACL of 74 mt in FY2013 though. Model results show the probability that recreational landings of haddock will not exceed the recreational sub-ACL in FY2013, under status quo measures, is predicted to be only 11% (Table 88).

Following the request of the NEFMC's Groundfish Recreational Advisory Panel, only increases in haddock minimum size limits in FY2013 were considered in this analysis. Results of raising the haddock minimum size to 20 and 21 inches are shown in Table 1. Model results show that raising the minimum size to 20 inches, results in a median value of haddock landings of about 82 mt (182,669 lbs) in FY2013. The probability that landings will remain below the sub-ACL (74 mt) in FY2013 is estimated to be 42% under a minimum size of 20 inches. Given that landings under a 20 inch minimum size in FY2013 are projected to be higher than the sub-ACL, and that the probability landings will remain below the sub-ACL is less than 50%, a 21 inch minimum size was also analyzed. The median value of haddock landings in FY2013 under a 21 inch minimum size is projected to be 57 mt (126,264 lbs), 17 mt below the haddock recreational sub-ACL. The probability that a minimum size of 21 inches will constrain landings below the recreational sub-ACL is 82%.

Table 88– Estimated Landings of GOM Hadock in FY2013 under Alternative Size Limits (Status quo GOM cod measures in FY2013).

Haddock Size Limit (inches)	Haddock Possession Limit	Haddock Closed Season	Haddock Landings (Median)	% Under Haddock ACL
18	None	None	153mt (337,692 lbs)	11
20	None	None	82 mt (182,669 lbs)	42
21	None	None	57 mt (126,264 lbs)	63

The following discussion is limited to a determination of significance of the proposed action based solely on economic criteria.

[11] GOM haddock and cod are often caught together, so changes in regulations for either species could have an impact on landings of both species. The simulation model incorporates this joint-catchability so status quo GOM cod measures were assumed for FY2013. This assumption is reasonable since status quo GOM cod measures are being proposed for FY2013.

The simulation model projects angler effort will be about 11% lower in FY2013 if the haddock minimum size is raised from 18 inches to 21 inches. This is because the number of encounters with legal-sized haddock will decline significantly so some anglers will reduce the number of trips they fish for haddock. An 11% decline in fishing trips translates into a loss of 16,927 fishing trips in FY2013. The actual realized loss in fishing trips may be lower though since some anglers will switch to other species besides haddock and cod (striped bass, bluefish, black sea bass, scup, etc.) not considered in the simulation model. Significant changes in angler behavior, such as changes in gear, fishing mode (for-hire, private boat, shore), fishing season, and fishing costs, could likely impede many anglers from switching to other species though. Thus, for purposes of this analysis it assumed that fishing trips will decline by 16,900 in FY2013.

MRIP data from 2011 show that trips aboard for-hire boats landed 42% of the haddock in the Gulf of Maine and the remaining 58% were on private boats. Assuming the projected decline in fishing trips in FY2013 is distributed according to these proportions, for-hire fishing trips will decline by 7,109 and private boat trips by 9,818. The impacts of this decline on businesses that sell goods and services to recreational fishermen is discussed next.

During 2011, economic expenditure data from marine recreational fishermen in each coastal state in the U.S. were gathered through an economic add-on to the MRIP intercept survey. As part of this survey, anglers were asked to delineate trip expenditures and purchases of durable equipment used primarily for saltwater recreational fishing. Results of the survey were used to project the potential losses to supporting businesses associated with the proposed increase in the haddock minimum size limit to 21 inches in FY2013.

Survey results indicate that the average trip expenditure in Maine, New Hampshire, and Massachusetts in 2011 was $51.93 for anglers fishing from a private/rental boat and 234.03 for anglers that fished from a for-hire boat. Trip expenditures included the following consumable items: (1) public and private transportation; (2) food, drink, and refreshments from grocery stores; (3) meals at restaurants; (4) auto rental; (5) lodging; (6) boat fuel; (7) boat or equipment rental; (8) charter fees; (9) charter crew tips; (10) catch processing; (11) access and parking; (12) bait; (13) ice; (14) tournament fees; and (15) gifts/souvenirs. Expenditures on durable items such as rods, reels, boats, special fishing clothing, etc., were also estimated but are not included in the subsequent analysis. Although expenditures on durable items may also be affected to a lesser extent by the proposed regulations, the extent of the impact would be difficult to quantify since these items could be used for many trips.

Reductions in anglers' trip-related purchases will have a direct effect on the sales of businesses that supply goods and services to saltwater fishermen. A decline in sales for these directly affected businesses could also affect employment decisions, wages and salaries paid to employees, and profits. In addition, the directly affected businesses that supply goods and services to recreational fishermen must also purchase goods and services, which in turn, could affect the sales, income, and employment of many additional businesses.

Estimated losses in direct sales were estimated by multiplying the projected declines in recreational fishing trips by for-hire and private boat anglers by the average trip expenditure estimates from the 2011 expenditure survey. The loss in sales due to a decline in angler expenditures is $1.66 million for for-hire anglers and $509.8 thousand for private boat anglers. Thus, the total loss in direct sales associated with an increase in the haddock minimum size limit to 21 inches in FY2013 is estimated to be $2.17 million. Additional losses in sales could accrue to indirectly affected businesses. Although the magnitude of the indirect losses are uncertain, typical indirect sales multipliers range from 1.5 - 2.0. This means that total direct and indirect sales losses from the proposed action could approach $3.26 - $4.34 million in FY2013.

8.11.1.5 Determination of Significance

The Proposed Action is not predicted to have an adverse impact on fishing vessels, purchasers of seafood products, ports, recreational anglers, and operators of party/charter businesses in excess of $100 million. Adverse economic impacts will result from this proposed action throughout the range of the groundfish fishery, including reduced income and employment opportunities. These impacts are estimated to be most significant for smaller vessels fishing in the inshore GOM. ACE trading and leasing will mitigate some of the adverse effects, and these transfer payments are expected to flow from larger vessels to smaller vessels, particularly those hailing from inshore Gulf of Maine ports. The potential decrease in gross revenues from fishing on sector trips under this action is estimated to be $26 million to $27 million from the FY 2011 observed revenues, falling short of the $100 million standard for significance. The only scenario that could come close to the $100 million mark would be under the No Action alternative where no new ACLs are set for selected and fishing for those species is prohibited entirely. Since total predicted gross revenues on groundfish trips for 2012 are below $100 million, and since much of the industry capitalization could be recovered through the sale or repurposing of assets, it is unlikely that the total pecuniary impact would surpass the threshold of significance as defined by E.O. 12866, even under such dire circumstances. A total shutdown could however impact local fishing communities in a material way, through a reduction in jobs and local expenditures as well as damage to cultural heritage. If such a circumstance were to come to pass, it would then be classified as significant under E.O. 12866.

8.11.2 Regulatory Flexibility Act

8.11.2.1 Introduction

The purpose of the Regulatory Flexibility Analysis (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct an IRFA for each proposed rule. The IRFA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. An IRFA is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." In addition to analyses conducted for the RIR, the IRFA provides: 1) A description of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for, the proposed rule; 3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and, 5) an identification, to the extent practicable, of all relevant federal rules, which may duplicate, overlap, or conflict with the proposed rule.

8.11.2.2 Description of reasons why action by the agency is being considered

The need and purpose of the actions are set forth in Section 3.2 of this document and are incorporated herein by reference.

8.11.2.3 Statement of the objectives of, and legal basis for, the proposed rule

The goals and objectives of Framework Adjustment 50 are the same as those detailed in Amendment 16 to the Northeast Multispecies Fishery FMP. In general, FW 50 is intended to modify catch limits and management measures to ensure that overfishing does not occur, while at the same time achieving optimal yield (OY).

8.11.2.4 Description and estimate of the number of small entities to which the proposed rule will apply

The Small Business Administration (SBA) defines a small business as one that is:

- independently owned and operated

- not dominant in its field of operation
- has annual receipts not in excess of -
    - $4.0 million in the case of commercial harvesting entities, or
    - $7.0 million in the case of for-hire fishing entities

- or if it has fewer than -
    - 500 employees in the case of fish processors, or
    - 100 employees in the case of fish dealers.

This framework action impacts mainly commercial harvesting entities engaged in the limited access groundfish as well as both the limited access general category and limited access scallop fisheries.

Regulated Commercial Harvesting Entities

Limited Access groundfish harvesting permits

The limited access groundfish fisheries are further sub-classified as those enrolled in the Sector allocation program and those in the Common Pool. Sector vessels are subject to Sector-level stock-specific Annual Catch Entitlements (ACE) that limit catch of allocated groundfish stocks. Accountability measures (AMs) include a prohibition on fishing inside designated areas once 100% of available Sector ACE has been caught, as well as area-based gear and effort restrictions that are triggered when catch of non-allocated groundfish stocks exceed Allowable Catch Limits (ACLs). Common Pool vessels are subject to various Days-at-sea and trip limits designed to keep catches below ACLs set for vessels enrolled in this program. In general, Sector-enrolled businesses rely more heavily on sales of groundfish species than Common Pool-enrolled vessels. At the beginning of the 2012 Fishing Year (May 1, 2012) there were 1,382 individual limited access permits. Each of these was eligible to join a Sector or enroll in the Common Pool. Alternatively they could also allow their permit to expire by failing to renew it. 827 permits were enrolled in the Sector program and 584 were in the Common Pool.

Limited access scallop harvesting permits

The limited access scallop fisheries are further sub-classified as Limited Access (LA) scallop permits and Limited Access General Category (LGC) scallop permits. LA scallop permit businesses are subject to a mixture of days-at-sea (DAS) and dedicated area trip restrictions. LGC scallop permit businesses are able to acquire and trade LGC scallop quota and there is an annual cap on quota/landings. At the beginning of the 2012 Fishing Year (March 1, 2012) there were 342 active LA scallop and 603 active LGC permits.

Permit-level data are presented for illustrative purposes, with gross receipts averaged across CY 2010-2012 (Table 89 and Table 9095).

Table 89 – Number of permits held in potentially impacted fisheries

	Total permits	Sector permits	Common Pool permits	Limited Access Scallop permits	Limited Access GC Scallop	Both Sector and LA Scallop permits	Both Sector and LGC Scallop permits	Both Common Pool and LA Scallop permits	Both Common Pool and LGC Scallop permits
2010	1916	747	709	343	649	26	239	24	88
2011	1845	804	607	336	613	31	227	25	81
2012	1838	827	584	342	603	35	232	23	77

Table 90 – Gross sales associated with potentially impacted permits

Gross sales category	Number permits	Median gross sales	Median gross sales of groundfish	Median gross sales of scallops
0	644	$0	$0	$0
<$50K	248	$12,143	$3,693	$0
$50-100K	105	$77,518	$15,876	$0
$100-500K	481	$211,653	$62,140	$446,383
$500K-1mil	134	$698,289	$166,705	$495,123
$1-4mil	384	$1,631,354	$194,572	$1,666,564
$4-10mil	26	$4,364,661	$1,002,113	$4,115,054

Ownership entities in regulated commercial harvesting businesses

Individually-permitted vessels may hold permits for several fisheries, harvesting species of fish that are regulated by several different fishery management plans, even beyond those impacted by the proposed action. Furthermore, multiple permitted vessels and/or permits may be owned by entities affiliated by stock ownership, common management, identity of interest, contractual relationships or economic dependency. For the purposes of this analysis, ownership entities are defined by those entities with common ownership personnel as listed on permit application documentation. Only permits with identical ownership personnel are categorized as an ownership entity. For example, if five permits have the same seven personnel listed as co-owners on their application paperwork, those seven personnel form one ownership entity, covering those five permits. If one or several of the seven owners also own additional vessels, with sub-sets of the original seven personnel or with new co-owners, those ownership arrangements are deemed to be separate ownership entities for the purpose of this analysis.

A summary of regulated ownership entities within potentially impacted fisheries

Ownership data are available for the four primary sub-fisheries potentially impacted by the proposed action from 2010 onward. However, current data do not support a common ownership entity data field across years. For this reason only one year's gross receipts will be reported, with calendar year 2011 serving as the baseline year for this analysis. Calendar year 2012 data are not yet available in a fully audited form.

In 2011 there were 1,370 distinct ownership entities identified. Of these, 1,312 are categorized as small and 58 are large entities as per SBA guidelines (Table 91).

These totals may mask some diversity among the entities. Many, if not most, of these ownership entities maintain diversified harvest portfolios, obtaining gross sales from many fisheries and not dependent on any one. However, not all are equally diversified. Those that depend most heavily on sales from harvesting species impacted directly by the proposed action are most likely to be affected. By defining dependence as deriving greater than 50% of gross sales from sales of either regulated groundfish or from scallops, we are able to identify those ownership groups most likely to be impacted by the proposed regulations. Using this threshold, we find that 135 entities are groundfish-dependent with 131 small and four large. We find that 47 entities are scallop-dependent with 39 small and 8 large (Table 9296).

Table 91 – Description of entities regulated by the Proposed Action

sales	Size standard	Number of ownership entities	Average number permits owned per entity	Maximum permits owned per entity	Median gross sales per entity	Average gross sales per entity	Average groundfish sales per entity	Average scallop sales per entity
$0	small	448	1.1	35	$0	$0	$0	$0
<$50K	small	150	1.1	6	$11,809	$16,069	$6,467	$0
$50-100K	small	88	1.1	3	$77,698	$75,342	$18,221	$0
$100-500K	small	334	1.2	4	$222,265	$244,526	$97,889	$0
$500K-1mil	small	103	1.5	7	$680,218	$700,954	$278,618	$546,111
$1-4mil	small	189	1.9	8	$1,806,443	$2,030,334	$704,861	$1,777,724
$4mil+	large	58	7.0	36	$7,950,960	$10,753,380	$2,398,832	$5,137,942
Total ownership entities:		*1370*						

Table 92 – Description of groundfish and scallop dependent entities regulated by the Proposed Action

Entity type	sales	Size standard	Number of ownership entities	Average number permits owned per entity	Maximum permits owned per entity	Median gross sales per entity	Average gross sales per entity	Average groundfish sales per entity	Average scallop sales per entity
groundfish_dependent	<$50K	small	13	1.0	1	$7,944	$13,980	$10,827	$0
groundfish_dependent	$50-100K	small	6	1.0	1	$81,481	$76,726	$58,902	$0
groundfish_dependent	$100-500K	small	61	1.6	4	$245,176	$256,524	$205,415	$0
groundfish_dependent	$500K-1mil	small	23	2.2	7	$791,387	$769,666	$564,253	$0
groundfish_dependent	$1-4mil	small	28	3.1	8	$1,546,338	$1,636,644	$1,373,636	$0
groundfish_dependent	$4mil+	large	4	4.8	8	$6,618,976	$6,984,382	$5,575,181	$2,005,277
scallop_dependent	$500K-1mil	small	4	1.0	1	$711,928	$708,607	$0	$546,111
scallop_dependent	$1-4mil	small	35	1.5	4	$1,975,662	$2,150,028	$204	$1,958,618
scallop_dependent	$4mil+	large	8	6.6	13	$10,423,610	$11,075,904	$41,363	$7,292,324
		groundfish dependent	*135*						
		scallop dependent	*47*						
		total dependent	*182*						

Limited access herring permits[12]

The Northeast Multispecies Fishery Management Plan allows for sub-allocations of regulated groundfish stocks for the purposes of bycatch in other fisheries, including sub-allocation of haddock intended as regulated bycatch for vessels permitted to fish for Atlantic herring under the Atlantic Herring Fishery Management Plan. Because the proposed action will decrease the available GOM and GB haddock Allowable Biological Catch for the groundfish fishery, vessels permitted in the Atlantic herring fishery are technically regulated by this action.

Table 93 categorizes the number of large and small permit holders in the herring fishery over the 2010-2012 time period. Note that open-access (Category D) permit holders, while quite numerous, are subject to fairly low possession limits for herring, are responsible for very small levels of landings, and derive relatively little revenue from this fishery. In 2012, there were 3 large entities and 86 small entities which had limited access permits. Another 1,984 small vessels held open access permits.

Table 93 – Description of large and small regulated herring entities (# vessels)

	2010		2011		2012	
Permit Cat	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**
A	0	43	3	39	3	37
B	0	4	0	4	0	4
C	0	49	0	47	0	45
D	0	2,276	0	2,124	0	1,984

Table 94 summarizes numbers of vessels, mean gross revenues, and mean gross revenues from herring associated with potentially impacted limited-access (A, B, or C) permits in 2012.

Table 94 – Gross sales for herring fishing entities by permit in 2012

Gross sales category	Number of Permits	Mean Gross sales	Mean sales of herring
0	15		
<$50K	4	$ 22,567	$ -
$50-100K	6	$ 73,943	$ 990
$100-500K	15	$ 261,931	$ 83,350
$500K-1M	15	$ 764,142	$ 185,495
$1-4M	39	$ 1,726,859	$ 416,479
$4+M	3	$ 5,263,488	$ 1,905,180

Ownership data are available for 2010 onward. Data for 2010-2012 are presented, although data for the calendar year 2012 are preliminary. Table 95 describes the large and small entities. While there are entities that hold limited-access herring permit (A/B/C) with gross receipts greater than $4M, none of these entities reported any herring revenues during 2010-2012; these

[12] The description of small and large entities in the herring fishery is excerpted from the Herring FMP FW2 IRFA. As such, there is potential overlap between the ownership groups identified here and the groundfish/scallop dependent entities presented by this IRFA.

entities are unlikely to be affected by the proposed action's changes to the sub-allocation for the herring fishery.

Table 95 – Gross sales for herring entities by ownership group

		2010		2011		2012	
	Revenue group	Some Herring Landings	No herring Landings	Some Herring Landings	No herring Landings	Some Herring Landings	No herring Landings
Small	**<$4M**	28	42	23	41	21	40
Large	**>=$4M**	0	1	0	4	0	3

Framework Adjustment 46 to the Northeast Multispecies fishery created separate mid-water trawl fishery haddock sub-ACLs for GB haddock and GOM haddock equal to 1% of the respective ABCs. In the event that the herring fishery exceeds their sub-allocation of haddock for either stock, harvesting restrictions in GB and GOM AM areas for herring will go into effect and the total amount of the overage will be deducted from the following fishing year's sub-ACL as well. The economic impacts section (8.4) of the Northeast Multispecies FMP FW46 presents a detailed simulation of MWT haddock catch levels under different levels of observer coverage. It concludes that based on historical fishing activity through March 2011, it is unlikely that the 1% sub-ACLs for haddock would be exceeded in any given year.

The mid-water trawl (MWT) sub-ACL for GB haddock is expected to decrease by 13 mt (5%) under the proposed action. The MWT sub-ACL for GOM haddock is expected to decrease by 6 mt (67%). If haddock bycatch rates for the MWT herring fishery change disproportionately to haddock biomass levels for FY2013, there could be risk of an overage to the haddock catch cap. Under those circumstances MWT herring vessels might face increased costs from avoidance strategies to prevent AMs or lost herring revenue from triggering the AMs. Because the ABCs are based off of latest stock assessment information and the MWT haddock sub-ACLs will be calculated at a fixed rate of 1%, it is unlikely that the MWT haddock AMs will be triggered as a result of the proposed action. As a result, small regulated entities that derive revenues from the herring fishery are not expected to be impacted by changes to the MWT sub-ACLs proposed by this action.

Regulated Recreational Harvesting Entities

Party/charter permits are issued as an open access category I permit under the Northeast Multispecies FMP. During FY 2010, 762 party/charter permits were issued. 332 of the 762 open access party/charter permit holders reported taking and retaining any species on at least one for-hire trip. No limited access commercial permit holders reported taking passengers for hire in 2010. 285 party/charter permits reported catching at least one cod or haddock in FY 2010. While all party/charter fishing businesses who catch cod or haddock may be affected by the proposed action, it is important to note that of 285 active party/charter businesses reported to have caught cod or haddock, 148 reported fishing in the Gulf of Maine stock area (Table 101).

Table 96 – Party/charter fishing trips and participating vessels, 2010-2012 (source: NMFS VTR)

		2010	2011	2012
All party/charter	#trips	17,622	17,281	15,536
	#vsls	351	356	280
Party/charter retaining at least 1 cod or haddock	#trips	10,790	10,215	8,274
	#vsls	305	302	224
At least 1 cod or haddock, fishing in the GOM cod stock area	#trips	8,824	7,878	6,927
	#vsls	165	151	117

For regulated party/charter operators the median value of gross receipts from passengers was just over $9,000 and did not exceed $500K in any year during 2001 to 2010. Therefore, all regulated party/charter operators are determined to be small entities under the RFA.

8.11.2.5Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

The proposed rules in FW 50 are not expected to create any additional reporting, record-keeping or other compliance requirements.

8.11.2.6Identification of all relevant Federal rules, which may duplicate, overlap or conflict with the proposed rule

No relevant Federal rules have been identified that would duplicate or overlap with the proposed action.

8.11.2.7Significance of economic impacts on small entities

<u>Substantial number criterion</u>

In colloquial terms, substantial number refers to “more than a few.” Given that the majority of entities in the commercial and recreational groundfish, scallop and herring industries, both at the permit and ownership entity level, earn less than $4 million annually, all of the proposed alternatives will have impacts on a substantial number of small entities.

<u>Significant economic impacts</u>

The outcome of “significant economic impact” can be ascertained by examining two factors: disproportionality and profitability.

- Disproportionality refers to whether or not the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities.

- Profitability refers to whether or not the regulations significantly reduce profits for a substantial number of small entities.

The proposed action may place small entities at a significant competitive disadvantage relative to large entities, particularly those small entities engaged in the commercial groundfish fishery. Analysis predicts that smaller entities, those generating less than $500K in annual gross sales, will be the most impacted with predicted gross sales losses on the order of 20-25% in total gross sales and 50-80% in gross sales from groundfish. Large entities (>$4mil) are predicted to face gross sales declines on the order of 5-10% and declines in gross sales from groundfish of approximately 20-25%.

Impacts on profitability from the proposed action are more uncertain, with the QCM predicting only a slight decrease in profitability. Because the model intentionally selects for the most profitable trips, it likely over-estimates the ability of the fishery to achieve significant efficiency gains under the proposed action. This result is almost certainly optimistic, and the proposed action will likely result in reductions in profitability for a substantial number of small entities.

Impacts to groundfish-dependent small entities

The provision to change the rebuilding strategy for SNE/MA winter flounder and the provision to lift the restriction on landing SNE/MA winter flounder are not expected to have adverse economic impacts on groundfish dependent small entities nor are they expected to place small entities at a competitive disadvantage. Setting a new rebuild target date of 2023 as described in section 7.4.1.1.2 of this document may allow for an estimated $40.2 million dollar increase in NPV over the no action option, assuming landing restrictions are also lifted. By permitting SNE/MA winter flounder to be landed, SNE/MA winter flounder regulatory discards would now have economic value to fishing businesses. Section 7.4.2.1.2 of this document predicts the FY2013 allocation of SNE/MA winter flounder to be worth $5.4 million in terms of ex-vessel gross revenues if landing is permitted.

The provision to revise the SNE/MA winter flounder AMs has the potential to impact the profitability of groundfish dependent small entities. The impacts will depend on whether or not the SNE/MA winter flounder AM proposed in FW48 has already been adopted. If it has not, then the FW50 AM option would remove the no possession mandate and would allow revenue to accrue from SNE/MA winter flounder. As discussed earlier, landings for this species would be worth approximately $5.4 million in FY2013 and the net present value of the future revenue stream over the ten-year rebuilding period would be approximately $40.2 million. There is the potential for increased operating costs under the new AM if restricted areas are activated for common pool vessels as a result of exceeding the common pool sub-ACL or the broad stock area is closed to sectors as a result of ACE exhaustion. This would most likely be outweighed by the increase in revenue from landings. If on the other hand, the FW48 AM has been adopted, then the impacts of the revised AM in FW50 would be based on the probability and cost of closures under each respective AM. Given that sector rules would provide more flexibility in terms of managing landings, it seems likely that net revenues for groundfish dependent small entities would be slightly higher under the AM proposed in FW50 than the one proposed in FW48. A more detailed discussion of the potential impacts can be found in Section 7.4.1.2.2 of this document.

The results of the QCM simulation discussed in Section 7.4.1.2.2 clearly indicate that those entities which are dependent on groundfish landings will be negatively impacted. Gross revenues for the groundfish industry are predicted to decrease in FY2013 by a range of $26 million to $27 million (23% to 25%) from FY2011. The QCM predicts net revenues will decrease by a much lower percentage (4% to 6%), but it is due in part to the model optimization, which selects the most profitable trips from the sample. As shown in Table 102, groundfish dependent small entities are expected to be disproportionately impacted by the proposed regulation, especially those that earn less than $500K annually. Though it is unclear how much of the lost revenue will be offset by efficiency gains, it seems likely that the profitability of many small entities will be significantly reduced under the proposed groundfish ACLs.

Table 97 – Median gross sales across entities in each sales group

Sales Cat	2011 Gross Sales	2011 Gross Sales on Groundfish Trips	2013 Gross Sales on Groundfish Trips	Change in Gross Sales*	Change in Gross Sales on Groundfish Trips
<$50K	$ 39,072	$ 7,612	$ 1,721	-6%	-84%
$50-100K	$ 81,601	$ 43,489	$ 19,019	-23%	-70%
$100-500K	$ 32,041	$ 137,661	$ 63,440	-25%	-52%
$500K-1mil	$ 706,059	$ 489,131	$ 281,113	-10%	-15%
$1-4mil	$ 1,577,738	$ 1,224,472	$ 1,088,850	-8%	-18%
$4-10mil	$ 1,938,227	$ 2,328,048	$ 1,890,108	-9%	-21%
$10mil+	$ 8,407,928	$ 5,038,893	$ 4,056,079	-5%	-24%

*Assumes non-groundfish gross sales are same as in 2011.

Impacts to scallop-dependent small entities

The scallop fishery GB yellowtail flounder sub-ACL is expected to decrease by 115.4 mt (38%) and the SNE/MA yellowtail flounder sub-ACL is expected to decrease by 65 mt (52%) under the proposed action. If scallop vessels participating in either open-area or access-area trips exceed their sub-allocation of yellowtail flounder bycatch and either the total yellowtail flounder (GB or SNE/MA) ACL is exceeded or the scallop fishery exceeds its ACL by 50 percent or more, yellowtail AMs for that stock will go into effect the following FY, as defined in Amendment 15 of the Atlantic Sea Scallop FMP and modified in FW23. The length of the AM area closures would be determined by the overage percent.

As discussed in FW23 of the Atlantic Sea Scallop FMP, the SNE/MA closures are not expected to have large impacts on the limited access fleet given that only 4.6% of the total landings of FT dredges and even a smaller proportion of the landings for full-time small dredges come from these areas. With regards to GB yellowtail flounder if the overage is greater than 56%, there would be no access to CA2 and the revenues would decline by $16.2 million (present value of revenues) and total economic benefits would decrease by $16.9 million (Section 7.4.2.3.1 of the Northeast Multispecies FMP FW 48). If the overage is less than 56%, the AM areas will be open to fishing part of the year, so fishing effort could be moved to other months. Shorter scallop fishing windows could increase operating costs and have potential negative price impacts from short-term supply increases. If the effort was shifted to other seasons when the meat weights are highest, there could be some positive impacts on the long-term revenues, possibly offsetting some of the negative economic effects.

The proposed action specifies a scallop fishery GB yellowtail sub-ACL that is 40% of the US ABC. This is equal to 192.1 mt which is greater than the high estimate of GB yellowtail bycatch (152.8 mt) in the scallop fishery under preferred Alternative 2 submitted in the Atlantic Sea Scallop FMP FW24. As such, it is unlikely that a significant overage will occur and thus scallop dependent small entities are not expected to be significantly impacted in terms of profitability.

Impacts to recreational fishing businesses

This analysis will present information relative to the impacts of this proposed action on small entities. Specifically, an assessment of potential changes in gross revenues for the alternative proposed in this action was conducted for federally permitted party/charter vessels operating in the Gulf of Maine. Estimates of the impacts upon profitability are not provided because data on costs and revenues for party/charter vessels are not available at this time.

Total potential losses in gross revenues for party/charter vessels operating in the Gulf of Maine are estimated by multiplying the projected FY2013 decline in fishing trips, associated with the increase in the haddock minimum size to 21 inches, by the estimated average access fee paid by party/charter anglers. The projected decline in the number of fishing trips aboard for-hire boats in the Gulf of Maine in FY2013 (7,109) was derived above, and the average party/charter fee ($137) was calculated from the previously mentioned 2011 angler expenditure survey. The multiplication of these two values results in total potential gross revenue losses of $974 thousand across participating for-hire vessels. Assuming the number of actively participating party/charter vessels in FY2013 will be the same as in FY2011, results in average projected gross revenue losses per vessel of $5,729 ($974 thousand / 170).

Actual losses will likely be lower than estimated though since some anglers will switch to other species besides haddock and cod (striped bass, bluefish, black sea bass, scup, etc.) not considered in the simulation model. For-hire businesses that are able to offer more non-groundfish fishing trips specifically marketed towards alternative species may be able offset some of the estimated losses.

8.11.2.8 Description of significant alternatives to the proposed rule and discussion of how the alternatives attempt to minimize economic impacts on small entities

This IRFA is intended to analyze the impacts of the alternatives described in Section 4.0 of FW 50 on small entities. These alternatives include modifications to the SNE/MA winter flounder rebuilding strategy, changes to the ABCs and sub-ACLs for many groundfish stocks, changes to the restriction on landing SNE/MA winter flounder, and changes to the commercial AM for SNE/MA winter flounder. For each of these four major categories, there is one alternative option that could be selected in place of the Proposed Action.

8.11.2.8.1 SNE/MA Winter Flounder Rebuilding Strategy Option 1: No Action

If this option would be adopted, the rebuilding strategy for SNE/MA winter flounder would continue to target an ending date of 2014 with a median probability of success. Since the stock is unlikely to rebuild by that date in the absence of all fishing mortality, the management objective would be to reduce fishing mortality to as close to 0 as possible until the stock is rebuilt. Relative to the scenarios considered in Option 2, this option provides the smallest discounted net economic benefit.

Annual Catch Limit Specifications Option 1: No Action

Under Option 1, ACLs will be based on FW47 specifications for the years 2013-2014, which have missing values for many species. Since many critical stocks will have no ACL specified at all, fishing would not be permitted for the species with undefined ACLs, nor would fishing be allowed in these species' broad stock areas. A detailed discussion of potential economic impacts is presented in Section 7.4.1.2.1 of this document. Between November 1, 2011 and October 31, 2012, only $35,763 in gross revenues was reported from sector trips that did not catch (land or discard) any of the zero-sub-ACL stocks and that did not occur in any of the broad stock areas associated with those stocks. Assuming full utilization of SNE/MA yellowtail flounder and current FY2012 prices, an upper bound estimate of groundfish revenue would be $1 million dollars. Under such assumptions gross sector revenues could reach an upper bound of $3.3 to $4 million dollars if ACE efficiency remains consistent with the trips identified in the analysis. Even if sector vessels became more efficient through the use of selective gear, new targeting practices for non-groundfish species, or market timing, and market prices increased due to reduced supply, it is unlikely gross revenues would surpass $10 million. Under such circumstances, extreme industry consolidation would be expected, leading to the loss of many groundfish fishing jobs and a reduction in household income for fishing families. Some of the reduction in income could be offset through lease transfers of SNE/MA yellowtail flounder, but it would likely be minimal. Shore-side infrastructure, including service and gear providers, as well as wholesalers, could become unprofitable due to the reduced business and may be forced to shut down, further impacting market prices and local communities.

SNE/MA Winter Flounder Landing Restrictions Option 1: No Action

This option would continue the prohibition on landing SNE/MA winter flounder. When compared to Option 2, this option would result in reduced fishing vessel revenues. Assuming the entire projected allocation of SNE/MA winter flounder to sectors and the common pool is landed, and an average ex-vessel price of $2.03 per pound, this option would be expected to result in a reduction in revenues of $5.4 million when compared to Option 2. This does not take into account that revenues of other stocks may be reduced as well since there may be fewer groundfish fishing trips as a result of the inability to land SNE/MA winter flounder.

Commercial Fishery Accountability Measures Option 1: No Action

Option 1 would retain the current commercial fishery AMs for SNE/MA winter flounder as defined in Amendment 16 and modified by subsequent management actions. The current AM prohibits landing of this stock, but FW 48 submitted a preferred alternative that would eliminate this AM and adopt area-based restrictions if the ACL is exceeded. The impacts of this option depend on whether or not the area-based AM measure from FW48 is adopted prior to the implementation of this action and whether or not the separate landing restriction measure discussed in Section 4.2.1 is lifted. If possession is allowed and the FW48 area-based AM measure has not yet been adopted, then there would be approximately $5.4 million in foregone revenue from selecting Option 1 as opposed to Option 2 since the current AM prohibits landing SNE/MA winter. If possession is allowed and the FW48 AM has also been adopted, this option would have the same impacts for common pool vessels as Option 2 since Option 2 has the same rules for common pool vessels as the AM described in FW48 which would remain in place under Option 1. As for sector vessels, the impact will depend on the value of the landed SNE/MA winter flounder stock versus the cost and likelihood of broad stock area closures upon ACE exhaustion. This is not readily quantifiable. Since Option 2 would only be selected if landing of SNE/MA winter flounder is permitted, Option 1 is the only alternative in the no possession scenario and the impacts are the same as those corresponding to the SNE/MA winter flounder AM that persists at the time, either no possession or the FW48 area-based AM. For a more detailed discussion refer to section 7.4.2.2.2 of this document.

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9.0 References

9.1 Glossary

Adult stage: One of several marked phases or periods in the development and growth of many animals. In vertebrates, the life history stage where the animal is capable of reproducing, as opposed to the juvenile stage.

Adverse effect: Any impact that reduces quality and/or quantity of EFH. May include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include sites-specific of habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

Aggregation: A group of animals or plants occurring together in a particular location or region.

Anadromous species: fish that spawn in fresh or estuarine waters and migrate to ocean waters

Amphipods: A small crustacean of the order Amphipoda, such as the beach flea, having a laterally compressed body with no carapace.

Anaerobic sediment: Sediment characterized by the absence of free oxygen.

Anemones: Any of numerous flowerlike marine coelenterates of the class Anthozoa, having a flexible cylindrical body and tentacles surrounding a central mouth.

Annual Catch Entitlement (ACE): Pounds of available catch that can be harvested by a particular sector. Based on the total PSC for the permits that join the sector.

Annual total mortality: Rate of death expressed as the fraction of a cohort dying over a period compared to the number alive at the beginning of the period (# total deaths during year / numbers alive at the beginning of the year). Optimists convert death rates into annual survival rate using the relationship
S=1-A.

ASPIC (A Surplus Production Model Incorporating Covariates): A non-equilibrium surplus production model developed by Prager (1995). ASPIC was frequently used by the Overfishing Definition Panel to define B_{MSY} and F_{MSY} reference points. The model output was also used to estimate rebuilding timeframes for the Amendment 9 control rules.

Bay: An inlet of the sea or other body of water usually smaller than a gulf; a small body of water set off from the main body; e.g. Ipswich Bay in the Gulf of Maine.

Benthic community: *Benthic* means the bottom habitat of the ocean, and can mean anything as shallow as a salt marsh or the intertidal zone, to areas of the bottom that are several miles deep in the ocean. *Benthic community* refers to those organisms that live in and on the bottom. (*In* meaning they live within the substrate; e.g, within the sand or mud found on the bottom. See *Benthic infauna,* below)

Benthic infauna: See *Benthic community*, above. Those organisms that live *in* the bottom sediments (sand, mud, gravel, etc.) of the ocean. As opposed to *benthic epifauna*, that live *on* the surface of the bottom sediments.

Benthivore: Usually refers to fish that feed on benthic or bottom dwelling organisms.

Berm: A narrow ledge typically at the top or bottom of a slope; e.g. a berm paralleling the shoreline caused by wave action on a sloping beach; also an elongated mound or wall of earth.

Biogenic habitats: Ocean habitats whose physical structure is created or produced by the animals themselves; e.g, coral reefs.

Biomass: The total mass of living matter in a given unit area or the weight of a fish stock or portion thereof. Biomass can be listed for beginning of year (Jan-1), Mid-Year, or mean (average during the entire year). In addition, biomass can be listed by age group (numbers at age * average weight at age) or summarized by groupings (e.g., age 1^+, ages 4+ 5, etc). See also spawning stock biomass, exploitable biomass, and mean biomass.

B_{MSY}: The stock biomass that would produce MSY when fished at a fishing mortality rate equal to F_{MSY}. For most stocks, B_{MSY} is about ½ of the carrying capacity. The proposed overfishing definition control rules call for action when biomass is below ¼ or ½ B_{MSY}, depending on the species.

$B_{threshold}$: 1) A limit reference point for biomass that defines an unacceptably low biomass i.e., puts a stock at high risk (recruitment failure, depensation, collapse, reduced long term yields, etc). 2) A biomass threshold that the SFA requires for defining when a stock is overfished. A stock is overfished if its biomass is below $B_{threshold}$. A determination of overfished triggers the SFA requirement for a rebuilding plan to achieve B_{target} as soon as possible, usually not to exceed 10 years except certain requirements are met. In Amendment 9 control rules, $B_{threshold}$ is often defined as either $1/2B_{MSY}$ or 1/4 B_{MSY}. $B_{threshold}$ is also known as $B_{minimum}$.

B_{target}: A desirable biomass to maintain fishery stocks. This is usually synonymous with B_{MSY} or its proxy.

Biomass weighted F: A measure of fishing mortality that is defined as an average of fishing mortality at age weighted by biomass at age for a ranges of ages within the stock (e.g., ages 1^+ biomass weighted F is a weighted average of the mortality for ages 1 and older, age 3^+ biomass weighted is a weighted average for ages 3 and older). Biomass weighted F can also be calculated using catch in weight over mean biomass. See also fully-recruited F.

Biota: All the plant and animal life of a particular region.

Bivalve: A class of mollusks having a soft body with platelike gills enclosed within two shells hinged together; e.g., clams, mussels.

Bottom roughness: The inequalities, ridges, or projections on the surface of the seabed that are caused by the presence of bedforms, sedimentary structures, sedimentary particles, excavations, attached and unattached organisms, or other objects; generally small scale features.

Bottom tending mobile gear: All fishing gear that operates on or near the ocean bottom that is actively worked in order to capture fish or other marine species. Some examples of bottom tending mobile gear are otter trawls and dredges.

Bottom tending static gear: All fishing gear that operates on or near the ocean bottom that I snot actively worked; instead, the effectiveness of this gear depends on species moving to the gear which is set in a particular manner by a vessel, and later retrieved. Some examples of bottom tending static gear are gillnets, traps, and pots.

Boulder reef: An elongated feature (a chain) of rocks (generally piled boulders) on the seabed.

Bryozoans: Phylum aquatic organisms, living for the most part in colonies of interconnected individuals. A few to many millions of these individuals may form one colony. Some bryozoans encrust rocky surfaces, shells, or algae others form lacy or fan-like colonies that in some regions may form an abundant component of limestones. Bryozoan colonies range from millimeters to meters in size, but the individuals that make up the colonies are rarely larger than a millimeter. Colonies may be mistaken for hydroids, corals or seaweed.

Burrow: A hole or excavation in the sea floor made by an animal (as a crab, lobster, fish, burrowing anemone) for shelter and habitation.

Bycatch: (v.) the capture of nontarget species in directed fisheries which occurs because fishing gear and methods are not selective enough to catch only target species; (n.) fish which are harvested in a fishery but are not sold or kept for personal use, including economic discards and regulatory discards but not fish released alive under a recreational catch and release fishery management program.

Capacity: the level of output a fishing fleet is able to produce given specified conditions and constraints. Maximum fishing capacity results when all fishing capital is applied over the maximum amount of available (or permitted) fishing time, assuming that all variable inputs are utilized efficiently.

Catch: The sum total of fish killed in a fishery in a given period. Catch is given in either weight or number of fish and may include landings, unreported landings, discards, and incidental deaths.

Closed Area Model: A General Algebraic Modeling System (GAMS) model used to evaluate the effectiveness of effort controls used in the Northeast Multispecies Fishery. Using catch data from vessels in the fishery, the model estimates changes in exploitation that may result from changes in

DAS, closed areas, and possession limits. These changes in exploitation are then converted to changes in fishing mortality to evaluate proposed measures.

Coarse sediment: Sediment generally of the sand and gravel classes; not sediment composed primarily of mud; but the meaning depends on the context, e.g. within the mud class, silt is coarser than clay.

Commensalism: See *Mutualism*. An interactive association of two species where one benefits in some way, while the other species is in no way affected by the association.

Continental shelf waters: The waters overlying the continental shelf, which extends seaward from the shoreline and deepens gradually to the point where the sea floor begins a slightly steeper descent to the deep ocean floor; the depth of the shelf edge varies, but is approximately 200 meters in many regions.

Control rule: A pre-determined method for determining fishing mortality rates based on the relationship of current stock biomass to a biomass target. Amendment 9 overfishing control rules define a target biomass (B_{MSY} or proxy) as a management objective. The biomass threshold ($B_{threshold}$ or B_{min}) defines a minimum biomass below which a stock is considered overfished.

Cohort: see year class.

Crustaceans: Invertebrates characterized by a hard outer shell and jointed appendages and bodies. They usually live in water and breathe through gills. Higher forms of this class include lobsters, shrimp and crawfish; lower forms include barnacles.

Days absent: an estimate by port agents of trip length. This data was collected as part of the NMFS weighout system prior to May 1, 1994.

Days-at-sea (DAS): the total days, including steaming time that a boat spends at sea to fish. Amendment 13 categorized DAS for the multispecies fishery into three categories, based on each individual vessel's fishing history during the period fishing year 1996 through 2001. The three categories are: Category A: can be used to target any groundfish stock; Category B: can only be used to target healthy stocks; Category C: cannot be used until some point in the future. Category B DAS are further divided equally into Category B (regular) and Category B (reserve).

DAS "flip": A practice in the Multispecies FMP that occurs when a vessel fishing on a Category B (regular) DAS must change ("flip") its DAS to a Category A DAS because it has exceeded a catch limit for a stock of concern.

Demersal species: Most often refers to fish that live on or near the ocean bottom. They are often called benthic fish, groundfish, or bottom fish.

Diatoms: Small mobile plants (algæ) with silicified (silica, sand, quartz) skeletons. They are among the most abundant phytoplankton in cold waters, and an important part of the food chain.

Discards: animals returned to sea after being caught; see Bycatch (n.)

Dissolved nutrients: Non-solid nutrients found in a liquid.

Echinoderms: A member of the Phylum Echinodermata. Marine animals usually characterized by a five-fold symmetry, and possessing an internal skeleton of calcite plates, and a complex water vascular system. Includes echinoids (sea urchins), crinoids (sea lillies) and asteroids (starfish).

Ecosystem-based management: a management approach that takes major ecosystem components and services—both structural and functional—into account, often with a multispecies or habitat perspective

Egg stage: One of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that occurs after reproduction and refers to the developing embryo, its food store, and sometimes jelly or albumen, all surrounded by an outer shell or membrane. Occurs before the *larval* or *juvenile stage*.

Elasmobranch: Any of numerous fishes of the class Chondrichthyes characterized by a cartilaginous skeleton and placoid scales: sharks; rays; skates.

Embayment: A bay or an indentation in a coastline resembling a bay.

Emergent epifauna: See *Epifauna*. Animals living upon the bottom that extend a certain distance above the surface.

Epifauna: See *Benthic infauna*. *Epifauna* are animals that live on the surface of the substrate, and are often associated with surface structures such as rocks, shells, vegetation, or colonies of other animals.

Essential Fish Habitat (EFH): Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The EFH designation for most managed species in this region is based on a legal text definition and geographical area that are described in the Habitat Omnibus Amendment (1998).

Estuarine area: The area of an estuary and its margins; an area characterized by environments resulting from the mixing of river and sea water.

Estuary: A water passage where the tide meets a river current; especially an arm of the sea at the lower end of a river; characterized by an environment where the mixing of river and seawater causes marked variations in salinity and temperature in a relatively small area.

Eutrophication: A set of physical, chemical, and biological changes brought about when excessive nutrients are released into the water.

Euphotic zone: The zone in the water column where at least 1% of the incident light at the surface penetrates.

Exclusive Economic Zone (EEZ): a zone in which the inner boundary is a line coterminous with the seaward boundary of each of the coastal States and the outer boundary is line 200 miles away and parallel to the inner boundary

Exempt fisheries: Any fishery determined by the Regional Director to have less than 5 percent regulated species as a bycatch (by weight) of total catch according to 50 CFR 648.80(a)(7).

Exploitable biomass: The biomass of fish in the portion of the population that is vulnerable to fishing.

Exploitation pattern: Describes the fishing mortality at age as a proportion of fully recruited F (full vulnerability to the fishery). Ages that are fully vulnerable experience 100% of the fully recruited F and are termed fully recruited. Ages that are only partially vulnerable experience a fraction of the fully recruited F and are termed partially recruited. Ages that are not vulnerable to the fishery (including discards) experience no mortality and are considered pre-recruits. Also known as the partial recruitment pattern, partial recruitment vector or fishery selectivity.

Exploitation rate (u): The fraction of fish in the exploitable population killed during the year by fishing. This is an annual rate compared to F, which is an instantaneous rate. For example, if a population has 1,000,000 fish large enough to be caught and 550,000 are caught (landed and discarded) then the exploitation rate is 55%.

Fathom: A measure of length, containing six feet; the space to which a man can extend his arms; used chiefly in measuring cables, cordage, and the depth of navigable water by soundings.

Fishing mortality (F): A measurement of the rate of removal of fish from a population caused by fishing. This is usually expressed as an instantaneous rate (F) and is the rate at which fish are harvested at any given point in a year. Instantaneous fishing mortality rates can be either fully recruited or biomass weighted. Fishing mortality can also be expressed as an exploitation rate (see exploitation rate) or less commonly, as a conditional rate of fishing mortality (m, fraction of fish removed during the year if no other competing sources of mortality occurred. Lower case m should not be confused with upper case M, the instantaneous rate of natural mortality).

$F_{0.1}$: a conservative fishing mortality rate calculated as the F associated with 10 percent of the slope at origin of the yield-per-recruit curve.

F_{MAX}: a fishing mortality rate that maximizes yield per recruit. F_{MAX} is less conservative than $F_{0.1}$.

F_{MSY}: a fishing mortality rate that would produce MSY when the stock biomass is sufficient for producing MSY on a continuing basis.

$F_{threshold}$: 1) The maximum fishing mortality rate allowed on a stock and used to define overfishing for status determination. Amendment 9 frequently uses F_{MSY} or F_{MSY} proxy for

$F_{threshold.}$ 2) The maximum fishing mortality rate allowed for a given biomass as defined by a control rule.

Fishing effort: the amount of time and fishing power used to harvest fish. Fishing power is a function of gear size, boat size and horsepower.

Framework adjustments: adjustments within a range of measures previously specified in a fishery management plan (FMP). A change usually can be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the New England Council, the procedure requires at least two Council meetings including at least one public hearing and an evaluation of environmental impacts not already analyzed as part of the FMP.

Furrow: A trench in the earth made by a plow; something that resembles the track of a plow, as a marked narrow depression; a groove with raised edges.

Glacial moraine: A sedimentary feature deposited from glacial ice; characteristically composed of unsorted clay, sand, and gravel. Moraines typically are hummocky or ridge-shaped and are located along the sides and at the fronts of glaciers.

Glacial till: Unsorted sediment (clay, sand, and gravel mixtures) deposited from glacial ice.

Grain size: the size of individual sediment particles that form a sediment deposit; particles are separated into size classes (e.g. very fine sand, fine sand, medium sand, among others); the classes are combined into broader categories of mud, sand, and gravel; a sediment deposit can be composed of few to many different grain sizes.

Growth overfishing: Fishing at an exploitation rate or at an age at entry that reduces potential yields from a cohort but does not reduce reproductive output (see recruitment overfishing).

Halocline: The zone of the ocean in which salinity increases rapidly with depth.

Habitat complexity: Describes or measures a habitat in terms of the variability of its characteristics and its functions, which can be biological, geological, or physical in nature. Refers to how complex the physical structure of the habitat is. A bottom habitat with *structure-forming organisms*, along with other three dimensional objects such as boulders, is more complex than a flat, featureless, bottom.

Highly migratory species: tuna species, marlin, oceanic sharks, sailfishes, and swordfish

Hydroids: Generally, animals of the Phylum Cnidaria, Class Hydrozoa; most hydroids are bush-like polyps growing on the bottom and feed on plankton, they reproduce asexually and sexually.

Immobile epifaunal species: See *epifauna*. Animals living on the surface of the bottom substrate that, for the most part, remain in one place.

Individual Fishing Quota (IFQ): federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by an individual person or entity

Juvenile stage: One of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that comes between the *egg* or *larval stage* and the *adult stage*; juveniles are considered immature in the sense that they are not yet capable of reproducing, yet they differ from the larval stage because they look like smaller versions of the adults.

Landings: The portion of the catch that is harvested for personal use or sold.

Land runoff: The part of precipitation, snowmelt, or irrigation water that reaches streams (and thence the sea) by flowing over the ground, or the portion of rain or snow that does not percolate into the ground and is discharged into streams instead.

Larvae stage: One of several marked phases or periods in the development and growth of many animals. The first stage of development after hatching from the *egg* for many fish and invertebrates. This life stage looks fundamentally different than the juvenile and adult stages, and is incapable of reproduction; it must undergo metamorphosis into the juvenile or adult shape or form.

Lethrinids: Fish of the genus *Lethrinus*, commonly called emperors or nor'west snapper, are found mainly in Australia's northern tropical waters. Distinctive features of Lethrinids include thick lips, robust canine teeth at the front of the jaws, molar-like teeth at the side of the jaws and cheeks without scales. Lethrinids are carnivorous bottom-feeding fish with large, strong jaws.

Limited-access permits: permits issued to vessels that met certain qualification criteria by a specified date (the "control date").

Lutjanids: Fish of the genus of the Lutjanidae: snappers. Marine; rarely estuarine. Some species do enter freshwater for feeding. Tropical and subtropical: Atlantic, Indian and Pacific Oceans.

Macrobenthos: See *Benthic community* and *Benthic infauna*. Benthic organisms whose shortest dimension is greater than or equal to 0.5 mm.

Maturity ogive: A mathematical model used to describe the proportion mature at age for the entire population. A_{50} is the age where 50% of the fish are mature.

Mean biomass: The average number of fish within an age group alive during a year multiplied by average weight at age of that age group. The average number of fish during the year is a function of starting stock size and mortality rate occurring during the year. Mean biomass can be aggregated over several ages to describe mean biomass for the stock. For example the mean biomass summed for ages 1 and over is the 1^+ mean biomass; mean biomass summed across ages 3 and over is 3^+ mean biomass.

Megafaunal species: The component of the fauna of a region that comprises the larger animals, sometimes defined as those weighing more than 100 pounds.

Mesh selectivity ogive: A mathematical model used to describe the selectivity of a mesh size (proportion of fish at a specific length retained by mesh) for the entire population. L_{25} is the length where 25% of the fish encountered are retained by the mesh. L_{50} is the length where 50% of the fish encountered are retained by the mesh.

Meter: A measure of length, equal to 39.37 English inches, the standard of linear measure in the metric system of weights and measures. It was intended to be, and is very nearly, the ten millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of a meridian.

Metric ton: A unit of weight equal to a thousand kilograms (1kgs = 2.2 lbs.). A metric ton is equivalent to 2,205 lbs. A thousand metric tons is equivalent to 2.2 million lbs.

Microalgal: Small microscopic types of algae such as the green algae.

Microbial: Microbial means of or relating to microorganisms.

Minimum spawning stock threshold: the minimum spawning stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long term.

Mobile organisms: organisms that are not confined or attached to one area or place, that can move on their own, are capable of movement, or are moved (often passively) by the action of the physical environment (waves, currents, etc.).

Molluscs: Common term for animals of the phylum Mollusca. Includes groups such as the bivalves (mussels, oysters etc.), cephalopods (squid, octopus etc.) and gastropods (abalone, snails). Over 80,000 species in total with fossils back to the Cambrian period.

Mortality: see Annual total mortality (A), Exploitation rate (u), Fishing mortality (F), Natural mortality (M), and instantaneous total mortality (Z).

Motile: Capable of self-propelled movement. A term that is sometimes used to distinguish between certain types of organisms found in water.

Multispecies: the group of species managed under the Northeast Multispecies Fishery Management Plan. This group includes whiting, red hake and ocean pout plus the regulated species (cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish).

Mutualism: See *Commensalism*. A symbiotic interaction between two species in which both derive some benefit.

Natural disturbance: A change caused by natural processes; e.g. in the case of the seabed, changes can be caused by the removal or deposition of sediment by currents; such natural processes can be common or rare at a particular site.

Natural mortality: A measurement of the rate of death from all causes other than fishing such as predation, disease, starvation, and pollution. Commonly expressed as an instantaneous rate (M). The rate of natural mortality varies from species to species, but is assumed to be M=0.2 for the five critical stocks. The natural mortality rate can also be expressed as a conditional rate (termed n and not additive with competing sources of mortality such as fishing) or as annual expectation of natural death (termed v and additive with other annual expectations of death).

Nearshore area: The area extending outward an indefinite but usually short distance from shore; an area commonly affected by tides and tidal and storm currents, and shoreline processes.

Nematodes: a group of elongated, cylindrical worms belonging to the phylum Nematoidea, also called thread-worms or eel-worms. Some non-marine species attack roots or leaves of plants, others are parasites on animals or insects.

Nemerteans: Proboscis worms belonging to the phylum Nemertea, and are soft unsegmented marine worms that have a threadlike proboscis and the ability to stretch and contract.

Nemipterids: Fishes of the Family Nemipteridae, the threadfin breams or whiptail breams. Distribution: Tropical and sub-tropical Indo-West Pacific.

Northeast Shelf Ecosystem: The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream.

Northwest Atlantic Analysis Area (NAAA): A spatial area developed for analysis purposes only. The boundaries of this the area are within the 500 fathom line to the east, the coastline to the west, the Hague line to the north, and the North Carolina/ South Carolina border to the south. The area is approximately 83,550 square nautical miles, and is used as the denominator in the EFH analysis to determine the percent of sediment, EFH, and biomass contained in an area, as compared to the total NAAA.

Nutrient budgets: An accounting of nutrient inputs to and production by a defined ecosystem (e.g., salt marsh, estuary) versus utilization within and export from the ecosystem.

Observer: any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under this Act

Oligochaetes: See *Polychaetes*. Oligochaetes are worms in the phylum Annelida having bristles borne singly along the length of the body.

Open access: describes a fishery or permit for which there is no qualification criteria to participate. Open-access permits may be issued with restrictions on fishing (for example, the type of gear that may be used or the amount of fish that may be caught).

Opportunistic species: Species that colonize disturbed or polluted sediments. These species are often small, grow rapidly, have short life spans, and produce many offspring.

Optimum Yield (OY): the amount of fish which A) will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery

Organic matter: Material of, relating to, or derived from living organisms.

Overfished: A conditioned defined when stock biomass is below minimum biomass threshold and the probability of successful spawning production is low.

Overfishing: A level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

Peat bank: A bank feature composed of partially carbonized, decomposed vegetable tissue formed by partial decomposition of various plants in water; may occur along shorelines.

Pelagic gear: Mobile or static fishing gear that is not fixed, and is used within the water column, not on the ocean bottom. Some examples are mid-water trawls and pelagic longlines.

Phytoplankton: Microscopic marine plants (mostly algae and diatoms) which are responsible for most of the photosynthetic activity in the oceans.

Piscivore: A species feeding preferably on fish.

Planktivore: An animal that feeds on plankton.

Polychaetes: Polychaetes are segmented worms in the phylum Annelida. Polychaetes (poly-chaetae = many-setae) differ from other annelids in having many setae (small bristles held in tight bundles) on each segment.

Porosity: The amount of free space in a volume of a material; e.g. the space that is filled by water between sediment particles in a cubic centimeter of seabed sediment.

Possession-limit-only permit: an open-access permit (see above) that restricts the amount of multispecies a vessel may retain (currently 500 pounds of "regulated species").

Potential Sector Contribution (PSC): The percentage of the available catch a limited access permit is entitled to after joining a sector. Based on landings history as defined in Amendment 16. The sum of the PSC's in a sector is multiplied by the groundfish sub-ACL to get the ACE for the sector.

Pre-recruits: Fish in size or age groups that are not vulnerable to the fishery (including discards).

Prey availability: The availability or accessibility of prey (food) to a predator. Important for growth and survival.

Primary production: The synthesis of organic materials from inorganic substances by photosynthesis.

Recovery time: The period of time required for something (e.g. a habitat) to achieve its former state after being disturbed.

Recruitment: the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be the recruitment to the fishery. "Recruitment" also refers to new year classes entering the population (prior to recruiting to the fishery).

Recruitment overfishing: fishing at an exploitation rate that reduces the population biomass to a point where recruitment is substantially reduced.

Regulated groundfish species: cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish. These species are usually targeted with large-mesh net gear.

Relative exploitation: an index of exploitation derived by dividing landings by trawl survey biomass. This measure does not provide an absolute magnitude of exploitation but allows for general statements about trends in exploitation.

Retrospective pattern: A pattern of systematic over-estimation or underestimation of terminal year estimates of stock size, biomass or fishing mortality compared to that estimate for that same year when it occurs in pre-terminal years.

Riverine area: The area of a river and its banks.

Saurids: Fish of the family Scomberesocidae, the sauries or needlefishes. Distribution: tropical and temperate waters.

Scavenging species: An animal that consumes dead organic material.

Sea whips: A coral that forms long flexible structures with few or no branches and is common on Atlantic reefs.

Sea pens: An animal related to corals and sea anemones with a featherlike form.

Sediment: Material deposited by water, wind, or glaciers.

Sediment suspension: The process by which sediments are suspended in water as a result of disturbance.

Sedentary: See *Motile* and *Mobile organisms*. Not moving. Organisms that spend the majority of their lives in one place.

Sedimentary bedforms: Wave-like structures of sediment characterized by crests and troughs that are formed on the seabed or land surface by the erosion, transport, and deposition of particles by water and wind currents; e.g. ripples, dunes.

Sedimentary structures: Structures of sediment formed on the seabed or land surface by the erosion, transport, and deposition of particles by water and wind currents; e.g. ripples, dunes, buildups around boulders, among others.

Sediment types: Major combinations of sediment grain sizes that form a sediment deposit, e.g. mud, sand, gravel, sandy gravel, muddy sand, among others.

Spawning adult stage: See *adult stage*. Adults that are currently producing or depositing eggs.

Spawning stock biomass (SSB): the total weight of fish in a stock that sexually mature, i.e., are old enough to reproduce.

Species assemblage: Several species occurring together in a particular location or region

Species composition: A term relating the relative abundance of one species to another using a common measurement; the proportion (percentage) of various species in relation to the total on a given area.

Species diversity: The number of different species in an area and their relative abundance

Species richness: See *Species diversity*. A measurement or expression of the number of species present in an area; the more species present, the higher the degree of species richness.

Species with vulnerable EFH: If a species was determined to be "highly" or "moderately" vulnerable to bottom tending gears (otter trawls, scallop dredges, or clam dredges) then it was included in the list of species with vulnerable EFH. Currently there are 23 species and life stages that are considered to have vulnerable EFH for this analysis.

Status Determination: A determination of stock status relative to $B_{threshold}$ (defines overfished) and $F_{threshold}$ (defines overfishing). A determination of either overfished or overfishing triggers a SFA requirement for rebuilding plan (overfished), ending overfishing (overfishing) or both.

Stock: A grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A region may have more than one stock of a species (for example, Gulf of Maine cod and Georges Bank cod). A species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

Stock assessment: determining the number (abundance/biomass) and status (life-history characteristics, including age distribution, natural mortality rate, age at maturity, fecundity as a function of age) of individuals in a stock

Stock of concern: a regulated groundfish stock that is overfished, or subject to overfishing.

Structure-forming organisms: Organisms, such as corals, colonial bryozoans, hydroids, sponges, mussel beds, oyster beds, and seagrass that by their presence create a three-dimensional physical structure on the bottom. See *biogenic habitats*.

Submerged aquatic vegetation: Rooted aquatic vegetation, such as seagrasses, that cannot withstand excessive drying and therefore live with their leaves at or below the water surface in shallow areas of estuaries where light can penetrate to the bottom sediments. SAV provides an important habitat for young fish and other aquatic organisms.

Surficial sediment: Sediment forming the sea floor or land surface; thickness of the surficial layer may vary.

Surplus production: Production of new stock biomass defined by recruitment plus somatic growth minus biomass loss due to natural deaths. The rate of surplus production is directly proportional to stock biomass and its relative distance from the maximum stock size at carrying capacity (K). B_{MSY} is often defined as the biomass that maximizes surplus production rate.

Surplus production models: A family of analytical models used to describe stock dynamics based on catch in weight and CPUE time series (fishery dependent or survey) to construct stock biomass history. These models do not require catch at age information. Model outputs may include stock biomass history, biomass weighted fishing mortality rates, MSY, F_{MSY}, B_{MSY}, K, (maximum population biomass where stock growth and natural deaths are balanced) and r (intrinsic rate of increase).

Survival rate (S): Rate of survival expressed as the fraction of a cohort surviving the a period compared to number alive at the beginning of the period (# survivors at the end of the year / numbers alive at the beginning of the year). Pessimists convert survival rates into annual total mortality rate using the relationship A=1-S.

Survival ratio (R/SSB): an index of the survivability from egg to age-of-recruitment. Declining ratios suggest that the survival rate from egg to age-of-recruitment is declining.

TAC: Total allowable catch. This value is calculated by applying a target fishing mortality rate to exploitable biomass.

Taxa: The plural of taxon. Taxon is a named group or organisms of any rank, such as a particular species, family, or class.

Ten-minute- "squares" of latitude and longitude (TMS): Are a measure of geographic space. The actual size of a ten-minute-square varies depending on where it is on the surface of the earth, but in general each square is approximately 70-80 square nautical miles in this region. This is the spatial area that EFH designations, biomass data, and some of the effort data have been binned into for analysis purposes in various sections of this document.

Topography: The depiction of the shape and elevation of land and sea floor surfaces.

Total Allowable Catch (TAC): The amount (in metric tons) of a stock that is permitted to be caught during a fishing year. In the Multispecies FMP, TACs can either be "hard" (fishing ceases when the TAC is caught) or a "target" (the TAC is merely used as an indicator to monitor effectiveness of management measures, but does not trigger a closure of the fishery).

Total mortality: The rate of mortality from all sources (fishing, natural, pollution) Total mortality can be expressed as an instantaneous rate (called Z and equal to F + M) or Annual rate (called A and calculated as the ratio of total deaths in a year divided by number alive at the beginning of the year)

Trophic guild: Trophic is defined as the feeding level within a system that an organism occupies; e.g., predator, herbivore. A guild is defined as a group of species that exploit the same class of environmental resources in a similar way. The trophic guild is a utilitarian concept covering both structure and organization that exists between the structural categories of trophic groups and species.

Turbidity: Relative water clarity; a measurement of the extent to which light passing through water is reduced due to suspended materials.

Two-bin (displacement) model: a model used to estimate the effects of area closures. This model assumes that effort from the closed areas (first bin) is displaced to the open areas (second bin). The total effort in the system is then applied to the landings-per-unit-effort (LPUE) in open areas to obtain a projected catch. The percent reduction in catch is calculated as a net result.

Vulnerability: In order to evaluate the potential adverse effects of fishing on EFH, the vulnerability of each species EFH was determined. This analysis defines vulnerability as the likelihood that the functional value of EFH would be adversely affected as a result of fishing with different gear types. A number of criteria were considered in the evaluation of the vulnerability of EFH for each life stage including factors like the function of habitat for shelter, food and/or reproduction.

Yield-per-recruit (YPR): the expected yield (weight) of individual fish calculated for a given fishing mortality rate and exploitation pattern and incorporating the growth characteristics and natural mortality.

Yearclass: also called cohort. Fish that were spawned in the same year. By convention, the "birth date" is set to January 1st and a fish must experience a summer before turning 1. For example, winter flounder that were spawned in February-April 1997 are all part of the 1997 cohort (or year-class). They would be considered age 0 in 1997, age 1 in 1998, etc. A summer flounder spawned in October 1997 would have its birth date set to the following January 1 and would be considered age 0 in 1998, age 1 in 1999, etc.

Z: instantaneous rate of total mortality. The components of Z are additive (i.e., Z = F+M)

Zooplankton: See *Phytoplankton*. Small, often microscopic animals that drift in currents. They feed on detritus, phytoplankton, and other zooplankton. They are preyed upon by fish, shellfish, whales, and other zooplankton.

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9.3 Index

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Appendix I

SSC's Recommendations on

ABCs for the

Northeast Multispecies Fishery

#2

New England Fishery Management Council
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C. M. "Rip" Cunningham, Jr., *Chairman* | Paul J. Howard, *Executive Director*

To: Paul J. Howard, Executive Director
From: Scientific and Statistical Committee
Date: 24 September 2012

Subject: Groundfish ABC for FY2013-2015

The Scientific and Statistical Committee (SSC) met on three occasions to address groundfish catch recommendations.

During the first meeting (March 28, 2012), the SSC was asked to:

2. Discuss the performance of projections for groundfish stocks based on the February 2012 groundfish assessment updates.
3. Review assessments and develop FY 2013and FY 2014 ABC recommendations for redfish, Georges Bank haddock, Gulf of Maine /Georges Bank windowpane flounder, Southern New England /Mid-Atlantic windowpane flounder, ocean pout, wolffish and halibut.

During the second and third meetings (August 24 and September 13, 2012), the SSC was asked to:

1. The SSC is asked to develop Overfishing Limit (OFL) and Acceptable Biological Catch (ABC) recommendations for Northeast Multispecies stocks as specified below. Specifications for GOM cod and GB Cod will be determined after SARC 55 is conducted this fall. OFL and ABC recommendations for other stocks were determined by the SSC at earlier meetings.
2. ABC recommendations are to be based on the fishing mortality strategies approved by the Council in Amendments 13 and 16 and related management actions. Status determination criteria should be used that are specified in Amendment 16 or subsequent actions, or that will be implemented through FW 48 consistent with the recommendations of recent SARCs. The general control rule for groundfish stocks that has been adopted is:
   "These ABC control rules will be used in the absence of better information that may allow a more explicit determination of scientific uncertainty for a stock or stocks. If such information is available – that is, if scientific uncertainty can be characterized in a more accurate fashion -- it can be used by the SSC to determine ABCs, These ABC control rules can be modified in a future Council action (an amendment, framework, or specification package):
   a. ABC should be determined as the catch associated with 75% of FMSY.
   b. If fishing at 75% of FMSY does not achieve the mandated rebuilding requirements for overfished stocks, ABC should be determined as the catch associated with the fishing mortality that meets rebuilding requirements (Frebuild).
   c. For stocks that cannot rebuild to BMSY in the specified rebuilding period, even with no fishing, the ABC should be based on incidental bycatch, including a reduction in bycatch rate (i.e., the proportion of the stock caught as bycatch).
   d. Interim ABCs should be determined for stocks with unknown status according to case-bycase recommendations from the SSC."

3. GB yellowtail flounder: Provide a range of ABCs for 2013-2014 that will meet management objectives and that will result in a low to neutral risk of exceeding FMSY (F=0.25).
4. Review the SARC-54 advice on a biomass target for SNE/MA yellowtail flounder. Provide advice on a process to reconcile the two biomass targets identified by the SARC review panel.
5. At its March meeting, the SSC directed the Plan Development Team to consider three approaches for setting ABCs because of concerns that the stock projections were not performing well. Consider the PDT's report on this issue and whether alternative approaches to setting the ABCs should be used for FY 2013- 2015.
6. Provide ABC recommendations for the following Northeast Multispecies stocks for FY 2013 – 2015.
    SNE/MA yellowtail flounder
    GOM haddock
    CC/GOM yellowtail flounder
    Witch flounder
    Plaice
7. Provide an ABC recommendation for white hake for FY 2013. A benchmark assessment is planned for early 2013, but an ABC is needed for the start of the fishing year on May 1 and none has been previously approved. There aren't any ABC carry-over provisions in the Northeast Multispecies FMP. There is no assessment update available.

In order to meet these terms of reference, the SSC considered the following:

1. Groundfish Plan Development Team memo to the SSC dated March 20, 2012
2. Groundfish Plan Development Team memo to the SSC dated August 14, 2012
3. Northeast Fisheries Science Center Reference Document 12-06. Assessment of Data Updates of 13 Northeast Groundfish Stocks through 2010
4. 54th Northeast Regional Stock Assessment Workshop Assessment Summary Report
5. 54th Northeast Regional Stock Assessment Workshop Report (draft)
6. Transboundary Resources Assessment Committee Status Report 2012/01. Georges Bank Yellowtail Flounder
7. Transboundary Resources Assessment Committee Reference Document 2012/02 Stock Assessment of Georges Bank Yellowtail Flounder for 2011
8. Pope, J.G. 1983. Analogies to the Status Quo TACs: Their nature and variance. Canadian Special Publication in Aquatic and Fishery Sciences. 66: 99-113
9. Two presentations from the Groundfish Plan Development Team on projection performance
10. Presentation from lead analyst on George Bank yellowtail flounder
11. Presentation from lead analyst on SNE/MA yellowtail flounder
12. Presentations from Groundfish Plan Development Team on stock specific projections

The SSC reviewed material provided by the PDT regarding the performance of historical projections for the Northeast Multispecies FMP stocks. The presentations by Tom Nies and Paul Nitscke as well as the groundfish PDT report were clear and concise, facilitating the catch advice discussion. Overall, the projections were biased high, meaning the projected stock increased more than the realized stock. This resulted in catches at or below recommended ABCs having fishing mortality rates above what was expected from the projections. For some stocks, this resulted in overfishing occurring despite the fishery catching less than the recommended ABC. The SSC reiterates its concern with medium term projections for these stocks and recommends conducting assessments more regularly so that projections are for shorter periods into the future. The SSC agrees with the

PDT concern regarding this historical performance, but felt this single analysis was insufficient to justify changing the default control rule for all the groundfish stocks. Changing the default control rule should involve a longer term and more systematic process than time allowed. Instead, the SSC examined each stock on a case-by-case basis to see if there was any reason to change from the default control rule. Reasons were found for five of the stocks: the three yellowtail flounder stocks, witch flounder, and Atlantic wolffish. Detailed reasons are provided for each of these stocks below. The 75%Fmsy control rule was applied for the remaining stocks with analytical assessments; the two haddock stocks, American plaice, redfish, and Atlantic halibut, and the three stocks with the index based assessments; the two windowpane stocks and ocean pout. The stocks with index based assessments held the 2013 OFL and ABC values constant for the three years following the default control rule for stocks with index based assessments.

Table 1 presents the OFL and ABC values for all 20 stocks in the Northeast Multispecies FMP for completeness. The three winter flounder stocks and pollock had OFL and ABC values set previously by the SSC. The two cod stocks do not have OFL or ABC values because both have benchmark assessments scheduled for SARC 55 (December 2012). The white hake OFL and ABC for 2013 were set to the values in 2012 because an update assessment was not available and there were no indications from fishery or survey data that any major changes had occurred since the 2012 values were set. White hake has a benchmark assessment scheduled for SARC 56 (February 2013), which will provide the basis for setting OFL and ABC for FY2014-2015.

Technical Notes on Specific Stocks:

- **Georges Bank yellowtail flounder** was updated during TRAC 2012. The SSC used the results of the 2012 TRAC assessment to formulate its recommendations. The assessment method used in recent years (the split series VPA) indicates that the stock is overfished, that overfishing is occurring, and that recent recruitment is weak. However, the assessment exhibited a stronger retrospective pattern this year than last year. The ratio of catch over survey biomass decreased substantially in 1995 and has remained low since, while estimates of total mortality from the survey have remained high. There are no positive signs that the stock is rebuilding. Based on the assessment results and associated uncertainties, the SSC recommends no directed fishery and no increase in bycatch. This recommendation reflects the poor performance of catch advice in recent years relative to reducing the fishing mortality rate below the desired target. In response to the Council's request for a range of ABCs (including US and Canadian catch) that will meet management objectives and that will result in a low to neutral risk of exceeding F_{MSY}, the SSC recommends that:
    1. A catch limit of 200 mt in 2013 is expected to have a low probability of overfishing and is expected to allow the stock to increase ("To achieve both a high probability that F in 2013 will be less than F_{ref} and that adult biomass will increase, a 2013 quota of approximately 200 mt would be required." TRAC 2012)
    2. A catch limit of 400-500 mt is expected to have greater probability of overfishing and allow some rebuilding ("A quota of 400-500 mt implies that either F will be below F_{ref} in 2013 in only one of the five sensitivity analyses or the adult biomass will increase from 2013 to 2014 for the other four." TRAC 2012). This is similar to the basis of the SSC advice for 2012.
    3. The catch associated with unintentional bycatch may exceed 500 mt, but total removals should be less than the 2012 ABC (1,150 mt) to account for the recommended removal of a directed fishery. This ABC of 1,150 mt should be considered a backstop measure only. If there is no directed fishery and measures are taken to reduce bycatch as much as possible,

then fishing mortality would be expected to be below Fmsy. If this low F results in a catch above 500 mt, it would be de facto evidence that the uncertainty in this stock assessment is greater than described by the sensitivity analyses conducted in the TRAC. Thus, this ABC is appropriate only when management measures are implemented that have a high probability in resulting in low fishing mortality rates. This advice is based on the difficulty of setting quota levels based on highly uncertain stock assessment results.

- **Southern New England-Mid Atlantic yellowtail flounder** had a benchmark assessment as part of SARC 54 (June 2012). The assessment of this stock was not questioned, but the SSC discussed the biomass biological reference point (BRP) because the SARC recommended two separate values. One BRP was based on using all the recruitment estimates from the stock assessment with two stanzas associated with different stock sizes (denoted two stanza recruitment). The other BRP was based on using only recent (since 1990) recruitment estimates from the assessment to reflect a change in productivity of this stock (denoted recent recruitment). Projections associated with these two BRPs were nearly identical for FY13 but diverged as years were added to the projections. The SSC considers the recent recruitment BRP the more appropriate reference point because the low recruitment has persisted for more than two decades and high recruitment has been observed in the past at spawning stock biomass similar to those observed during the recent period. Using this BRP, the stock is fully rebuilt. The SSC did not want to recommend fishing at a rate that would cause catches to increase suddenly then decrease as the stock is fished down to the new biomass BRP. So instead, the SSC selected the long term 75%Fmsy catch as the ABC for all three projection years (which is lower than the catch associated with fishing at 75%Fmsy in years 2013-2015). This should allow an examination of how recruitment responds to low fishing mortality rates for a number of years. If the recruitment does considerably increase for multiple years, then the biomass BRP should be updated. While if the recruitment remains low, this will confirm the change in productivity of this stock, and the stock ABC can be set in the future based on applying 75%Fmsy to the extant stock abundance.
- **Cape Cod-Gulf of Maine yellowtail flounder** was updated during the groundfish update assessment review in February 2012. This updated assessment exhibited a retrospective pattern, while the previous assessment did not. To account for the retrospective pattern, the stock abundance at age was reduced at the start of the projections, which assumes whatever mechanism caused the retrospective pattern will continue in the future. The standard projections using the 75%Fmsy control rule resulted in relatively large increases in catch in FY2014-2015 relative to FY2013. The SSC thought the new retrospective pattern, even with the adjustment for starting stock size, was an additional source of uncertainty for this stock, so the SSC set the FY2014 and 2015 ABC values equal to the FY2013 ABC. This results in a larger buffer between OFL and ABC in years 2014 and 2015 than would have occurred from the default control rule to account for the additional uncertainty associated with this stock assessment.
- **Witch flounder** was updated during the groundfish update assessment review in February 2012. The most recent recruitment estimate was estimated to be one of the largest in the time series. Sensitivity projections which reduced the size of this year class resulted in much lower ABC because this stock is in a rebuilding plan and the $F_{rebuild}$ was much lower with the lower recruitment. As in all assessments, the most recent recruitment estimate is highly uncertain. The impact of large versus small cohorts in the projections differs though, with large cohorts having disproportionate impact on $F_{rebuild}$ calculations. To account for this source of uncertainty in the assessment, the SSC set the 2014 and 2015 ABC to the 2013 ABC, which was calculated by applying the $F_{rebuild}$ in 2013. This resulted in a larger buffer between the OFL and ABC in years 2014 and 2015 than the application of the default control rule of $F_{rebuild}$ in each year.

- **Atlantic wolffish** was updated during the groundfish update assessment review in February 2012. This stock did not have a calibration coefficient available to relate the Bigelow and Albatross survey time series due to insufficient numbers of this fish caught during the calibration experiment. Instead, a calibration from ocean pout was used because it has a similar body shape and habitat as wolffish. The assessment results were sensitive to the choice of the calibration. To account for this additional uncertainty, the SSC set the FY2014 and 2015 ABC equal to the FY2013 ABC, which was calculated by applying 75%Fmsy in 2013. This resulted in a larger buffer between the OFL and ABC in years 2014 and 2015 than the application of the default control rule in each year.

The SSC recommends:

1. **The overfishing limits (OFL) and acceptable biological catches (ABC) for 2013-2015 by stock in Table 1.**
2. **Based on the assessment results and associated uncertainties in the Georges Bank yellowtail fishery assessment, the SSC recommends no directed fishery and no increase in bycatch for this stock.**
3. **Updated assessments for all the groundfish stocks in the Northeast Multispecies Fishery Management Plan should be conducted as soon as possible.**

Table 1. Overfishing limits (OFL) and acceptable biological catches (ABC) in metric tons for years 2013-2015 for the groundfish stocks in the Northeast Multispecies Fishery Management Plan. The four stocks in grey font (three winter flounder stocks and pollock) are included for information purposes only, these OFL and ABC values were set previously by the SSC. For the three US/CA stocks (GB cod, GB haddock, and GB yellowtail flounder), the values shown are total amounts, the US amounts will be lower due to the US/CA sharing agreement.

	2013		2014		2015		Remarks
Stock	OFL	ABC	OFL	ABC	OFL	ABC	
GB cod							TBD after SARC 55
GOM cod							TBD after SARC 55
GB haddock	46,185	35,783	46,268	35,699	56,293	43,606	75%Fmsy
GOM haddock	371	290	440	341	561	435	75%Fmsy
GB yellowtail flounder		200-1,150					range of objectives, 2014-2015 TBD after TRAC 2013-2014
SNE/MA yellowtail flounder	773	700	773	700	773	700	long term 75%Fmsy held constant (ref point uncertainty)
CC/GOM yellowtail flounder	713	548	936	548	1,194	548	2013 75%Fmsy held constant (retrospective uncertainty)
Plaice	2,035	1,557	1,981	1,515	2,021	1,544	75%Fmsy
Witch flounder	1,196	783	1,512	783	1,846	783	2013 Frebuild held constant (recruitment uncertainty)
GB winter flounder	4,819	3,750	4,626	3,598			set previously based on SARC 52 assessment
GOM winter flounder	1,458	1,078	1,458	1,078			set previously based on SARC 52 assessment
SNE/MA winter flounder	2,637	697	3,471	912			set previously based on SARC 52 assessment
Redfish	15,468	10,995	16,130	11,465	16,845	11,974	75%Fmsy
White hake	5,306	3,638					rollover 2012, 2014-2015 TBD after SARC 56
Pollock	20,060	15,600	20,554	16,000			set previously based on SARC 50 assessment
N windowpane	202	151	202	151	202	151	75%Fmsy held constant (index assessment)
S windowpane	730	548	730	548	730	548	75%Fmsy held constant (index assessment)
Ocean pout	313	235	313	235	313	235	75%Fmsy held constant (index assessment)
Atlantic halibut	164	99	180	109	198	119	75%Fmsy
Atlantic wolffish	94	70	94	70	94	70	2013 75%Fmsy held constant (calibration uncertainty)

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C. M. "Rip" Cunningham, Jr., *Chairman* | Paul J. Howard, *Executive Director*

To: Paul J. Howard, Executive Director
From: Scientific and Statistical Committee
Date: December 13, 2012

Subject: Georges Bank Yellowtail Flounder OFL for FY2013-2015

The Scientific and Statistical Committee (SSC) met on November 19, 2012 to address the following term of reference from the Council:

Provide the Council with an overfishing limit for Georges Bank yellowtail flounder for their (the SSC's) ABC recommendation #3 (included below) by the December 20 Council meeting.

The ABC recommendation referenced in the term of reference read as follows:

3. The catch associated with unintentional bycatch may exceed 500 mt, but total removals should be less than the 2012 ABC (1,150 mt) to account for the recommended removal of a directed fishery. This ABC of 1,150 mt should be considered a backstop measure only. If there is no directed fishery and measures are taken to reduce bycatch as much as possible, then fishing mortality would be expected to be below Fmsy. If this low F results in a catch above 500 mt, it would be de facto evidence that the uncertainty in this stock assessment is greater than described by the sensitivity analyses conducted in the TRAC. Thus, this ABC is appropriate only when management measures are implemented that have a high probability in resulting in low fishing mortality rates. This advice is based on the difficulty of setting quota levels based on highly uncertain stock assessment results.

Background Information
The SSC considered the following the following documents in its deliberations:

1. DRAFT Memo from SSC to Paul Howard re Northeast Multispecies ABCs for FY 2012-2014
2. Sept. 24. 2012 Memo from SSC to Paul Howard re Northeast Multispecies ABCs for FY 2012-2014
3. November 16, 2012 Memo from Council Staff to SSC re GB Yellowtail Flounder Overfishing Limit
4. TRAC Status Report for GB Yellowtail Flounder 2012
5. Stock Assessment of Georges Bank Yellowtail Flounder for 2012, TRAC Ref Doc 2012/02

The SSC concluded that the OFL for Georges Bank yellowtail flounder is **unknown** at present. The SSC reached this conclusion because the ABC recommendation of 1,150mt is not based on the 2012 assessment and instead represents a status quo ABC in the face of an unknown OFL. The TRAC assessment produced a wide range of catch projections using defensible model configurations. These varied widely, lowering confidence in any individual outcome and resulting in the SSC being unable to agree upon a single OFL value derived from one or a combination (e.g., average) of the approaches used. Furthermore, a retrospective pattern, which was present in the previous TRAC assessment, became stronger in the current assessment, resulting in less confidence among the SSC in the model outcomes.

Although the SSC was not comfortable with the assessment outcomes as a basis for providing catch advice, it should be noted that the range of information provided by the assessment did help the SSC understand the nature of uncertainties in the assessment. Moreover, the SSC noted that having had a Committee member serve as a liaison to the TRAC during the assessment process helped the TRAC provide information that helped the SSC better understand uncertainty. However, in the future it would be helpful for the TRAC to directly estimate OFL if possible, even if it is not needed in the Canadian management arena, to remove ambiguity surrounding its value in the U.S. management process.

Also, the SSC recognized that having its liaison to the TRAC chair the initial deliberation on the ABC for Georges Bank yellowtail flounder compromised his ability to convey insights on the TRAC process. Therefore, those roles should be separated in the future.

The SSC reiterates the advice that there should be no directed fishery and no increase in bycatch of Georges Bank yellowtail flounder in light of the high uncertainty and concern that the stock is at low levels relative to its potential productivity. The SSC advised that an ABC of 1,150 mt should only be considered a backstop measure and, "Thus, this ABC is appropriate **ONLY** (emphasis added) when management measures are implemented that have a high probability in resulting in low fishing mortality rates."

Finally, the SSC expressed appreciation for the efforts of Groundfish PDT Chair Tom Nies and Groundfish PDT member Fiona Hogan for developing a series of potential OFL options on very short notice. Those options provided extremely valuable starting points for SSC deliberations and accelerated a difficult decision.

The overfishing limit (OFL) for Georges Bank yellowtail flounder is <u>unknown</u> at present.

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C. M. "Rip" Cunningham, Jr., *Chairman* | Paul J. Howard, *Executive Director*

To: Paul J. Howard, Executive Director
From: Scientific and Statistical Committee
Date: January 29, 2013

Subject: **Georges Bank cod, Gulf of Maine cod and Southern New England/Mid-Atlantic winter flounder ABCs for FY2013-2015**

The SSC met on January 23, 2013 to address the following terms of reference (TOR):

1. The SSC is asked to develop Overfishing Limit (OFL) and Acceptable Biological Catch (ABC) recommendations for Northeast Multispecies stocks as specified below.

2. ABC recommendations are to be based on the fishing mortality strategies approved by the Council in Amendments 13 and 16 and related management actions. Status determination criteria should be used that are specified in Amendment 16 or subsequent actions, or that will be implemented through FW 48 consistent with the recommendations of recent SARCs. The general control rule for groundfish stocks that has been adopted is:

3. "These ABC control rules will be used in the absence of better information that may allow a more explicit determination of scientific uncertainty for a stock or stocks. If such information is available – that is, if scientific uncertainty can be characterized in a more accurate fashion -- it can be used by the SSC to determine ABCs, These ABC control rules can be modified in a future Council action (an amendment, framework, or specification package):
    a. ABC should be determined as the catch associated with 75% of FMSY.
    b. If fishing at 75% of FMSY does not achieve the mandated rebuilding requirements for overfished stocks, ABC should be determined as the catch associated with the fishing mortality that meets rebuilding requirements (Frebuild).
    c. For stocks that cannot rebuild to BMSY in the specified rebuilding period, even with no fishing, the ABC should be based on incidental bycatch, including a reduction in bycatch rate (i.e., the proportion of the stock caught as bycatch).
    d. Interim ABCs should be determined for stocks with unknown status according to case-by-case recommendations from the SSC."

4. GOM cod: Provide an OFL and ABC for 2013-2015 that will prevent overfishing and that is consistent with the default ABC control rule. This stock is currently subject to a formal rebuilding program and the ABC should be based the default ABC control rule. Should SARC 55 determine that this stock is overfished and cannot rebuild by 2014, a revised rebuilding plan will be implemented at the beginning of FY 2014.

5. GB cod: Provide an OFL and ABC for 2013-2015 that will prevent overfishing and that is consistent with the default ABC control rule. This stock is currently subject to a formal rebuilding program and the ABC should be based on the default ABC control rule.

6. SNE/MA winter flounder: Provide an OFL and ABC for 2013-2015 that will prevent overfishing and that is consistent with alternative management strategies that will be considered by the Council.

7. The following documents are provided for the SSC's review:
   a. Groundfish Plan Development Team memo to the SSC dated January 16, 2013
   b. 55th Northeast Regional SAW Assessment Summary Report http://www.nefsc.noaa.gov/publications/crd/crd1301/
   c. 55th Northeast Regional SAW and Reviewer Reports from Cadigan, Casey and Holmes (4 reports total) http://www.nefsc.noaa.gov/saw/saw55/
   d. 55th Northeast Regional SAW Assessment Reports for GOM Cod and GB Cod http://www.nefsc.noaa.gov/SAW-Public/
   e. 52nd Northeast Regional Stock Assessment Workshop Assessment Summary Report http://www.nefsc.noaa.gov/publications/crd/crd1111/index.html (includes SNE/MA Winter Flounder)
   f. 52nd Northeast Regional Stock Assessment Workshop Report http://www.nefsc.noaa.gov/saw/saw52/crd1117.pdf (includes SNE/MA Winter Flounder)

Georges Bank cod

The PDT presented two ABC alternatives to the SSC. The first method applies 75% of the F_{MSY} proxy to the projected biomass, resulting in values of 2,506mt for 2013, 2,732mt for 2014, and 3,172mt for 2015. The second method applies 75% of the F_{MSY} proxy to the projected biomass in 2013 and then retains that value for 2014 and 2015. **The SSC favors the second option: ABC should not exceed 2,506mt for 2013-2015.** This recommendation was based on several factors.

Repeated experiences in recent years demonstrate poor performance of stock projections. Projections often deviate substantially from updated perceptions of stock dynamics revealed by later assessments, and this problem increases further into the future from the starting year of the projection. Therefore, while there is some confidence in estimated biomass in the first year of the projection, 2013, rapid deviations mean that confidence is much lower for 2014 and especially 2015. In fact, the SSC's preference is to only provide ABCs for 2013 and 2014. While the SSC recognizes the rationale for setting a 2015 ABC at this stage as a placeholder in case circumstances do not allow it to be set later, the SSC cautions against basing fisheries management on data that is several years old (i.e., basing the ABC in 2015 on data no more recent than 2011).

Deviations between projections and stock performance have recently tended toward over-optimistic expectations of stock growth. Despite ACLs set with uncertainty buffers and catch below those ACLs, later assessments often reveal continued overfishing. Instead of adjusting ABC based on optimistic projections of future stock growth, holding catch constant provides an additional buffer against that outcome.

In addition to significant concerns about the performance of stock and catch projections, other issues raised include:

- During public comment at the SSC meeting, several industry members highlighted that fish have been hard to find, especially over the past year, despite ample ACE being available and high prices for cod.
- Age structure of GB cod has been severely truncated since the mid-1990s. Older and larger cod spawn more frequently, produce disproportionately more eggs per spawn, and have higher egg quality and juvenile survival. These attributes are not captured by the assessment, and could cause underestimation of the effects of a loss of the older age groups.
- Distribution of cod through time has seen a consistent shift north and eastward, which might be changing availability of fish to the fleet.
- Spawning stock biomass is very low and close to the origin of the stock-recruitment relationship, where predator traps and other ecological phenomena can reduce per-capita reproductive rates.

Industry members also commented that the federal government has issued a disaster declaration for the groundfish fishery, which specifies that poor stock status persists despite adherence to catch limits. This suggests that other factors are inhibiting recovery, and that these factors need to be better understood and, where possible, mitigated. Therefore, the SSC urges greater attention to conditions and processes that affect stock dynamics beyond those typically captured by the assessment and ABC-setting process. See below for further discussion of this issue.

<u>Gulf of Maine cod</u>
The PDT presented two ABC alternatives to the SSC. Both adopt a constant catch approach. The first is based on 75% of the F_{MSY} proxy applied to the 2013 biomass projected from the base model in the assessment, resulting in a value of 1,249mt for 2013-2015. The second is based on the M-ramp model and sets the value of 1,550mt as the ABC for 2013-2015 based on F declining from 0.27 in 2013 to the F_{MSY} proxy in 2015 due to projected increase in the stock. This second constant catch ABC has F less than the F_{MSY} proxy under the M=0.2 model for all three years. **The SSC agreed with the PDT that the preferred ABC for 2013-2015 should not exceed 1,249mt, but also includes the second alternative of ABC not to exceed 1,550mt for 2013-2015 in our recommendation for reasons outlined below.**

The PDT preferred the first approach given the overfished state of the stock and the comparatively small economic differences predicted between the two options. However, the PDT noted that economic impacts looming for the groundfish fishery due to a series of ACL cuts in 2013 and beyond might mean that even small differences in economic outcomes will be significant. The SSC agreed with the PDT's evaluation of the two options, and noted that both alternatives appropriately use the assessment outcomes and account for scientific uncertainty. An ABC of 1,550mt is the maximum the SSC endorses based on the PDT analysis, but urges the Council to consider the 1,249mt alternative in order to conserve the stock and enhance the likelihood of rebuilding. Furthermore, although the SSC has serious concerns about the status of the stock which motivate the preference for ABC=1,249mt, we also recognize that either value represents a substantial reduction in recent harvest, and is expected to promote rebuilding more than recent level of catch have allowed.

The GOM cod assessment took an important step that was welcomed by the SSC in presenting two models to help understand stock dynamics. The potential value of considering multiple models with comparable performance and plausibility has been discussed by the SSC in the past, and reviewing both models in the course of this decision provided additional insights and understanding of the nature and extent of uncertainty. However, presenting two models also introduced new difficulties into the deliberations and development of ABC advice. Two models converged to common estimates of SSB, F and recruitment in the terminal year so projections began from a common starting point, but the implications of ABC alternatives differed between subsequent projections from the two models.

Consideration of the M-ramp model also raised important and unresolved questions. It is unclear whether the increase in M to 0.4 assumed for the M-ramp model will be persistent or ephemeral, i.e., whether or not M will return to the longer term estimate of 0.2, and the base model assumed no change at all. The SARC panel determined that, if M has increased, an eventual return to 0.2 is likely given that it is more consistent with inherent life history traits of cod (growth, longevity, maturity) and that the mechanism for the increase is not clear. Therefore, fishing mortality targets used in the projections from either model were based on reference points that assumed M=0.2.

In addition to the approaches adopted during the assessment and PDT analysis, the SSC discussed two other aspects of the potential shift in the mortality regime, one related to policy and the other related to science. The policy discussion focused on the implications of the National Standards guidance for the methods used. Again, based on SARC recommendations, the increased natural mortality was not carried through to the overfishing definition or the rebuilding target. The SARC recommendation might not be consistent with NS1 guidelines that, "*MSY is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions…*" However, elsewhere it is stated that, "*Some short-term environmental changes can alter the current size of a stock or stock complex without affecting the long-term productive capacity of the stock or stock complex*." Therefore, depending upon the interpretation of the terms "prevailing" and "short-term", it may or may not be necessary to apply different F values to biomass projected from the two models in determining catch advice.

There was disagreement within the SSC about whether the M-ramp model's increase in the natural mortality rate should lead to an increase or a decrease in the target fishing mortality rate. The SSC was unable to resolve this difference in directional change of target fishing mortality rate during the meeting. The discussion raised larger scientific questions about the nature and implications of regime shifts, similar to those raised in the discussion about both GB cod and SNEMA winter flounder, questions that require urgent attention and resolution (see below).

Southern New England/Mid-Atlantic winter flounder

The PDT presented two ABC alternatives to the SSC. Both adopt a constant catch approach. The first adopts an ABC of 2,000mt for 2013-2015, which keeps F within 75% of F_{MSY} in 2013 and within $F_{rebuild}$ thereafter. The second adopts an ABC of 1,676mt, which is the long-term yield expected if 75% of F_{MSY} is maintained indefinitely and recruitment follows more recent trends rather than the longer term trend used in the assessment. The PDT recommended the latter alternative, and **the SSC agreed that ABC for 2013-2015 should not exceed 1,676mt**.

The primary impetus for this decision is a clear pattern in the stock-recruitment residuals, wherein actual recruitment for 1999-2010 has been consistently below recruitment predicted by the Beverton-Holt model used in the assessment. Residuals should be distributed more or less evenly on either side of the predicted relationship if the relationship still holds. A persistent bias in one direction suggests that something in the environment has changed or that the model fit is too poor to use for predictions.

Other recommendations

As noted above, the SSC had some discomfort with setting ABCs for 2015 given poor performance of some recent assessments, low confidence in projections, rapid and incompletely understood changes in the ecosystem, and socio-economic impacts of our catch advice. We felt compelled to meet the terms of reference provided by the Council, but also to caveat our advice appropriately. However, we strongly urge the Council, NOAA, NRCC and other institutions in the science and management system to do everything possible to provide updated information in the form of new update or benchmark assessments, survey data, catch information, and other research results within 2014 so that the 2015 ABCs can be revisited and possibly adjusted if appropriate.

This information will not, however, resolve overarching questions about changes in the ecosystem, and especially whether there has been a persistent regime shift, questions that were a component of SSC discussions of all of these stocks. In fact, similar questions have been raised in other SSC deliberations. For example, our initial ABC advice for silver hake included unanswered questions about whether there has been a fundamental change in productivity, which resulted in the substantial increase in the ABC relative to historical catch trends. Also, our review of the GOM cod analyses provided by Drs. Butterworth and Rademeyer in March 2012 raised question about how far back in time an assessment should go if a regime shift has taken place, since the earliest years will be most dissimilar from the new regime. A series of scientific publications over the past decade provide evidence for a possible regime shift, and the extreme temperatures and resultant changes in species' distributions and behavior provides more immediate and tangible evidence that the system might be behaving in a fundamentally different way than in the past.

Therefore, we recommend that processes be initiated at the regional or, preferably, national level to accomplish three primary objectives. First, identify the key metrics and threshold values of those metrics that define when a regime shift has taken place. Second, evaluate data against those thresholds to determine if a regime shift has taken place in the Gulf of Maine/Georges Bank/Southern New England region, or if one is underway. Third, determine appropriate management responses for when a regime shift is determined to have taken place.

The SSC recognizes that progress was made on the proposed work plan to address cod management units. However, the SSC reiterates its previous recommendation that "There should be a comprehensive evaluation of scientific information on cod population structure and its management implications, including the possibility of revising management units. This evaluation should occur in time to be taken into account in the next management cycle, beginning with the 2014 fishing year."

Summary of recommendations

1. **The ABC for Georges Bank cod for 2013, 2014 and 2015 should not exceed 2,506mt. The associated OFLs are 3,279 mt, 3,570 mt, and 4,191 mt for FY 2013-2015, respectively.**
2. **The preferred ABC for Gulf of Maine cod for 2103, 2014 and 2015 should not exceed 1,249mt, but the Council might also consider alternative values not to exceed 1,550mt depending upon its risk tolerance. The OFLs associated with the 1,249 mt constant catch ABC are 1,635 mt, 1,966 mt, and 2,705 mt for FY 2013-2015, respectively, while the OFLs associated with the 1,550 mt constant catch ABC are 1,635 mt, 1,917 mt, and**

2,639 mt for FY 2013-2015, respectively. Both sets of OFLs are based on the M=0.2 model.

3. **The ABC for Southern New England/Mid-Atlantic winter flounder for 2013, 2014 and 2015 should not exceed 1,676mt. The associated OFLs are 2,732 mt, 3,372 mt, and 4,439 mt for FY 2013-2015, respectively.**
4. **Updated information to re-evaluate 2015 ABCs should be produced within 2014.**
5. **A regional or national process to better define regime shifts, develop metrics for when they occur, and determine management strategies as a result is urgently needed.**

Summary of 2013-2015 OFLs and ABCs for Georges Bank cod, Gulf of Maine cod, and Southern New England/Mid-Atlantic winter flounder (all values in metric tons, mt).

	2013		2014		2015	
	OFL	ABC	OFL	ABC	OFL	ABC
Georges Bank cod	3,279	2,506	3,570	2,506	4,191	2,506
Gulf of Maine cod – preferred	1,635	1,249	1,966	1,249	2,705	1,249
Gulf of Maine cod – alternative	1,635	1,550	1,917	1,550	2,639	1,550
SNEMA winter flounder	2,732	1,676	3,372	1,676	4,439	1,676

Framework Adjustment 50

to the

Northeast Multispecies FMP

Appendix II

Analytic Techniques: Derivation of Accountability Measure Areas

Development of Accountability Measure (AM) Areas

This action proposes to adopt area-based AMs for SNE/MA winter flounder for common pool vessels. This section describes the analyses used to identify and define the areas. Much of the information in this section summarizes Groundfish Plan Development Team (PDT) reports documenting this work. This appendix includes information for areas for other stocks so that the analytic approach can be understood in its overall context and application.

The approach used to identify the AM areas uses a combination of observer data and fishery-dependent data. To simplify analyses and make them consistent with data sources used in assessments, the fishery dependent catch data was queried from the "AA" tables created by the Northeast Fisheries Science Center (NEFSC). These tables assign a catch location to catch weights as reported to dealers by matching VTR records to dealer records. Not all trips can be matched and so some dealer records do not have position information; these were not included in the analyses. The analyses were performed for the major groundfish gear: otter trawl, longline, and sink gillnet. Note that these gears are used in other fisheries in addition to the groundfish fishery, particularly in the area south of New England. No attempt was made to assign each trip to a particular fishery, which introduces uncertainty into evaluating the impacts of the AM measures because as proposed they would only limit groundfish fishing trips.

Observer Data Analysis

The first step in the analysis was to query the observer database and extract observed tows for the three primary gears used in the groundfish fishery: large mesh otter trawl, large and extra-large mesh sink gillnets, and longlines. The following discussion will describe the steps used in the analysis for trawl gear catches of windowpane flounder and ocean pout, but similar approaches were used for the other two gears.

Data analyzed were from calendar years 2008 – 2010; all data were pooled. Pooling was done to get a greater geographic coverage of the observed tows and to increase the number of observed tows in the data set. This approach is problematic in that discard rates can differ from year to year and pooling the data glosses over those differences. On the other hand, the management system is unlikely to change the areas annually and so this approach gives a blended picture of discard rates over a recent time period.

The observed tow information on total kept catch and on the discards of windowpane flounder and ocean pout[1] were plotted in Arcview© GIS. The plotted tows were binned into ten-minute squares. This provided an illustration of the range of observer coverage as well as an indication of the squares where most observed discards were documented (see Figure 1 and Figure 2 for an example). The magnitude of observed discards in a square is related to the number of observed trips in a square so these data alone do not necessarily

[1] Since almost all windowpane flounder and ocean pout has been discarded in recent years, the analysis for these species focused on discards. For wolffish and halibut the analysis included kept catch.

indicate the correct areas for AMs. The second step was to calculate a simple ratio of observed species discards to total kept catch (d/kall) in each ten-minute square. This identifies areas with higher discard rates but still does not account for the number of observed tows – there is no measure of variability in this plot, and a square with one observed tow cannot be differentiated from a square with hundreds of observed tows (see Figure 3 for an example).

The discards from a ten-minute square are a function not only of the d/kall ratio but of the total fishing effort in the area. Conceptually the discard ratio can be expanded to an estimate of total discards from the area by multiplying it by the total kept catch in the same area. There is a concern with doing this type of analysis at small spatial scales because of the uncertainty over reported fishing locations. Groundfish fishermen are required to report one fishing location for every statistical area fished that represents the general area of fishing activity. Several studies have shown that while the information is reliable for assigning catch at the stock area level, it becomes less accurate as the spatial scale gets smaller (see, for example, Palmer and Wigley 2009). Nevertheless, the information is often used at small scales. Analyses for the future habitat actions bin the data into 10-km squares; protected species catch estimates bin the data at various depth profiles (Murray 2007); and the impacts of closed areas have been evaluated using the data binned into ten minute squares (Murawski et al. 2005). So for this analysis the data was binned at ten-minute squares. The data limitations must be kept in mind while evaluating these analyses and a criticism of this approach is that it places a heavy reliance on the accuracy of self-reported fishing locations that are known to be inaccurate. A assumption is that by pooling data over a three-year period it is likely the data are a fair representation of fishing activity even if an individual trip is misreported. Another consideration was the desire to make the AM areas as small as can be justified to minimize interference with other groundfish fishing activities. Binning the data at larger scales would make it difficult to identify smaller areas. A sensitivity analysis was performed with the data binned at 30 minute squares in the case of windowpane flounder and trawl gear to see how the analyses would change if binned at a larger scale.

With both observed d/kall and catch data binned into the same ten-minute squares the discards from each square can be estimated by multiplying the observed ratio by the reported kept all. The resulting value can be plotted - or, as is the case in Figure XXX, the log of the value can be plotted because the data are highly skewed. This gives an illustration of the distribution of discards. Note that discards are only estimated in a ten-minute square with both observed trips and reported kept catch. This is more of an issue with sink gillnet gear than trawl gear, as the distribution of observed hauls does not cover the range of reported kept catches (see Figure 20).

The estimated discards by ten-minute square were further analyzed to identify statistically-significant "hotspots" – areas with higher or lower discards than the region as a whole. ArcGis© includes an analytic tool which calculates these areas. As described by the software "This tool identifies statistically significant spatial clusters of high values (hot spots) and low values (cold spots)." The tool uses a spatial statistic called the Getis - Ord G* statistic. It does not identify isolated features with a high or low value; it identifies features that have a high (or low) value that are surrounded by other features with a high (or low) value. These areas reflect a statistically significant departure from complete spatial randomness. These areas generally match areas with high d/kall ratios.

The use of the statistic requires the user to define the appropriate neighborhood for the analysis, and results can be sensitive to the choice of the neighborhood. For this analysis the neighborhood was defined with a fixed distance of 25,000 meters, or roughly the eight squares surrounding each ten-minute square. This neighborhood scale was selected primarily because of a desire to use a scale that would allow for designing AM areas that were as small as possible. In addition, only ten minute squares with more than 10 or more observed tows were used in order to minimize effects of isolated observed tows. A sensitivity analysis was run using all squares for windowpane flounder and trawl gear; the results were not noticeably different than when all squares were included.

For wolffish and halibut a similar approach was followed. Because a larger proportion of the catches of these species were retained in recent years the approach was modified to use a catch/kall ratio for the observer data and kept catches of the species were combined with the estimated discards in each ten-minute square.

Once the hot-spot areas were plotted the AM areas were identified by drawing boundaries around a group of ten-minute squares that accounted for a desired reduction in catches. Because of data limitations with respect to the accuracy of reported fishing locations and the expectation that the areas would not be completely effective, they areas were drawn larger than would be expected if the data were completely accurate and compliance was 100 percent. The area boundaries may be adjusted in the future as experience is gained on the effectiveness of the AM system. For SNE/MA winter flounder, AM areas were selected in several locations in order to spread the effects of the AM areas across the region.

The figures following this discussion are the output from the analyses.

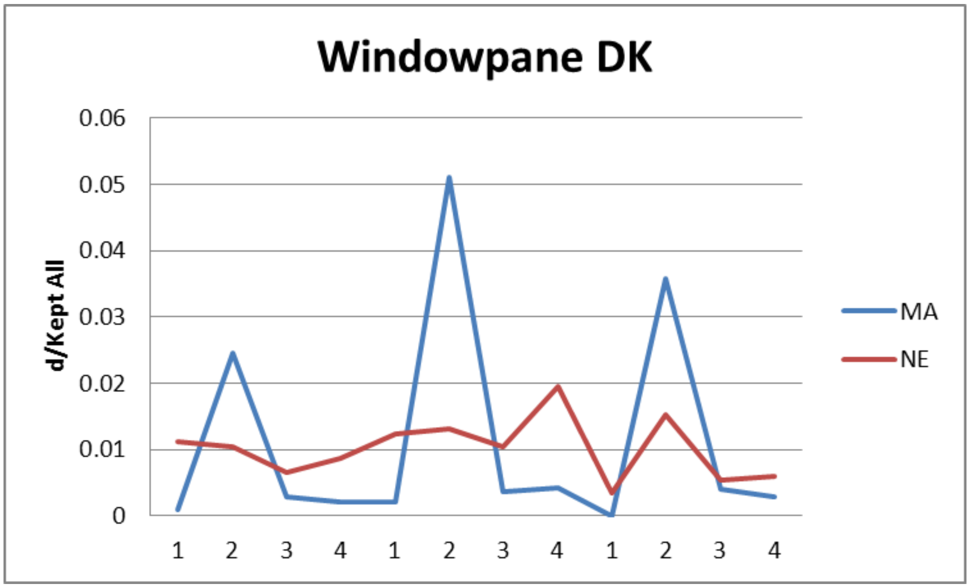
Additional Analyses

The preceding section describes the method used to identify the AM areas. A second approach applied regression trees to windowpane flounder during development of the areas. The results from this approach were consistent and are documented in PDT reports, while not as detailed as the GIS analyses.

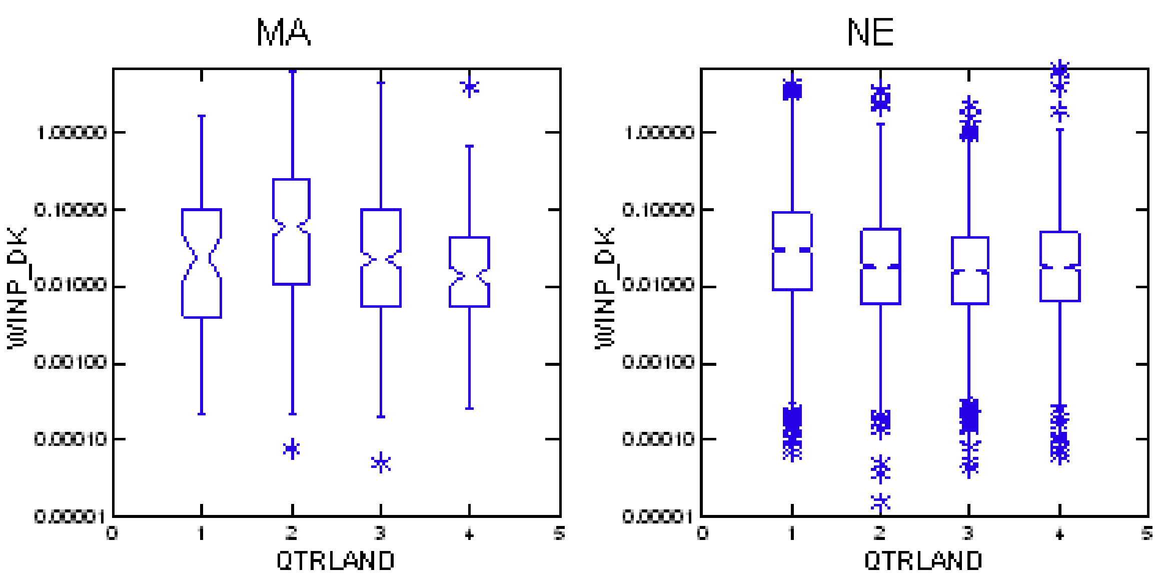
As noted, the analyses used pooled data. Since discard rates may change seasonally within a year, the observer data were analyzed to see if there were different discard rates in each quarter.

The following plot shows the simple windowpane observed sum discards/sum kept all ratio, by quarter, for large mesh otter trawls from 2008 – 2010. The two lines represent trips departing from NE ports and from MA ports (not area fished).

Note there seems to be a clear pattern for trips from MA ports with the ratio peaking in the second quarter. But there does not seem to be as obvious a pattern for trips leaving from NE ports.



The same l data were used for these box plots but were analyzed differently. These charts summarize the discard/kept all ratios on **<u>individual tows</u>** for tows that discarded windowpane flounder (note log scale). There still seems to be an increase in the second quarter for trips departing from MA ports. For NE ports, there might be a suggestion of a higher rate in the first quarter but it is not as pronounced as for the MA ports. The distributions overlap quite a bit, though.



Charts were plotted (not included here) that show the d/Kall ratios by ten minute square and quarter for large mesh otter trawls (050). All data are pooled for the years 2008 – 2010. The data include some tows coded as gear 050 but using an excluder device such as a separator. The ratio is a simple sum of discards divided by the sum of the total kept on observed tows in each ten-minute square. With windowpane flounder on GB there do not appear to be large differences in the observed discard ratios over the four quarters. In the GOM, however, ratios seem higher in the first quarter in the inshore area. There are few squares in SNE that have more than nine tows, making it difficult to draw conclusions

For ocean pout, ratios on GB appear higher in the second and possibly the third quarters, and lower in the first and fourth quarters. The inshore GOM seems to follow an opposite pattern. Again, the lack of observations in SNE makes it difficult to draw conclusions.

Wolffish discard ratios appear to be lowest in the first quarter. In the inshore GOM the ratios appear higher in the third quarter, but there does not seem to be much difference between the second through fourth quarters. It is difficult to detect much seasonality in the discard ratios for halibut. For sink gillnet gear, wolffish were not observed in sink gillnet tows at all in the first quarter. The second and third quarter seemed to have the highest catch/ kept all ratios.

Literature Cited:

Murawski, S. A., Wigley, S. E., Fogarty, M. J., Rago, P. J., and Mountain, D. G. 2005. Effort distribution and catch patterns adjacent to temperate MPAs. ICES Journal of Marine Science, 62: 1150-1167.

Murray KT. 2007. Estimated bycatch of loggerhead sea turtles (*Caretta caretta*) in U.S. Mid-Atlantic scallop trawl gear, 2004-2005, and in sea scallop dredge gear, 2005. US Dep Commer, Northeast Fish Sci Cent Ref Doc 07-04; 30 p.

Palmer, Michael C. and Wigley, Susan E. 2009. Using Positional Data from Vessel Monitoring Systems to Validate the Logbook-Reported Area Fished and the Stock Allocation of Commercial Fisheries Landings. North American Journal of Fisheries Management, Vol. 29, Issue 4, 2009.

Figure 1 – Number of observed large mesh otter trawl tows, by ten-minute square, 2008 and later

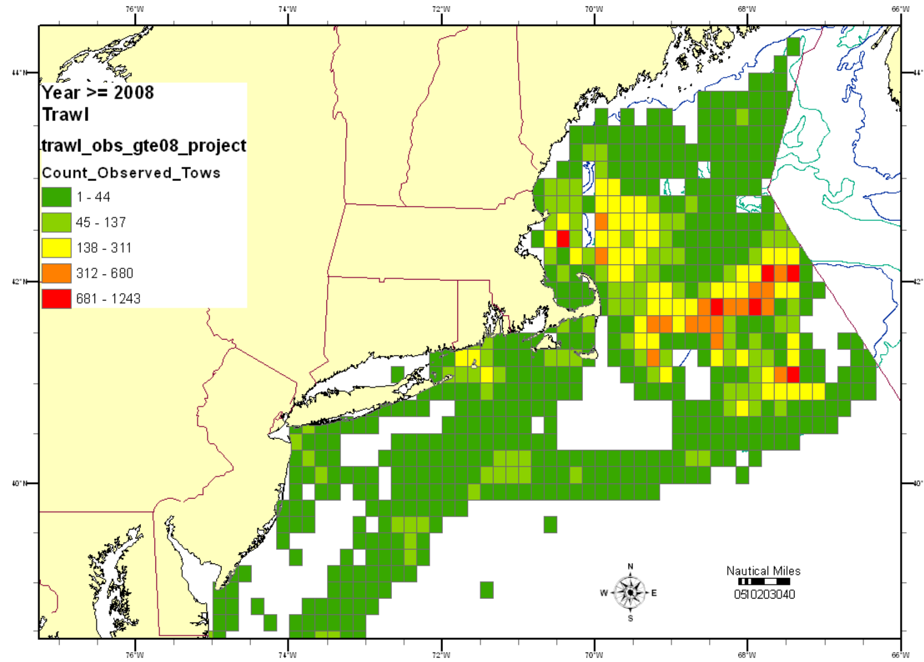


Figure 2 – Large mesh otter trawl expanded discards of ocean pout, 2008 - 2010

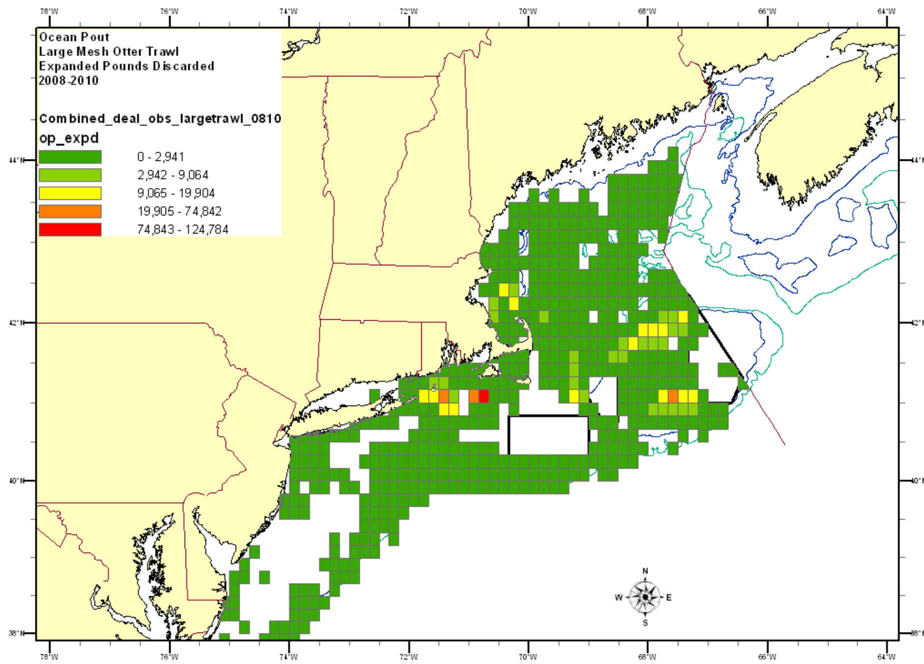


Figure 3 – Large mesh otter trawl expanded discards of ocean pout (log scale), 2008 - 2010

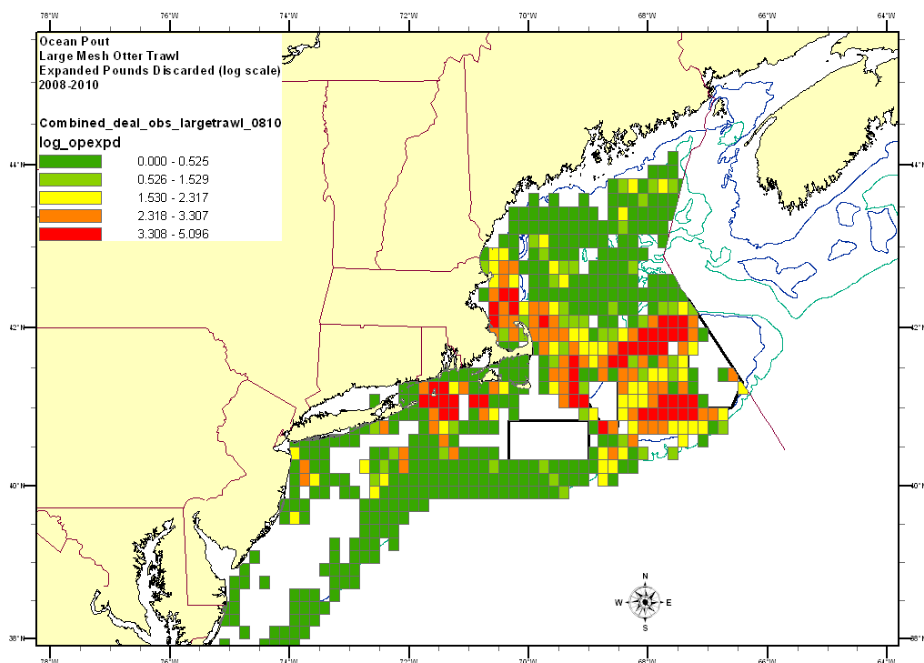


Figure 4 - – Getis Gi* hotspots for large mesh otter trawl expanded discards of ocean pout, all observed tows.

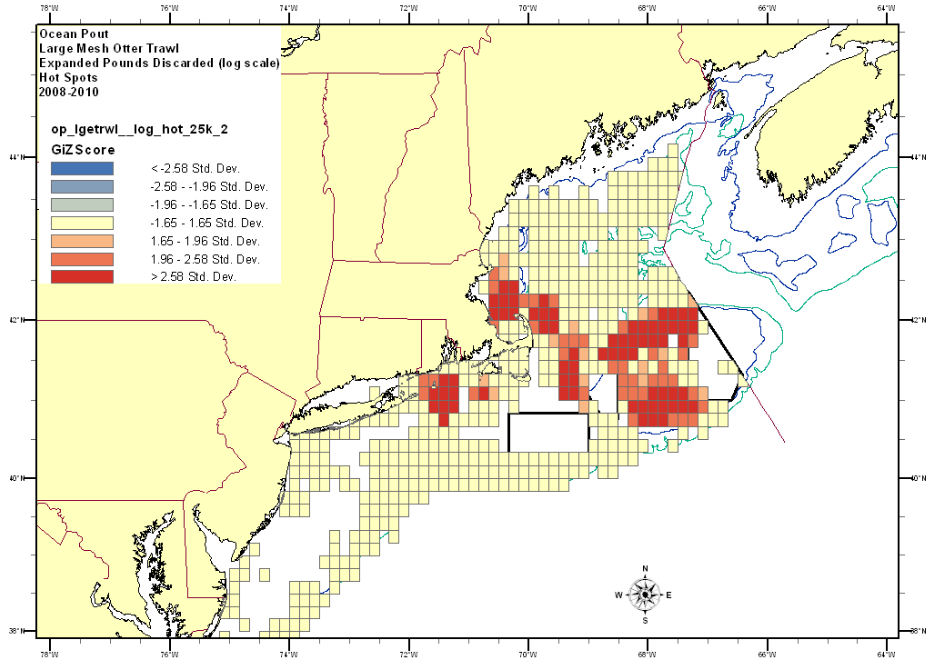


Figure 5 - Getis Gi* hotspots for large mesh otter trawl expanded discards of ocean pout, 10 or more observed tows in each ten-minute square

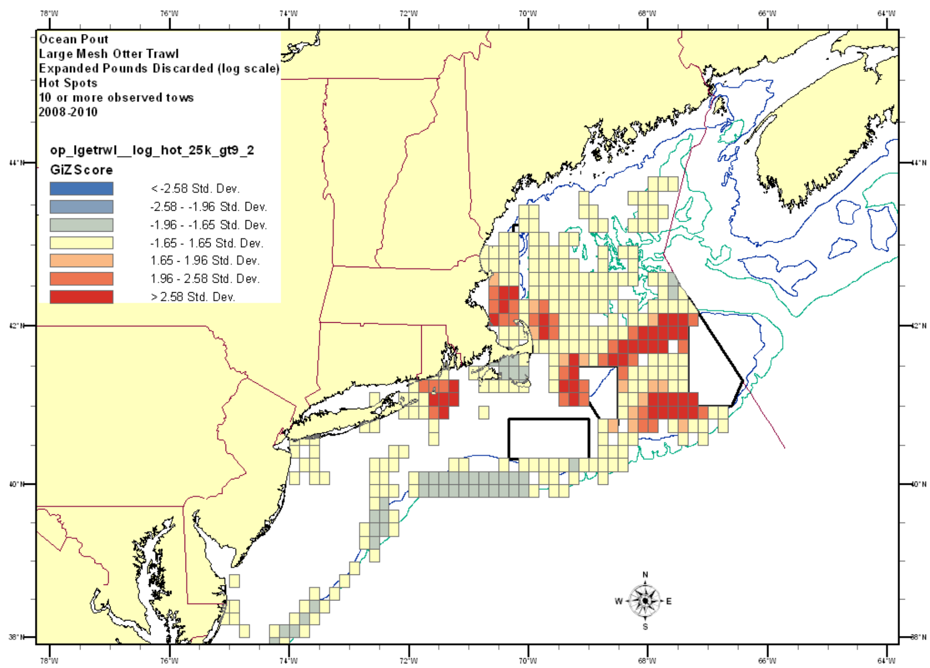


Figure 6 – Large mesh otter trawl catches of Atlantic halibut (reported kept catch plus expanded discards)

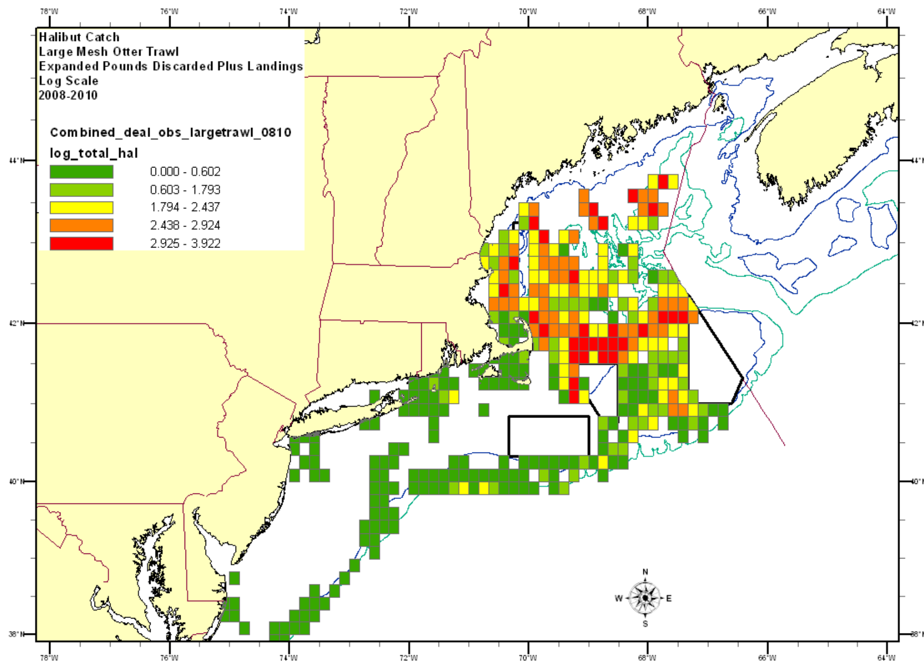


Figure 7 - – Large mesh otter trawl catches of Atlantic halibut (reported kept catch plus expanded discards), log scale

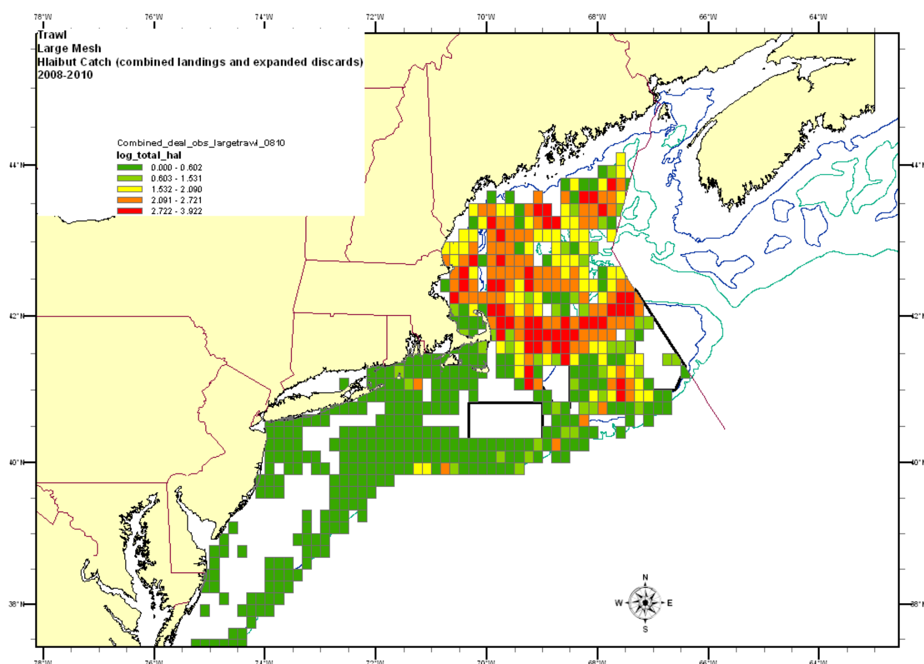


Figure 8 - Getis Gi* hotspots for large mesh otter trawl catch of halibut, all observed tows

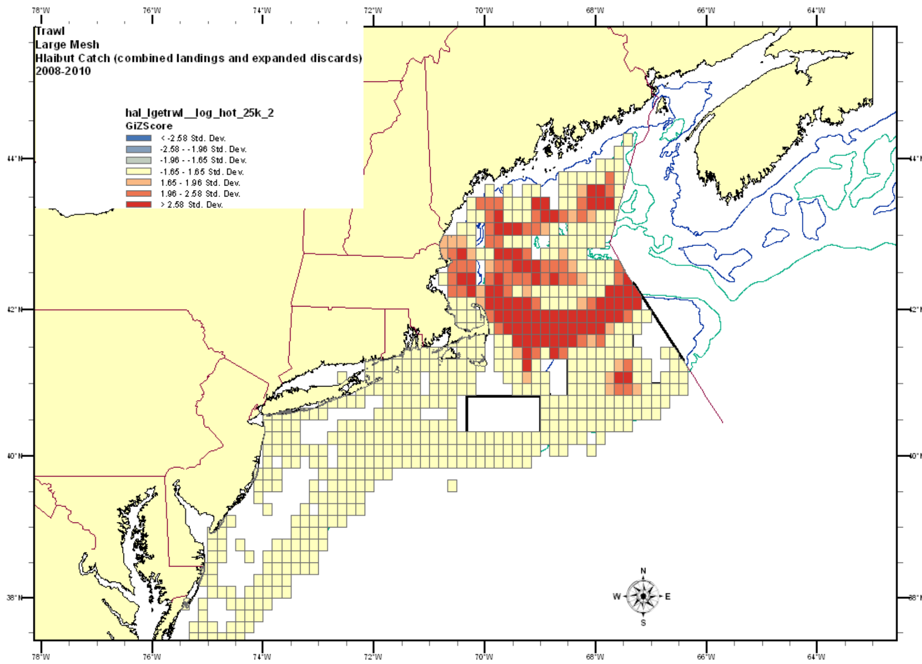


Figure 9 - Getis Gi* hotspots for large mesh otter trawl catch of halibut, 10 or more observed tows in each ten-minute square

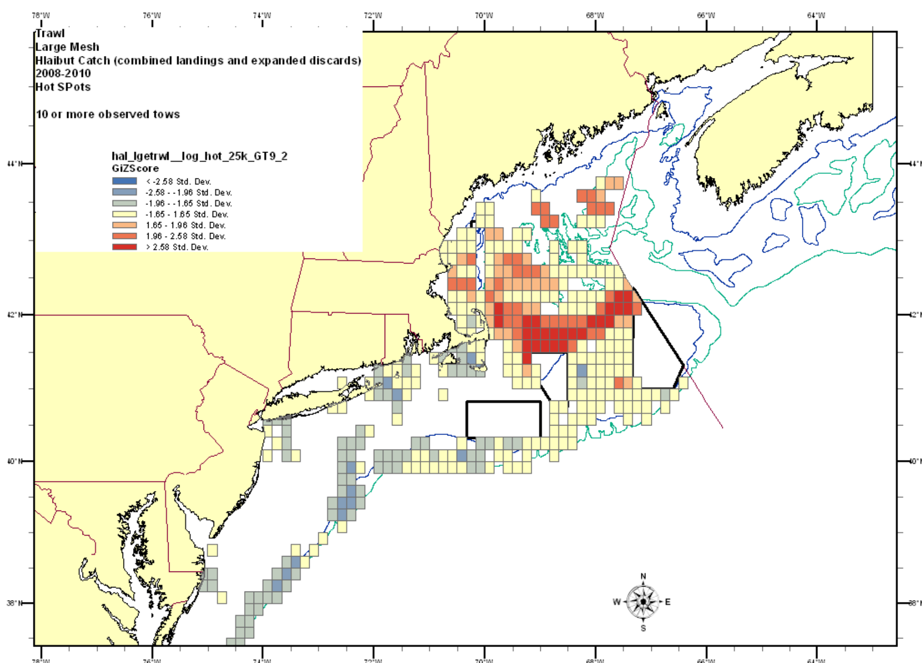


Figure 10 – Large mesh otter trawl Atlantic wolffish catch (landings plus expanded discards)

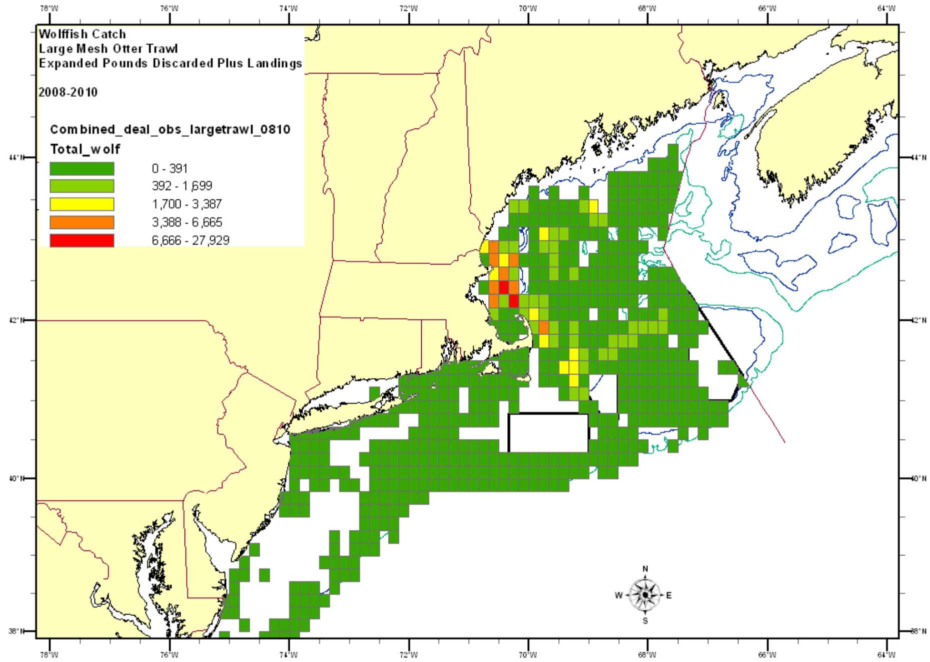


Figure 11 – Large mesh otter trawl Atlantic wolffish catch (landings plus expanded discards), log scale

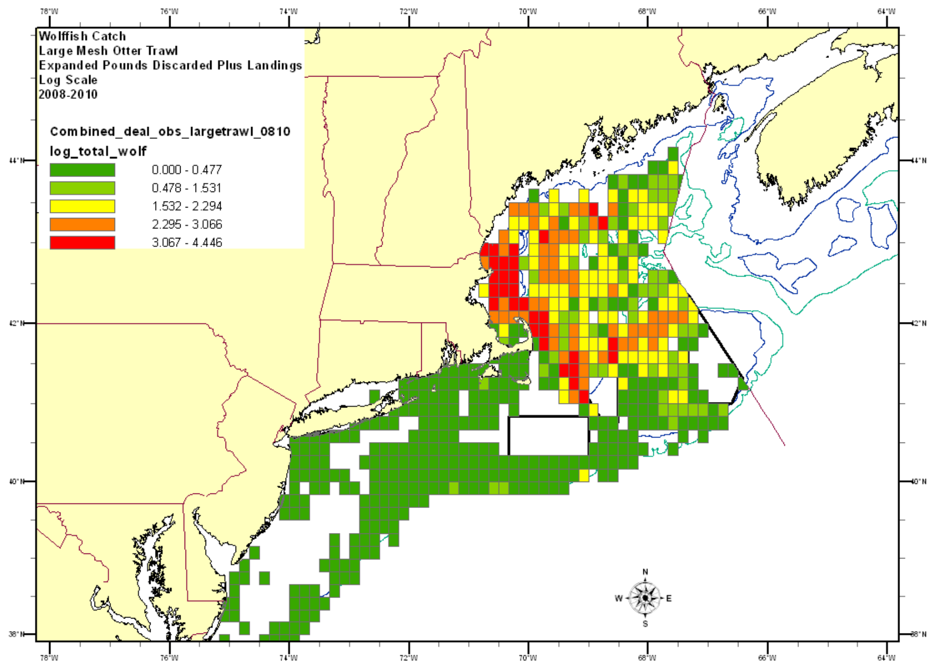


Figure 12 - - Getis Gi* hotspots for large mesh otter trawl expanded catch of wolffish, all observed tows

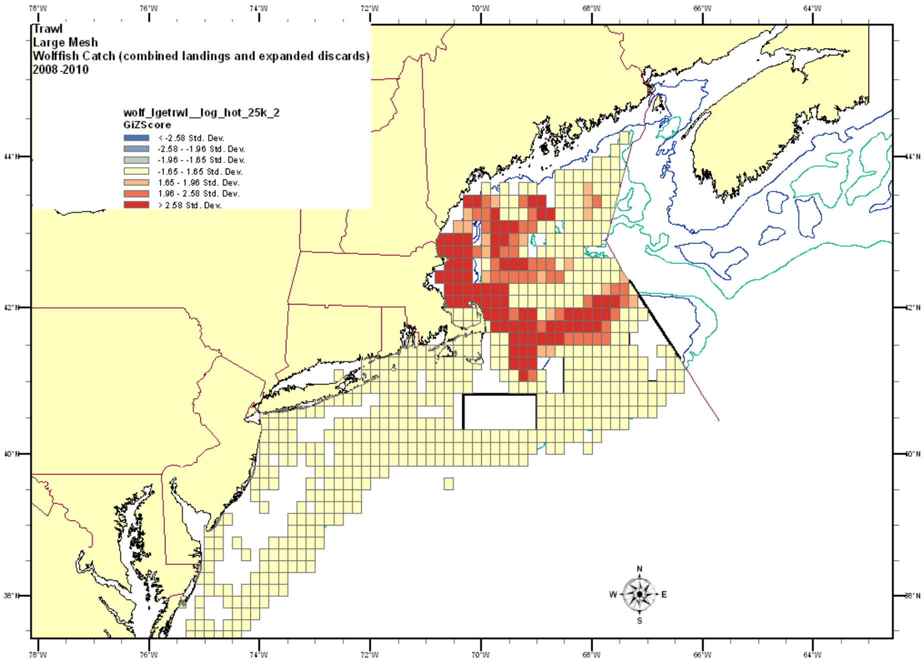


Figure 13 - Getis Gi* hotspots for large mesh otter trawl catch wolffish, 10 or more observed tows in each ten-minute square

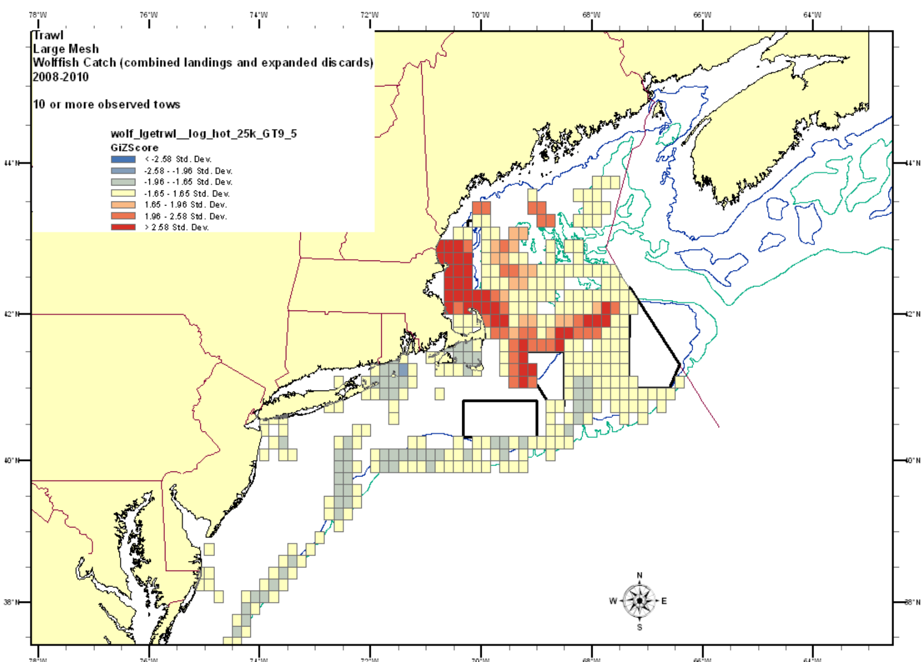


Figure 14 – Observed large and extra-large mesh sink gillnet hauls plotted over sink gillnet reported kept catch by ten-minute square, 2008 - 2010

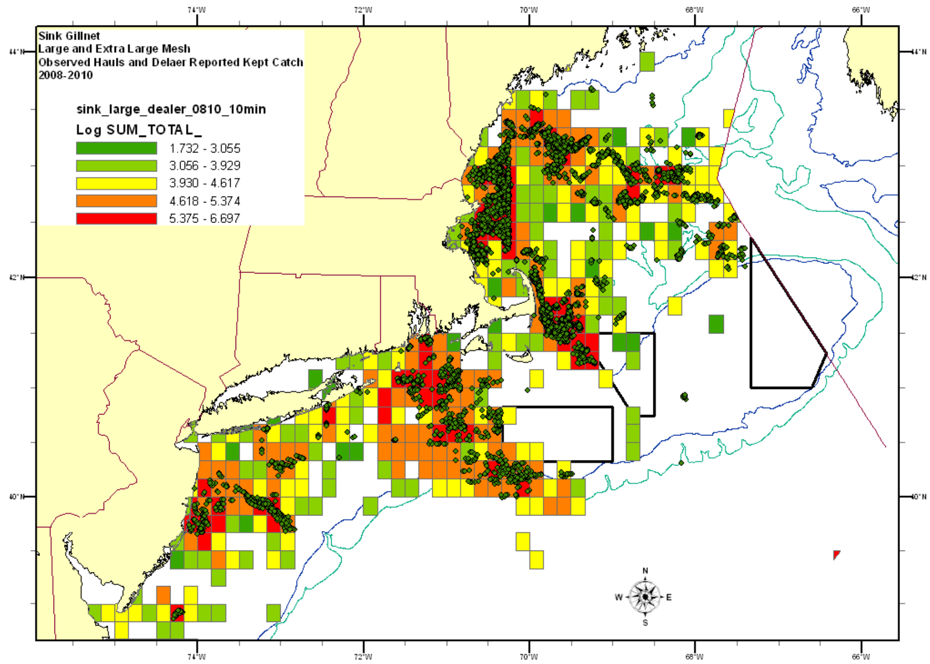


Figure 15 – Sink gillnet catch, areas with 10 or more observed tows, 2008 - 2010

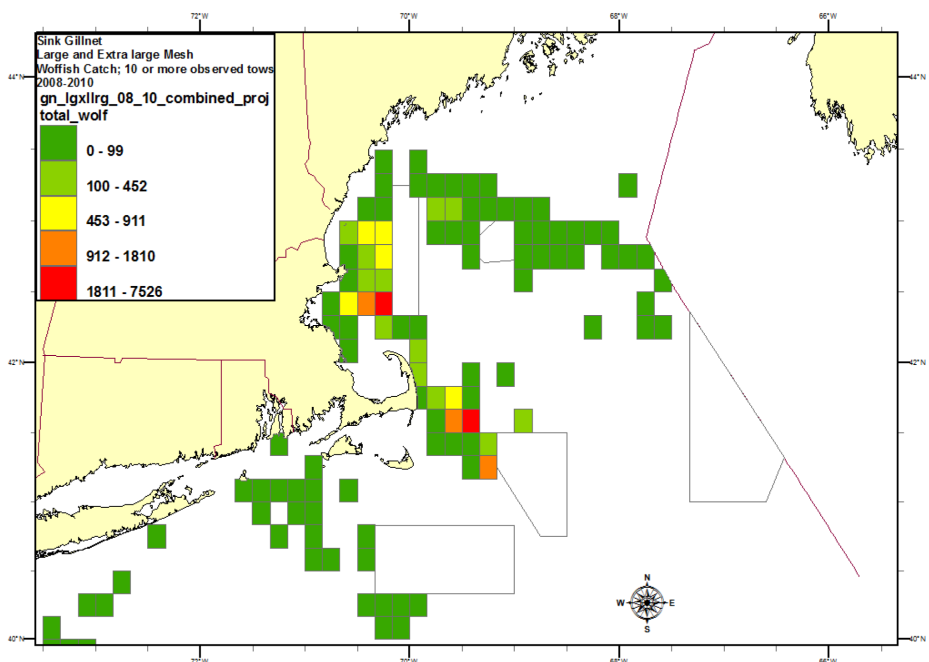


Figure 16 – Sink gillnet catch, areas with 10 or more observed tows, log scale, 2008 - 2010

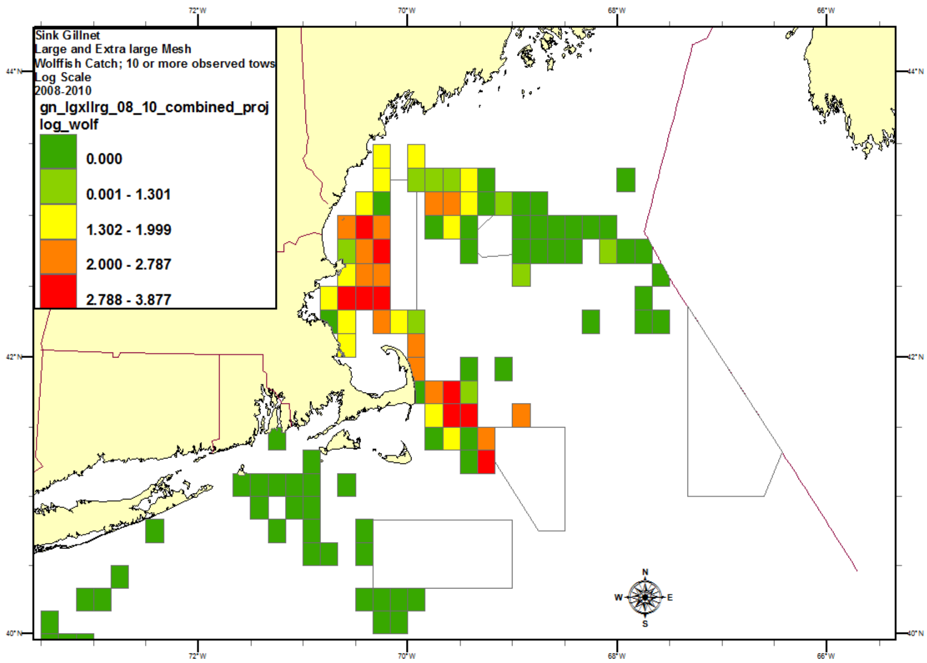


Figure 17 – Sink gillnet wolffish hotspots, areas with ten or more observed tows only, 2008 - 2010

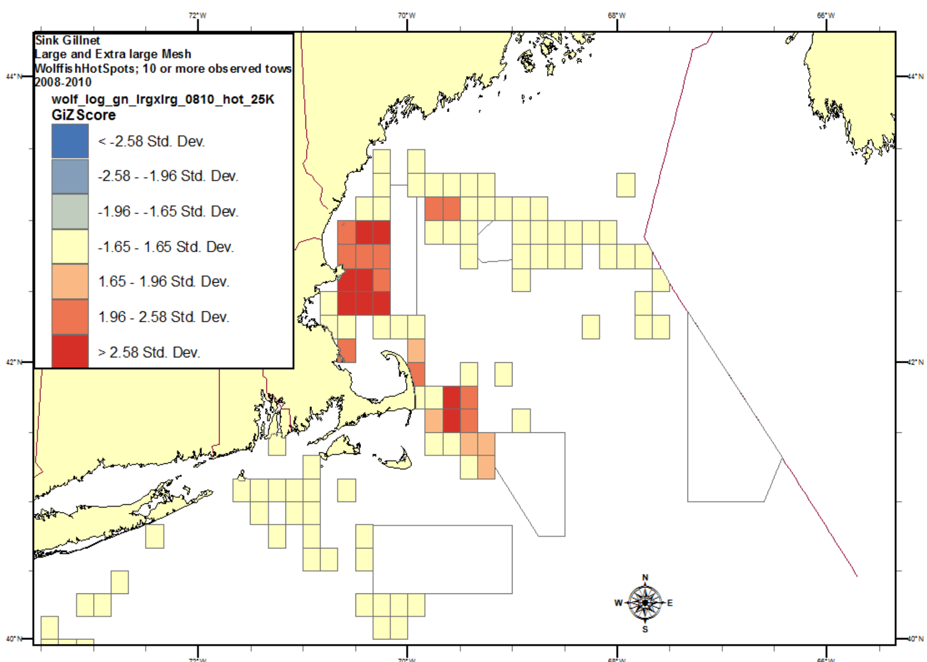


Figure 18 – Sink gillnet halibut catch, areas with ten or more observed tows, 2008 -2010

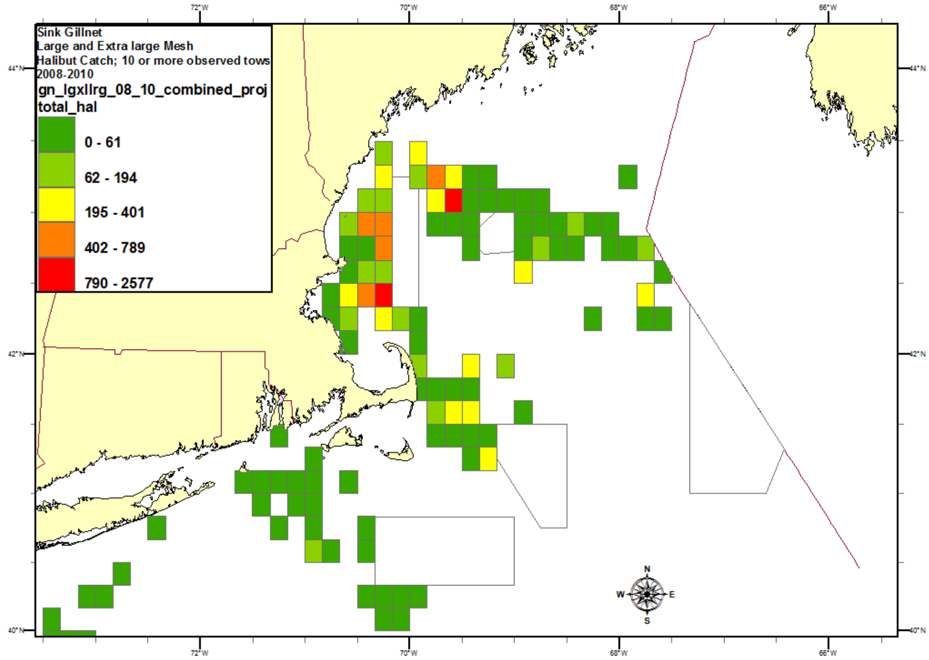


Figure 19 – Sink gillnet halibut catch, log scale, areas with ten or more observed tows, 2008 -2010

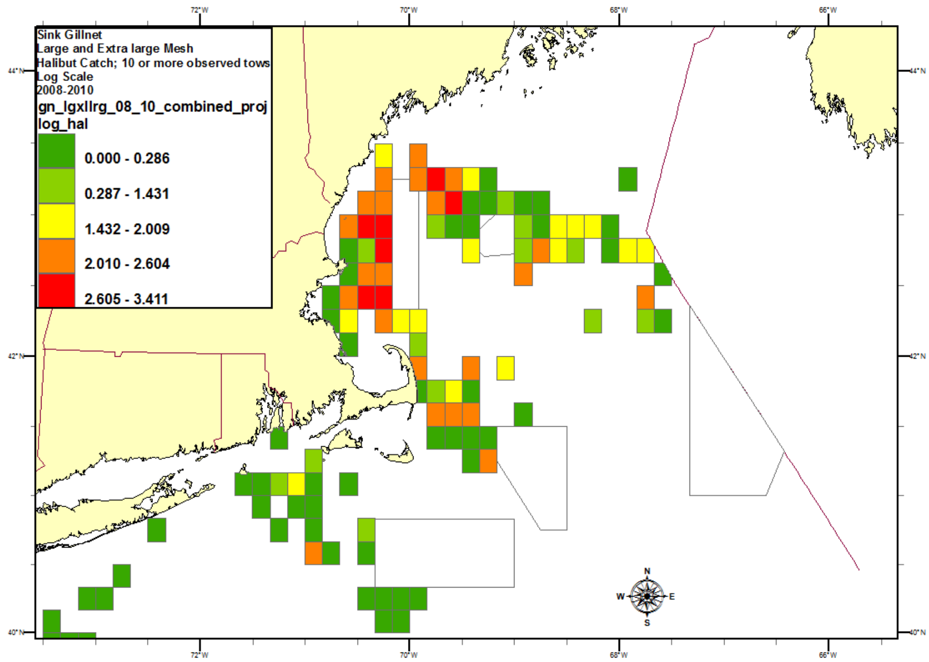


Figure 20 – Sink gillnet halibut hotspots, areas with ten or more observed tows, 2008 - 2010

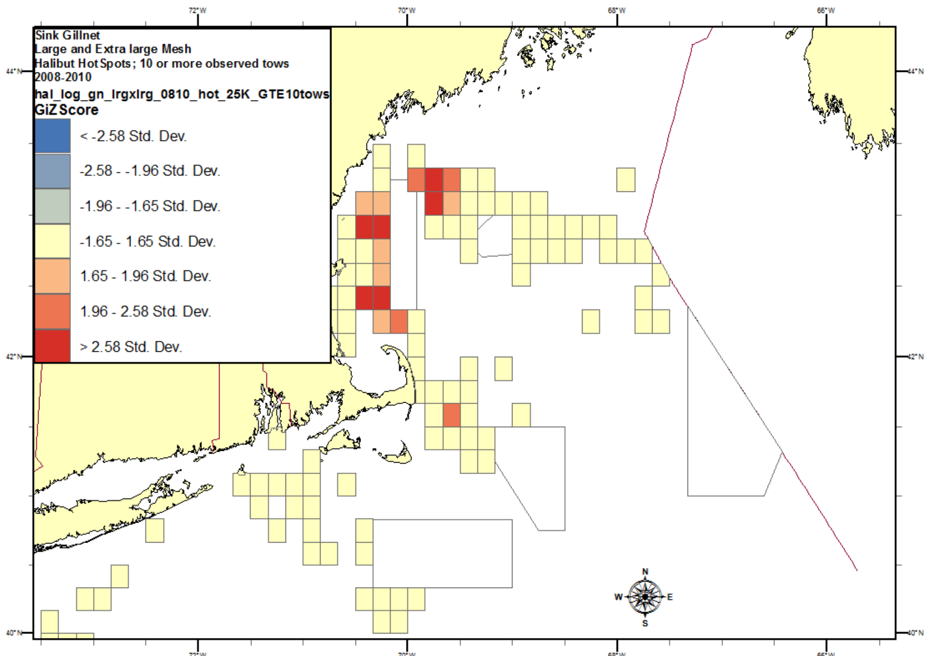


Figure 21 – Large mesh otter trawl observed discards of SNE/MA winter flounder, log scale

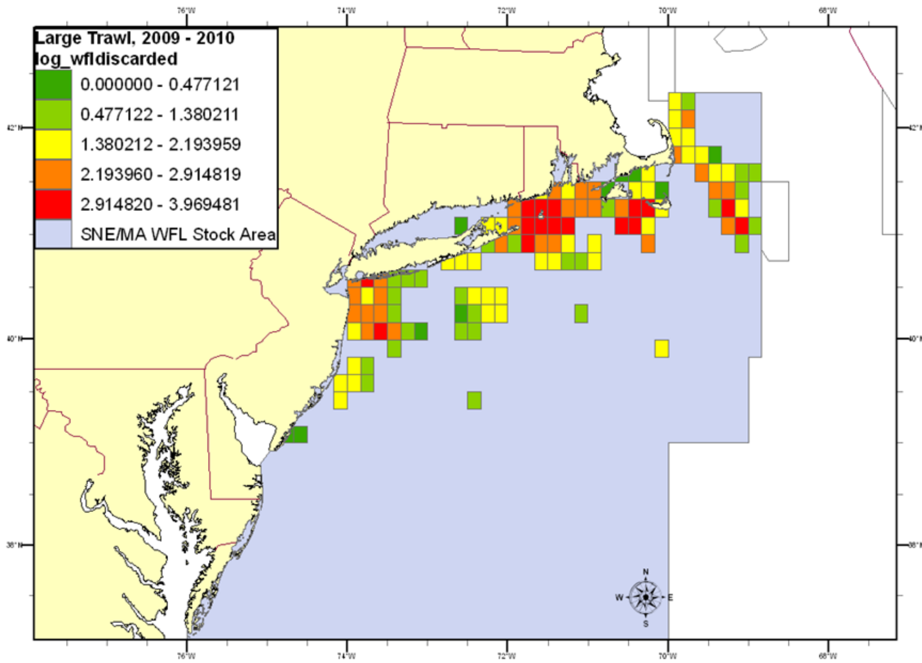


Figure 22 – Large mesh otter trawl observed discard/kept all ratios, SNE/MA winter flounder

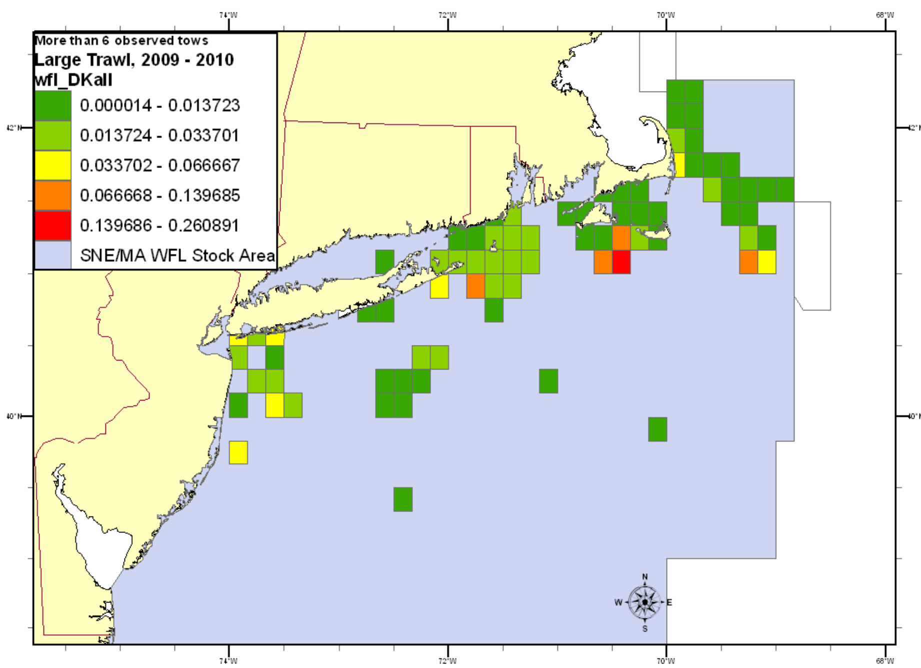


Figure 23 – Large mesh otter trawl expanded discards of SNE/MA winter flounder, log scale

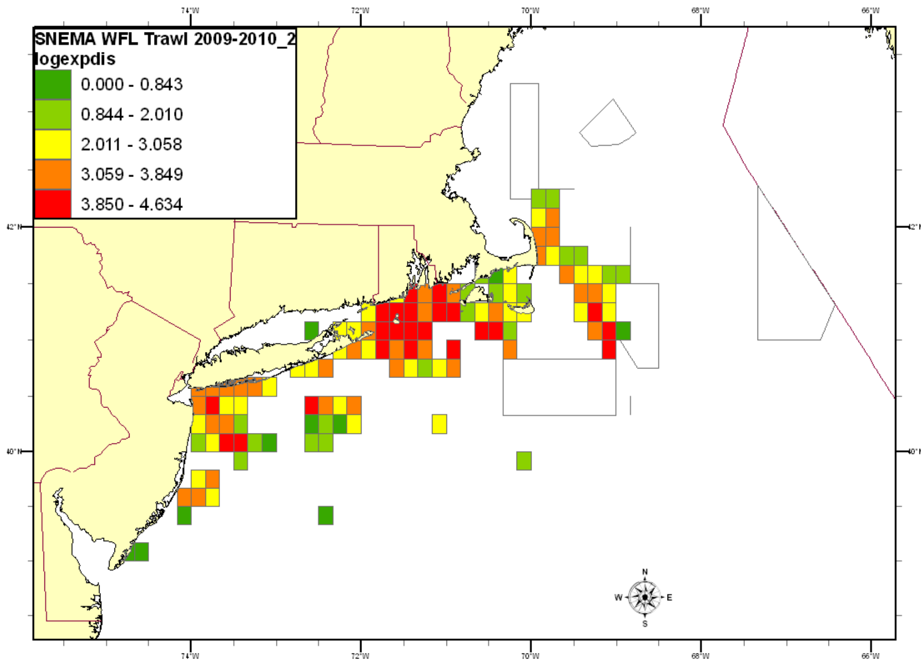
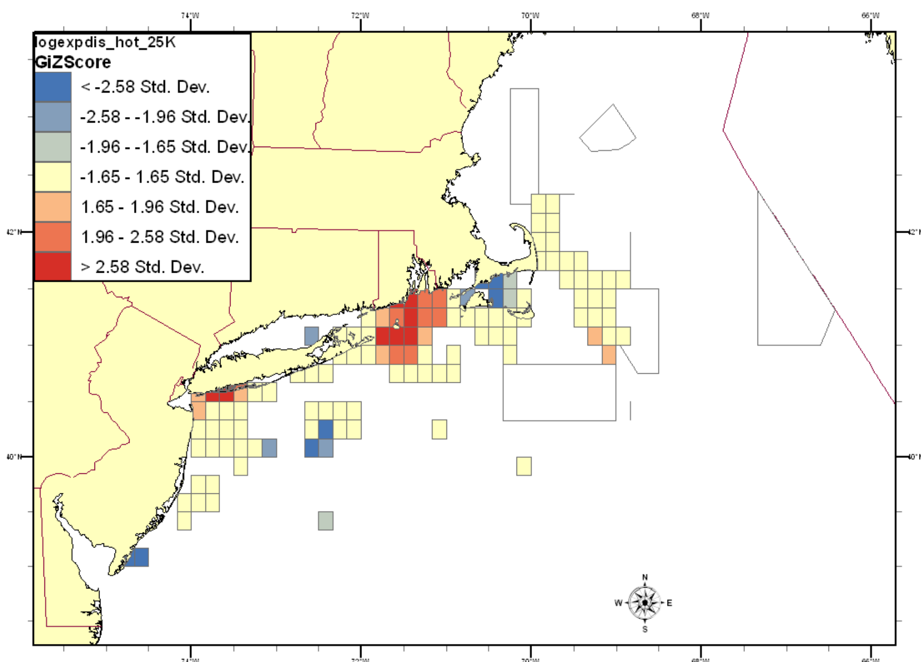


Figure 24 – Large mesh otter trawl Getis-G* hotspots for SNE/MA winter flounder discards



Identifying hotspots of windowpane discard using regression tree analyses on windowpane discards per tow and proportion of tows with windowpane

Developed for the groundfish PDT

by

Steven Correia
Massachusetts Division of Marine Fisheries
July 19, 2011

I used regression trees to identify geographic areas with high and low proportion of tows with windowpane or log10 discards of windowpane per tow. Tom Nies provided a dataset of observed tows. The analysis was based on tow observations. Total discards were estimated by multiplying the discard rate (discard (species)/ (kept all) by the kept hailweight. Tow observations were treated as independent, that is the correlation of tows within trips was ignored.   All analyses were completed on at tow level, and the distribution of observed effort or fleet effort was not taken into account in this analysis.

Tree regression proceeds by binary recursive partitioning of the predictor variables in order to minimize the variance within each split and maximize the difference in mean between the two splits. The use of latitude and negative longitude as variables results in the creation of rectangles with homogeneous catches.

Proportion of tows with windowpane.

Tows were coded as having windowpane (1) or no windowpane(0). The overall proportion of tows with windowpane over the entire study area was 0.30.   The proportion of tows with windowpane is plotted against latitude and negative longitude (Figure 27 and Figure 28). The plot suggests that the highest proportion of positive tows with windowpane occur between 41 and 42 degrees north latitude and west of 70 degrees longitude and east of 69 degrees longitude.

I used a tree regression of presence/ absence of windowpane in tow with negative longitude and latitude as predictor variables. The full tree was pruned using 10-fold cross-validation and a complexity parameter chosen using the 1 standard deviation rule on the average error from cross-validation.   The pruned tree is shown in Figure 28 and explains 29.9% of the deviance.   Fitted proportions were derived using gridded area defined by latitude 35.5 to 44.3 in 0.1 degree increments and longitude (-75.7 to -63.6, in 0.1 degree increments.   Note that portions of this area do not contain observed trips. The fitted proportion positive tows are shown as level plots in Figure 29. Tow locations are shown in Figure 30.   Areas with relatively high proportion of tows with windowpane are western Georges Bank, Southern New England near Long Island and the Nantucket Light ship area and inshore western Gulf of Maine.

Catch of windowpane weight per tow

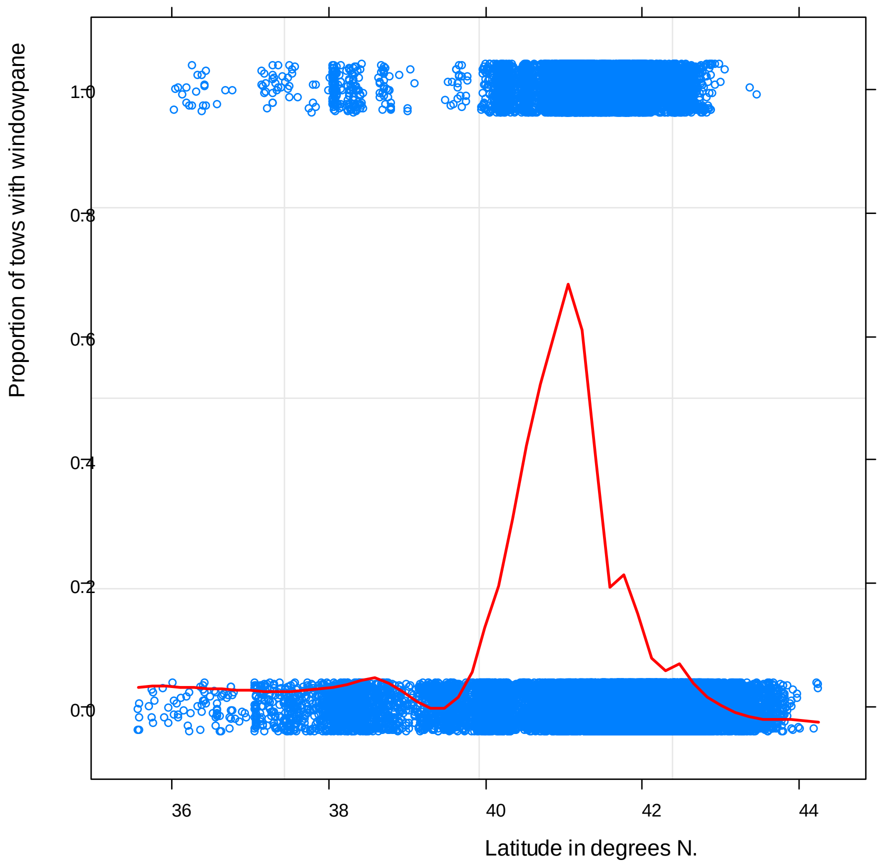
Windowpane are generally caught in small quantities, and 75% of tows with windowpane discards are 38 lb or less. However, the distribution is highly skewed right and tows with large amount of windowpane occur but are relatively rare. For example, the 90th quantile is 94 lb, the 99th quantile is 363, and the 99.9 is 1018 lb. Boxplots of the windowpane catch by bins of latitude and longitude are shown in Figure 31 and Figure 32. The Large contrast in the median or iterquartile range is not apparent in either the bins of latitiude or longitude. Bins with high number of observations do tend to have more observations at the tails than bins with fewer observations.

I used a regression tree to log10 windowpane discards using the same method applied to the proportion of tows. This analysis included tows with zero observations. The pruned tree is shown in Figure 33 and explains 29.9% of the deviance.   Fitted proportions were derived using gridded area defined by latitude 35.5 to 44.3 in 0.1 degree increments and longitude (-75.7 to -63.6, in 0.1 degree increments. Note that portions of this area do not contain observed trips. An attempt to fit a regression tree to only tows with windowpane was unsuccessful, likely a result of lack of contrast in the observations.

The fitted proportion positive tows are shown as level plots in Figure 34. Tow locations are shown in Figure 30. Results are similar to areas identified with proportions. Given the lack of contrast in distribution of discards in the positive tows and skewness in the distribution, the proportion of zero tows is having a large influence on the analysis. The fitted values are highest off Long Island (7.0 lb per tow) and Southern Georges (5.6 lb per tow) and Georges Bank (3.7).

Comparison with spatial statistics analysis.
These areas identified as high and low discards generally correspond to area's identified Tom Nies's high-low clustering analysis using Getis-Ord G statistics.

Implications for using area management as an accountability measure.
The regression tree analyses identified areas with high and low proportion of tows with windowpane and also areas with high and low discard per tow. These results would need to be scaled by expected effort in order to be useful for defining areas to use as accountability measure. Additionally, the effects of redistributing effort to non- AM on windowpane discards needs consideration. The lack of contrast in the distribution of discarded windowpane suggests that areas may need to be larger rather than smaller to reduce windowpane discards and may reduce the economic yield from other groundfish species.


Proportion of tows with windowpane
1.0
0.8
0.6
0.4
0.2
0.0
36
38
40
42
44
Latitude in degrees N.

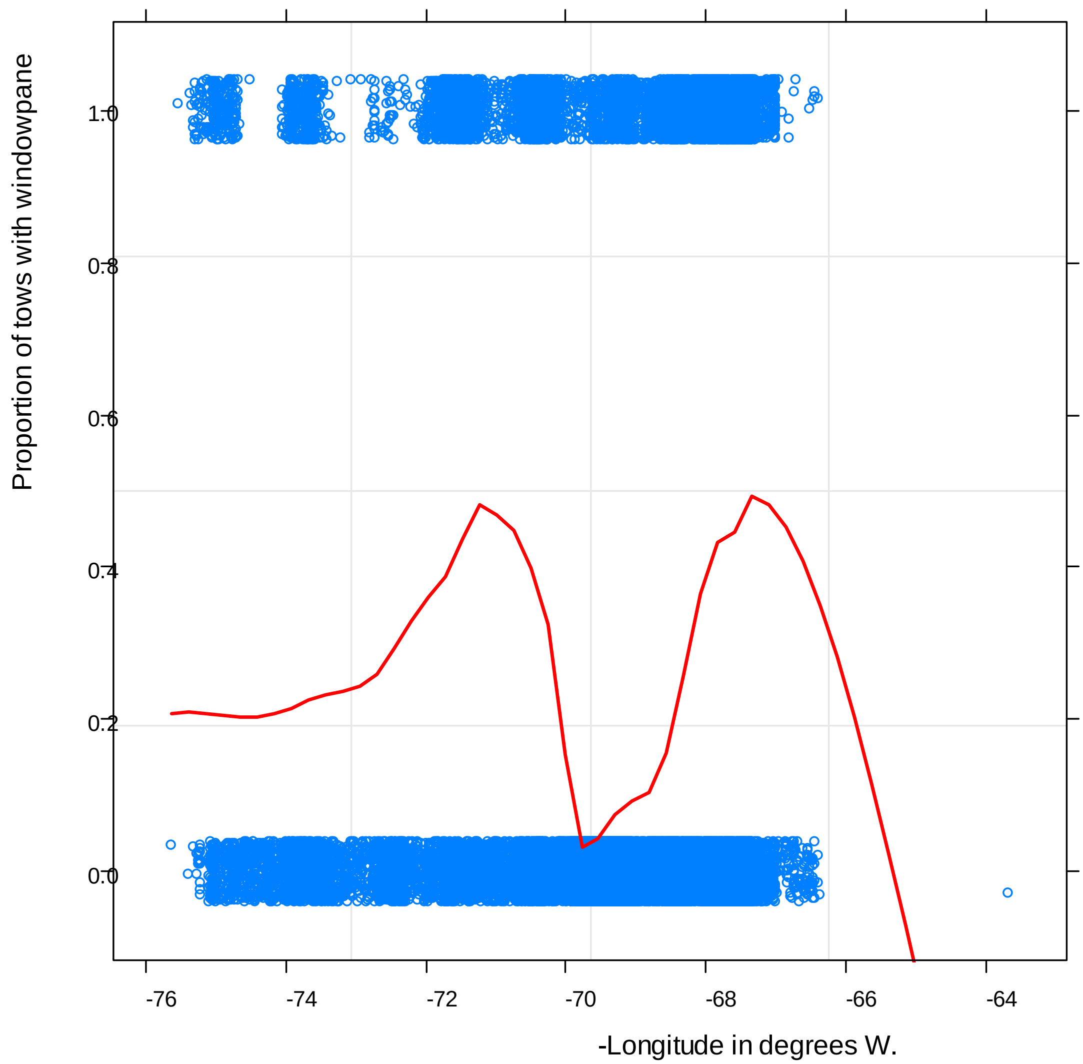


Figure 25. Proportion of tows with windowpane against beginning longitude. Red line is loess with span=0.2 and degree=1 and represents proportion positive tows. Blue dots are jittered presence (1)/ absence (0) of windowpane.

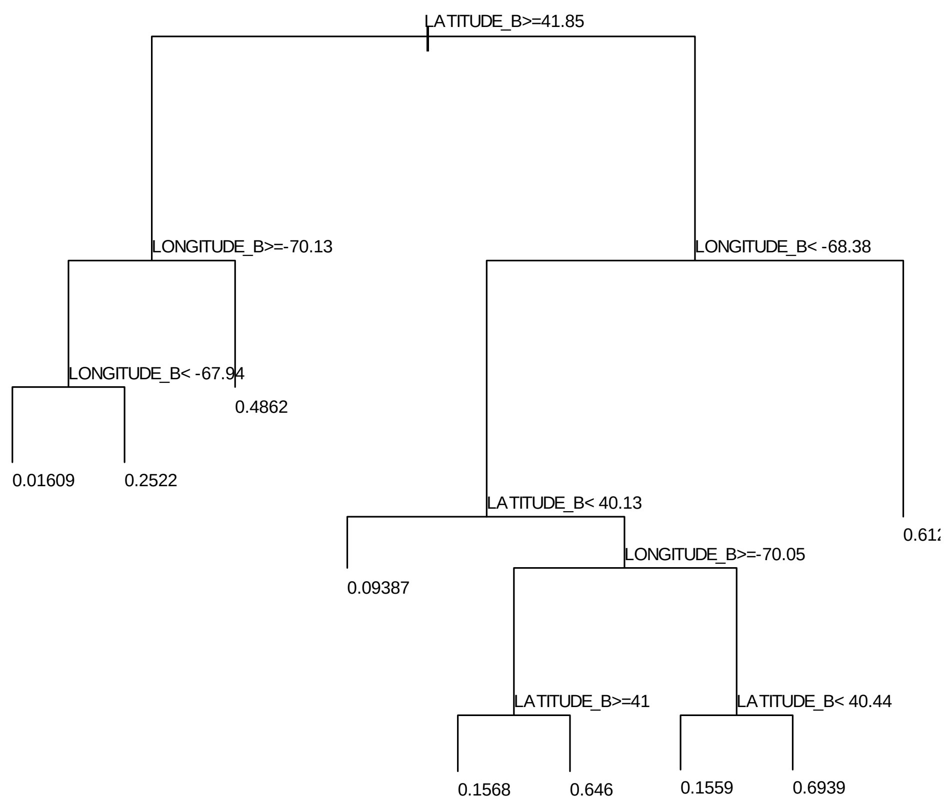


Figure 26. Partition tree for presence/absence (proportion) of windowpane in observed tows. Pruned tree using xerror+1 standard deviation as cut off criterion. Numbers at end of splits are fitted proportion of tows with windowpane.

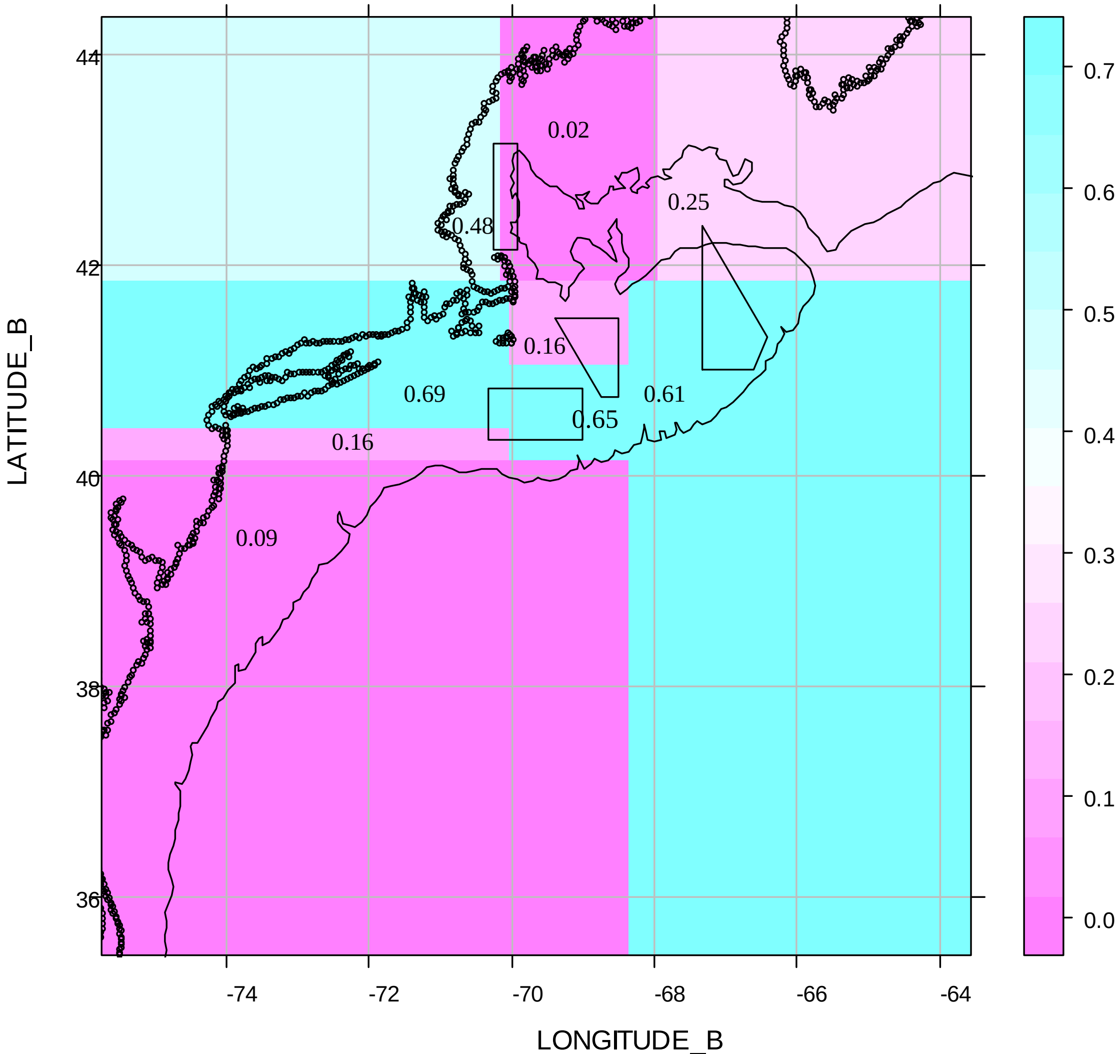


Figure 27. Levelplot of predicted proportion positive tows from tree regression based on latitude and longitude. Number within shaded area is proportion positive tows. Note that predicted values for areas without data should be ignored (see Figure 30 for location of tows) .

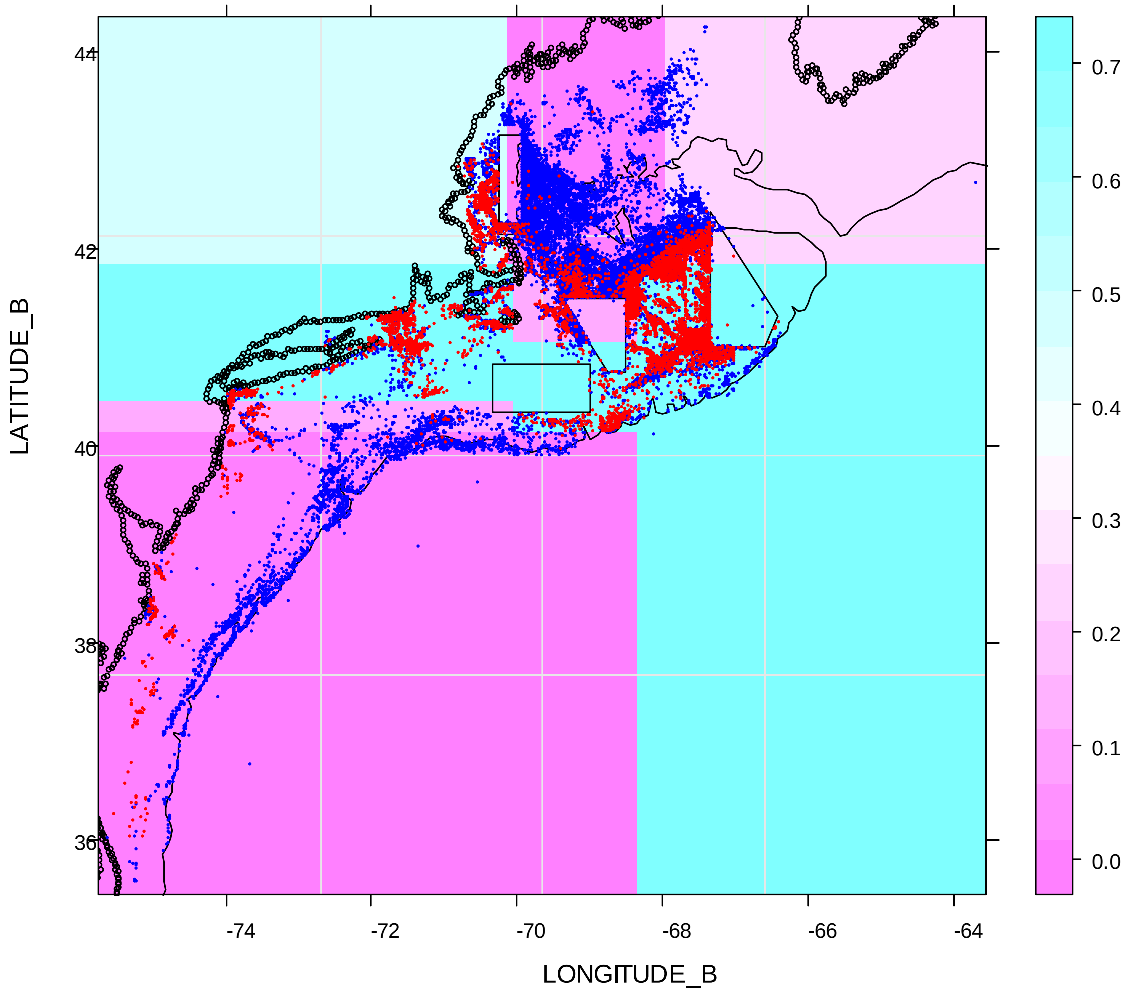


Figure 28. Same as Figure 3 but with observed tows (blue=no windowpane, red=windowpane observed). Colored regions coded to represent proportion of tows with windowpane (see scale on right).

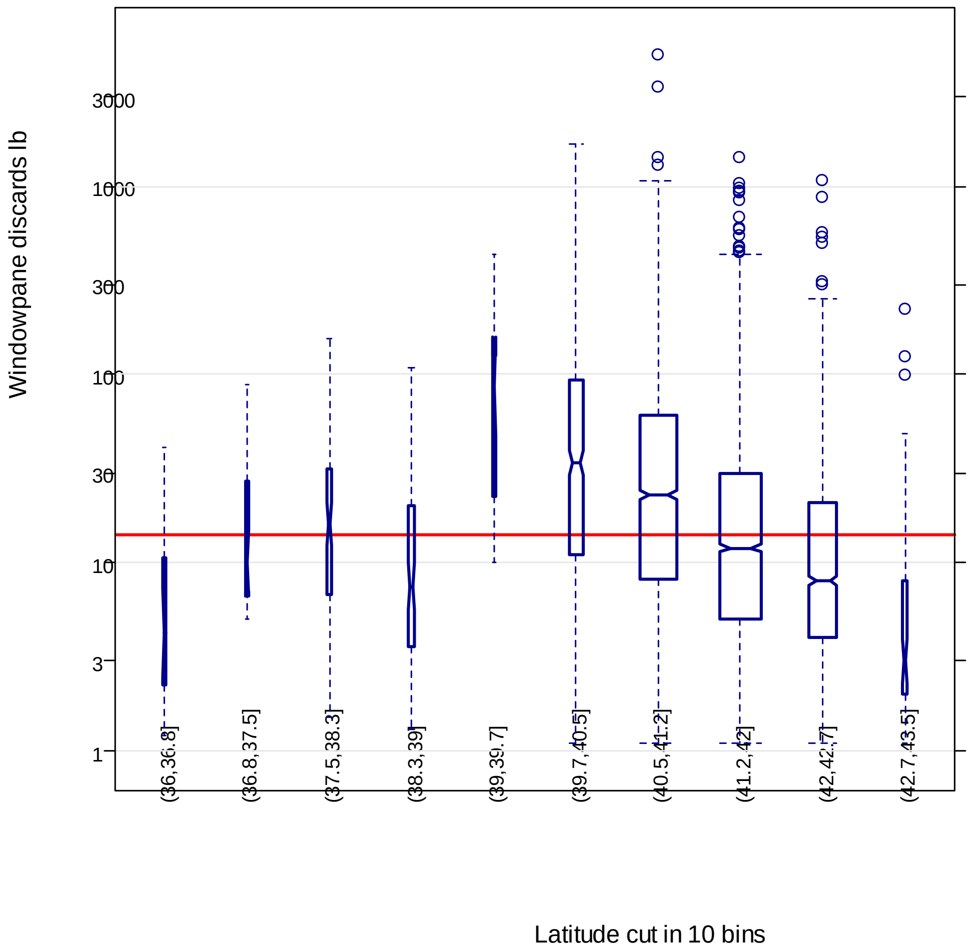


Figure 29. Boxplots of windowpane catch per tow (lb) by 10 bins of latitude. Zero tows not included. Width of box is proportional to square root of the number of observations. Red line is overall median. Note that y axis scale is logarithmic.

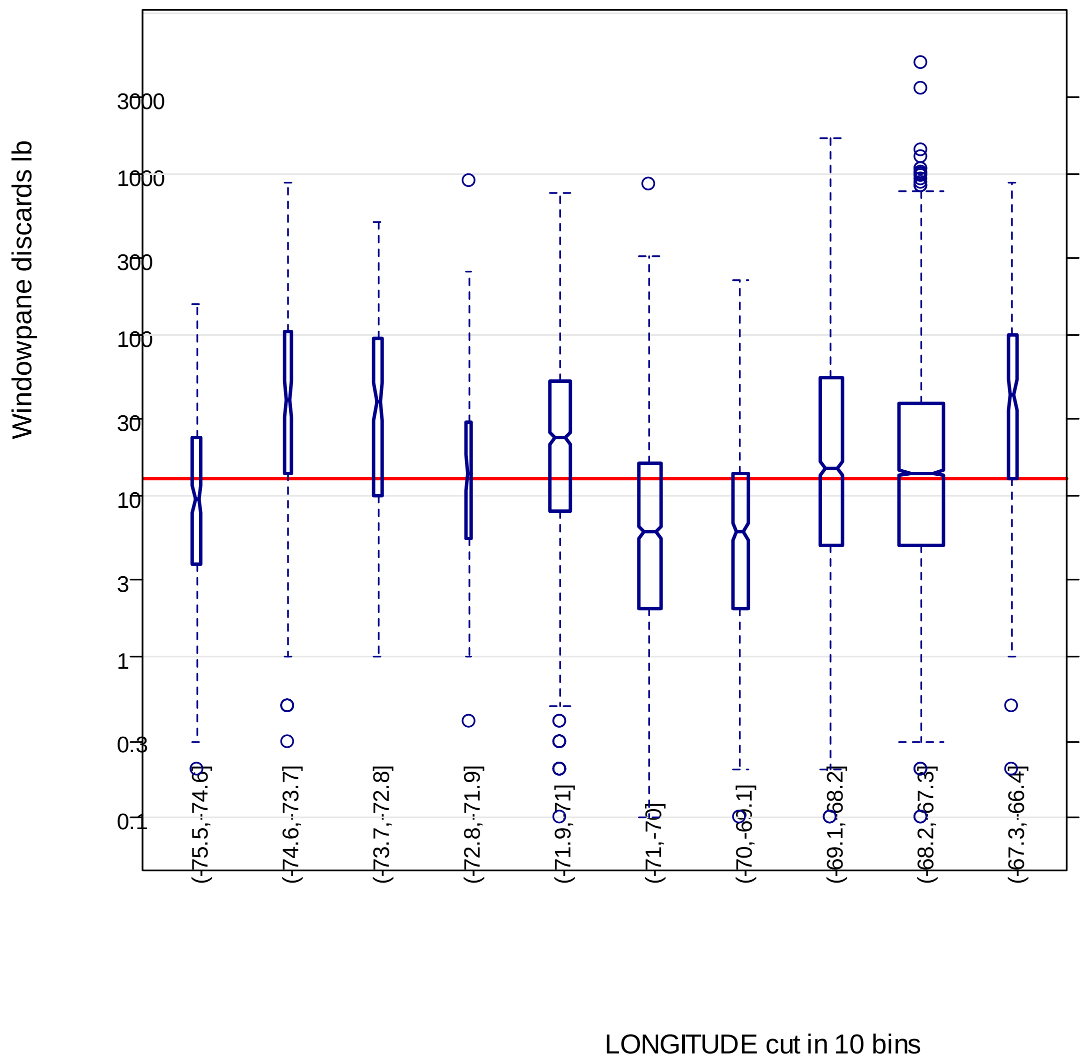


Figure 30. Boxplots of windowpane catch per tow (lb) by 10 bins of negative longitude. Zero tows not included. Width of box is proportional to square root of the number of observations. Red line is overall median. Note that y axis scale is logarithmic.

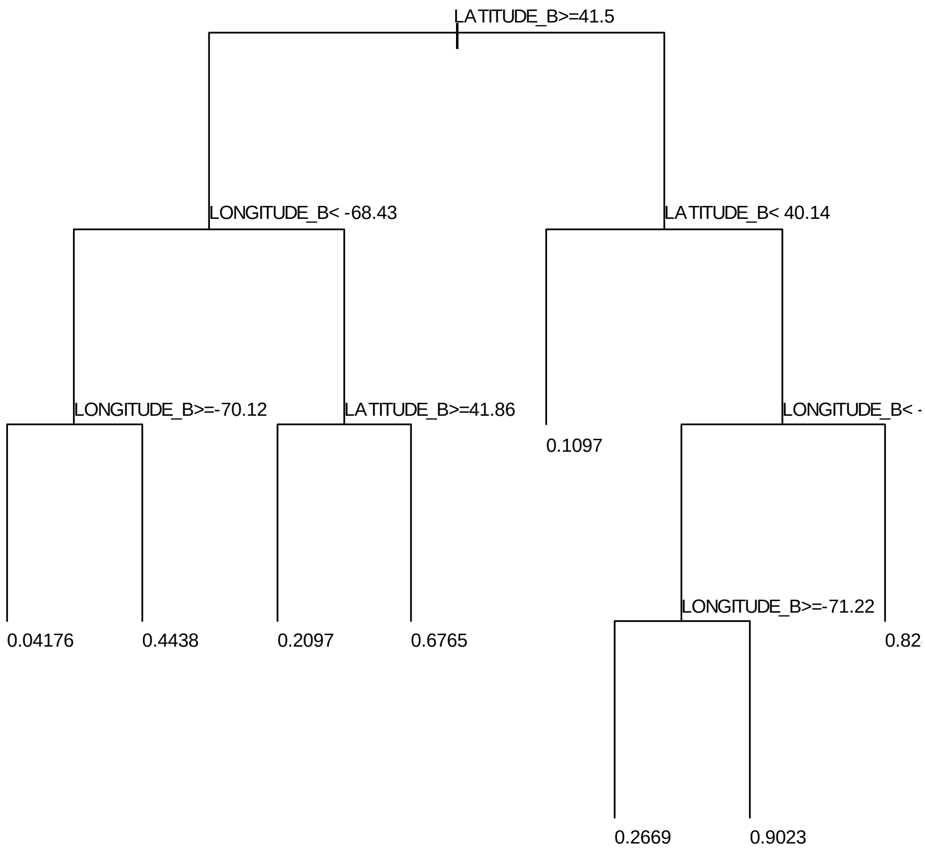
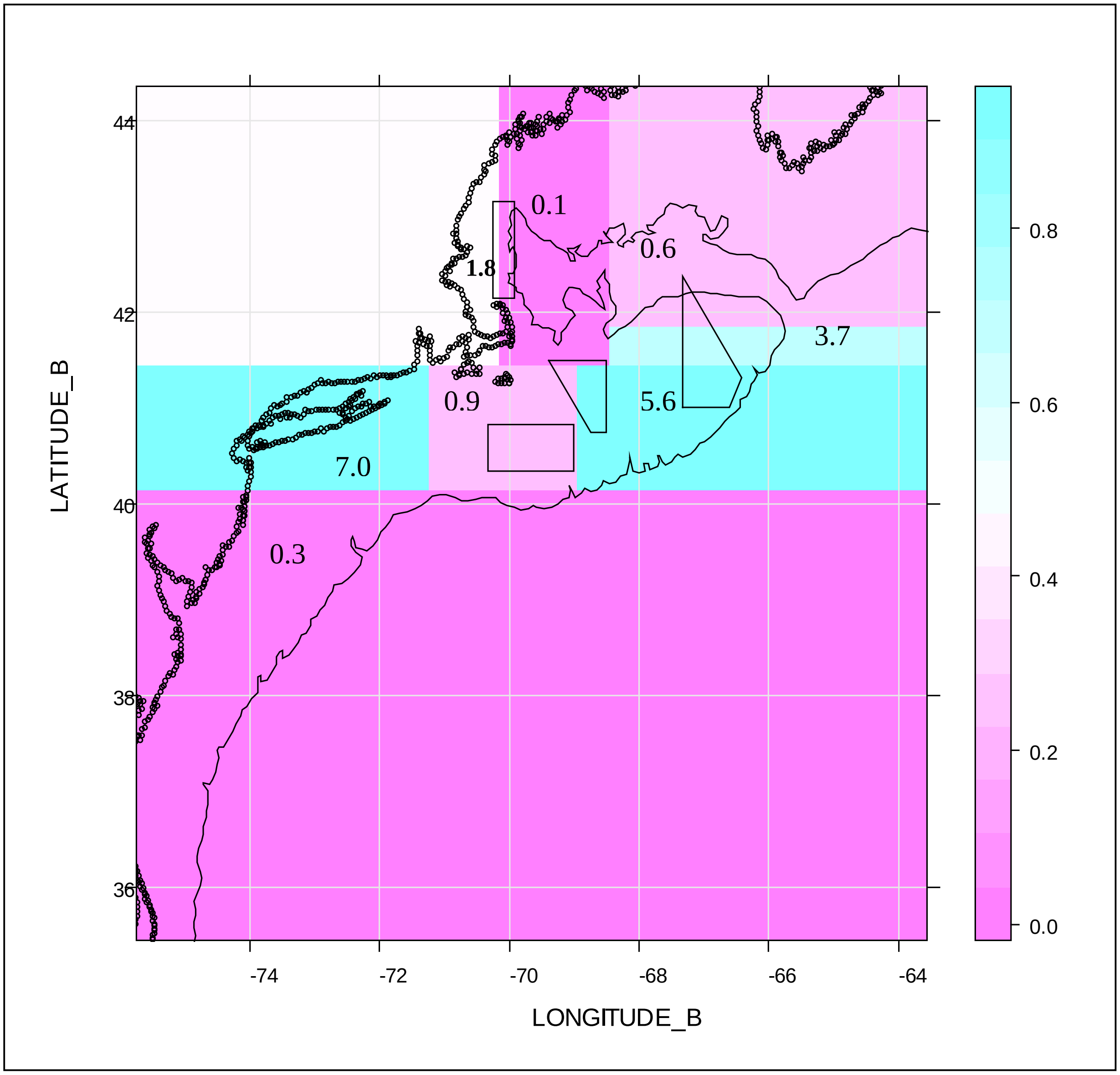


Figure 31. Pruned tree from regressing log10 windowpane discards against negative longitude and latitude. Numbers at end of leaves are log10 windowpane discards in lb.



0.1
0.6
1.8
3.7
0.9
5.6
7.0
0.3
44
42
40
38
36
-74
-72
-70
-68
-66
-64
LATITUDE_B
LONGITUDE_B
0.8
0.6
0.4
0.2
0.0

Figure 32. Levelplot of tree regression of log10 windowpane dk* hailwt +1 lb. Numbers within the chart are the back-transformed geometric mean catch (lb). Scale on right bar is in common logs. Note that predicted values for areas without data should be ignored (see Figure 30 for location of tows)

Framework Adjustment 50

to the

Northeast Multispecies FMP

Appendix III

Calculation of Northeast Multispecies Annual Catch Limits, FY 2013 – FY 2015

This appendix documents the calculation of Northeast Multispecies Overfishing Levels (OFLs), Acceptable Biological Catches (ABCs), and Annual Catch Limits (ACLs) for FY 2013 - FY 2015. The general approach for all stocks is to first determine the OFL and then determine the ABC. The ABC in all cases is consistent with the recommendations of the SSC. The ABC is distributed to various components of the fishery, and then an adjustment is made to these "sub-ABCs" to determine the ACLs, sub-ACLs, or other sub-components. The descriptions in this section are only accurate if the preferred alternative specifications are adopted.

For this action, the preferred alternative lists specifications for all Northeast Multispecies stocks for FY 2013- FY 2014, and for several stocks to FY 2015. For three stocks (pollock, GOM winter flounder, GB winter flounder), the FY 2013-FY 2014 values were established by FW 47 and the calculation of OFLs and ABCs are described in Appendix III to that document. That information is not repeated here; it is available at www.nefmc.org. For the remaining stocks, specifications are proposed for FY 2013 – FY 2015 and the calculations are described in detail. These stocks are:

GB cod
GOM cod
GB haddock
GOM haddock
GB yellowtail flounder (FY 2013 only)
SNE/MA yellowtail flounder
CC/GOM yellowtail flounder
Plaice
Witch Flounder
SNE/MA winter flounder
Redfish
White hake (FY 2013 only)
GOM/GB windowpane flounder
SNE/MAB windowpane flounder
Ocean pout
Atlantic halibut
Atlantic wolffish

This appendix also documents and clarifies how available catches are distributed to the sub-components of the fishery. These are listed for all stocks (even those where specifications are determined only for FY 2013) in order to keep a clear record of the distribution. Amendment 16 authorized changes to be made in a framework action and this summary documents several changes.

Determining OFL and ABC

Stocks with Age-Based Assessments and Projections

Catch levels (including OFLs, ABCs, and ACLs) for the following stocks are based on age-based projections. For these stocks the projections were performed using the Northeast Fisheries Science Center's (NEFSC) AGEPRO projection model. The projections are based on the most recent benchmark or operational assessment for each stock, as shown in the list:

GB cod	(SARC 55)
GOM cod	(SARC 55)
GB haddock	(2012 Assessment Updates)
GOM haddock	(2012 Assessment Updates)
GB yellowtail flounder	(TRAC 2012)
SNE/MA yellowtail flounder	(SARC 54)
CC/GOM yellowtail flounder	(2012 Assessment Updates)
Plaice	(2012 Assessment Updates)
Witch Flounder	(2012 Assessment Updates)
SNE/MA winter flounder	(SARC 52)
Redfish	(2012 Assessment Updates)
White hake	(GARM III)
Atlantic halibut	(2012 Assessment Updates)
Atlantic wolffish	(2012 Assessment Updates)

There are a number of assumptions that must be made to complete the projections. All of these assumptions are potential sources of error. The assumptions for recruitment, selectivity, and weights-at-age that were used were those recommended by the assessment review panels.

Since the first year for ACLs based on these projections is 2013, an additional assumption must be made in the projections for the years between the terminal year and 2013. An estimate of catch developed by the Plan Development Team (PDT) was input into the projection model. The values may differ from realized catches and introduce uncertainty into the results. The catch assumptions for these projections are provided in Table 1.

When calculating the OFL in future years, F_{MSY} is used as the fishing mortality in the projection. When calculating the ABC, either 75% of F_{MSY} or Frebuild is used (whichever is lower). This is consistent with the ABC control rules recommended by the Science and Statistical Committee (SSC) and adopted in Amendment 16. Specific mortality targets used for the ABC projections are provided in Table 2.

Recent experience and analyses by the PDT have demonstrated that projections are often optimistic. This means that future stock growth is projected to be higher than what is realized, and as a result catches less than the ACLs have frequently led to overfishing. For this reason, in many cases the ABCs that were recommended by the SSC are lower than the projection output in order to take into account this additional uncertainty. In most (but not all) cases, the ABC in FY 2013 is based on the projection output at the target fishing mortality, and then this ABC is used for FY 2014 and FY 2015 as well. This means that effectively the target fishing mortality is lower for FY 2014 and FY 2015. Specific deviations from the projection output are identified below. Projection output used for setting ABCs is in Appendix IV.

a. GB cod: The ABC for FY 2013 - 2015 is based the 2013 catch at 75% of F_{MSY}. The ABC is held constant because of concern over the tendency of projections to be biased.

b. GOM cod: Two assessment models were forwarded. The ABC is held constant for three years because of the uncertainty in projections. The ABC was set between F_{MSY} and 75% F_{MSY} (base case model) based on a large decrease in F in 2013 and achieving the F_{MSY} proxy in FY 2015 for the Mramp model.

c. GB yellowtail flounder: The ABC of 1,150 mt was recommended by the SSC as a backstop measure and is based on the ABC for FY 2012. The SSC rationale was as follows: "The catch associated with unintentional bycatch may exceed 500 mt, but total removals should be less than the 2012 ABC (1,150 mt) to account for the recommended removal of a directed fishery. This ABC of 1,150 mt should be considered a backstop measure only. If there is no directed fishery and measures are taken to reduce bycatch as much as possible, then fishing mortality would be expected to be below Fmsy. If this low F results in a catch above 500 mt, it would be de facto evidence that the uncertainty in this stock assessment is greater than described by the sensitivity analyses conducted in the TRAC. Thus, this ABC is appropriate only when management measures are implemented that have a high probability in resulting in low fishing mortality rates. This advice is based on the difficulty of setting quota levels based on highly uncertain stock assessment results."

d. SNE/MA yellowtail flounder: The ABC of 700 mt for three years (FY 2013 –FY 2015) is based on the long-term catch at 75% of F_{MSY} based on recent low recruitment stanza.

e. CC/GOM yellowtail flounder: The assessment has developed a retrospective pattern. Because the standard projections result in a large catch increase in FY 2014-2015 relative to the FY 2013 catch, the SSC set the FY 2014 and 2015 catches at the FY 2013 ABC.

f. SNE/MA winter flounder: The ABC is consistent with the preferred rebuilding strategy. The catch is lower than the calculated Frebuild. The ABC is based on the long term yield that would be expected to result if recruitment remains poor for this stock.

g. Witch flounder: To account for the uncertainty over a recent recruitment estimate, the FY 2014 and FY 2015 ABCs were set at the FY 2013 ABC that is based on

Frebuild. This results in a larger buffer between the ABC and ACL in years 2014 and 2015 than would result from a strict application of Frebuild.

h. Atlantic wolffish: This stock was updated during the 2012 groundfish assessment updates. This stock did not have calibration coefficient for converting Bigelow to Albatross surveys, so the coefficient for ocean pout was used. To account for this additional uncertainty the FY 2014 and FY 2015 ABC was set at the FY 2013 ABC which is calculated based on 75% of F_{MSY} .

Stocks with Index-Based Assessments

For these three stocks, the OFL was calculated as the F_{MSY} proxy applied to the most recent biomass estimate (a survey-based proxy). The ABC was calculated as 75% of F_{MSY} applied to the most recent biomass estimate. The index-based projection model was not used for any of these stocks. The R/V Bigelow survey indices were converted to R/V Albatross units but this correction did not use length-based conversion factors because these are not yet available.

Northern Windowpane Flounder
Southern Windowpane Flounder
Ocean Pout

Other Stocks

The GOM winter flounder assessment approved at SARC 52 is based on a swept area assessment model. The OFL and ABC are based on applying the F_{MSY} proxy to an estimate of swept area biomass, while the ABC is based on the default ABC control rule – 75 percent of the F_{MSY} proxy applied to the most recent estimate of swept area biomass.

Distribution of ABCs

Because the Council wants the ability to consider a different adjustment for management uncertainty for different components of the fishery, ABCs were first distributed to the components prior to applying this adjustment. A brief description of the components follows. Note that there are a few stock-specific instances (described in a later section) that may differ from this general overview.

ABC: Acceptable Biological Catch for the entire stock.

Canadian Share/Allowance: An amount from the stock that Canadian vessels are expected to harvest. For GB cod, GB haddock, and GB yellowtail flounder, this is based on the Canadian allocation under the TMGC (but see the GB yellowtail flounder discussion below).

U.S. ABC: That portion of the ABC available to U.S. fishermen after accounting for Canadian harvests.

State waters: Portion of the U.S. ABC expected to be harvested from state waters, outside of the federal management plan. This is not an allocation.

Other sub-components: Portion of the U.S. ABC expected to be harvested by unidentified non-groundfish fishery components. These are not attributed to specific components because individual amounts are small. This action clarifies that in cases where there is no specific recreational allocation, unless otherwise specified recreational catches are counted against this sub-component. There are a few stocks where this may not be the case, such as when the majority of recreational catches are from state waters and the recreational catch is considered part of the state waters sub-component. These instances will be specifically identified.

Scallops: Portion of U.S. ABC allocated to that fishery.

Groundfish: Portion of the U.S. ABC available to the groundfish fishery (including recreational and commercial vessels if there is a specific allocation). This ABC has several sub-components:

Commercial: Portion of the U.S. ABC available to commercial vessels; this is further sub-divided into sector and common-pool portions.

Recreational: Portion of the U.S. ABC available to recreational vessels, when a specific allocation is made

MWT: Portion of the ABC available to herring mid-water trawl vessels. Currently only applies to the two haddock stocks.

Small-Mesh Fisheries: FW 48 proposes to allocate a portion of the U.S. ABC of GB yellowtail flounder for small-mesh fisheries

Amendment 16 provides that the distribution to various sub-components can be modified in a framework or specification action. These adjustments are often made as more experience is gained with the ACL system adopted by Amendment 16. Changes can also be required if there are large changes in ABCs, particularly because the sub-components of the fishery are not subject to specific catch controls by the FMP and a specific percentage allocation has not been defined. This is the case for state waters and other – sub-component catches. Unlike the case when a specific allocation has been specified, the PDT estimates the expected catch from these two components and then compares that amount to the ABC to determine the percentage that should be set aside to account for these catches. Table 6 summarizes the state waters and other sub-component distribution for recent years and the distribution that would result from the Preferred Alternative.

Table 3 summarizes the distribution of the U.S. ABC to the various components of the fishery, while Table 4 provides the resulting ABCs. Details on the distribution of specific stocks are provided below. Changes are the result of FY 2010 – FY 2011 catches and are intended to more closely align allocations with recent experiences. It is expected that these values may be changed in future actions as more experience with the ACL system is gained.

a. GB cod: Since the Council has not identified a specific commercial/recreational allocation, recreational catches will be assigned to the "other subcomponents" category unless a recreational allocation is made in the future. This practice, adopted in FW 47, is continued.

b. GOM cod: The division into sub-components was calculated differently for this stock based on the way the components were calculated by the PDT. First, the PDT calculated the recreational/commercial allocation as described in Amendment 16 using the numbers of fish caught (as determined by GARM III). This was done without regard to whether the fish were caught in state waters or not. In contrast, the state waters component (10 percent) came from a NMFS report required by the M-S Act reauthorization and included commercial catches only. Similarly, "other sub-components" represented only commercial catches since a specific recreational/commercial component was anticipated. The state waters component and the other sub-component portion are thus calculated as a percent of the commercial allocation (e.g. 10 percent of the 66.3 percent commercial allocation).

The recreational harvest of cod from state waters (without regard to stock) averaged 19 percent from 2001-2008, but was highly variable and ranged from 9 percent to 35 percent. Proportional standard errors (PSEs) are also high for the state waters components, indicating high uncertainty over these values. It is not known how much of the state waters recreational catch came from party/charter boats with federal permits that should be subject to ACL requirements. These factors make it difficult to determine what percentage of the recreational allocation is expected to be harvested from state waters.

The PDT calculated the groundfish recreational and commercial ACLs based on the recreational/commercial percentages as determined by the Council (based on historical data). Since some of the recreational catch comes from state waters, the ACL for recreational fishermen is higher than if a specific state water recreational allocation could be identified. It also means in order to monitor and account for recreational catch, all recreational catches (including state waters catches) should be applied against the ACL. With the recent adoption of the MRIP estimation method for recreational catches, there have been some changes to the time series of recreational catches. Because the Council has not revisited the recreational/commercial allocation issue using the revised catch streams, no changes have been made based on this updated data stream.

The commercial components (state waters, other sub-components, and federal waters) add to the total commercial allocation.

		Rec	Comm	Total
Shares,	Based on Total Catch, in Numbers	0.337	0.663	1.0
	FY 2013 ABC, Based on Totals	*522*	*1,028*	*1,550*
	State waters (assumed all commercial)		*103*	
	Other sub (assumed all commercial)		*51*	
	Adjusted ABC	*522*	*874*	

c. GB haddock: Under the terms of the U.S./Canada Resource Sharing Understanding, a portion of this stock is allocated to Canada. Because this allocation is determined annually, it is only specified for FY 2013. Future values will be adopted based on future TMGC advice.

d. GOM haddock: This stock has similar issues recreational/commercial issues as GOM cod. Calculations were done in a similar fashion. One difference is that there is a portion of this stock that is allocated to the MWT fishery. This is based on 1% of the total ABC. The ABC is first divided between the recreational and commercial fisheries. This action continues the state waters allowance at 2% and the other subcomponents at 3%. The MWT share is also subtracted from the commercial ABC.

		Rec	Comm	Total
Shares,	Based on Total Catch, in Numbers	0.275	0.725	1
	ABC, Based on Totals	*80*	*210*	*290*
	MWT Haddock		*2*	
	State waters (assumed all commercial)		*4*	
	Other sub (assumed all commercial)		*6*	
	Adjusted ABC	*80*	***198***	
	ACL			

d. GB yellowtail flounder: There is no state waters component because the stock area does not include state waters. There are three changes from previous years. The “other sub-component” amount would be reduced from 4 percent to 2 percent, a new sub-ACL for small-mesh fisheries would be established at 2 percent (a Preferred Alternative in FW 48), and there are changes to the scallop fishery sub-ACL that are proposed in FW 48 – a fixed percentage is adopted. The scallop fishery sub-ACL for FY 2013 is 40 percent, and the sub-ACL for future years is 16 percent.

e. SNE/MA yellowtail flounder: One percent is expected to be taken in state waters. Four percent is considered an “other subcomponent” caught in other fisheries. As described in the framework text, there is an allocation to the scallop fishery that is based on an estimate of the amount the fishery is expected to harvest if the scallop yield is taken. No other changes are included in this action

f. CC/GOM yellowtail flounder: State waters catches in FY 2011 were 3.5 times the amount allowed for state waters catches. This action would increase the amount allowed for state waters from 3 percent to 6 percent. There is a concern that an expected increase in scallop fishing activity in SA 521 in FY 2013 may result in an increase in the catch in the other sub-components category. The PDT discussed this issue with the Scallop PDT. Scallop effort in SA 521 is expected to increase and the Scallop PDT estimated that CC/GOM yellowtail flounder catches may double as a result, but an adjustment to the other sub-components does not appear necessary for FY 2013- 2015.

g. Plaice: Only ten percent of the other sub-components amount was caught in FY 2011. The reduction in the ABC/ACL for FY 2013 suggests that state waters catches might exceed the current amount. This action would reduce the other sub-components by 2 percent (to 2 percent of the ABC), increase the state waters amount by 1 percent to (to 2 percent of the ABC), and increase the groundfish amount by 1 percent.

g. Witch flounder: Catches in state waters were 1.6 times the amount expected, and other sub-component catches were 2.9 times the amount expected. The state waters catches seemed unusual, as witch flounder is usually found in deeper water. The PDT examined this catch estimate and concluded it was accurate, and further noted that witch flounder are caught in the DMF inshore survey. The other sub-components amount is being driven by an increase in discards in the squid and whiting fisheries, which discarded 62 mt in FY 2011. This may be the result of an increase in the squid quota from 2010 to 2011. In order to account for these catches this action would increase the other-sub-components category to 15 percent (from 4 percent). This is large enough that the Council may need to consider adopting an additional sub-ACL for this stock in a future action.

h. GB winter flounder: There is no state waters allocation because the stock area does not include state waters. Fifty percent of the other sub-components amount was caught in FY 2011. This action would reduce this share to 3 percent for FY 2013-2015.

i. GOM winter flounder: The PDT discussed the possibility of reducing the state waters sub-component since FY 2011 catches were only about 70 percent of the amount expected. If FY 2011 catches were similar to catches expected in FY 2013, the state waters sub-component could be reduced. However, the ASMFC is considering an increase in the state waters trip limit from 250 lbs. to 500 lbs., consistent with the increase in the ABC/ACL and change in stock status. Given the likelihood that the state waters trip limit will increase this year, this action would not change the percentage for state waters until the effect of the trip limit change can be evaluated.

j. SNE/MA winter flounder: FW 47 increased the state waters allowance to 28% (from 8%). The other subcomponents portion increased to 20% (from 5%). Because of the increase in ABC as a result of the revised rebuilding plan, the state waters allowance would be reduced to 14% and the other –sub-components allowance would be reduced to 10% by this action. As is the case for GOM winter flounder, for this stock nearly all the recreational catches are taken in state waters. For this stock recreational catches are counted against the state waters catches.

i. White hake: Less than 10 percent of the allowance for state waters and other sub-components amounts were caught. This action would reduce the state waters allowance to 1 percent and the other sub-components amount to 2 percent. These changes may need to be revisited if the upcoming assessment results in a dramatic change in stock status.

j. Pollock: Ninety percent of the state waters allowance was caught in FY 2011, but only 52.5 percent of the other sub-components amount. This action would increase the state waters allowance to 6 percent (from 5 percent) and reduce the other sub-components allocation to 7 percent (from 9 percent). As a result, the groundfish portion increases 1 percent.

k. Atlantic halibut: Only 18 percent of the state waters allowance was caught in FY 2011. This action would reduce this estimate to 40 percent (from 50 percent)t. There are also some Canadian catches that will be attributed to the other subcomponents category

l. GOM/GB windowpane flounder: Scallop fishery catches of this stock are expected to increase to 50 mt in FY 2013. For this reason, this action would increase the other sub-components to 29 percent. If scallop fishery catches continue to account for 25 percent of the catch, the Council may need to consider a scallop fishery sub-ACL for this stock.

m. SNE/MAB windowpane flounder: FW 48 includes a Preferred Alternative that allocates a sub-ACL to the scallop fishery of 36 percent, included in this action. This reduces the amount for other- sub-components to 34 percent.

n. Ocean pout: FW 47 increased the other sub-components allocation to 9% and kept the state waters catch at 1%. No changes are included in this action.

ACLs

After the ABCs are distributed to the various components, they are adjusted for management uncertainty if the catches will be subject to an ACL and corresponding AMs. An uncertainty buffer is not generally applied to state waters catches that are outside the jurisdiction of the FMP. As discussed in Appendix II of FW 44, elements of management uncertainty are taken into account that reduces the ABC to the ACL. The FW 44 the default sets the ACL at 95 percent of the ABC. For stocks with less management uncertainty the ACL was set at 97 percent of the ABC; for stocks with more uncertainty it was set at 93 percent of the ACL.

When first adopted, most groundfish stocks and components used a buffer of 5 percent. GB yellowtail flounder used a buffer of 3 percent and SNE/MA winter flounder used a buffer of 7 percent. The 3 percent buffer was originally adopted for GB yellowtail flounder because there are no state waters catches, observer coverage in the US/CA area had been high (reducing uncertainty about discards), and there are in-season measures that can be adjusted to reduce the probability that the overall ACL is exceeded. A 7 percent buffer is used for other stocks that are discarded (windowpane flounder, ocean pout, wolffish) and for recreational catches of GOM haddock and cod. This increased buffer is because of the increased uncertainty in estimating catches of these stocks, which are almost entirely composed of discards.

The Council discussed increasing the management uncertainty buffer for all stocks because of evidence that the behavior of fishermen on observed and unobserved trips is different. The rationale would be to increase the buffer because of suspected bias in discard estimates that could result in an underestimate of discards. Such an approach, however, would require an estimate of the amount of suspected bias in order to establish the correct buffer. The PDT was unable to identify this bias estimate. In addition, total catches of most allocated stocks have been below 90 percent of the total allocated ACL – in essence reducing the risk that the actual catch exceeds the ACL if there is a bias in the discard estimates.

A second reason to consider a change in the management uncertainty buffer is because FW 48 may modify the minimum size limits for many groundfish species (this is a Preferred Alternative in that action). This could lead to a change in selectivity to younger fish. If the change in selectivity does occur, then ABCs/ACLs that are set assuming a different selectivity pattern may be too high. This issue was examined by the PDT for a few illustrative stocks and the analysis suggested that in the short term this is not a major concern as long as the shift is in the range of one year or so. Over the long-term, however, a shift in selectivity will affect potential yields and status determination criteria. As long as assessment updates are performed within a few years, the shift should be detected and quotas can be adjusted accordingly.

For these reasons this action would not adopt a general increase in management uncertainty buffers. With a few exceptions the Council agreed that the management uncertainty buffer should be 3 percent for stocks with no state waters catch, 7 percent for zero possession stocks and recreational fisheries, and 5 percent for most other stocks/components of the fishery based on the reasons above. Using this rationale, this action would decrease the uncertainty buffer for GB winter flounder to 3 percent (from 5 percent). Similar to GB yellowtail flounder, this stock does not have a state waters component. This action would also reduce the uncertainty buffer for groundfish catches of SNE/MA yellowtail flounder to 5 percent (from 7 percent). The higher buffer was originally adopted because the target TAC for this stock had been exceeded for several years. Recent catches have been below the ACL so an adjustment seems warranted, and this action would allow this stock to be landed. Except for GB yellowtail flounder the buffer for the scallop fishery remains unchanged at 7 percent because nearly all the catch is discarded. The uncertainty buffer for GB yellowtail flounder for the scallop fishery is 3 percent due to reasons described above.

Adjustments are shown in Table 5.

Incidental Catch TACs

Part of the commercial non-sector ACL is allocated to the incidental catch TACs that limit catches of stocks of concern in the Category B (regular) DAS program and certain SAPs. Table 6 and Table 7 are reproduced from Amendment 16.

An incidental catch TAC is specified for American plaice even though GARM III determined this stock was not overfished and overfishing was not occurring. This was done for several reasons. First, stock size barely exceeds the minimum biomass threshold and is at 51% of B_{MSY}, and has not completed stock rebuilding. Given uncertainty in the assessment it was considered prudent to continue to control catches until certain that rebuilding is on track. Second, plaice is often caught with witch flounder, an overfished stock, and allowing vessels to target plaice in these programs would likely lead to excessive catches of witch flounder.

Incidental catch TACs are no longer specified for pollock, GB winter flounder, and SNE/MA yellowtail flounder because these stocks are rebuilt.

Table 1 – 2011 and 2012 catch assumption used in age-based projections for stocks with recent age-based analytic assessments.

Stock	2011 Catch	2012 Catch
GB Cod	N/A	2,910
GB Haddock	18,385	15,697
GB Yellowtail	N/A	1,150
SNE/MA Yellowtail	N/A	634
CC/GOM Yellowtail	747	950
GOM Cod	N/A	3,767
Witch Flounder	1069	1,318
Plaice	1624	1,922
GOM Winter Flounder	205	N/A
SNE/MA Winter Flounder	363	400
GB Winter Flounder	2,230	N/A
White Hake	2,903	N/A
Pollock	8,951	N/A
Redfish	2,303	2,999
GOM Haddock	696	727
Ocean pout	N/A	N/A
Northern windowpane	N/A	N/A
Southern windowpane	N/A	N/A

Table 2 – Mortality targets used to calculate ABCs, FY 2013 – 2015. ABCs were set constant for several groundfish stocks from FY 2013-2014 (GB cod, GOM cod, SNE yellowtail, CC/GOM yellowtail, SNE winter flounder, witch flounder, GOM winter flounder, wolffish and the index stocks)

Species	Stock	Basis for Target Fishing Mortality	Targeted Fishing Mortality or Exploitation	F_{msy}
Cod	**GB**	75%FMSY	0.135	0.18
Cod	**GOM**	75%FMSY (see text)	0.135 (see text)	0.18
Haddock	**GB**	75%FMSY	0.29	0.39
Haddock	**GOM**	75%FMSY	0.345	0.46
Yellowtail Flounder	**GB**	See text	N/A	0.254
Yellowtail Flounder	**SNE/MA**	75%FMSY (see text)	0.237 (see text)	0.316
Yellowtail Flounder	**CC/GOM**	75%FMSY (see text)	0.195 (see text)	0.26
American Plaice	**GB/GOM**	75%FMSY	0.135	0.18
Witch Flounder		Frebuild	0.17	0.27
Winter Flounder	**GB**	75% FMSY	0.315	0.420
Winter Flounder	**GOM**	75% FMSY	0.2325	0.31
Winter Flounder	**SNE/MA**	Frebuild (see text)	0.178 (See text)	0.29
Redfish		75%FMSY	0.03	0.038
White Hake	**GB/GOM**	Frebuild	0.084	0.125
Pollock	**GB/GOM**	75%FMSY		
Windowpane	**GOM/GB**	75%FMSY	0.33 c/i	0.44 c/i
Windowpane	**SNE/MA**	75%FMSY	1.57 c/i	2.09 c/i
Ocean Pout		75%FMSY	0.57 c/i	0.76
Atlantic Halibut		Frebuild	0.044	0.073
Atlantic Wolffish		75% FMSY	0.251 (See text)	0.334

Table 3 - Summary of ABC Distribution to state and other sub-components (percent of ABC shown)

Stock	State sub-component			Other sub-component		
	FW 44 (FY 10-11)	FW 47 (FY 12)	FW 50 (FY13-15)	FW 44 (FY 10-11)	FW 47 (FY 12)	FW 50 (FY13-15)
GB cod	0.01	0.01	0.01	0.04	0.04	0.04
GOM cod	0.10	0.10	0.10	0.05	0.05	0.05
GB Haddock	0.01	0.01	0.01	0.04	0.04	0.04
GOM Haddock	0.01	***0.02***	0.02	0.04	<u>**0.03**</u>	0.03
GB Yellowtail Flounder	0.00	0.00	0.00	0.05	<u>**0.04**</u>	<u>**0.02**</u>
SNE/MA Yellowtail Flounder	0.01	0.01	0.01	0.04	0.04	0.04
CC/GOM Yellowtail Flounder	0.01	***0.03***	***0.06***	0.04	<u>**0.02**</u>	0.02
Plaice	0.01	0.01	***0.02***	0.04	0.04	<u>**0.02**</u>
Witch Flounder	0.01	***0.03***	0.03	0.04	0.04	***0.15***
GB Winter Flounder	0.00	0.00	0.00	0.05	0.05	<u>**0.03**</u>
GOM Winter Flounder	0.25	0.25	0.25	0.05	0.05	0.05
SNE/MA Winter Flounder	0.08	***0.28***	<u>0.14</u>	0.05	***0.20***	<u>0.10</u>
Redfish	0.01	0.01	0.01	0.04	0.04	<u>**0.02**</u>
White Hake	0.01	***0.02***	<u>**0.01**</u>	0.04	***0.03***	<u>**0.02**</u>
Pollock	0.06	<u>**0.05**</u>	***0.06***	0.06	***0.09***	<u>**0.07**</u>
Northern Windowpane	0.01	0.01	0.01	0.29	<u>**0.19**</u>	***0.29***
Southern Windowpane	0.01	***0.10***	0.10	0.29	***0.70***	0.70
Ocean Pout	0.01	0.01	0.01	0.04	***0.09***	0.09
Halibut	0.50	0.50	<u>**0.40**</u>	0.05	0.05	0.05
Wolffish	0.01	0.01	0.01	0.04	0.04	0.04

Note: Changes in the percentage relative to the previous year are shown in bold font as follows: red/italic text indicates increase to sub-component percentage; green/underlined text indicates decrease.

Table 4 – Distribution of ABC to fishery components. Sector PSCs are preliminary and may change based on final sector rosters.
(1) Includes commercial ABC in state waters and other subcomponents

Stock	Year	ABC	Canadian Share/ Allowance	US ABC	State Waters	Other Sub-Components	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	MWT/ Small-Mesh
GB Cod	2013	2,506	504	2,002	0.01	0.04		0.95	0.95		0.9823204	
	2014	*2,506*	*504*	*2,002*	*0.01*	*0.04*		*0.95*	*0.95*		*0.9823204*	
	2015	*2,506*	*504*	*2,002*	*0.01*	*0.04*		*0.95*	*0.95*		*0.9823204*	
GOM Cod	2013	1,550		1,550	0.10	0.05			0.663	0.337	0.981037334	
	2014	1,550		1,550	0.10	0.05			0.663	0.337	0.981037334	
	2015	1,550		1,550	0.10	0.05			0.663	0.337	0.981037334	
GB Haddock	2013	35,783	6,448	29,335	0.01	0.04		0.940	0.94		0.997258146	0.01
	2014	*35,699*		*35,699*	*0.01*	*0.04*		*0.940*	*0.94*		*0.997258146*	*0.01*
	2015	*43,606*		*43,606*	*0.01*	*0.04*		*0.940*	*0.94*		*0.997258146*	*0.01*
GOM Haddock	2013	290		290	0.02	0.03		0.94	0.725	0.275	0.992915418	0.01
	2014	341		341	0.02	0.03		0.94	0.725	0.275	0.992915418	0.01
	2015	435		435	0.02	0.03		0.94	0.725	0.275	0.992915418	0.01
GB Yellowtail Flounder	2013	1,150	655	495	0.00	0.02	0.400	0.560	0.56		0.988535172	0.02
	2014											
	2015											
SNE/MA Yellowtail Flounder	2013	700		700	0.01	0.04	0.093	0.857	0.86		0.798211632	
	2014	700		700	0.01	0.04	0.102	0.848	0.85		0.798211632	
	2015	700		700	0.01	0.04	0.099	0.851	0.85		0.798211632	
CC/GOM Yellowtail Flounder	2013	548		548	0.06	0.02		0.92	0.92		0.975764987	
	2014	548		548	0.06	0.02		0.92	0.92		0.975764987	
	2015	548		548	0.06	0.02		0.92	0.92		0.975764987	
Plaice	2013	1,557		1,557	0.02	0.02		0.96	0.96		0.983290759	
	2014	1,515		1,515	0.02	0.02		0.96	0.96		0.983290759	
	2015	1,544		1,544	0.02	0.02		0.96	0.96		0.983290759	
Witch Flounder	2013	783		783	0.03	0.15		0.82	0.82		0.984707922	
	2014	783		783	0.03	0.15		0.82	0.82		0.984707922	
	2015	783		783	0.03	0.15		0.82	0.82		0.984707922	

Stock	Year	ABC	Canadian Share/ Allowance	US ABC	State Waters	Other Sub-Components	Scallops	Ground-fish	Comm Groundfish	Rec Groundfish	Sector PSC	MWT
GB Winter Flounder	2013	3,750		3,750	0.00	0.03		0.97	0.97		0.994187508	
	2014	3,598		3,598	0.00	0.03		0.97	0.97		0.994187508	
	2015											
GOM Winter Flounder	2013	1,078		1,078	0.25	0.05		0.70	0.70		0.949972429	
	2014	1,078		1,078	0.25	0.05		0.70	0.70		0.949972429	
	2015											
SNE/MA Winter Flounder	2013	1,676		1,676	0.14	0.10		0.76	0.76		0.8	
	2014	1,676		1,676	0.14	0.10		0.76	0.76		0.8	
	2015	1,676		1,676	0.14	0.10		0.76	0.76		0.8	
Redfish	2013	10,995		10,995	0.01	0.02		0.97	0.97		0.995942609	
	2014	11,465		11,465	0.01	0.02		0.97	0.97		0.995942609	
	2015	11,974		11,974	0.01	0.02		0.97	0.97		0.995942609	
White Hake	2013	3,638		3,638	0.02	0.03		0.95	0.95		0.990422378	
	2014											
	2015											
Pollock	2013	15,600		15,600	0.05	0.09		0.86	0.86		0.992546584	
	2014	16,000		16,000	0.05	0.09		0.87	0.87		0.992546584	
	2015											
N. Window-pane Flounder	2013	151		151	0.01	0.29		0.70	0.70			
	2014	151		151	0.01	0.29		0.70	0.70			
	2015	151		151	0.01	0.29		0.70	0.70			
S. Window-pane Flounder	2013	548		548	0.10	0.34	0.36	0.20	0.20			
	2014	548		548	0.10	0.34	0.36	0.20	0.20			
	2015	548		548	0.10	0.34	0.36	0.20	0.20			
Ocean Pout	2013	235		235	0.01	0.09		0.90	0.90			
	2014	235		235	0.01	0.09		0.90	0.90			
	2015	235		235	0.01	0.09		0.90	0.90			

Stock	Year	ABC	Canadian Share/ Allowance	US ABC	State Waters	Other Sub-Components	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	MWT
Atlantic Halibut	2013	99		99	0.40	0.05		0.55	0.55			
	2014	109		109	0.40	0.05		0.55	0.55			
	2015	119		119	0.40	0.05		0.55	0.55			
Atlantic Wolffish	2013	70		70	0.01	0.04		0.95	0.95			
	2014	70		70	0.01	0.04		0.95	0.95			
	2015	70		70	0.01	0.04		0.95	0.95			

Table 5 – Distribution of ABC to fishery components

(1) Includes commercial ABC in state waters and other sub-components

Stock	Year	ABC	Canadian Share/ Allowance	US ABC	State Waters	Other Sub-Compo-nents	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	Non-Sector	MWT
GB Cod	2013	2,506	504	2,002	7	28	0	661	661	0	650	12	0
	2014	*2,506*	*504*	*2,002*	*7*	*28*	*0*	*661*	*661*	*0*	*650*	*12*	*0*
	2015	*2,506*	*504*	*2,002*	*7*	*28*	*0*	*661*	*661*	*0*	*650*	*12*	*0*
GOM Cod	2013	1,550		1,550	103	51	0	1,550	1,028	522	857	17	0
	2014	1,550		1,550	103	51	0	1,550	1,028	522	857	17	0
	2015	1,550		1,550	103	51	0	1,550	1,028	522	857	17	0
GB Haddock	2013	35,783	6,448	29,335	293	1,173	0	27,575	27,575	0	27,499	76	293
	2014	*35,699*		*35,699*	*357*	*1,428*	*0*	*33,557*	*33,557*	*0*	*33,465*	*92*	*357*
	2015	*43,606*		*43,606*	*436*	*1,744*	*0*	*40,990*	*40,990*	*0*	*40,877*	*112*	*436*
GOM Haddock	2013	290		290	4	6	0	290	210	80	195	1	3
	2014	341		341	5	7	0	341	247	94	230	2	3
	2015	435		435	6	9	0	435	315	120	293	2	4
GB Yellowtail Flounder	2013	1,150	655	495	0	10	198.0	277	277	0	274	3	10
	2014												0
	2015									0			0
SNE/MA Yellowtail Flounder	2013	700		700	7	28	65	600	600	0	479	121	7
	2014	700		700	7	28	71	594	594	0	474	120	7
	2015	700		700	7	28	69	596	596	0	475	120	7
CC/GOM Yellowtail Flounder	2013	548		548	33	11	0	504	504	0	492	12	33
	2014	548		548	33	11	0	504	504	0	492	12	33
	2015	548		548	33	11	0	504	504	0	492	12	33
Plaice	2013	1,557		1,557	31	31	0	1,495	1,495	0	1,470	25	0
	2014	1,515		1,515	30	30	0	1,454	1,454	0	1,430	24	0
	2015	1,544		1,544	31	31	0	1,482	1,482	0	1,457	25	0

Stock	Year	ABC	Canadian Share/ Allow-ance	US ABC	State Waters	Other Sub-Compo-nents	Scallops	Ground-fish	Comm Ground-fish	Rec Ground-fish	Sector PSC	Non-Sector	MWT
Witch Flounder	2013	783		783	23	117	0	642	642	0	632	10	0
	2014	783		783	23	117	0	642	642	0	632	10	0
	2015	783		783	23	117	0	642	642	0	632	10	0
GB Winter Flounder	2013	3,750		3,750	0	113	0	3,638	3,638	0	3,616	21	0
	2014	3,598		3,598	0	108	0	3,490	3,490	0	3,470	20	0
	2015												
GOM Winter Flounder	2013	1,078		1,078	272	54	0	752	752	0	727	26	0
	2014	1,078		1,078	272	54	0	752	752	0	727	26	0
	2015												
SNE/MA Winter Flounder	2013	1,676		1,676	235	168	0	1,274	1,274	0	1,019	255	0
	2014	1,676		1,676	235	168	0	1,274	1,274	0	1,019	255	0
	2015	1,676		1,676	235	168	0	1,274	1,274	0	1,019	255	0
Redfish	2013	10,995		10,995	110	220	0	10,665	10,665	0	10,622	43	0
	2014	11,465		11,465	115	229	0	11,121	11,121	0	11,076	45	0
	2015	11,974		11,974	120	239	0	11,615	11,615	0	11,568	47	0
White Hake	2013	3,638		3,638	36	73	0	3,529	3,529	0	3,501	28	0
	2014												
	2015												
Pollock	2013	15,600		15,600	936	1,092	0	13,572	13,572	0	13,484	88	0
	2014	16,000		16,000	960	1,120	0	13,920	13,920	0	13,830	90	0
	2015												
N. Window-pane Flounder	2013	151		151	2	44	0	106	106	0	0	106	0
	2014	151		151	2	44	0	106	106	0	0	106	0
	2015	151		151	2	44	0	106	106	0	0	106	0
S. Window-pane Flounder	2013	548		548	55	186	197	110	110	0	0	110	0
	2014	548		548	55	186	197	110	110	0	0	110	0
	2015	548		548	55	186	197	110	110	0	0	110	0

Stock	Year	ABC	Canadian Share/ Allow-ance	US ABC	State Waters	Other Sub-Compo-nents	Scallops	Ground-fish	Comm Ground-fish	Rec Ground-fish	Sector PSC	Non-Sector	MWT
Ocean Pout	2013	235		235	2	21	0	212	212	0	0	212	0
	2014	235		235	2	21	0	212	212	0	0	212	0
	2015	235		235	2	21	0	212	212	0	0	212	0
Atlantic Halibut	2013	99		99	40	5	0	54	54	0	0	54	0
	2014	109		109	44	5	0	60	60	0	0	60	0
	2015	119		119	48	6	0	65	65	0	0	65	0
Atlantic Wolffish	2013	70		70	1	3	0	67	67	0	0	67	0
	2014	70		70	1	3	0	67	67	0	0	67	0
	2015	70		70	1	3	0	67	67	0	0	67	0

Table 6 – ACL adjustments

Stock	Year	State Waters	Other Sub-Components	Scallops	Groundfish	Comm/Non_ Sector Groundfish	Rec Groundfish	Sector PSC	MWT
GB Cod	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
GOM Cod	2013	1	1	1	0.95	0.95	0.93	0.95	1
	2014	1	1	1	0.95	0.95	0.93	0.95	1
	2015	1	1	1	0.95	0.95	0.93	0.95	1
GB Haddock	2013	1	1	1	0.95	0.95	0.95	0.95	0.93
	2014	1	1	1	0.95	0.95	0.95	0.95	0.93
	2015	1	1	1	0.95	0.95	0.95	0.95	0.93
GOM Haddock	2013	1	1	1	0.95	0.95	0.93	0.95	0.93
	2014	1	1	1	0.95	0.95	0.93	0.95	0.93
	2015	1	1	1	0.95	0.95	0.93	0.95	0.93
GB Yellowtail Flounder	2013	1	1	0.97	0.97	0.97	0.95	0.97	0.93
	2014	1	1	0.97	0.97	0.97	0.95	0.97	0.93
	2015	1	1	0.97	0.97	0.97	0.95	0.97	0.93
SNE/MA Yellowtail Flounder	2013	1	1	0.93	0.95	0.95	0.95	0.95	1
	2014	1	1	0.93	0.95	0.95	0.95	0.95	1
	2015	1	1	0.93	0.95	0.95	0.95	0.95	1
CC/GOM Yellowtail Flounder	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
Plaice	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
Witch Flounder	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1

Stock	Year	State Waters	Other Sub-Components	Scallops	Groundfish	Comm/Non-Sector Groundfish	Rec Groundfish	Sector PSC	MWT
GB Winter Flounder	2013	1	1	1	0.97	0.97	0.97	0.97	1
	2014	1	1	1	0.97	0.97	0.97	0.97	1
	2015	1	1	1	0.97	0.97	0.97	0.97	1
GOM Winter Flounder	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
SNE/MA Winter Flounder	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
Redfish	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
White Hake	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
Pollock	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
N. Windowpane Flounder	2013	1	1	1	0.93	0.93	0.95	0.93	1
	2014	1	1	1	0.93	0.93	0.95	0.93	1
	2015	1	1	1	0.93	0.93	0.95	0.93	1
S. Windowpane Flounder	2013	1	1	0.93	0.93	0.93	0.95	0.93	1
	2014	1	1	0.93	0.93	0.93	0.95	0.93	1
	2015	1	1	0.93	0.93	0.93	0.95	0.93	1
Ocean Pout	2013	1	1	1	0.93	0.93	0.95	0.93	1
	2014	1	1	1	0.93	0.93	0.95	0.93	1
	2015	1	1	1	0.93	0.93	0.95	0.93	1

Stock	Year	State Waters	Other Sub-Components	Scallops	Groundfish	Comm/Non-Sector Groundfish	Rec Groundfish	Sector PSC	MWT
Atlantic Halibut	2013	1	1	1	0.95	0.95	0.95	0.95	1
	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	1	0.95	0.95	0.95	0.95	1
Atlantic Wolffish	2013	1	1	1	0.93	0.93	0.95	0.95	1
	2014	1	1	1	0.93	0.93	0.95	0.95	1
	2015	1	1	1	0.93	0.93	0.95	0.95	1

Table 7 – Proposed incidental catch TACs for major stocks of concern (mt). TACs are for the fishing year. TACs shown are metric tons, live weight. Note: GB cod and GB yellowtail flounder TAC is determined annually and cannot be estimated in advance. Values are dependent on ACLs, which have not yet been determined.

	Percentage of Common Pool ACL
GB cod	Two
GOM cod	One
GB Yellowtail	Two
CC/GOM yellowtail	One
Plaice	Five
Witch Flounder	Five
SNE/MA Winter Flounder	One

Table 8 - Proposed allocation of incidental catch TACs for major stocks of concern to Category B DAS programs (shown as percentage of the incidental catch TAC)

	Category B (regular) DAS Program	CAI Hook Gear SAP	Eastern US/CA Haddock SAP	Southern CAII Haddock SAP
GOM cod	100%	NA	NA	
GB cod	50%	16%	34%	
CC/GOM yellowtail	100%	NA	NA	
Plaice	100%	NA	NA	
White Hake	100%	NA	NA	
SNE/MA Winter Flounder	100%	NA	NA	
Witch Flounder	100%	NA	NA	
GB Yellowtail	50%	NA	50%	

Framework Adjustment 50

To the

Northeast Multispecies FMP

Appendix IV

ABC Projection Output

Georges Bank Cod

AGEPRO VERSION 4.2

base run 75%fmsy 2012 catch estimated

Date & Time of Run: 15 Jan 2013 11:59

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GBCOD\GBCOD_TY11_3YR_75FMSY_CONSTANT2506.INP

First Age Class: 1
Number of Age Classes: 10
Number of Years in Projection: 19
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 100

Bootstrap File Name: D:\NIT\GROUNDFISH_SARC55_COD\GBCOD\RUN42W.V5.3.BSN

Number of Feasible Solutions: 100000 of 100000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	2910
2013	Landings	2506
2014	Landings	2506
2015	Landings	2506
2016	F-Mult	0.1350
2017	F-Mult	0.1350
2018	F-Mult	0.1350
2019	F-Mult	0.1350
2020	F-Mult	0.1350
2021	F-Mult	0.1350
2022	F-Mult	0.1350
2023	F-Mult	0.1350
2024	F-Mult	0.1350
2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000000 Fish

Year Class	Average	StdDev
2012	6.5824	3.0603
2013	6.6101	3.0667
2014	6.6163	3.1261
2015	6.6836	3.3569
2016	7.2159	4.7705

2017	8.2159	6.6621
2018	9.9773	8.6897
2019	12.1899	10.3270
2020	14.7373	11.4229
2021	16.8673	11.8588
2022	19.1806	11.8780
2023	20.6857	11.6920
2024	21.5654	11.3917
2025	22.3173	11.1986
2026	22.7435	11.0425
2027	23.1444	10.8517
2028	23.3314	10.7572
2029	23.5449	10.6757
2030	23.6715	10.6458

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1.3105	1.5192	2.5846	3.9838	6.9040	8.1316	10.2901	11.8675	15.5037
2013	1.3130	1.5345	2.6078	4.0080	6.9457	8.1368	10.3283	11.9372	15.5406
2014	1.3118	1.5227	2.5681	3.9847	6.9622	8.1369	10.3025	11.9583	15.6008
2015	1.3098	1.5467	2.6401	4.0017	6.9669	8.1520	10.4119	12.2012	15.8428
2016	1.3146	1.5890	2.7451	4.1746	7.0103	8.2352	11.1203	14.2242	27.5237
2017	1.3168	1.6300	2.8575	4.3671	7.0779	9.1935	13.7289	22.1749	42.0584
2018	1.3229	1.7859	3.2509	4.8995	7.2210	10.4868	23.0748	28.0168	45.5423
2019	1.3369	2.0170	3.8365	5.5162	8.1221	15.8607	27.2711	33.4727	46.1960
2020	1.3584	2.4524	3.9502	6.4918	10.1423	22.3716	28.9086	41.6078	46.4961
2021	1.3910	3.2351	3.9823	7.1887	11.7758	25.3727	31.4494	44.5757	46.6471
2022	1.4452	3.9403	5.4112	9.5492	19.4189	26.7486	36.4739	45.0572	46.7338
2023	1.5694	4.2388	7.0067	10.3938	20.7992	27.3327	39.1520	45.2802	46.7817
2024	2.0174	5.5180	8.1238	10.7546	21.4715	27.5446	40.1542	45.3678	46.7941
2025	2.6415	7.0192	9.4891	11.0190	21.9085	27.7397	41.4444	45.4845	46.8171
2026	3.6534	8.0869	9.7541	12.1185	22.2519	27.9306	41.7574	45.5318	46.8171
2027	3.9565	9.3256	9.9795	13.7207	22.6804	28.0363	42.1324	45.5541	46.8069
2028	4.2763	9.4656	10.1006	14.3432	22.8321	28.0714	42.2861	45.6140	46.8235
2029	5.7073	9.5666	10.1960	15.0991	23.0237	28.1439	42.6322	45.5724	46.8302
2030	6.9641	9.6438	10.2779	15.5254	23.0827	28.2185	42.8928	45.6491	46.8535

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	18.9041	4.8470
2013	20.9189	6.0390
2014	22.2908	6.5635
2015	27.1993	7.3483
2016	33.5825	8.3072
2017	38.6527	8.4673
2018	43.1908	9.0063
2019	47.3654	10.9400
2020	52.4247	15.1671
2021	58.6320	21.0328
2022	67.8629	28.0671
2023	78.8437	34.9540
2024	91.3700	40.9601
2025	105.2480	45.3584
2026	119.7351	48.2095

2027	133.9953	49.7064
2028	147.6430	50.1618
2029	160.3010	49.7662
2030	171.8106	48.6274

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	10.2027	12.1902	13.1443	15.4682	18.1843	21.8044	25.3344	27.7523	32.3852
2013	10.0970	12.4840	13.7795	16.4997	20.1897	24.6318	28.7589	32.4368	38.0781
2014	10.6480	12.9810	14.5096	17.4674	21.5481	26.3128	30.7390	34.5353	41.2006
2015	13.1903	16.4740	18.3708	21.9062	26.5252	31.6805	36.8635	40.5044	47.3440
2016	16.9366	21.0968	23.4619	27.7220	32.9698	38.7498	44.4970	48.2117	55.5078
2017	21.2163	25.7937	28.3284	32.7938	38.1282	43.9536	49.5761	53.1033	60.5599
2018	25.2481	29.9861	32.6070	37.1799	42.6097	48.3768	54.0972	58.0122	67.2525
2019	28.5509	33.3236	36.1034	40.6976	46.1290	51.9723	58.7253	64.5511	88.0977
2020	31.4617	36.3880	39.1365	43.8118	49.3502	56.1343	67.0742	82.7815	114.3587
2021	33.8180	38.7884	41.5123	46.2409	52.2441	62.1099	86.9293	105.0233	138.3583
2022	36.3533	41.4862	44.2456	49.2661	56.9049	78.8233	110.3607	128.9821	160.9077
2023	38.3314	43.4621	46.3302	52.0453	64.1912	100.3795	132.1012	149.7712	179.5718
2024	39.7129	44.9925	48.1983	55.5699	81.1815	121.3815	151.4301	167.9346	196.7649
2025	40.8801	46.4443	50.2200	62.2408	101.7423	139.7771	168.1974	183.7908	212.0069
2026	41.9079	48.0307	52.9343	78.3770	121.3775	156.0928	183.1328	198.0863	225.9154
2027	42.7875	50.0220	57.4727	97.8058	138.3157	170.5003	196.6300	210.9693	237.9106
2028	43.8977	52.5162	67.4992	115.9834	153.1975	183.5568	208.4529	222.6592	248.4087
2029	44.9348	56.6117	85.7221	131.9477	166.3778	195.1298	218.7529	232.6556	257.3000
2030	46.2491	65.6045	104.6663	146.2897	177.9409	205.0562	227.6919	240.9192	265.3605

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	22.5191	5.5629
2013	24.8558	6.5244
2014	28.1289	7.0846
2015	34.0313	8.0822
2016	40.9933	9.2908
2017	46.4948	9.8404
2018	51.7534	11.4518
2019	57.0732	14.9671
2020	63.8397	20.6589
2021	72.2179	27.6053
2022	83.9301	35.2824
2023	97.4084	42.3507
2024	112.3618	48.0943
2025	128.2812	52.0932
2026	144.4145	54.5305
2027	160.0718	55.6499
2028	174.9067	55.7563
2029	188.5839	55.0138
2030	200.9516	53.5281

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	12.4259	14.6982	15.9477	18.4839	21.6980	25.9128	29.9140	32.8044	38.3191
2013	13.2552	15.5668	17.1076	20.0599	24.0901	28.8571	33.2894	37.0362	43.3848

2014	15.0756	17.9603	19.7076	22.9811	27.4088	32.4504	37.3994	41.0655	47.9160
2015	18.1528	22.0609	24.2552	28.2827	33.3698	38.9872	44.6346	48.4164	55.6669
2016	22.2031	27.0394	29.7009	34.4985	40.3516	46.7472	53.0549	57.0178	65.2831
2017	26.9381	31.9818	34.8895	39.8639	45.7995	52.2231	58.4497	62.8497	74.4591
2018	31.1864	36.4757	39.4239	44.5047	50.5361	56.9393	64.5378	71.6134	90.0328
2019	34.6928	40.0268	43.0962	48.2204	54.2493	61.4729	73.6693	85.3748	115.6499
2020	37.7795	43.2638	46.3345	51.5198	57.8372	69.1867	89.4805	107.6294	143.2329
2021	40.2045	45.8438	48.8377	54.1414	62.1665	81.5095	112.2065	132.1468	168.1728
2022	42.9384	48.6749	51.7628	57.5925	70.7764	102.4900	137.3401	157.4280	191.5387
2023	45.0444	50.8105	54.0638	61.7520	84.5384	126.2533	160.6153	179.3767	212.1204
2024	46.5977	52.5009	56.3080	69.2265	105.0675	148.3793	180.7817	198.7332	230.2079
2025	47.8982	54.2682	59.1860	82.0302	127.3152	167.9442	198.6169	215.5863	246.2005
2026	49.0976	56.1804	64.3204	101.5483	147.8032	185.1481	214.4874	230.6829	260.7931
2027	50.0329	58.7773	73.5680	122.2357	165.8133	200.5195	228.7314	244.4431	273.6278
2028	51.2788	63.3958	89.1416	141.5307	181.5290	214.3704	241.2518	257.0417	285.1408
2029	52.5825	72.0472	109.4443	158.6220	195.4976	226.6482	252.3548	267.6184	294.5201
2030	53.9698	86.4660	129.1464	173.5413	207.7898	237.1286	262.0134	276.3061	303.1783

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	23.6194	6.2136
2013	25.9163	6.8236
2014	31.0593	7.6431
2015	37.6302	8.7307
2016	43.9307	9.4802
2017	49.1368	10.3102
2018	54.3577	12.8708
2019	60.1953	17.6956
2020	67.7773	24.4123
2021	77.6258	32.0133
2022	90.4299	39.6838
2023	104.9081	46.2655
2024	120.7254	51.1051
2025	137.0158	54.1639
2026	153.0257	55.7199
2027	168.2588	56.1079
2028	182.4103	55.6017
2029	195.2731	54.3525
2030	206.6882	52.4973

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	12.4401	14.9041	16.2645	19.0648	22.8565	27.4191	31.5993	35.3856	41.1421
2013	13.6637	16.1816	17.8288	20.8970	25.1759	30.0761	34.7741	38.5368	45.2614
2014	16.3354	19.8435	21.8612	25.5855	30.3994	35.7245	41.1073	44.8050	51.8668
2015	20.0173	24.4858	26.9685	31.4872	37.0031	43.0594	49.0639	52.9162	60.5397
2016	24.5478	29.5990	32.4222	37.3860	43.3451	49.8182	56.0943	59.9907	68.3467
2017	29.0126	34.3037	37.2370	42.3477	48.3824	54.8219	61.2417	65.8772	79.3644
2018	32.9080	38.3544	41.4259	46.6057	52.7066	59.2755	67.6259	76.2312	103.4313
2019	36.2180	41.7426	44.8112	50.0406	56.2290	64.1861	79.4452	96.5949	130.8191
2020	38.9963	44.6663	47.7096	53.0313	59.8020	73.2851	101.5671	121.1518	158.5751
2021	41.3963	47.0999	50.1798	55.7208	64.8476	91.5052	125.9487	146.3077	182.2993
2022	43.8008	49.5306	52.7309	59.1057	75.3544	115.1953	150.3974	170.1619	203.8746
2023	45.5621	51.4561	54.9842	63.8428	94.5772	138.6378	172.2832	190.7914	223.3070

2024	47.0245	53.1731	57.4257	73.4592	117.0544	159.5385	191.4699	209.0438	240.0155
2025	48.2390	55.0357	60.7032	91.5342	138.8492	177.9873	208.1313	224.8281	255.3653
2026	49.2869	57.2746	67.0060	112.7368	158.0583	194.0978	222.9157	238.8498	268.3790
2027	50.4764	60.2824	79.7431	133.0310	174.8427	208.5127	235.9010	251.6403	280.3051
2028	51.7105	65.9144	99.6481	150.9475	189.4384	221.2429	247.4627	262.7528	290.1648
2029	53.1860	77.6617	120.3452	167.0096	202.2149	232.3351	257.5985	272.2441	299.6521
2030	54.7475	96.9292	139.1577	180.6816	213.2472	241.6218	266.2147	280.3284	306.8188

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	2.9100	0.0000
2013	2.5060	0.0000
2014	2.5060	0.0000
2015	2.5060	0.0000
2016	4.1059	1.0438
2017	4.7694	1.0628
2018	5.3546	1.1168
2019	5.8874	1.3088
2020	6.4914	1.7750
2021	7.2558	2.4862
2022	8.3455	3.3681
2023	9.6670	4.2663
2024	11.2142	5.0743
2025	12.9471	5.6977
2026	14.7920	6.1094
2027	16.6304	6.3310
2028	18.3873	6.3981
2029	20.0145	6.3433
2030	21.4795	6.1887

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100
2013	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060
2014	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060
2015	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060
2016	2.0367	2.5472	2.8389	3.3676	4.0256	4.7517	5.4754	5.9565	6.8789
2017	2.5896	3.1539	3.4715	4.0295	4.7030	5.4322	6.1471	6.5971	7.5311
2018	3.0998	3.6968	4.0301	4.6021	5.2837	6.0113	6.7297	7.2149	8.3377
2019	3.5348	4.1413	4.4851	5.0677	5.7556	6.4875	7.3177	8.0107	10.3740
2020	3.9052	4.5222	4.8776	5.4657	6.1610	6.9994	8.2651	9.8148	13.7222
2021	4.2278	4.8544	5.2029	5.8006	6.5502	7.7316	10.3610	12.6353	16.9592
2022	4.5362	5.1854	5.5366	6.1644	7.0983	9.4248	13.3678	15.7450	19.9073
2023	4.7748	5.4285	5.7887	6.4931	7.9293	12.0482	16.1984	18.4998	22.3667
2024	4.9477	5.6125	6.0092	6.9040	9.6782	14.8314	18.7606	20.8914	24.5885
2025	5.0845	5.7799	6.2454	7.6541	12.2621	17.2756	20.9629	22.9908	26.6038
2026	5.2100	5.9733	6.5765	9.3384	14.8689	19.4317	22.9301	24.8622	28.4152
2027	5.3257	6.2135	7.0925	11.8099	17.1278	21.3251	24.6647	26.5336	29.9510
2028	5.4541	6.5185	8.1900	14.2324	19.1141	23.0056	26.1947	27.9697	31.2424
2029	5.5975	7.0038	10.2566	16.3636	20.8142	24.4794	27.4914	29.2413	32.3200
2030	5.7706	7.9953	12.7342	18.2313	22.2862	25.7146	28.5750	30.2596	33.3300

Landings x 1000 MT

Year	Average	StdDev
2012	2.9100	0.0000
2013	2.5060	0.0000
2014	2.5060	0.0000
2015	2.5060	0.0000
2016	4.1059	1.0438
2017	4.7694	1.0628
2018	5.3546	1.1168
2019	5.8874	1.3088
2020	6.4914	1.7750
2021	7.2558	2.4862
2022	8.3455	3.3681
2023	9.6670	4.2663
2024	11.2142	5.0743
2025	12.9471	5.6977
2026	14.7920	6.1094
2027	16.6304	6.3310
2028	18.3873	6.3981
2029	20.0145	6.3433
2030	21.4795	6.1887

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100	2.9100
2013	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060
2014	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060
2015	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060	2.5060
2016	2.0367	2.5472	2.8389	3.3676	4.0256	4.7517	5.4754	5.9565	6.8789
2017	2.5896	3.1539	3.4715	4.0295	4.7030	5.4322	6.1471	6.5971	7.5311
2018	3.0998	3.6968	4.0301	4.6021	5.2837	6.0113	6.7297	7.2149	8.3377
2019	3.5348	4.1413	4.4851	5.0677	5.7556	6.4875	7.3177	8.0107	10.3740
2020	3.9052	4.5222	4.8776	5.4657	6.1610	6.9994	8.2651	9.8148	13.7222
2021	4.2278	4.8544	5.2029	5.8006	6.5502	7.7316	10.3610	12.6353	16.9592
2022	4.5362	5.1854	5.5366	6.1644	7.0983	9.4248	13.3678	15.7450	19.9073
2023	4.7748	5.4285	5.7887	6.4931	7.9293	12.0482	16.1984	18.4998	22.3667
2024	4.9477	5.6125	6.0092	6.9040	9.6782	14.8314	18.7606	20.8914	24.5885
2025	5.0845	5.7799	6.2454	7.6541	12.2621	17.2756	20.9629	22.9908	26.6038
2026	5.2100	5.9733	6.5765	9.3384	14.8689	19.4317	22.9301	24.8622	28.4152
2027	5.3257	6.2135	7.0925	11.8099	17.1278	21.3251	24.6647	26.5336	29.9510
2028	5.4541	6.5185	8.1900	14.2324	19.1141	23.0056	26.1947	27.9697	31.2424
2029	5.5975	7.0038	10.2566	16.3636	20.8142	24.4794	27.4914	29.2413	32.3200
2030	5.7706	7.9953	12.7342	18.2313	22.2862	25.7146	28.5750	30.2596	33.3300

Total Fishing Mortality

Year	Average	StdDev
2012	0.1804	0.0497
2013	0.1414	0.0445
2014	0.1311	0.0436
2015	0.1102	0.0340
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000
2019	0.1350	0.0000
2020	0.1350	0.0000

2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.0957	0.1112	0.1228	0.1438	0.1745	0.2079	0.2461	0.2675	0.3254
2013	0.0696	0.0824	0.0927	0.1090	0.1350	0.1651	0.2005	0.2227	0.2816
2014	0.0625	0.0750	0.0847	0.0997	0.1232	0.1541	0.1884	0.2126	0.2653
2015	0.0562	0.0664	0.0736	0.0862	0.1043	0.1280	0.1541	0.1729	0.2171
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

Probability Spawning Stock Biomass Exceeds Threshold 93.268 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000230
2018	0.001470
2019	0.007110
2020	0.031150
2021	0.080600
2022	0.171990
2023	0.291580
2024	0.424960
2025	0.553030
2026	0.673090
2027	0.769110
2028	0.838220
2029	0.886100

2030	0.918230

Probability Threshold Exceeded at Least Once = 0.9182

Probability Jan-1 Stock Biomass Exceeds Threshold 186.535 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000020
2019	0.000140
2020	0.000640
2021	0.003270
2022	0.013250
2023	0.036630
2024	0.081270
2025	0.150470
2026	0.241410
2027	0.348210
2028	0.462220
2029	0.572280
2030	0.669080

Probability Threshold Exceeded at Least Once = 0.6712

Probability Mean Biomass Exceeds Threshold 186.535 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000060
2019	0.000350
2020	0.001780
2021	0.007950
2022	0.024600
2023	0.059980
2024	0.118520
2025	0.200770
2026	0.300610
2027	0.412540
2028	0.523380
2029	0.627350
2030	0.713560

Probability Threshold Exceeded at Least Once = 0.7171

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	0.448000
2013	0.167270
2014	0.123030
2015	0.038580
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.4480

Gulf of Maine Cod (Base Model)

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 11 Jan 2013 15:40

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_FMSY1550_CONSTANT_12CAT3767.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 19
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\SAW55_3BLOCK_BASE_MCMC.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	3767
2013	Landings	1550
2014	Landings	1550
2015	Landings	1550
2016	F-Mult	0.1350
2017	F-Mult	0.1350
2018	F-Mult	0.1350
2019	F-Mult	0.1350
2020	F-Mult	0.1350
2021	F-Mult	0.1350
2022	F-Mult	0.1350
2023	F-Mult	0.1350
2024	F-Mult	0.1350
2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000 Fish

Year Class	Average	StdDev
2012	6926.7937	4465.8077
2013	6923.5380	4386.4587
2014	6937.4571	4438.1684

2015	6919.2931	4527.0696
2016	6848.1821	4336.7865
2017	6927.8128	4327.1141
2018	6904.8750	4345.1040
2019	6853.8386	4341.3137
2020	6939.1845	4398.8850
2021	6952.5694	4402.3823
2022	6973.7562	4462.6114
2023	6932.3252	4365.9713
2024	7044.3441	4564.4314
2025	6897.3804	4358.1031
2026	6933.3608	4380.3428
2027	6924.7521	4452.7725
2028	7017.1113	4540.7667
2029	6852.1367	4397.8307
2030	6883.5775	4300.2626

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.400	24545.30
2013	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.230	23718.65
2014	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.550	24503.19
2015	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.940	25285.66
2016	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.410	23761.43
2017	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.490	23644.62
2018	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.790	24138.61
2019	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.140	23837.61
2020	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.020	24248.44
2021	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.070	24361.13
2022	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.660	24755.97
2023	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.530	24085.35
2024	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.550	25080.21
2025	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.680	23778.28
2026	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.720	24428.42
2027	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.720	24567.25
2028	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.150	24868.98
2029	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.440	4672.360
2030	1347.1080	2222.8420	3135.0670	3934.5510	5235.3460	9103.0150	11930.1300	14588.280	23922.89

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	9.1991	2.2879
2013	9.6303	2.7992
2014	12.1844	3.3437
2015	17.0548	4.3132
2016	24.0582	6.1549
2017	30.8545	7.7239
2018	36.4370	8.7408
2019	41.1580	9.4627
2020	46.7927	10.0909
2021	52.6068	11.3023
2022	56.7406	11.7907
2023	59.6995	12.0344
2024	61.8307	12.1961

2025	63.3682	12.2173
2026	64.5300	12.2546
2027	65.3700	12.3134
2028	65.9612	12.4048
2029	66.4109	12.4656
2030	66.7227	12.5135

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.5775	5.7814	6.3344	7.6328	8.9946	10.5319	12.2511	13.3323	15.3653
2013	4.0748	5.4706	6.1618	7.6747	9.3379	11.2658	13.2800	14.5909	17.1890
2014	5.5897	7.2253	8.1301	9.8494	11.8594	14.1133	16.5414	18.2603	21.1959
2015	8.5859	10.7074	11.8940	14.0303	16.6252	19.6921	22.8109	24.8150	28.7771
2016	12.7785	15.3866	16.9277	19.7991	23.3299	27.5006	32.0999	35.2834	42.4527
2017	17.1081	20.0903	22.0315	25.4153	29.8499	35.0405	41.0781	45.2907	53.8794
2018	20.9428	24.2779	26.3604	30.1708	35.2547	41.2852	48.3838	52.5726	61.9581
2019	24.3347	27.9449	30.1276	34.3687	39.8738	46.6777	53.8656	58.6836	68.3307
2020	28.7488	32.6137	34.9767	39.5806	45.4700	52.7946	60.2929	65.3184	75.8191
2021	31.9971	36.5315	39.2989	44.5435	51.1913	59.3951	67.7167	73.3241	84.4398
2022	34.8353	39.6085	42.6930	48.2927	55.4122	63.8625	72.3513	78.1084	89.6737
2023	37.1254	42.1055	45.2177	51.0895	58.4396	66.9804	75.5812	81.3933	93.3046
2024	38.4770	43.8941	47.2167	53.1805	60.7331	69.1385	78.0220	83.7370	96.1771
2025	39.8966	45.2677	48.5991	54.6523	62.2506	70.6704	79.6831	85.2189	96.9217
2026	41.0171	46.3774	49.7446	55.8272	63.4734	72.1078	80.9023	86.5558	97.5674
2027	41.9387	47.2839	50.4451	56.5345	64.1695	72.9750	82.0568	87.5543	98.3613
2028	42.4324	47.7280	51.0775	57.0245	64.7354	73.4717	82.6616	88.2189	99.3615
2029	43.1584	48.0024	51.3368	57.3798	65.1948	74.1046	83.1816	88.8296	100.5612
2030	43.2552	48.3591	51.6808	57.6110	65.4257	74.4322	83.6252	89.1794	100.4140

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	13.4228	3.2496
2014	17.7954	4.1255
2015	24.3936	5.8109
2016	32.8202	8.0701
2017	40.4029	9.6737
2018	46.4853	10.6607
2019	51.6148	11.3257
2020	57.7423	11.9054
2021	64.0602	13.1250
2022	68.5665	13.6299
2023	71.8095	13.9020
2024	74.1451	14.0843
2025	75.8303	14.1051
2026	77.1040	14.1465
2027	78.0070	14.2333
2028	78.6287	14.3402
2029	79.1178	14.3862
2030	79.4634	14.4255

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%

2012	7.2801	8.7308	9.4238	10.9381	12.5757	14.4349	16.4055	17.7124	20.3350
2013	6.9289	8.5818	9.4709	11.1568	13.1364	15.3082	17.6458	19.3062	22.1702
2014	9.6423	11.6795	12.8354	14.9050	17.4025	20.3315	23.2732	25.2390	28.8738
2015	13.5901	16.0697	17.6305	20.3853	23.7354	27.6812	32.0133	34.9502	41.4651
2016	18.1829	21.5489	23.4846	27.2039	31.8075	37.2640	43.4743	47.8347	57.0152
2017	23.1256	26.8458	29.2432	33.5125	39.1525	45.7101	53.3022	58.4654	68.4612
2018	27.5065	31.5209	34.1326	38.8620	44.9781	52.7135	60.7878	66.1101	77.2267
2019	31.3069	35.6597	38.4200	43.4857	50.1580	58.3656	66.7125	72.3194	84.5293
2020	36.0655	40.7478	43.7212	49.2494	56.3096	64.8609	73.6277	79.5937	91.3487
2021	39.6866	45.1617	48.4668	54.6665	62.5727	71.9368	81.5828	88.1200	100.3934
2022	42.7981	48.6021	52.3198	58.8729	67.2245	76.8575	86.6516	92.9218	106.1872
2023	45.2688	51.3233	55.1724	61.9773	70.4451	80.2931	90.3134	96.6570	110.5833
2024	46.9716	53.2311	57.1196	64.1247	72.9296	82.6065	92.9404	99.1437	113.4691
2025	48.6449	54.8112	58.7260	65.7326	74.5219	84.4917	94.4679	101.2812	114.1070
2026	49.5396	56.2122	59.9659	67.0291	75.8702	85.9725	96.1593	102.4329	114.5765
2027	50.5441	57.0851	60.8299	67.8231	76.6801	86.8255	97.1121	103.5176	115.6960
2028	51.4240	57.3574	61.2916	68.3937	77.1880	87.4203	97.9601	104.2386	117.4412
2029	52.0547	57.8041	61.7217	68.7162	77.7868	88.0273	98.3133	104.9595	118.3885
2030	51.7987	58.2044	62.0531	68.9974	78.1215	88.5120	98.8611	105.2415	117.7897

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	14.3147	3.3501
2013	16.7512	3.8996
2014	22.9344	5.3201
2015	31.4651	7.8036
2016	40.2633	10.0751
2017	47.6777	11.4580
2018	53.7498	12.3348
2019	58.9776	12.9309
2020	64.5596	13.3790
2021	69.9195	14.1381
2022	73.7481	14.4831
2023	76.5267	14.6925
2024	78.5435	14.8361
2025	80.0122	14.8732
2026	81.1047	14.9323
2027	81.8780	15.0378
2028	82.3975	15.1322
2029	82.8056	15.1457
2030	83.0970	15.1704

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.5656	9.2700	10.1480	12.0071	13.9723	16.2416	18.7126	20.2041	23.1613
2013	8.8839	10.9303	12.0446	13.9980	16.4139	19.1471	21.9088	23.7872	27.1326
2014	12.7449	15.2888	16.6993	19.2475	22.3109	25.9800	29.9650	32.5838	38.1786
2015	17.5498	20.8055	22.5546	25.9923	30.4105	35.7075	41.6558	45.9004	55.5526
2016	22.7857	26.3681	28.7872	33.0955	38.9198	45.6824	53.6124	59.1659	69.8415
2017	27.6966	31.7884	34.4773	39.4862	46.1300	54.1811	63.3309	68.9915	81.1737
2018	31.8855	36.4314	39.3441	44.9392	52.0948	60.9676	70.3190	76.4174	89.6226
2019	35.6567	40.7095	43.7644	49.6945	57.3955	66.6410	76.3454	82.5408	96.0284
2020	40.0564	45.2876	48.7288	55.0704	62.9849	72.6659	82.4928	89.3465	102.1391
2021	43.4337	49.2558	53.0225	59.7927	68.3820	78.5208	88.6856	95.6031	109.0343

2022	46.0576	52.5104	56.3777	63.4312	72.3423	82.6534	92.8702	99.5707	113.5705
2023	48.2391	54.7435	58.8387	66.0885	75.1347	85.2758	96.1720	102.5746	117.3787
2024	50.0585	56.6347	60.5034	67.9245	77.2233	87.5916	98.4029	105.0781	118.6436
2025	51.2637	58.0145	62.0204	69.4412	78.7203	89.2843	100.0193	106.6627	120.0412
2026	52.0474	59.2698	63.0165	70.4597	79.7064	90.3861	101.2565	107.7163	120.9288
2027	53.2815	59.7407	63.7237	71.0999	80.3355	91.0376	102.1460	108.8703	122.2035
2028	54.0922	60.1087	64.0968	71.4938	80.8730	91.6810	102.8565	109.8122	123.2374
2029	53.9267	60.4687	64.4212	71.8447	81.4189	92.2792	103.2746	109.9260	123.7133
2030	54.1646	60.9305	64.8618	72.1197	81.7733	92.4836	103.3222	110.1525	123.3349

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.5500	0.0000
2014	1.5500	0.0000
2015	1.5500	0.0000
2016	2.9746	0.7784
2017	3.9245	1.0292
2018	4.7412	1.1927
2019	5.4510	1.3224
2020	6.2036	1.4225
2021	6.9272	1.5540
2022	7.4428	1.6045
2023	7.8082	1.6289
2024	8.0726	1.6450
2025	8.2657	1.6492
2026	8.4112	1.6575
2027	8.5162	1.6656
2028	8.5952	1.6755
2029	8.6522	1.6855
2030	8.6892	1.6921

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670
2013	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2014	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2015	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2016	1.5240	1.8792	2.0766	2.4370	2.8784	3.4115	3.9906	4.4122	5.3245
2017	2.1266	2.5274	2.7549	3.2008	3.7871	4.4743	5.2598	5.8527	7.0645
2018	2.6788	3.1045	3.3750	3.8873	4.5684	5.3856	6.3497	6.9769	8.2494
2019	3.1601	3.6310	3.9233	4.5021	5.2622	6.2081	7.2473	7.9137	9.2646
2020	3.6958	4.2086	4.5489	5.1875	6.0198	7.0494	8.1248	8.8093	10.3909
2021	4.1321	4.7223	5.1126	5.8153	6.7195	7.8488	9.0034	9.8086	11.3649
2022	4.4966	5.1311	5.5342	6.2996	7.2539	8.4123	9.5688	10.3786	11.8920
2023	4.7739	5.4501	5.8709	6.6398	7.6252	8.7972	9.9622	10.7286	12.3341
2024	4.9729	5.6782	6.1138	6.9000	7.9032	9.0681	10.2465	11.0231	12.6465
2025	5.1486	5.8480	6.2701	7.0844	8.1182	9.2496	10.4675	11.2172	12.7794
2026	5.2646	5.9510	6.4134	7.2285	8.2535	9.4308	10.6340	11.4011	12.9549
2027	5.3941	6.0754	6.5076	7.3194	8.3480	9.5337	10.7568	11.5111	12.9761
2028	5.4528	6.1566	6.6064	7.3914	8.4162	9.6081	10.8525	11.6192	13.1534
2029	5.5205	6.1814	6.6316	7.4332	8.4841	9.6670	10.9367	11.7087	13.2474
2030	5.5459	6.2257	6.6506	7.4618	8.5124	9.7412	10.9780	11.7208	13.3063

Landings x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.5500	0.0000
2014	1.5500	0.0000
2015	1.5500	0.0000
2016	2.9746	0.7784
2017	3.9245	1.0292
2018	4.7412	1.1927
2019	5.4510	1.3224
2020	6.2036	1.4225
2021	6.9272	1.5540
2022	7.4428	1.6045
2023	7.8082	1.6289
2024	8.0726	1.6450
2025	8.2657	1.6492
2026	8.4112	1.6575
2027	8.5162	1.6656
2028	8.5952	1.6755
2029	8.6522	1.6855
2030	8.6892	1.6921

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670
2013	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2014	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2015	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2016	1.5240	1.8792	2.0766	2.4370	2.8784	3.4115	3.9906	4.4122	5.3245
2017	2.1266	2.5274	2.7549	3.2008	3.7871	4.4743	5.2598	5.8527	7.0645
2018	2.6788	3.1045	3.3750	3.8873	4.5684	5.3856	6.3497	6.9769	8.2494
2019	3.1601	3.6310	3.9233	4.5021	5.2622	6.2081	7.2473	7.9137	9.2646
2020	3.6958	4.2086	4.5489	5.1875	6.0198	7.0494	8.1248	8.8093	10.3909
2021	4.1321	4.7223	5.1126	5.8153	6.7195	7.8488	9.0034	9.8086	11.3649
2022	4.4966	5.1311	5.5342	6.2996	7.2539	8.4123	9.5688	10.3786	11.8920
2023	4.7739	5.4501	5.8709	6.6398	7.6252	8.7972	9.9622	10.7286	12.3341
2024	4.9729	5.6782	6.1138	6.9000	7.9032	9.0681	10.2465	11.0231	12.6465
2025	5.1486	5.8480	6.2701	7.0844	8.1182	9.2496	10.4675	11.2172	12.7794
2026	5.2646	5.9510	6.4134	7.2285	8.2535	9.4308	10.6340	11.4011	12.9549
2027	5.3941	6.0754	6.5076	7.3194	8.3480	9.5337	10.7568	11.5111	12.9761
2028	5.4528	6.1566	6.6064	7.3914	8.4162	9.6081	10.8525	11.6192	13.1534
2029	5.5205	6.1814	6.6316	7.4332	8.4841	9.6670	10.9367	11.7087	13.2474
2030	5.5459	6.2257	6.6506	7.4618	8.5124	9.7412	10.9780	11.7208	13.3063

Total Fishing Mortality

Year	Average	StdDev
2012	0.4853	0.1465
2013	0.1848	0.0683
2014	0.1544	0.0568
2015	0.1097	0.0323
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000

2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.2546	0.3003	0.3289	0.3835	0.4593	0.5539	0.6857	0.7657	0.9762
2013	0.0885	0.1060	0.1172	0.1391	0.1699	0.2127	0.2741	0.3138	0.4524
2014	0.0745	0.0882	0.0981	0.1169	0.1434	0.1766	0.2266	0.2587	0.3633
2015	0.0587	0.0684	0.0749	0.0874	0.1041	0.1254	0.1502	0.1701	0.2214
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

Probability Spawning Stock Biomass Exceeds Threshold 27.372 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000100
2015	0.018400
2016	0.256300
2017	0.642900
2018	0.866800
2019	0.960200
2020	0.995300
2021	0.999400
2022	0.999900
2023	1.000000
2024	1.000000
2025	1.000000
2026	1.000000
2027	1.000000

2028	1.000000
2029	1.000000
2030	1.000000

Probability Threshold Exceeded at Least Once = 1.0000

Probability Jan-1 Stock Biomass Exceeds Threshold 54.743 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.014600
2017	0.082500
2018	0.200600
2019	0.345300
2020	0.554000
2021	0.747500
2022	0.854100
2023	0.905900
2024	0.935000
2025	0.950900
2026	0.963500
2027	0.970300
2028	0.974500
2029	0.976500
2030	0.978900

Probability Threshold Exceeded at Least Once = 0.9953

Probability Mean Biomass Exceeds Threshold 54.743 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.011000
2016	0.087300
2017	0.236100
2018	0.409800
2019	0.586900
2020	0.758600
2021	0.869000
2022	0.922900
2023	0.950100
2024	0.966000
2025	0.975500
2026	0.980100
2027	0.985000
2028	0.987400
2029	0.987300
2030	0.988100

Probability Threshold Exceeded at Least Once = 0.9985

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	1.000000
2013	0.419700
2014	0.232100
2015	0.035200
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

Gulf of Maine Cod (M-Ramp Model, m=0.4 in projection)

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE_M_SPLIT_M2_M4 constant catch to Fmsy in 2015

Date & Time of Run: 13 Feb 2013 10:37

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\CONSEQ\GOMCOD_SAW55_3BLOCK_BASE_M_SPLIT_SHORT_M2_M4_CONCATCH1550TO75FMSYIN2016.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 19
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\SAW55_3BLOCK_BASE_M_SPLIT_MCMC.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	3767
2013	Landings	1550
2014	Landings	1550
2015	Landings	1550
2016	F-Mult	0.1350
2017	F-Mult	0.1350
2018	F-Mult	0.1350
2019	F-Mult	0.1350
2020	F-Mult	0.1350
2021	F-Mult	0.1350
2022	F-Mult	0.1350
2023	F-Mult	0.1350
2024	F-Mult	0.1350
2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000 Fish

Year Class	Average	StdDev
2012	9985.3016	4499.7145
2013	9980.1062	4418.7273
2014	9992.7390	4484.4149

2015	9984.3928	4574.4027
2016	9910.6022	4396.8604
2017	10008.8254	4369.0852
2018	9994.3002	4382.4993
2019	9930.6162	4383.1333
2020	10002.2530	4439.5398
2021	10019.2755	4434.9654
2022	10037.0560	4502.0955
2023	10023.2603	4399.4114
2024	10112.4051	4586.6946
2025	9965.7712	4408.4764
2026	10006.1027	4420.3127
2027	9990.1856	4498.5884
2028	10086.3476	4563.4764
2029	9904.6094	4454.0054
2030	9954.5384	4364.0414

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3084.0340	4464.3150	4826.0260	6075.4450	9369.2435	12076.740	14885.620	16318.690	26554.700
2013	3053.9170	4488.0110	4821.2830	6096.2980	9355.0205	12289.030	14955.270	16275.980	25690.760
2014	3028.6220	4448.6700	4823.9840	6043.3970	9354.8410	12453.560	14845.710	16250.760	26510.690
2015	2997.2930	4417.4790	4812.7290	6049.1100	9368.2390	12156.000	14776.130	16282.320	27328.460
2016	3020.9140	4450.5810	4820.1490	6005.7110	9326.5315	12104.880	14686.400	16226.980	25735.470
2017	2974.8380	4513.4320	4825.5810	6204.6330	9445.7220	12321.060	14768.600	16248.800	25613.380
2018	3004.4740	4490.4460	4826.7280	6209.7520	9421.7100	12116.210	14787.260	16229.240	26129.660
2019	3012.9220	4476.9820	4820.5590	6143.9190	9326.3535	11981.540	14799.690	16246.580	25815.090
2020	3038.9820	4441.7070	4816.5940	6116.1890	9412.9675	12363.480	14871.420	16248.360	26244.440
2021	3024.5370	4481.7560	4826.7160	6147.9420	9417.7375	12412.280	14887.520	16271.110	26362.230
2022	3068.8740	4487.4360	4828.3950	6088.5490	9462.0240	12389.770	14865.240	16274.490	26774.870
2023	3079.3760	4478.8410	4833.3400	6256.1130	9437.2485	12391.760	14823.810	16202.520	26074.000
2024	2971.1920	4451.0850	4816.6490	6174.8860	9519.9120	12662.190	14942.320	16402.030	27113.740
2025	3034.1400	4487.6400	4821.1690	6078.1770	9385.8425	12180.380	14750.650	16234.800	25753.080
2026	3039.8660	4462.4540	4818.5770	6157.3630	9443.0490	12285.690	14918.340	16194.190	26432.550
2027	3112.1110	4494.9200	4823.2330	6038.2350	9372.8005	12265.590	14782.970	16297.250	26577.640
2028	3046.7730	4505.4440	4827.0180	6158.7390	9423.1225	12676.8600	14911.48	16375.180	26892.980
2029	2941.6680	4448.3070	4813.6180	5960.3250	9326.0795	11996.980	14724.240	16311.170	26687.490
2030	2978.3980	4489.3250	4828.6120	6083.3600	9396.9025	12279.560	14645.660	16189.990	25904.210

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	7.8824	1.9512
2013	7.0006	1.9983
2014	8.4322	2.0267
2015	11.4647	2.3529
2016	15.1470	3.0994
2017	18.3113	3.5922
2018	20.5557	3.8197
2019	22.2295	3.9277
2020	24.0277	3.9672
2021	25.3344	4.0261
2022	26.1108	4.0339
2023	26.5705	4.0509
2024	26.8544	4.0826

2025	27.0350	4.1055
2026	27.1639	4.1228
2027	27.2500	4.1375
2028	27.2902	4.1618
2029	27.3051	4.1680
2030	27.3091	4.1562

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.0764	5.0099	5.4907	6.4933	7.7107	9.1441	10.5412	11.2546	13.1345
2013	3.2621	4.0719	4.6025	5.5832	6.7649	8.2861	9.7602	10.5460	12.6627
2014	4.6726	5.4908	5.9933	6.9676	8.1987	9.7081	11.1564	12.0392	13.9907
2015	6.9604	7.9745	8.5695	9.7787	11.2854	12.8952	14.5774	15.6854	17.6766
2016	9.1351	10.5491	11.3628	12.9883	14.9106	17.0205	19.1395	20.5670	23.7941
2017	11.2218	12.8930	13.9827	15.8316	18.0439	20.4224	22.9697	24.6686	28.2405
2018	12.8667	14.8225	15.9383	17.9025	20.2516	22.8950	25.5438	27.3212	30.8797
2019	14.2996	16.3503	17.4785	19.5076	21.9316	24.5548	27.3887	29.1580	33.1914
2020	16.0624	18.0755	19.2280	21.2924	23.7180	26.4183	29.0847	31.0763	34.9382
2021	17.1226	19.2395	20.3975	22.5833	25.0608	27.8231	30.5573	32.4367	36.0575
2022	17.7881	19.9496	21.1775	23.3320	25.8201	28.5960	31.3528	33.0702	37.0345
2023	18.1296	20.3490	21.5608	23.7948	26.3275	29.0993	31.7329	33.5963	37.5738
2024	18.3927	20.5552	21.8194	24.0145	26.6443	29.3980	32.1566	34.0368	37.6927
2025	18.5106	20.7098	21.9955	24.1625	26.8117	29.5326	32.3499	34.2990	37.6930
2026	18.7842	20.8973	22.1000	24.2807	26.9006	29.7008	32.5679	34.4112	38.2190
2027	18.8278	20.9918	22.2286	24.3350	26.9941	29.7984	32.7003	34.5626	38.1085
2028	18.9385	21.0088	22.2054	24.3906	26.9871	29.8850	32.7304	34.6196	38.2806
2029	18.8810	20.9367	22.1686	24.3937	26.9845	29.9511	32.8014	34.6701	38.2906
2030	18.7936	20.9135	22.1884	24.3983	27.0775	29.9275	32.7805	34.6191	38.2439

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.5504	2.5212
2013	12.1869	2.5515
2014	15.4929	2.8880
2015	19.8260	3.7221
2016	24.3114	4.6603
2017	28.0167	5.1468
2018	30.5877	5.3476
2019	32.5092	5.4095
2020	34.5690	5.4164
2021	36.0586	5.4744
2022	36.9531	5.4958
2023	37.4948	5.5378
2024	37.8311	5.5841
2025	38.0511	5.6040
2026	38.2044	5.6206
2027	38.2889	5.6526
2028	38.3191	5.6733
2029	38.3399	5.6643
2030	38.3458	5.6611

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%

2012	7.8706	8.8912	9.5367	10.7573	12.2644	14.1628	15.9817	16.9844	19.8071
2013	7.3741	8.4757	9.0957	10.3440	11.9067	13.7957	15.6134	16.7121	19.1725
2014	9.9272	11.2185	11.9298	13.4045	15.2758	17.2687	19.3299	20.6653	23.1685
2015	12.5862	14.2692	15.2676	17.2308	19.5587	22.0965	24.6889	26.3323	29.9301
2016	15.0954	17.2598	18.7047	21.1031	23.9468	27.0596	30.3744	32.6012	37.2146
2017	17.6320	20.2201	21.7785	24.4515	27.6347	31.1663	34.7154	37.1401	41.9252
2018	19.8065	22.6026	24.0927	26.8439	30.1917	33.8330	37.5765	39.9297	45.4741
2019	21.6484	24.3682	25.9468	28.7873	32.1030	35.8063	39.5258	42.1886	47.3055
2020	23.5896	26.3835	27.9136	30.8342	34.1845	37.8864	41.5369	44.2188	49.2474
2021	24.7666	27.7053	29.3688	32.2575	35.6664	39.4350	43.1568	45.4926	50.8858
2022	25.4234	28.4812	30.1232	33.1842	36.6035	40.3983	43.9997	46.4766	51.5517
2023	25.8931	28.9163	30.6389	33.7010	37.1990	40.9430	44.6476	47.0964	52.2508
2024	26.1956	29.1950	30.9479	33.9985	37.4675	41.2579	45.0490	47.7996	52.2794
2025	26.4437	29.5053	31.1584	34.1397	37.7120	41.5320	45.4017	47.8821	52.7433
2026	26.5286	29.7655	31.3475	34.2921	37.8288	41.6736	45.6171	48.0279	52.9841
2027	26.8532	29.7543	31.3603	34.3207	37.8868	41.8068	45.6997	48.2148	52.8670
2028	26.9284	29.6992	31.2968	34.3350	37.8742	41.8579	45.7818	48.3445	53.2769
2029	26.7285	29.6245	31.3723	34.3604	38.0005	41.8146	45.8104	48.3924	53.2492
2030	26.4933	29.6186	31.3602	34.4180	37.9748	41.9343	45.8555	48.2780	53.0614

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	13.3203	2.8804
2013	15.0890	2.9272
2014	19.8397	3.6678
2015	25.1062	4.8829
2016	29.6608	5.7210
2017	33.0593	6.0817
2018	35.4669	6.2223
2019	37.2483	6.2283
2020	38.9112	6.2055
2021	40.0712	6.2272
2022	40.7692	6.2618
2023	41.2059	6.3168
2024	41.4857	6.3624
2025	41.6810	6.3812
2026	41.8032	6.4011
2027	41.8629	6.4406
2028	41.8706	6.4420
2029	41.8880	6.4215
2030	41.8854	6.4341

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.7113	9.0722	9.8618	11.2734	12.9848	15.1691	17.2607	18.4335	21.3612
2013	9.4828	10.7357	11.5328	12.9950	14.8238	16.9563	18.9512	20.3240	22.9821
2014	12.7064	14.3897	15.3310	17.2457	19.5822	22.0563	24.6299	26.2119	29.8478
2015	15.5311	17.7836	19.1591	21.7433	24.7192	28.0290	31.4291	33.6696	38.7641
2016	18.2820	21.0443	22.7617	25.7134	29.2137	33.0599	37.0403	39.8117	45.3096
2017	20.8726	23.9715	25.6938	28.8337	32.5948	36.7601	40.9843	43.8503	49.7264
2018	22.9348	26.1478	27.9249	31.1632	34.9853	39.2429	43.6298	46.4175	52.6631
2019	24.6249	27.8972	29.6818	32.9521	36.7597	41.0041	45.2363	48.3685	54.3494
2020	26.3720	29.4530	31.3093	34.6805	38.4339	42.7017	46.9977	49.8218	55.4393
2021	27.1221	30.4877	32.3665	35.8138	39.6527	43.9293	48.0194	50.7366	56.9145

2022	27.5889	31.1684	32.9648	36.4445	40.4135	44.6727	48.7500	51.5455	57.6075
2023	28.1451	31.5428	33.3699	36.8657	40.8068	45.1448	49.3834	52.4101	58.0814
2024	28.4528	31.7740	33.6685	37.0486	41.0858	45.3560	49.7845	52.7282	58.1810
2025	28.5940	32.1800	33.8559	37.2347	41.2529	45.6228	50.0715	52.8988	58.4534
2026	28.7793	32.1095	34.1148	37.2569	41.3637	45.7841	50.2336	52.9761	58.5697
2027	29.1180	32.0917	33.9619	37.3695	41.3455	45.8750	50.2826	53.2968	58.9363
2028	28.9240	31.9771	34.0142	37.3220	41.4890	45.9087	50.4278	53.2086	58.8408
2029	28.6957	31.9465	33.9927	37.4250	41.4877	45.8495	50.3872	53.2231	58.5741
2030	28.4448	32.0115	34.0239	37.4127	41.5036	45.8874	50.3476	53.1545	58.6214

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.5500	0.0000
2014	1.5500	0.0000
2015	1.5500	0.0000
2016	1.6956	0.3620
2017	2.1306	0.4419
2018	2.4538	0.4802
2019	2.6935	0.5026
2020	2.9159	0.5117
2021	3.0726	0.5169
2022	3.1663	0.5152
2023	3.2199	0.5159
2024	3.2532	0.5189
2025	3.2750	0.5220
2026	3.2903	0.5261
2027	3.3007	0.5271
2028	3.3081	0.5298
2029	3.3100	0.5320
2030	3.3095	0.5309

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670
2013	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2014	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2015	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2016	1.0025	1.1618	1.2525	1.4410	1.6701	1.9094	2.1557	2.3270	2.7259
2017	1.2694	1.4680	1.5948	1.8276	2.0941	2.3906	2.6955	2.9041	3.3780
2018	1.4999	1.7385	1.8781	2.1175	2.4185	2.7427	3.0707	3.3075	3.7857
2019	1.6970	1.9366	2.0918	2.3461	2.6541	2.9934	3.3494	3.5766	4.0975
2020	1.8843	2.1552	2.2988	2.5632	2.8744	3.2219	3.5849	3.8154	4.3452
2021	2.0332	2.2936	2.4430	2.7143	3.0366	3.3871	3.7419	3.9937	4.4713
2022	2.1150	2.3849	2.5369	2.8149	3.1277	3.4848	3.8464	4.0755	4.5398
2023	2.1569	2.4301	2.5890	2.8686	3.1872	3.5415	3.8775	4.1093	4.6204
2024	2.1789	2.4584	2.6114	2.8945	3.2243	3.5742	3.9187	4.1519	4.6610
2025	2.1924	2.4716	2.6317	2.9138	3.2444	3.5959	3.9513	4.2072	4.6600
2026	2.2081	2.4879	2.6479	2.9229	3.2576	3.6137	3.9854	4.2170	4.6902
2027	2.2258	2.5167	2.6535	2.9312	3.2623	3.6214	3.9958	4.2270	4.7016
2028	2.2359	2.5090	2.6689	2.9358	3.2685	3.6359	3.9991	4.2465	4.7333
2029	2.2413	2.5001	2.6575	2.9387	3.2684	3.6390	3.9991	4.2587	4.7335
2030	2.2352	2.5000	2.6589	2.9341	3.2713	3.6432	4.0109	4.2508	4.7042

Landings x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.5500	0.0000
2014	1.5500	0.0000
2015	1.5500	0.0000
2016	1.6956	0.3620
2017	2.1306	0.4419
2018	2.4538	0.4802
2019	2.6935	0.5026
2020	2.9159	0.5117
2021	3.0726	0.5169
2022	3.1663	0.5152
2023	3.2199	0.5159
2024	3.2532	0.5189
2025	3.2750	0.5220
2026	3.2903	0.5261
2027	3.3007	0.5271
2028	3.3081	0.5298
2029	3.3100	0.5320
2030	3.3095	0.5309

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670	3.7670
2013	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2014	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2015	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500	1.5500
2016	1.0025	1.1618	1.2525	1.4410	1.6701	1.9094	2.1557	2.3270	2.7259
2017	1.2694	1.4680	1.5948	1.8276	2.0941	2.3906	2.6955	2.9041	3.3780
2018	1.4999	1.7385	1.8781	2.1175	2.4185	2.7427	3.0707	3.3075	3.7857
2019	1.6970	1.9366	2.0918	2.3461	2.6541	2.9934	3.3494	3.5766	4.0975
2020	1.8843	2.1552	2.2988	2.5632	2.8744	3.2219	3.5849	3.8154	4.3452
2021	2.0332	2.2936	2.4430	2.7143	3.0366	3.3871	3.7419	3.9937	4.4713
2022	2.1150	2.3849	2.5369	2.8149	3.1277	3.4848	3.8464	4.0755	4.5398
2023	2.1569	2.4301	2.5890	2.8686	3.1872	3.5415	3.8775	4.1093	4.6204
2024	2.1789	2.4584	2.6114	2.8945	3.2243	3.5742	3.9187	4.1519	4.6610
2025	2.1924	2.4716	2.6317	2.9138	3.2444	3.5959	3.9513	4.2072	4.6600
2026	2.2081	2.4879	2.6479	2.9229	3.2576	3.6137	3.9854	4.2170	4.6902
2027	2.2258	2.5167	2.6535	2.9312	3.2623	3.6214	3.9958	4.2270	4.7016
2028	2.2359	2.5090	2.6689	2.9358	3.2685	3.6359	3.9991	4.2465	4.7333
2029	2.2413	2.5001	2.6575	2.9387	3.2684	3.6390	3.9991	4.2587	4.7335
2030	2.2352	2.5000	2.6589	2.9341	3.2713	3.6432	4.0109	4.2508	4.7042

Total Fishing Mortality

Year	Average	StdDev
2012	0.6130	0.1889
2013	0.2899	0.1123
2014	0.2672	0.0900
2015	0.1834	0.0424
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000

2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.3196	0.3782	0.4096	0.4811	0.5763	0.7064	0.8611	0.9599	1.2158
2013	0.1333	0.1625	0.1777	0.2122	0.2669	0.3350	0.4278	0.4923	0.6656
2014	0.1297	0.1561	0.1696	0.2021	0.2522	0.3127	0.3821	0.4378	0.5584
2015	0.1075	0.1234	0.1342	0.1524	0.1782	0.2080	0.2405	0.2614	0.3041
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

Probability Spawning Stock Biomass Exceeds Threshold 40.100 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000100
2019	0.000200
2020	0.000600
2021	0.001700
2022	0.001900
2023	0.003000
2024	0.003100
2025	0.002900
2026	0.003400
2027	0.003800

2028	0.004300
2029	0.003600
2030	0.003100

Probability Threshold Exceeded at Least Once = 0.0158

Probability Jan-1 Stock Biomass Exceeds Threshold 80.200 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.0000

Probability Mean Biomass Exceeds Threshold 80.200 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.0000

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	1.000000
2013	0.891400
2014	0.868200
2015	0.482500
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

Georges Bank Haddock

AGEPRO VERSION 4.1

gbh 2012 update short proj **flat 6+ no downweight age1 by 50% same recr as for ref pts

Date & Time of Run: 19 Mar 2012 14:03

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\BGBHAD\GBH_5885CAT11_6487CAT12_75%FMSY_DOWN59.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 20
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 100

Bootstrap File Name: C:\NIT\GARM_2012_UPDATE_PROJ\BGBHAD\GBH_2012_FINAL_BOOT.BSN

Number of Feasible Solutions: 100000 of 100000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Landings	18385
2012	Landings	15697
2013	F-Mult	0.2925
2014	F-Mult	0.2925
2015	F-Mult	0.2925
2016	F-Mult	0.2925
2017	F-Mult	0.2925
2018	F-Mult	0.2925
2019	F-Mult	0.2925
2020	F-Mult	0.2925
2021	F-Mult	0.2925
2022	F-Mult	0.2925
2023	F-Mult	0.2925
2024	F-Mult	0.2925
2025	F-Mult	0.2925
2026	F-Mult	0.2925
2027	F-Mult	0.2925
2028	F-Mult	0.2925
2029	F-Mult	0.2925
2030	F-Mult	0.2925

Recruits 1000000 Fish

Year Class	Average	StdDev
2011	57.4106	41.2821
2012	57.9878	41.4357
2013	57.5400	41.4149
2014	57.5798	41.4308

2015	57.8603	41.5190
2016	57.7842	41.3715
2017	57.8821	41.3003
2018	57.8419	41.5090
2019	57.9415	41.4179
2020	58.1149	41.5215
2021	57.9118	41.5283
2022	57.8274	41.4214
2023	57.8107	41.3733
2024	57.5964	41.2994
2025	57.9740	41.4995
2026	57.8167	41.4647
2027	58.0586	41.3807
2028	57.8108	41.4889
2029	57.7720	41.4828
2030	57.5810	41.4483

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.4618	4.0148	5.3889	25.5541	53.9726	86.1807	122.5146	130.0583	165.9165
2012	1.4067	4.0669	5.4261	26.5993	54.3512	87.3275	122.6300	130.1169	167.8919
2013	1.3851	3.9645	5.3443	25.6880	54.0734	86.2274	122.6242	130.1917	167.5249
2014	1.4425	3.9701	5.3632	25.3942	54.1887	86.7522	122.5817	130.1491	167.3780
2015	1.4304	4.0130	5.3900	26.2059	54.2854	86.9209	122.6663	130.1595	168.0808
2016	1.4267	4.0284	5.3838	26.2136	54.2955	86.8050	122.6685	130.1226	166.9012
2017	1.4186	4.0282	5.4383	26.4027	54.4814	86.8713	122.6966	130.0961	166.2497
2018	1.4375	3.9977	5.4015	26.2186	54.2594	86.9984	122.6475	130.2072	168.2152
2019	1.4148	4.0119	5.3932	26.4944	54.4905	87.1692	122.6860	130.0699	167.3642
2020	1.4205	4.0795	5.4456	26.5826	54.7339	87.5403	122.7244	130.2088	167.9910
2021	1.4234	3.9872	5.3837	25.8394	54.7232	87.3287	122.6834	130.2557	166.5469
2022	1.4201	4.0225	5.3646	26.2296	54.3510	87.0148	122.6675	130.1781	167.2290
2023	1.4015	4.0248	5.3842	26.3855	54.4139	86.7847	122.5946	130.1499	167.5222
2024	1.4042	4.0239	5.4039	25.8459	54.0339	86.6351	122.5853	130.1058	166.6724
2025	1.3803	3.9752	5.3816	26.3951	54.6475	87.2735	122.6944	130.2627	168.2291
2026	1.4409	4.0375	5.3797	26.0805	54.2723	86.9663	122.6674	130.1833	167.8664
2027	1.4429	4.1171	5.4508	26.7154	54.9283	87.1588	122.6867	130.1585	167.5610
2028	1.4464	4.0390	5.3942	25.8410	54.4009	87.2665	122.6444	130.1275	167.2841
2029	1.4514	4.0222	5.3795	25.7518	54.3156	86.9330	122.6577	130.2280	167.0240
2030	1.4269	4.0165	5.3518	25.4878	54.1660	86.4154	122.6016	130.0950	166.5622

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	150.8287	29.0253
2012	187.6790	59.9915
2013	277.9423	153.3848
2014	296.1742	174.5591
2015	278.8662	154.7017
2016	248.0021	120.7074
2017	214.0717	86.1196
2018	191.2217	64.2598
2019	178.9375	53.1218
2020	166.0598	44.3438
2021	158.2257	40.5570
2022	153.4934	39.0271

2023	150.6571	38.5016
2024	148.8982	38.3273
2025	147.7713	38.2669
2026	147.0183	38.2498
2027	146.5136	38.2885
2028	146.2562	38.3220
2029	146.1335	38.3179
2030	146.0997	38.2894

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	92.6845	106.5512	115.3871	129.9328	148.4419	170.0196	190.9173	202.1456	225.0032
2012	97.1316	115.6388	125.5626	148.0945	177.1356	215.9248	259.7037	289.8049	404.7484
2013	104.0300	128.2987	142.4978	180.9918	236.3776	333.0066	453.1777	558.7647	918.3434
2014	99.2684	126.4368	144.1479	184.5609	249.8564	357.6450	493.8440	613.7167	1027.6440
2015	94.8612	123.4219	141.5987	179.8905	239.9887	334.5507	452.9234	557.1102	916.4925
2016	91.6158	118.9718	136.4936	170.8501	220.8677	293.2544	384.7768	461.2690	730.6402
2017	87.2326	112.7246	128.5494	158.0799	198.3694	250.2609	313.7522	362.3228	538.0869
2018	83.4055	107.8984	121.7979	148.3999	182.4980	222.7473	267.3904	300.1556	409.7061
2019	80.9886	104.4587	117.9505	142.6811	173.5256	208.2678	243.8018	269.3220	340.9401
2020	77.3284	99.1961	111.9709	135.0693	163.0742	193.3262	222.8808	242.3656	286.4265
2021	74.4359	95.1298	107.4924	129.6635	156.2644	184.5549	211.6016	228.3550	261.1845
2022	72.0984	92.1662	104.3593	125.8656	151.6739	179.2047	205.0084	220.8409	249.6546
2023	70.0041	90.3847	102.0580	123.2831	148.9574	176.1412	201.4183	217.0036	245.9712
2024	68.8044	88.8593	100.4651	121.5532	147.3258	174.1893	199.5616	214.9559	243.4881
2025	67.8149	87.6147	99.4609	120.5498	146.2217	173.2026	198.2331	213.4453	242.3048
2026	66.8096	86.9200	98.7843	119.7936	145.3355	172.3130	197.5075	212.7910	241.4744
2027	66.5478	86.6848	98.0175	119.3566	144.7670	171.7959	196.8916	212.3810	242.1402
2028	66.5026	86.1683	97.8164	119.1393	144.5872	171.5007	196.7448	212.0145	241.9779
2029	66.1245	86.0895	97.6464	118.8487	144.4511	171.3225	196.8934	212.0136	240.8487
2030	66.3166	86.1444	97.8227	118.9163	144.4103	171.3096	196.7065	211.9370	240.7883

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	241.4378	75.2822
2012	286.7600	122.1680
2013	340.2668	178.6304
2014	347.7832	190.8804
2015	331.5151	172.1517
2016	300.1694	137.2198
2017	261.8325	98.3764
2018	236.0010	73.9138
2019	222.1091	61.5653
2020	207.5558	51.9254
2021	198.7430	47.8466
2022	193.3834	46.2042
2023	190.1254	45.6159
2024	188.1111	45.4382
2025	186.7950	45.3869
2026	185.9809	45.4152
2027	185.4437	45.4214
2028	185.1805	45.4278
2029	185.0289	45.4097
2030	184.9437	45.4205

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	131.1304	154.1617	167.1050	192.5695	226.6717	274.5460	328.7722	371.9217	527.4716
2012	133.5810	158.6819	175.0602	208.7559	256.5914	333.7777	425.2225	505.5595	784.5204
2013	132.8016	163.3271	182.4338	226.8535	292.7839	405.3257	543.4870	664.4667	1086.1150
2014	126.3433	159.2487	180.2838	225.8141	298.2061	416.2685	562.9562	693.2568	1140.2150
2015	122.8797	156.2290	177.7031	221.6928	289.3899	394.0933	525.5172	640.3017	1037.4100
2016	119.0781	151.9331	172.5962	212.2798	270.0380	352.6010	456.0552	541.4119	845.4932
2017	113.4335	144.9174	163.2543	197.9041	244.5001	303.6871	375.7720	430.5718	629.3054
2018	109.1231	138.6153	155.2901	186.6245	226.4173	272.8044	323.7372	361.2951	485.4420
2019	106.7869	134.8200	150.8974	180.0147	216.2369	256.3836	297.4006	326.6044	408.1062
2020	102.3595	128.7969	143.8963	171.4046	204.3574	239.9521	274.1634	296.8099	345.7802
2021	98.6798	123.9169	138.7183	165.0592	196.6115	229.9301	261.5363	281.0237	318.9089
2022	95.7399	120.4923	135.2203	160.7299	191.4850	223.8905	254.2727	272.5089	307.1242
2023	93.4482	118.1974	132.6313	157.7936	188.3736	220.2381	250.3973	268.5227	302.2161
2024	91.8440	116.4872	130.7202	155.9207	186.4766	218.1407	248.0626	266.2706	299.3915
2025	90.6077	115.3616	129.4170	154.7107	185.1411	217.0552	246.3425	264.3726	298.5826
2026	89.7612	114.7029	128.3702	154.0064	184.1683	215.9965	245.6460	263.8662	298.2341
2027	89.2604	113.8369	128.0677	153.4672	183.7531	215.4244	245.0250	263.3640	298.1888
2028	89.1696	113.5152	127.7589	153.1453	183.5272	215.0900	245.0583	263.0450	297.5106
2029	88.9891	113.5675	127.4984	152.8962	183.2830	215.0620	244.7360	262.8455	297.2411
2030	88.9637	113.2548	127.6326	152.5846	183.2719	214.9532	244.7008	262.6218	297.3733

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	252.0711	97.2263
2012	323.5981	164.1220
2013	357.5783	200.3852
2014	335.9210	180.1662
2015	313.1494	154.0591
2016	277.0805	116.0206
2017	243.9066	83.8628
2018	223.6958	65.9051
2019	211.5116	56.4086
2020	200.0468	49.9713
2021	193.1263	47.3745
2022	188.9236	46.3728
2023	186.3396	46.0315
2024	184.7142	45.9231
2025	183.6263	45.9030
2026	182.9673	45.9537
2027	182.5556	45.9630
2028	182.3894	45.9601
2029	182.2816	45.9212
2030	182.2047	45.9397

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	125.1571	146.5001	161.8841	190.1249	228.5435	290.5526	360.6917	421.7926	640.1861
2012	131.6763	159.8518	177.6305	219.1696	279.9067	384.6580	510.4974	621.4232	1006.5340
2013	128.3658	161.1737	182.0710	229.8129	304.5125	429.1200	584.7632	721.6311	1196.4890
2014	120.5922	154.4215	175.9098	220.8301	290.6780	401.2899	538.7994	660.3072	1078.4000

2015	117.9330	151.0837	172.5323	214.6056	277.4715	370.1120	487.2467	586.2843	935.4181
2016	113.5395	145.2547	164.8659	202.3142	253.9245	323.7265	410.2699	478.6283	724.4194
2017	107.5949	138.3176	155.5940	188.6140	231.4315	282.9116	342.2822	386.3872	539.5599
2018	103.7444	132.4261	148.8603	179.0873	216.6199	259.3793	303.4057	335.6076	429.4016
2019	100.5779	128.0753	144.0929	172.5266	207.2413	245.1169	282.2360	307.9389	370.8118
2020	96.9791	122.8571	137.9532	165.0366	197.4599	231.9637	265.1602	286.1910	328.2998
2021	93.6412	118.6354	133.5855	159.8732	191.0725	224.2605	255.4283	274.5831	310.5739
2022	90.9027	115.8431	130.4883	155.9797	187.1042	219.6082	250.1335	268.7254	303.3046
2023	89.3428	113.8161	128.2478	153.5525	184.5716	216.7419	247.1421	265.4595	299.0790
2024	87.5792	112.4656	126.7732	152.2000	182.9450	215.2511	245.1975	263.4488	297.1874
2025	86.6731	111.3610	125.7279	151.1914	181.7493	214.0592	244.0213	262.3179	296.9855
2026	85.9135	110.8290	124.8034	150.5490	181.0657	213.3244	243.1457	261.7987	297.0174
2027	85.8289	110.0914	124.4313	150.0717	180.7333	212.8710	243.0710	261.2334	296.5952
2028	85.7916	109.9728	124.2929	149.8629	180.5725	212.6245	243.0037	260.9970	296.2423
2029	85.5463	110.0736	124.2097	149.7815	180.5376	212.6572	242.4661	261.0954	295.3833
2030	85.4893	109.7190	124.2528	149.7095	180.4099	212.6084	242.6969	260.6733	294.9327

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	18.3850	0.0000
2012	15.6970	0.0000
2013	38.6593	14.2334
2014	41.0530	20.3817
2015	51.8884	31.0663
2016	54.2595	31.8970
2017	44.5467	21.6179
2018	38.6137	15.4240
2019	35.0231	11.8055
2020	31.6511	9.0252
2021	29.5996	7.7229
2022	28.3510	7.1636
2023	27.5977	6.9473
2024	27.1412	6.8654
2025	26.8650	6.8454
2026	26.6877	6.8424
2027	26.5635	6.8407
2028	26.4876	6.8442
2029	26.4379	6.8467
2030	26.4194	6.8486

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850
2012	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970
2013	18.2897	22.2930	24.7776	29.4363	35.7830	44.9030	55.2030	63.6397	93.9179
2014	16.9399	20.5925	22.8604	28.0834	35.6985	48.6561	64.2977	77.8484	125.5471
2015	17.2860	21.9981	24.9899	32.0386	43.6056	62.7279	86.9385	108.5305	181.9901
2016	17.6911	22.9639	26.4059	33.8452	46.0480	65.4849	90.0377	111.8603	186.4170
2017	16.5717	21.4462	24.5755	30.7312	39.6810	52.6649	69.0335	82.7138	131.1077
2018	15.8906	20.4661	23.2820	28.5881	35.8003	45.0687	56.4094	65.1879	96.6061
2019	15.4063	19.8196	22.3727	27.1525	33.3583	40.7236	49.0012	55.0418	75.5615
2020	14.6672	18.7499	21.1076	25.4464	30.7966	36.8034	42.8436	47.0377	58.3225
2021	14.0008	17.8417	20.1214	24.1680	29.1190	34.4486	39.5911	42.8809	50.0604
2022	13.5211	17.2025	19.3587	23.2848	28.0069	33.0412	37.7918	40.7285	46.3379

2023	13.1457	16.6600	18.8304	22.6913	27.2701	32.1780	36.7764	39.5940	44.7227
2024	12.7417	16.3749	18.4917	22.2518	26.8509	31.6767	36.2394	38.9712	44.0028
2025	12.5499	16.1512	18.2513	21.9746	26.5786	31.3989	35.9466	38.6762	43.6744
2026	12.3840	15.9663	18.0402	21.7917	26.3871	31.2437	35.7238	38.4549	43.5516
2027	12.2150	15.8410	17.9277	21.7022	26.2747	31.1067	35.5996	38.3521	43.4910
2028	12.1568	15.7972	17.8328	21.6599	26.1657	31.0086	35.4734	38.2956	43.5032
2029	12.1764	15.6817	17.7895	21.5812	26.1336	30.9430	35.4428	38.2313	43.4914
2030	12.1737	15.6801	17.7702	21.5413	26.1102	30.9358	35.4773	38.1569	43.3905

Landings x 1000 MT

Year	Average	StdDev
2011	18.3850	0.0000
2012	15.6970	0.0000
2013	38.6593	14.2334
2014	41.0530	20.3817
2015	51.8884	31.0663
2016	54.2595	31.8970
2017	44.5467	21.6179
2018	38.6137	15.4240
2019	35.0231	11.8055
2020	31.6511	9.0252
2021	29.5996	7.7229
2022	28.3510	7.1636
2023	27.5977	6.9473
2024	27.1412	6.8654
2025	26.8650	6.8454
2026	26.6877	6.8424
2027	26.5635	6.8407
2028	26.4876	6.8442
2029	26.4379	6.8467
2030	26.4194	6.8486

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850	18.3850
2012	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970	15.6970
2013	18.2897	22.2930	24.7776	29.4363	35.7830	44.9030	55.2030	63.6397	93.9179
2014	16.9399	20.5925	22.8604	28.0834	35.6985	48.6561	64.2977	77.8484	125.5471
2015	17.2860	21.9981	24.9899	32.0386	43.6056	62.7279	86.9385	108.5305	181.9901
2016	17.6911	22.9639	26.4059	33.8452	46.0480	65.4849	90.0377	111.8603	186.4170
2017	16.5717	21.4462	24.5755	30.7312	39.6810	52.6649	69.0335	82.7138	131.1077
2018	15.8906	20.4661	23.2820	28.5881	35.8003	45.0687	56.4094	65.1879	96.6061
2019	15.4063	19.8196	22.3727	27.1525	33.3583	40.7236	49.0012	55.0418	75.5615
2020	14.6672	18.7499	21.1076	25.4464	30.7966	36.8034	42.8436	47.0377	58.3225
2021	14.0008	17.8417	20.1214	24.1680	29.1190	34.4486	39.5911	42.8809	50.0604
2022	13.5211	17.2025	19.3587	23.2848	28.0069	33.0412	37.7918	40.7285	46.3379
2023	13.1457	16.6600	18.8304	22.6913	27.2701	32.1780	36.7764	39.5940	44.7227
2024	12.7417	16.3749	18.4917	22.2518	26.8509	31.6767	36.2394	38.9712	44.0028
2025	12.5499	16.1512	18.2513	21.9746	26.5786	31.3989	35.9466	38.6762	43.6744
2026	12.3840	15.9663	18.0402	21.7917	26.3871	31.2437	35.7238	38.4549	43.5516
2027	12.2150	15.8410	17.9277	21.7022	26.2747	31.1067	35.5996	38.3521	43.4910
2028	12.1568	15.7972	17.8328	21.6599	26.1657	31.0086	35.4734	38.2956	43.5032
2029	12.1764	15.6817	17.7895	21.5812	26.1336	30.9430	35.4428	38.2313	43.4914
2030	12.1737	15.6801	17.7702	21.5413	26.1102	30.9358	35.4773	38.1569	43.3905

Total Fishing Mortality

Year	Average	StdDev
2011	0.1428	0.0308
2012	0.1348	0.0326
2013	0.2925	0.0000
2014	0.2925	0.0000
2015	0.2925	0.0000
2016	0.2925	0.0000
2017	0.2925	0.0000
2018	0.2925	0.0000
2019	0.2925	0.0000
2020	0.2925	0.0000
2021	0.2925	0.0000
2022	0.2925	0.0000
2023	0.2925	0.0000
2024	0.2925	0.0000
2025	0.2925	0.0000
2026	0.2925	0.0000
2027	0.2925	0.0000
2028	0.2925	0.0000
2029	0.2925	0.0000
2030	0.2925	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.0882	0.0997	0.1063	0.1202	0.1389	0.1615	0.1827	0.1981	0.2320
2012	0.0816	0.0904	0.0980	0.1116	0.1305	0.1517	0.1777	0.1931	0.2281
2013	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2014	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2015	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2016	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2017	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2018	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2019	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2020	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2021	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2022	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2023	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2024	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2025	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2026	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2027	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2028	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2029	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925
2030	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925	0.2925

Probability Spawning Stock Biomass Exceeds Threshold 62.450 (1000 MT)

Year	Probability
2011	1.000000
2012	0.999000
2013	1.000000

2014	0.999930
2015	0.999720
2016	0.999600
2017	0.999050
2018	0.998610
2019	0.998500
2020	0.997830
2021	0.997140
2022	0.996210
2023	0.995590
2024	0.994570
2025	0.994120
2026	0.993500
2027	0.993480
2028	0.993290
2029	0.993310
2030	0.993480

Probability Threshold Exceeded at Least Once = 1.0000

Probability Total Fishing Mortality Exceeds Threshold 0.3900

Year	Probability
2011	0.000000
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.0000

Gulf of Maine Haddock

AGEPRO VERSION 4.1

Gulf of Maine haddock 2012 update

Date & Time of Run: 04 May 2012 14:18

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GOM_HADDOCK\2012_UPDATE\GOM_HADDOCK_696IN2011_727IN2012_75%FMSY.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 20
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 100

Bootstrap File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GOM_HADDOCK\2012_UPDATE\GOM_HADDOCK_VPA_2012_FINAL_BOOTS.BSN

Number of Feasible Solutions: 99904 of 100000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Removals	696
2012	Removals	727
2013	F-Mult	0.3450
2014	F-Mult	0.3450
2015	F-Mult	0.3450
2016	F-Mult	0.3450
2017	F-Mult	0.3450
2018	F-Mult	0.3450
2019	F-Mult	0.3450
2020	F-Mult	0.3450
2021	F-Mult	0.3450
2022	F-Mult	0.3450
2023	F-Mult	0.3450
2024	F-Mult	0.3450
2025	F-Mult	0.3450
2026	F-Mult	0.3450
2027	F-Mult	0.3450
2028	F-Mult	0.3450
2029	F-Mult	0.3450
2030	F-Mult	0.3450

Recruits 1000 Fish

Year Class	Average	StdDev
2011	2797.8164	3298.4744

2012	2795.4337	3282.3285
2013	2812.0059	3330.7047
2014	2785.9732	3285.0410
2015	2803.5528	3292.8715
2016	2781.0831	3270.9798
2017	2802.1765	3292.2741
2018	2778.1947	3269.0074
2019	2778.3539	3275.2342
2020	2795.3273	3291.8154
2021	2783.6871	3272.6621
2022	2796.7205	3285.6949
2023	2791.5677	3292.9655
2024	2813.8109	3315.7971
2025	2801.7481	3288.5893
2026	2787.6040	3273.3480
2027	2795.1566	3293.6834
2028	2807.0054	3305.2290
2029	2801.1599	3296.5139
2030	2802.1343	3322.1634

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	106.9115	208.2426	396.9382	916.000	1467.2775	3973.0590	6749.3780	9169.3350	15973.880
2012	107.2121	206.3719	389.0553	916.000	1467.2215	3976.6510	6753.5260	8898.4240	15961.370
2013	105.2082	204.1281	383.7448	916.000	1466.2365	3975.6100	6761.9120	9546.5380	16013.000
2014	105.7144	206.6380	382.2811	916.000	1466.4005	3972.0250	6746.2010	8951.9180	15964.280
2015	106.0619	205.9608	396.0084	916.000	1474.0735	3976.1690	6749.6750	9008.3080	15980.190
2016	107.4179	207.4155	387.9743	916.000	1466.3035	3969.6290	6735.5340	8903.8540	15967.830
2017	106.9836	211.3873	395.6702	916.000	1472.6740	3976.6630	6751.1190	9002.9960	15965.390
2018	105.1022	206.2869	391.0127	916.000	1468.6940	3968.1410	6728.3020	8581.0460	15973.620
2019	106.0807	206.7894	385.2970	916.000	1465.5510	3968.2670	6736.3470	8868.1060	15945.160
2020	107.2892	209.0162	392.8875	916.000	1469.3505	3971.8770	6751.0050	9053.6250	15971.820
2021	104.5025	205.7006	395.0759	916.000	1470.7565	3970.3480	6746.4050	8729.0360	15958.500
2022	105.9710	205.9123	382.3269	916.000	1473.2885	3975.5920	6749.5440	8797.1070	15983.000
2023	107.2154	209.0857	395.0791	916.000	1459.8935	3974.4900	6743.3000	9008.6500	15990.660
2024	107.1266	209.4197	409.7412	916.000	1474.7075	3976.9920	6768.8920	9351.7070	15979.750
2025	106.9713	206.6156	396.7266	916.000	1470.2300	3977.0800	6760.7960	8989.6530	15973.230
2026	106.1823	207.0781	389.2403	916.000	1469.2540	3972.9410	6747.1760	8835.8740	15943.130
2027	106.0891	210.3785	399.9581	916.000	1466.8820	3972.0820	6741.0310	8970.7200	15983.650
2028	106.5353	209.7812	387.8760	916.000	1468.8755	3978.3220	6763.3060	9288.9770	15965.950
2029	105.3359	206.7320	387.2531	916.000	1473.8640	3976.0290	6767.1330	8998.2260	15974.570
2030	104.6988	207.1955	398.3488	916.000	1466.3970	3970.3760	6759.6850	9439.6820	16002.290

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	2.7742	4.0564
2012	2.2513	3.3486
2013	2.0957	2.5490
2014	2.7214	1.8957
2015	3.6285	2.1202
2016	4.4510	2.4332
2017	5.1041	2.6461
2018	5.5588	2.7408
2019	5.8406	2.7748

2020	6.0187	2.7920
2021	6.1178	2.7980
2022	6.1713	2.7966
2023	6.2045	2.7948
2024	6.2239	2.7981
2025	6.2375	2.8022
2026	6.2482	2.8043
2027	6.2606	2.8077
2028	6.2695	2.8105
2029	6.2708	2.8029
2030	6.2709	2.7988

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.0956	1.3280	1.4725	1.7371	2.1268	2.6758	3.5570	4.9194	12.3546
2012	0.6436	0.8733	1.0527	1.3190	1.7108	2.2746	3.0383	4.1839	9.9576
2013	0.6971	0.9082	1.0383	1.3179	1.6879	2.1962	2.8572	3.8574	8.4884
2014	1.0389	1.2835	1.4325	1.7359	2.2277	3.1243	4.2516	5.9763	8.1073
2015	1.2500	1.5541	1.7450	2.1642	3.0247	4.3646	6.4537	8.3077	10.7193
2016	1.4197	1.7881	2.0365	2.6302	3.8478	5.4673	8.0859	9.4422	12.1120
2017	1.5612	2.0066	2.3207	3.1344	4.4735	6.4386	8.9659	10.3283	13.2968
2018	1.7020	2.2171	2.5928	3.5280	4.9335	7.0233	9.4699	10.9110	13.9114
2019	1.8173	2.3906	2.8112	3.7870	5.2485	7.3385	9.7719	11.2187	14.2518
2020	1.9293	2.5257	2.9686	3.9523	5.4378	7.5188	9.9580	11.4173	14.4499
2021	1.9907	2.6157	3.0541	4.0512	5.5362	7.6291	10.0643	11.5140	14.5820
2022	2.0448	2.6664	3.1114	4.1055	5.5896	7.6774	10.1182	11.5584	14.6333
2023	2.0784	2.6984	3.1410	4.1375	5.6282	7.7113	10.1480	11.6095	14.5927
2024	2.0979	2.7169	3.1547	4.1575	5.6464	7.7337	10.1682	11.6594	14.6622
2025	2.1004	2.7218	3.1752	4.1737	5.6589	7.7397	10.1619	11.6207	14.7555
2026	2.1130	2.7300	3.1871	4.1841	5.6660	7.7466	10.1931	11.6520	14.7866
2027	2.1186	2.7516	3.1994	4.1856	5.6630	7.7960	10.2242	11.7015	14.6993
2028	2.1302	2.7522	3.1959	4.1984	5.6710	7.7830	10.2234	11.7151	14.7325
2029	2.1424	2.7509	3.1944	4.2003	5.6878	7.7912	10.2064	11.6948	14.7879
2030	2.1286	2.7493	3.2075	4.1976	5.6842	7.7978	10.2263	11.6721	14.7342

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	3.4293	4.2662
2012	3.1779	3.5385
2013	3.2415	3.0419
2014	4.0776	2.4800
2015	5.0777	2.6709
2016	5.9946	2.9784
2017	6.7229	3.1875
2018	7.2435	3.2936
2019	7.5660	3.3336
2020	7.7679	3.3520
2021	7.8810	3.3559
2022	7.9447	3.3554
2023	7.9833	3.3572
2024	8.0064	3.3612
2025	8.0242	3.3646
2026	8.0387	3.3669
2027	8.0511	3.3695

2028	8.0581	3.3676
2029	8.0610	3.3606
2030	8.0634	3.3599

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.6368	1.8813	2.0487	2.3106	2.7396	3.3635	4.3662	5.7418	13.3852
2012	1.3577	1.6271	1.7978	2.1346	2.6192	3.2759	4.1549	5.4608	12.0214
2013	1.1653	1.4729	1.6753	2.0792	2.7022	3.5337	4.8874	6.1026	10.7422
2014	1.5111	1.8717	2.1036	2.6008	3.4507	4.8163	6.5186	8.5591	11.8722
2015	1.7873	2.2169	2.5071	3.1710	4.4075	6.1180	8.8350	10.5922	13.6835
2016	2.0149	2.5317	2.8993	3.7870	5.3082	7.3715	10.3609	11.9471	15.1972
2017	2.1982	2.8199	3.2730	4.3594	6.0057	8.4070	11.2757	12.9242	16.4086
2018	2.3700	3.0846	3.6179	4.8030	6.5518	9.0619	11.8687	13.5915	17.0814
2019	2.5296	3.3104	3.8626	5.0983	6.8993	9.4344	12.2292	13.9573	17.5397
2020	2.6635	3.4711	4.0395	5.2878	7.1161	9.6385	12.4608	14.1995	17.7826
2021	2.7471	3.5715	4.1484	5.3989	7.2286	9.7651	12.5679	14.2777	17.8471
2022	2.8033	3.6289	4.2135	5.4637	7.2959	9.8226	12.6411	14.3488	17.9927
2023	2.8332	3.6677	4.2433	5.4961	7.3360	9.8665	12.6976	14.4105	17.9365
2024	2.8698	3.6821	4.2684	5.5270	7.3555	9.8721	12.7069	14.4511	18.0517
2025	2.8683	3.6985	4.2978	5.5424	7.3763	9.8921	12.7263	14.4438	18.1065
2026	2.8887	3.7239	4.3019	5.5507	7.3672	9.9243	12.7526	14.4742	18.0638
2027	2.8927	3.7289	4.3157	5.5649	7.3806	9.9541	12.7577	14.5134	17.9811
2028	2.9205	3.7267	4.3168	5.5755	7.3996	9.9348	12.7519	14.5187	18.1242
2029	2.8993	3.7385	4.3250	5.5777	7.4079	9.9521	12.7611	14.4740	18.1148
2030	2.9138	3.7314	4.3272	5.5880	7.4145	9.9543	12.7451	14.4913	18.0739

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	3.2374	3.8862
2012	3.1481	3.2644
2013	3.7631	2.7548
2014	4.7643	2.7191
2015	5.7244	2.9741
2016	6.5556	3.2261
2017	7.1952	3.3801
2018	7.6070	3.4434
2019	7.8672	3.4727
2020	8.0186	3.4814
2021	8.1042	3.4805
2022	8.1549	3.4806
2023	8.1850	3.4858
2024	8.2042	3.4896
2025	8.2209	3.4921
2026	8.2368	3.4969
2027	8.2460	3.4961
2028	8.2485	3.4882
2029	8.2514	3.4854
2030	8.2561	3.4890

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.4410	1.6913	1.8792	2.1649	2.6046	3.2455	4.1065	5.5508	12.1315

2012	1.2094	1.5083	1.6977	2.0739	2.6201	3.3276	4.4032	5.5384	11.1341
2013	1.3522	1.6919	1.9097	2.3586	3.0936	4.3611	5.9344	8.0744	11.3952
2014	1.6415	2.0495	2.3095	2.9050	4.0651	5.6803	8.3087	10.2832	13.9859
2015	1.9030	2.3814	2.7177	3.5182	5.0211	7.0178	10.1239	11.7269	15.1498
2016	2.1114	2.6916	3.1078	4.1601	5.7943	8.2291	11.1982	12.8673	16.4438
2017	2.2934	2.9734	3.4908	4.6965	6.4401	9.0770	11.9693	13.7005	17.3340
2018	2.4665	3.2236	3.7833	5.0561	6.8993	9.5491	12.4410	14.1810	17.8963
2019	2.6120	3.4266	4.0090	5.2960	7.1819	9.8238	12.7121	14.5045	18.2721
2020	2.7093	3.5545	4.1397	5.4437	7.3384	9.9783	12.8800	14.6525	18.4135
2021	2.7810	3.6274	4.2372	5.5320	7.4187	10.0713	12.9612	14.7104	18.5175
2022	2.8335	3.6833	4.2835	5.5777	7.4724	10.1187	13.0345	14.7848	18.4655
2023	2.8715	3.7156	4.3068	5.6094	7.4999	10.1450	13.0560	14.8354	18.5481
2024	2.8866	3.7190	4.3218	5.6365	7.5262	10.1637	13.0640	14.8229	18.6784
2025	2.8870	3.7336	4.3475	5.6390	7.5373	10.1853	13.0877	14.8748	18.7145
2026	2.9054	3.7542	4.3637	5.6500	7.5299	10.2330	13.1229	14.9192	18.6069
2027	2.9160	3.7561	4.3606	5.6708	7.5497	10.2124	13.1158	14.9362	18.6821
2028	2.9271	3.7658	4.3643	5.6701	7.5614	10.2403	13.1120	14.8824	18.6601
2029	2.9089	3.7635	4.3761	5.6776	7.5619	10.2203	13.1160	14.8880	18.6082
2030	2.9011	3.7616	4.3719	5.6792	7.5743	10.2303	13.1052	14.9112	18.5844

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	0.6960	0.0000
2012	0.7264	0.0213
2013	0.4137	0.7656
2014	0.4153	0.4584
2015	0.5083	0.3212
2016	0.7029	0.4056
2017	0.8586	0.4588
2018	1.0018	0.5160
2019	1.0920	0.5355
2020	1.1471	0.5432
2021	1.1776	0.5449
2022	1.1959	0.5467
2023	1.2048	0.5457
2024	1.2106	0.5458
2025	1.2142	0.5464
2026	1.2162	0.5466
2027	1.2187	0.5476
2028	1.2204	0.5477
2029	1.2226	0.5487
2030	1.2228	0.5474

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960
2012	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270
2013	0.0710	0.1094	0.1445	0.2011	0.2896	0.4165	0.5855	0.8436	2.2095
2014	0.1347	0.1782	0.2056	0.2622	0.3414	0.4449	0.5879	0.7634	1.5637
2015	0.2140	0.2587	0.2873	0.3446	0.4345	0.5765	0.7668	1.0017	1.4032
2016	0.2455	0.3061	0.3443	0.4275	0.5861	0.8538	1.1794	1.6112	2.1028
2017	0.2883	0.3600	0.4081	0.5211	0.7398	1.0561	1.5090	1.8441	2.3335
2018	0.3139	0.4018	0.4646	0.6193	0.8791	1.2473	1.7462	2.0480	2.5923
2019	0.3388	0.4416	0.5168	0.6963	0.9721	1.3670	1.8544	2.1521	2.7260

2020	0.3619	0.4755	0.5581	0.7459	1.0324	1.4333	1.9133	2.2144	2.8025
2021	0.3820	0.5003	0.5856	0.7758	1.0659	1.4619	1.9457	2.2440	2.8284
2022	0.3942	0.5155	0.6019	0.7933	1.0834	1.4832	1.9675	2.2683	2.8549
2023	0.4044	0.5245	0.6115	0.8027	1.0923	1.4923	1.9719	2.2718	2.8689
2024	0.4097	0.5308	0.6168	0.8077	1.0981	1.4966	1.9768	2.2828	2.8592
2025	0.4129	0.5341	0.6201	0.8102	1.1027	1.5006	1.9856	2.2894	2.8671
2026	0.4136	0.5360	0.6217	0.8141	1.1044	1.5015	1.9830	2.2838	2.8871
2027	0.4148	0.5375	0.6253	0.8168	1.1073	1.5039	1.9879	2.2884	2.8993
2028	0.4164	0.5403	0.6268	0.8167	1.1053	1.5126	1.9888	2.3018	2.8804
2029	0.4195	0.5418	0.6269	0.8199	1.1071	1.5082	1.9952	2.2965	2.8825
2030	0.4208	0.5407	0.6260	0.8194	1.1098	1.5107	1.9888	2.2991	2.8977

Landings x 1000 MT

Year	Average	StdDev
2011	0.6960	0.0000
2012	0.7264	0.0213
2013	0.4137	0.7656
2014	0.4153	0.4584
2015	0.5083	0.3212
2016	0.7029	0.4056
2017	0.8586	0.4588
2018	1.0018	0.5160
2019	1.0920	0.5355
2020	1.1471	0.5432
2021	1.1776	0.5449
2022	1.1959	0.5467
2023	1.2048	0.5457
2024	1.2106	0.5458
2025	1.2142	0.5464
2026	1.2162	0.5466
2027	1.2187	0.5476
2028	1.2204	0.5477
2029	1.2226	0.5487
2030	1.2228	0.5474

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960	0.6960
2012	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270	0.7270
2013	0.0710	0.1094	0.1445	0.2011	0.2896	0.4165	0.5855	0.8436	2.2095
2014	0.1347	0.1782	0.2056	0.2622	0.3414	0.4449	0.5879	0.7634	1.5637
2015	0.2140	0.2587	0.2873	0.3446	0.4345	0.5765	0.7668	1.0017	1.4032
2016	0.2455	0.3061	0.3443	0.4275	0.5861	0.8538	1.1794	1.6112	2.1028
2017	0.2883	0.3600	0.4081	0.5211	0.7398	1.0561	1.5090	1.8441	2.3335
2018	0.3139	0.4018	0.4646	0.6193	0.8791	1.2473	1.7462	2.0480	2.5923
2019	0.3388	0.4416	0.5168	0.6963	0.9721	1.3670	1.8544	2.1521	2.7260
2020	0.3619	0.4755	0.5581	0.7459	1.0324	1.4333	1.9133	2.2144	2.8025
2021	0.3820	0.5003	0.5856	0.7758	1.0659	1.4619	1.9457	2.2440	2.8284
2022	0.3942	0.5155	0.6019	0.7933	1.0834	1.4832	1.9675	2.2683	2.8549
2023	0.4044	0.5245	0.6115	0.8027	1.0923	1.4923	1.9719	2.2718	2.8689
2024	0.4097	0.5308	0.6168	0.8077	1.0981	1.4966	1.9768	2.2828	2.8592
2025	0.4129	0.5341	0.6201	0.8102	1.1027	1.5006	1.9856	2.2894	2.8671
2026	0.4136	0.5360	0.6217	0.8141	1.1044	1.5015	1.9830	2.2838	2.8871
2027	0.4148	0.5375	0.6253	0.8168	1.1073	1.5039	1.9879	2.2884	2.8993

2028	0.4164	0.5403	0.6268	0.8167	1.1053	1.5126	1.9888	2.3018	2.8804
2029	0.4195	0.5418	0.6269	0.8199	1.1071	1.5082	1.9952	2.2965	2.8825
2030	0.4208	0.5407	0.6260	0.8194	1.1098	1.5107	1.9888	2.2991	2.8977

Total Fishing Mortality

Year	Average	StdDev
2011	0.5122	0.2125
2012	0.8581	0.5572
2013	0.3450	0.0000
2014	0.3450	0.0000
2015	0.3450	0.0000
2016	0.3450	0.0000
2017	0.3450	0.0000
2018	0.3450	0.0000
2019	0.3450	0.0000
2020	0.3450	0.0000
2021	0.3450	0.0000
2022	0.3450	0.0000
2023	0.3450	0.0000
2024	0.3450	0.0000
2025	0.3450	0.0000
2026	0.3450	0.0000
2027	0.3450	0.0000
2028	0.3450	0.0000
2029	0.3450	0.0000
2030	0.3450	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.0594	0.1746	0.2561	0.3791	0.4964	0.6315	0.7856	0.8831	1.1198
2012	0.0762	0.2270	0.3504	0.5172	0.7396	1.0508	1.4765	1.8522	3.1462
2013	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2014	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2015	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2016	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2017	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2018	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2019	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2020	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2021	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2022	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2023	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2024	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2025	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2026	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2027	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2028	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2029	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450
2030	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450	0.3450

Probability Spawning Stock Biomass Exceeds Threshold 4.904 (1000 MT)

Year Probability

2011	0.052000
2012	0.040490
2013	0.032690
2014	0.071450
2015	0.184300
2016	0.315630
2017	0.426130
2018	0.505130
2019	0.555290
2020	0.587060
2021	0.604140
2022	0.611770
2023	0.619150
2024	0.623380
2025	0.624970
2026	0.625500
2027	0.626800
2028	0.629140
2029	0.630290
2030	0.629990

Probability Threshold Exceeded at Least Once = 0.9596

Probability Jan-1 Stock Biomass Exceeds Threshold 4.904 (1000 MT)

Year	Probability
2011	0.066000
2012	0.061170
2013	0.099170
2014	0.237740
2015	0.418160
2016	0.564690
2017	0.667890
2018	0.735640
2019	0.775870
2020	0.800650
2021	0.814240
2022	0.822600
2023	0.827130
2024	0.829830
2025	0.831640
2026	0.834100
2027	0.835130
2028	0.835200
2029	0.835220
2030	0.836050

Probability Threshold Exceeded at Least Once = 0.9917

Probability Mean Biomass Exceeds Threshold 4.904 (1000 MT)

Year	Probability
2011	0.063000
2012	0.071840

2013	0.177250
2014	0.360510
2015	0.519800
2016	0.638760
2017	0.720870
2018	0.770910
2019	0.800300
2020	0.817670
2021	0.827980
2022	0.834180
2023	0.836710
2024	0.839010
2025	0.841680
2026	0.843160
2027	0.843100
2028	0.844080
2029	0.844850
2030	0.844760

Probability Threshold Exceeded at Least Once = 0.9943

Probability Total Fishing Mortality Exceeds Threshold 0.4600

Year	Probability
2011	0.588500
2012	0.812910
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.8138

Southern New England Yellowtail Flounder

AGEPRO VERSION 4.1

ASAP_RUN26_SNEMA_SARC54_Agepro_Panel_Rec_Two_Stanzas

Date & Time of Run: 10 Sep 2012 15:00

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\SNEYT\ASAP_RUN26_75FMSY_RECENT_700IN2013_PDT12CAT634.INP

First Age Class: 1
Number of Age Classes: 6
Number of Years in Projection: 19
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name: C:\NIT\GARM_2012_UPDATE_PROJ\SNEYT\RUN26_MCMC1_REVISED.BSN

Number of Feasible Solutions: 9999 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Removals	634
2013	Removals	700
2014	Removals	700
2015	Removals	700
2016	Removals	700
2017	Removals	700
2018	Removals	700
2019	Removals	700
2020	Removals	700
2021	Removals	700
2022	Removals	700
2023	Removals	700
2024	Removals	700
2025	Removals	700
2026	Removals	700
2027	Removals	700
2028	Removals	700
2029	Removals	700
2030	Removals	700

Recruits 1 Fish

Year Class	Average	StdDev
2012	6006163.2421	2405683.3379
2013	5967403.9961	2393290.9254
2014	5992378.2384	2404526.2158
2015	6025341.2905	2424612.0352

2016	6009569.9509	2397755.1403
2017	6002245.8511	2408461.4576
2018	5993302.2278	2407799.3348
2019	5979694.9943	2435956.9948
2020	5995379.5906	2397963.1675
2021	6000807.4711	2410340.6717
2022	6016511.7220	2410178.0976
2023	6011104.0418	2409539.6123
2024	5996865.6416	2426969.9349
2025	6031209.4373	2410373.3483
2026	6012226.8692	2404524.6792
2027	5999828.8792	2411908.1945
2028	5980070.1710	2397887.7416
2029	6008591.9022	2405586.1895
2030	6008461.6998	2415443.5809

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1943898.00	2067138.0	3248775.0	3968334	5840541.0	7951956.0	9414015	10011340	11168760
2013	1942370.00	2056803.0	3180687.0	3965151	5804267.5	7930796.0	9323988	10008690	11193490
2014	1938993.00	2083574.0	3241175.0	3961370	5777230.0	7948677.0	9472843	10027870	11141030
2015	1946576.00	2134914.0	3248121.0	3950943	5875216.0	7954118.0	9526848	10140790	11226320
2016	1944835.00	2127714.0	3250115.0	3964941	5869478.5	7953061.0	9370136	10016250	11164520
2017	1939933.00	2120111.0	3252258.0	3986663	5784401.5	7948674.0	9462285	10112490	11185320
2018	1941555.00	2088791.0	3249224.0	3951763	5786343.5	7950875.0	9486999	10019550	11165580
2019	1943821.00	2062897.0	3113830.0	3915432	5810020.0	7951401.0	9484445	10066300	11180080
2020	1940554.00	2064251.0	3221856.0	3999760	5796234.5	7946795.0	9423655	9999043	11153270
2021	1937949.00	2067512.0	3230486.0	3947127	5860139.5	7952547.0	9407058	10015170	11165840
2022	1947040.00	2106091.0	3248068.0	3963169	5897860.5	7952341.0	9482798	10076370	11182820
2023	1943607.00	2066946.0	3250065.0	3980738	5786524.0	7954244.0	9516591	10007840	11140750
2024	1937686.00	2067261.0	3136260.0	3935418	5871816.5	7947194.0	9438348	10150190	11191220
2025	1939877.00	2135331.0	3251834.0	3980509	5871834.0	7954139.0	9488636	10097240	11116600
2026	1935559.00	2062880.0	3249780.0	3967948	5893996.0	7951230.0	9400758	10031830	11147370
2027	1942779.00	2063254.0	3189097.0	3958262	5818195.5	7952692.0	9382039	10025230	11141330
2028	1939487.00	2066458.0	3251866.0	3944373	5795253.5	7953223.0	9386063	9971312	11125960
2029	1943299.00	2164183.0	3247610.0	3953691	5825803.5	7951366.0	9376537	10054910	11174760
2030	1938747.00	2084889.0	3250722.0	3959676	5869812.0	7954192.0	9486932	10031760	11153260

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	3.9324	0.5490
2013	4.0116	0.7026
2014	4.2275	0.9616
2015	4.1971	0.9800
2016	4.0951	0.9782
2017	4.0691	1.0065
2018	3.9814	0.9572
2019	3.9072	0.9316
2020	3.8449	0.9154
2021	3.7915	0.8996
2022	3.7457	0.8908
2023	3.7087	0.8856
2024	3.6786	0.8804
2025	3.6543	0.8771

2026	3.6331	0.8763
2027	3.6161	0.8779
2028	3.6038	0.8784
2029	3.5910	0.8808
2030	3.5775	0.8816

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.7424	3.0346	3.2409	3.5478	3.9084	4.2908	4.6447	4.8854	5.2434
2013	2.5551	2.9475	3.1661	3.5218	3.9551	4.4338	4.9837	5.2566	5.7890
2014	2.4086	2.8698	3.1161	3.5496	4.1029	4.7851	5.5371	6.0045	6.8592
2015	2.3005	2.7592	3.0223	3.4938	4.0925	4.7978	5.5072	5.9938	6.8679
2016	2.1534	2.6130	2.9003	3.4102	4.0102	4.7102	5.3920	5.8258	6.6756
2017	2.0465	2.5453	2.8367	3.3762	3.9852	4.7074	5.3991	5.8503	6.7072
2018	1.9506	2.4813	2.7876	3.3145	3.9308	4.6163	5.2296	5.6458	6.3712
2019	1.8688	2.4402	2.7461	3.2481	3.8769	4.5387	5.1149	5.4925	6.1649
2020	1.8294	2.3737	2.6834	3.2156	3.8171	4.4549	5.0348	5.3902	6.0034
2021	1.7893	2.3493	2.6633	3.1667	3.7721	4.3923	4.9619	5.2868	5.9140
2022	1.7114	2.3224	2.6233	3.1162	3.7367	4.3445	4.9004	5.2341	5.8602
2023	1.7056	2.2822	2.5897	3.0871	3.6890	4.3045	4.8658	5.1869	5.7979
2024	1.7017	2.2600	2.5478	3.0660	3.6672	4.2734	4.8316	5.1302	5.7519
2025	1.6508	2.2143	2.5346	3.0479	3.6483	4.2435	4.8006	5.1236	5.6941
2026	1.6431	2.1969	2.5079	3.0314	3.6269	4.2208	4.7726	5.0882	5.6742
2027	1.6257	2.1708	2.4895	3.0151	3.6097	4.2200	4.7456	5.0862	5.6846
2028	1.5919	2.1609	2.4916	2.9993	3.5925	4.2010	4.7335	5.0529	5.6661
2029	1.5613	2.1494	2.4615	2.9924	3.5916	4.1871	4.7235	5.0501	5.6718
2030	1.5788	2.1338	2.4525	2.9726	3.5800	4.1755	4.7094	5.0226	5.6541

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	5.3447	0.7748
2013	5.4362	0.9038
2014	5.5512	1.0462
2015	5.5407	1.0764
2016	5.4298	1.0688
2017	5.4169	1.1172
2018	5.3192	1.0711
2019	5.2369	1.0403
2020	5.1673	1.0182
2021	5.1098	1.0036
2022	5.0613	0.9948
2023	5.0224	0.9887
2024	4.9898	0.9832
2025	4.9615	0.9808
2026	4.9404	0.9794
2027	4.9221	0.9808
2028	4.9066	0.9829
2029	4.8905	0.9830
2030	4.8773	0.9804

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.7541	4.1721	4.4284	4.7977	5.2840	5.8194	6.3964	6.7412	7.2856

2013	3.6495	4.1187	4.3633	4.8030	5.3373	5.9758	6.6707	7.0865	7.7972
2014	3.5270	4.0305	4.3167	4.8115	5.4294	6.1734	6.9648	7.4758	8.4249
2015	3.3918	3.9339	4.2349	4.7860	5.4357	6.2154	6.9791	7.4653	8.3961
2016	3.2591	3.7993	4.1225	4.6981	5.3494	6.1184	6.8325	7.3198	8.2200
2017	3.1183	3.7277	4.0489	4.6376	5.3228	6.1276	6.8813	7.3914	8.3037
2018	3.0542	3.6550	3.9953	4.5635	5.2727	6.0304	6.7123	7.1684	7.9878
2019	2.9549	3.5822	3.9302	4.5165	5.1987	5.9256	6.5963	6.9918	7.7775
2020	2.8963	3.5417	3.8809	4.4521	5.1369	5.8441	6.4943	6.8606	7.5931
2021	2.8227	3.5055	3.8424	4.4074	5.0933	5.7770	6.4078	6.7930	7.5050
2022	2.8168	3.4748	3.8097	4.3643	5.0505	5.7326	6.3408	6.7345	7.4347
2023	2.7575	3.4336	3.7684	4.3351	5.0056	5.6892	6.3137	6.6639	7.3735
2024	2.7589	3.3943	3.7370	4.3097	4.9778	5.6504	6.2751	6.6241	7.2957
2025	2.7569	3.3574	3.7126	4.2963	4.9538	5.6160	6.2442	6.5917	7.2557
2026	2.7159	3.3138	3.6895	4.2615	4.9354	5.6080	6.2013	6.5796	7.2308
2027	2.6706	3.3156	3.6632	4.2541	4.9161	5.5889	6.1878	6.5551	7.2286
2028	2.6337	3.2940	3.6413	4.2373	4.8984	5.5796	6.1727	6.5120	7.2381
2029	2.6623	3.2688	3.6241	4.2201	4.8878	5.5540	6.1408	6.5116	7.2189
2030	2.6688	3.2670	3.6264	4.2088	4.8709	5.5423	6.1357	6.4684	7.1842

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	5.2298	0.8374
2013	5.3467	1.0234
2014	5.3698	1.0794
2015	5.3191	1.0804
2016	5.2249	1.0676
2017	5.1918	1.0852
2018	5.1034	1.0508
2019	5.0285	1.0272
2020	4.9647	1.0070
2021	4.9118	0.9951
2022	4.8682	0.9880
2023	4.8335	0.9828
2024	4.8046	0.9786
2025	4.7788	0.9776
2026	4.7598	0.9773
2027	4.7441	0.9781
2028	4.7293	0.9809
2029	4.7134	0.9805
2030	4.7009	0.9755

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.5113	4.0018	4.2270	4.6403	5.1518	5.7271	6.3682	6.7369	7.3356
2013	3.4019	3.8845	4.1547	4.6182	5.2270	5.9448	6.7389	7.2400	8.1253
2014	3.2671	3.7848	4.0787	4.5989	5.2555	6.0301	6.8092	7.3430	8.3195
2015	3.1611	3.6872	3.9916	4.5603	5.2242	6.0046	6.7575	7.2358	8.1472
2016	3.0268	3.5780	3.9049	4.4949	5.1556	5.9177	6.6242	7.0844	7.9624
2017	2.8945	3.5106	3.8657	4.4322	5.1213	5.8971	6.6134	7.0972	7.9316
2018	2.8242	3.4585	3.7948	4.3697	5.0704	5.8082	6.4608	6.9028	7.6636
2019	2.7657	3.3802	3.7401	4.3166	4.9936	5.7074	6.3656	6.7621	7.4825
2020	2.7460	3.3554	3.6990	4.2598	4.9457	5.6386	6.2796	6.6367	7.3721
2021	2.6465	3.3172	3.6625	4.2202	4.8953	5.5731	6.1967	6.5814	7.2893
2022	2.6244	3.2915	3.6177	4.1807	4.8522	5.5342	6.1538	6.5267	7.1875

2023	2.6029	3.2501	3.5842	4.1533	4.8167	5.4990	6.1192	6.4694	7.1536
2024	2.5659	3.1954	3.5547	4.1276	4.8005	5.4608	6.0766	6.4352	7.0883
2025	2.5779	3.1813	3.5292	4.1118	4.7663	5.4345	6.0470	6.4032	7.0829
2026	2.5206	3.1473	3.5094	4.0942	4.7494	5.4307	6.0106	6.3909	7.0591
2027	2.5023	3.1421	3.4931	4.0720	4.7340	5.4102	6.0101	6.3559	7.0471
2028	2.4689	3.1238	3.4739	4.0635	4.7225	5.3964	5.9801	6.3498	7.0237
2029	2.4725	3.1024	3.4522	4.0463	4.7128	5.3814	5.9693	6.3190	7.0287
2030	2.5094	3.1005	3.4492	4.0381	4.6929	5.3635	5.9626	6.2949	6.9903

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	0.6340	0.0000
2013	0.7000	0.0000
2014	0.7000	0.0000
2015	0.7000	0.0000
2016	0.7000	0.0000
2017	0.7000	0.0000
2018	0.7000	0.0000
2019	0.7000	0.0000
2020	0.7000	0.0000
2021	0.7000	0.0000
2022	0.7000	0.0000
2023	0.7000	0.0000
2024	0.7000	0.0000
2025	0.6999	0.0070
2026	0.7000	0.0000
2027	0.7000	0.0000
2028	0.7000	0.0000
2029	0.7000	0.0000
2030	0.7000	0.0000

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340
2013	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2014	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2015	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2016	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2017	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2018	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2019	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2020	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2021	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2022	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2023	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2024	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2025	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2026	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2027	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2028	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2029	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2030	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000

Landings x 1000 MT

Year	Average	StdDev
2012	0.6340	0.0000
2013	0.7000	0.0000
2014	0.7000	0.0000
2015	0.7000	0.0000
2016	0.7000	0.0000
2017	0.7000	0.0000
2018	0.7000	0.0000
2019	0.7000	0.0000
2020	0.7000	0.0000
2021	0.7000	0.0000
2022	0.7000	0.0000
2023	0.7000	0.0000
2024	0.7000	0.0000
2025	0.6999	0.0070
2026	0.7000	0.0000
2027	0.7000	0.0000
2028	0.7000	0.0000
2029	0.7000	0.0000
2030	0.7000	0.0000

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340	0.6340
2013	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2014	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2015	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2016	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2017	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2018	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2019	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2020	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2021	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2022	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2023	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2024	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2025	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2026	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2027	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2028	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2029	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
2030	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000

Total Fishing Mortality

Year	Average	StdDev
2012	0.1961	0.0287
2013	0.2113	0.0366
2014	0.2072	0.0457
2015	0.2059	0.0538
2016	0.2128	0.0597
2017	0.2165	0.0650
2018	0.2218	0.0678
2019	0.2265	0.0708

2020	0.2310	0.0750
2021	0.2351	0.0797
2022	0.2387	0.0846
2023	0.2421	0.0930
2024	0.2448	0.0974
2025	0.2463	0.0874
2026	0.2480	0.0857
2027	0.2496	0.0855
2028	0.2511	0.0877
2029	0.2525	0.0914
2030	0.2541	0.0967

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.1428	0.1534	0.1620	0.1754	0.1930	0.2124	0.2339	0.2487	0.2741
2013	0.1446	0.1581	0.1693	0.1867	0.2072	0.2331	0.2570	0.2771	0.3180
2014	0.1260	0.1418	0.1524	0.1755	0.2029	0.2333	0.2653	0.2879	0.3509
2015	0.1129	0.1313	0.1433	0.1678	0.1997	0.2359	0.2739	0.3037	0.3688
2016	0.1159	0.1348	0.1471	0.1707	0.2039	0.2432	0.2892	0.3227	0.4016
2017	0.1164	0.1352	0.1474	0.1711	0.2055	0.2473	0.2981	0.3363	0.4261
2018	0.1233	0.1407	0.1530	0.1754	0.2089	0.2514	0.3058	0.3447	0.4554
2019	0.1281	0.1452	0.1572	0.1789	0.2116	0.2565	0.3089	0.3533	0.4763
2020	0.1323	0.1488	0.1599	0.1824	0.2150	0.2607	0.3174	0.3611	0.4888
2021	0.1340	0.1511	0.1624	0.1854	0.2184	0.2645	0.3218	0.3727	0.5036
2022	0.1362	0.1542	0.1646	0.1877	0.2209	0.2692	0.3263	0.3751	0.5254
2023	0.1376	0.1547	0.1666	0.1898	0.2236	0.2722	0.3314	0.3782	0.5498
2024	0.1392	0.1566	0.1676	0.1914	0.2258	0.2747	0.3360	0.3878	0.5465
2025	0.1399	0.1578	0.1690	0.1928	0.2272	0.2768	0.3404	0.3910	0.5509
2026	0.1416	0.1582	0.1700	0.1939	0.2283	0.2786	0.3435	0.4003	0.5517
2027	0.1409	0.1594	0.1710	0.1945	0.2304	0.2808	0.3464	0.4045	0.5710
2028	0.1411	0.1597	0.1713	0.1951	0.2309	0.2819	0.3483	0.4082	0.5806
2029	0.1414	0.1600	0.1718	0.1957	0.2317	0.2832	0.3519	0.4096	0.5932
2030	0.1416	0.1610	0.1723	0.1961	0.2328	0.2851	0.3551	0.4136	0.5897

Probability Spawning Stock Biomass Exceeds Threshold 1.498 (1000 MT)

Year	Probability
2012	1.000000
2013	1.000000
2014	1.000000
2015	1.000000
2016	0.999600
2017	0.999300
2018	0.998600
2019	0.997400
2020	0.996800
2021	0.995700
2022	0.995500
2023	0.994100
2024	0.995000
2025	0.994500
2026	0.994600
2027	0.994800
2028	0.992900

2029	0.992200
2030	0.992200

Probability Threshold Exceeded at Least Once = 1.0000

Probability Jan-1 Stock Biomass Exceeds Threshold 2.995 (1000 MT)

Year	Probability
2012	1.000000
2013	1.000000
2014	0.999200
2015	0.998200
2016	0.996400
2017	0.993600
2018	0.991400
2019	0.988600
2020	0.987600
2021	0.984400
2022	0.982900
2023	0.983000
2024	0.980600
2025	0.980100
2026	0.977700
2027	0.975300
2028	0.974700
2029	0.973500
2030	0.974000

Probability Threshold Exceeded at Least Once = 1.0000

Probability Mean Biomass Exceeds Threshold 2.995 (1000 MT)

Year	Probability
2012	1.000000
2013	0.998700
2014	0.996600
2015	0.994300
2016	0.991100
2017	0.986800
2018	0.983100
2019	0.981300
2020	0.979600
2021	0.976300
2022	0.974100
2023	0.972600
2024	0.970400
2025	0.967000
2026	0.964500
2027	0.963900
2028	0.962500
2029	0.960400
2030	0.960900

Probability Threshold Exceeded at Least Once = 1.0000

Probability Total Fishing Mortality Exceeds Threshold 0.2370

Year	Probability
2012	0.091000
2013	0.218800
2014	0.226800
2015	0.243900
2016	0.282100
2017	0.299100
2018	0.319200
2019	0.344100
2020	0.362600
2021	0.379400
2022	0.401000
2023	0.415700
2024	0.430100
2025	0.440600
2026	0.447500
2027	0.454900
2028	0.461000
2029	0.464600
2030	0.472100

Probability Threshold Exceeded at Least Once = 0.8080

Cape Cod Yellowtail Flounder

AGEPRO VERSION 4.1

ccgom yt 2012

Date & Time of Run: 12 Sep 2012 11:02

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\CCGOM_YT\2012UPDATE\CCYT_747IN2011_950IN2012_CONSTANT548.INP

First Age Class: 1
Number of Age Classes: 6
Number of Years in Projection: 13
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\CCGOM_YT\2012UPDATE\CCGOM_YT_2012_BOOT.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Landings	747
2012	Landings	950
2013	Landings	548
2014	Landings	548
2015	Landings	548
2016	F-Mult	0.1950
2017	F-Mult	0.1950
2018	F-Mult	0.1950
2019	F-Mult	0.1950
2020	F-Mult	0.1950
2021	F-Mult	0.1950
2022	F-Mult	0.1950
2023	F-Mult	0.1950

Recruits 1000 Fish

Year Class	Average	StdDev
2011	7778.9610	3580.3267
2012	7752.2018	3508.0252
2013	7805.2947	3578.3402
2014	7722.3086	3536.0119
2015	7720.7547	3470.0572
2016	7802.7860	3570.1444
2017	7763.4433	3516.2567
2018	7707.3225	3530.1599
2019	7763.4732	3490.6190

2020	7756.0315	3528.4042
2021	7731.8980	3563.2829
2022	7718.5500	3490.7776
2023	7793.0191	3615.7742

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	2983.3850	3369.5650	3919.0710	5773.2600	7263.1580	9007.3400	11606.17	15191.11	21620.760
2012	2984.8100	3395.1990	3951.0020	5774.2090	7267.1000	9084.9150	11579.19	14496.61	21632.940
2013	2983.3280	3439.9060	4000.9210	5777.5560	7270.7055	9084.3440	11618.15	15176.79	21700.640
2014	2984.3170	3331.6630	3884.5440	5769.9380	7242.9895	8935.7480	11577.53	14731.42	21418.610
2015	2985.4120	3401.4520	3951.1120	5773.5880	7275.2175	8964.5130	11447.86	14332.03	21510.410
2016	2984.2430	3443.6720	3985.6830	5781.6980	7281.7730	9037.0360	11604.81	15222.93	21631.980
2017	2984.3530	3387.2060	3917.3110	5780.2860	7294.6350	8989.0320	11477.94	14765.22	21580.810
2018	2983.7670	3327.1290	3903.7910	5766.8790	7222.6335	9021.2880	11518.25	14667.07	21631.760
2019	2985.5370	3422.8410	3999.5590	5779.8310	7288.5050	9028.9240	11500.27	14557.91	21636.230
2020	2985.0920	3417.7720	3998.9740	5777.8320	7258.3540	8961.0770	11480.18	14664.48	21764.850
2021	2982.8910	3295.4140	3876.2150	5770.8230	7248.2180	9021.0840	11577.87	15130.17	21475.910
2022	2984.8120	3337.2270	3938.6340	5774.0830	7236.1325	9023.6840	11544.26	14270.83	21578.890
2023	2984.0440	3382.6470	3951.3490	5772.2330	7271.0385	9073.1670	11626.96	15339.59	21731.770

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	2.8749	0.4477
2012	2.9563	0.5459
2013	3.4958	0.5929
2014	4.7101	0.9312
2015	5.9178	1.2319
2016	6.9635	1.4141
2017	7.5624	1.4698
2018	7.9223	1.4418
2019	8.1606	1.4258
2020	8.3130	1.4188
2021	8.4092	1.4169
2022	8.4807	1.4171
2023	8.5267	1.4241

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.9656	2.2112	2.3201	2.5475	2.8442	3.1621	3.4687	3.6665	3.9996
2012	1.8700	2.1277	2.2970	2.5522	2.9221	3.3050	3.6849	3.9125	4.3339
2013	2.3094	2.6243	2.7751	3.0548	3.4585	3.8816	4.2816	4.5428	4.9359
2014	3.0211	3.4110	3.6557	4.0702	4.6025	5.1874	5.8333	6.4910	7.6844
2015	3.7250	4.2538	4.5509	5.0787	5.7456	6.5269	7.5464	8.4099	9.6629
2016	4.4566	5.0716	5.3846	5.9828	6.7363	7.6809	8.9667	9.7524	11.0535
2017	4.9514	5.5862	5.9167	6.5333	7.3160	8.3602	9.6339	10.3432	11.9032
2018	5.3669	5.9444	6.2759	6.9004	7.7040	8.7300	9.9294	10.6162	11.9825
2019	5.6084	6.1750	6.5358	7.1548	7.9445	8.9756	10.1449	10.7873	12.2881
2020	5.7200	6.3633	6.7041	7.3206	8.0964	9.0903	10.2687	10.9802	12.3370
2021	5.7942	6.4666	6.8208	7.4128	8.2003	9.2096	10.3365	11.0460	12.4865
2022	5.8866	6.5426	6.8720	7.4833	8.2662	9.2755	10.4408	11.1154	12.5939
2023	5.9512	6.5651	6.8932	7.5258	8.3166	9.3134	10.4790	11.2090	12.7230

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	3.8956	0.4883
2012	4.4355	0.5953
2013	5.1464	0.7898
2014	6.4941	1.1314
2015	7.6639	1.3884
2016	8.9982	1.6301
2017	9.7317	1.7132
2018	10.1702	1.6917
2019	10.4464	1.6755
2020	10.6233	1.6663
2021	10.7404	1.6687
2022	10.8243	1.6693
2023	10.8756	1.6671

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	2.9102	3.1684	3.3024	3.5353	3.8677	4.2077	4.5491	4.7704	5.1080
2012	3.2400	3.5538	3.7109	3.9972	4.3954	4.8254	5.2182	5.4848	5.9472
2013	3.6173	3.9877	4.1986	4.5862	5.0800	5.6159	6.1663	6.5740	7.4071
2014	4.4126	4.9045	5.1965	5.7125	6.3550	7.0981	7.9620	8.6223	9.9286
2015	5.1339	5.7590	6.0941	6.6884	7.4589	8.3864	9.5638	10.3411	11.7231
2016	6.0477	6.7464	7.1409	7.8578	8.7551	9.8612	11.2721	12.1348	13.6726
2017	6.6640	7.3602	7.7579	8.5229	9.4839	10.6845	12.1226	12.9043	14.5627
2018	7.1276	7.7960	8.2103	8.9687	9.9362	11.1538	12.5042	13.3000	14.8977
2019	7.3615	8.0803	8.5098	9.2666	10.2138	11.4241	12.7303	13.5118	15.1702
2020	7.4984	8.3081	8.7247	9.4416	10.3931	11.5800	12.8796	13.7358	15.2375
2021	7.6400	8.4288	8.8268	9.5660	10.5135	11.7328	13.0015	13.8217	15.4448
2022	7.7269	8.4920	8.9026	9.6304	10.5856	11.7983	13.1030	13.9433	15.5513
2023	7.8275	8.5137	8.9487	9.6881	10.6516	11.8743	13.1402	13.9761	15.6079

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	4.0050	0.5362
2012	4.6685	0.6627
2013	5.8071	1.0281
2014	7.1294	1.3242
2015	8.3384	1.5680
2016	9.3111	1.6908
2017	9.8962	1.7166
2018	10.2571	1.7021
2019	10.4795	1.6914
2020	10.6222	1.6848
2021	10.7230	1.6902
2022	10.7908	1.6922
2023	10.8298	1.6830

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	2.9373	3.2013	3.3574	3.6101	3.9721	4.3602	4.7263	4.9420	5.3672
2012	3.3560	3.6887	3.8751	4.1876	4.6162	5.0811	5.5322	5.8474	6.4943

2013	3.9522	4.3746	4.6338	5.1070	5.6818	6.3368	7.0673	7.7632	9.0653
2014	4.7375	5.3170	5.6334	6.2142	6.9452	7.8114	8.9111	9.7333	11.0684
2015	5.5118	6.2036	6.5760	7.2548	8.0923	9.1503	10.5414	11.3541	12.9077
2016	6.2709	7.0059	7.3785	8.1196	9.0500	10.2541	11.6712	12.4771	14.1973
2017	6.8052	7.5009	7.9119	8.6705	9.6447	10.8748	12.2724	13.0861	14.6495
2018	7.1718	7.8630	8.3024	9.0402	10.0234	11.2592	12.5983	13.3715	15.0622
2019	7.3392	8.1236	8.5376	9.2893	10.2437	11.4471	12.7742	13.6676	15.1923
2020	7.4814	8.2935	8.6915	9.4319	10.3901	11.6098	12.9115	13.7417	15.3613
2021	7.5855	8.3768	8.7967	9.5273	10.4901	11.7158	13.0307	13.8455	15.5485
2022	7.6819	8.4302	8.8295	9.5935	10.5555	11.7916	13.0815	13.9061	15.6028
2023	7.7654	8.4503	8.8799	9.6324	10.5971	11.8186	13.1153	13.9935	15.5818

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	0.7470	0.0000
2012	0.9500	0.0000
2013	0.5480	0.0000
2014	0.5480	0.0000
2015	0.5480	0.0000
2016	1.1765	0.2471
2017	1.2919	0.2588
2018	1.3598	0.2550
2019	1.4040	0.2500
2020	1.4339	0.2491
2021	1.4527	0.2484
2022	1.4654	0.2487
2023	1.4744	0.2491

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470
2012	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
2013	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480
2014	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480
2015	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480
2016	0.7427	0.8453	0.9026	1.0055	1.1379	1.2961	1.5158	1.6732	1.9176
2017	0.8347	0.9432	1.0018	1.1128	1.2486	1.4260	1.6556	1.7935	2.0513
2018	0.9064	1.0137	1.0703	1.1785	1.3184	1.4991	1.7156	1.8390	2.0843
2019	0.9599	1.0601	1.1176	1.2278	1.3684	1.5445	1.7472	1.8745	2.1273
2020	0.9867	1.0889	1.1551	1.2597	1.3950	1.5699	1.7761	1.8973	2.1711
2021	0.9947	1.1124	1.1728	1.2806	1.4163	1.5894	1.7878	1.9348	2.1670
2022	1.0100	1.1250	1.1858	1.2893	1.4273	1.6060	1.8082	1.9297	2.1817
2023	1.0265	1.1337	1.1903	1.2990	1.4384	1.6106	1.8142	1.9480	2.1949

Landings x 1000 MT

Year	Average	StdDev
2011	0.7470	0.0000
2012	0.9500	0.0000
2013	0.5480	0.0000
2014	0.5480	0.0000
2015	0.5480	0.0000
2016	1.1765	0.2471
2017	1.2919	0.2588

2018	1.3598	0.2550
2019	1.4040	0.2500
2020	1.4339	0.2491
2021	1.4527	0.2484
2022	1.4654	0.2487
2023	1.4744	0.2491

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470	0.7470
2012	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
2013	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480
2014	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480
2015	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480	0.5480
2016	0.7427	0.8453	0.9026	1.0055	1.1379	1.2961	1.5158	1.6732	1.9176
2017	0.8347	0.9432	1.0018	1.1128	1.2486	1.4260	1.6556	1.7935	2.0513
2018	0.9064	1.0137	1.0703	1.1785	1.3184	1.4991	1.7156	1.8390	2.0843
2019	0.9599	1.0601	1.1176	1.2278	1.3684	1.5445	1.7472	1.8745	2.1273
2020	0.9867	1.0889	1.1551	1.2597	1.3950	1.5699	1.7761	1.8973	2.1711
2021	0.9947	1.1124	1.1728	1.2806	1.4163	1.5894	1.7878	1.9348	2.1670
2022	1.0100	1.1250	1.1858	1.2893	1.4273	1.6060	1.8082	1.9297	2.1817
2023	1.0265	1.1337	1.1903	1.2990	1.4384	1.6106	1.8142	1.9480	2.1949

Total Fishing Mortality

Year	Average	StdDev
2011	0.3416	0.0546
2012	0.3810	0.0786
2013	0.1998	0.0408
2014	0.1479	0.0272
2015	0.1137	0.0230
2016	0.1950	0.0000
2017	0.1950	0.0000
2018	0.1950	0.0000
2019	0.1950	0.0000
2020	0.1950	0.0000
2021	0.1950	0.0000
2022	0.1950	0.0000
2023	0.1950	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.2396	0.2598	0.2755	0.3035	0.3353	0.3769	0.4139	0.4352	0.4873
2012	0.2420	0.2698	0.2886	0.3243	0.3718	0.4279	0.4805	0.5183	0.6068
2013	0.1289	0.1430	0.1518	0.1705	0.1948	0.2245	0.2521	0.2704	0.3179
2014	0.0941	0.1078	0.1154	0.1288	0.1454	0.1646	0.1833	0.1959	0.2222
2015	0.0640	0.0768	0.0864	0.0986	0.1122	0.1272	0.1435	0.1535	0.1743
2016	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950
2017	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950
2018	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950
2019	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950
2020	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950
2021	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950
2022	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950

2023	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950	0.1950

Probability Spawning Stock Biomass Exceeds Threshold 7.080 (1000 MT)

Year	Probability
2011	0.000000
2012	0.000000
2013	0.000000
2014	0.026900
2015	0.148800
2016	0.393300
2017	0.576600
2018	0.697700
2019	0.770100
2020	0.819600
2021	0.839500
2022	0.857900
2023	0.865100

Probability Threshold Exceeded at Least Once = 0.9585

Probability Jan-1 Stock Biomass Exceeds Threshold 7.080 (1000 MT)

Year	Probability
2011	0.000000
2012	0.000100
2013	0.019700
2014	0.254700
2015	0.634400
2016	0.910900
2017	0.971700
2018	0.990500
2019	0.995400
2020	0.997000
2021	0.997300
2022	0.998400
2023	0.998600

Probability Threshold Exceeded at Least Once = 0.9997

Probability Mean Biomass Exceeds Threshold 7.080 (1000 MT)

Year	Probability
2011	0.000000
2012	0.001100
2013	0.099500
2014	0.453800
2015	0.790200
2016	0.941000
2017	0.980300
2018	0.992700
2019	0.995000
2020	0.996200

2021	0.997100
2022	0.998000
2023	0.998200

Probability Threshold Exceeded at Least Once = 0.9999

Probability Total Fishing Mortality Exceeds Threshold 0.2600

Year	Probability
2011	0.950000
2012	0.974000
2013	0.071800
2014	0.001000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000

Probability Threshold Exceeded at Least Once = 0.9770

American Plaice

AGEPRO VERSION 4.1

Am. plaice F40% ty10, 2010 catch

Date & Time of Run: 14 Aug 2012 09:51

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\AMERICAN_PLAICE\PROJECTION\APLAICE_1624IN2011_1922IN2012_75%FMSY.INP

First Age Class: 1
Number of Age Classes: 11
Number of Years in Projection: 20
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 100

Bootstrap File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\AMERICAN_PLAICE\PROJECTION\TY10_AP_GMGB_BOOT.BSN

Number of Feasible Solutions: 100000 of 100000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Removals	1624
2012	Removals	1922
2013	F-Mult	0.1350
2014	F-Mult	0.1350
2015	F-Mult	0.1350
2016	F-Mult	0.1350
2017	F-Mult	0.1350
2018	F-Mult	0.1350
2019	F-Mult	0.1350
2020	F-Mult	0.1350
2021	F-Mult	0.1350
2022	F-Mult	0.1350
2023	F-Mult	0.1350
2024	F-Mult	0.1350
2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000000 Fish

Year Class	Average	StdDev
2011	27.5793	10.8541
2012	27.5133	10.8347

2013	27.4833	10.8329
2014	27.5381	10.8844
2015	27.5873	10.9148
2016	27.5429	10.8428
2017	27.5649	10.8590
2018	27.5284	10.8377
2019	27.5245	10.8270
2020	27.5742	10.8889
2021	27.5755	10.9058
2022	27.4967	10.8240
2023	27.4763	10.8144
2024	27.5988	10.8957
2025	27.5384	10.8899
2026	27.5476	10.8503
2027	27.5420	10.8516
2028	27.5511	10.8657
2029	27.5648	10.8822
2030	27.4872	10.8186

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	12.0129	15.3036	16.4124	20.2295	24.7118	32.3526	45.1625	49.0366	59.7382
2012	11.9803	15.3305	16.4002	20.2126	24.6919	31.9039	45.0833	49.0003	59.7013
2013	11.9790	15.3136	16.3833	20.1356	24.6860	31.6698	45.0358	48.9768	59.8150
2014	11.9291	15.2834	16.3821	20.1534	24.6943	32.0386	45.1690	49.0081	59.9963
2015	12.0049	15.3025	16.4015	20.1819	24.6974	32.2935	45.3192	49.0554	59.8498
2016	11.9706	15.2899	16.3938	20.2265	24.7024	32.0681	45.1614	48.9817	59.5273
2017	12.0138	15.3589	16.4111	20.1967	24.6945	32.1353	45.1562	49.0190	59.6064
2018	11.9123	15.2904	16.3905	20.1659	24.7124	32.1484	45.0898	48.9712	59.6415
2019	11.9738	15.3228	16.4025	20.1823	24.6962	31.9542	45.1263	48.9505	59.5557
2020	11.9669	15.3198	16.3915	20.1872	24.6868	32.2597	45.2401	49.0565	59.8561
2021	12.0331	15.3405	16.3994	20.1822	24.6822	32.2073	45.2234	49.0962	59.9150
2022	11.9550	15.2997	16.4034	20.1969	24.6894	31.8515	45.0088	48.9737	59.6568
2023	11.9648	15.2884	16.3906	20.1595	24.6749	31.5804	45.1120	48.9070	59.5012
2024	11.9560	15.3296	16.4156	20.1683	24.7157	32.4850	45.1803	49.0398	59.8494
2025	11.9570	15.2833	16.3744	20.1706	24.7057	31.9418	45.1805	49.0923	59.8710
2026	12.0043	15.3648	16.4095	20.2356	24.7033	31.9345	45.1259	49.0451	59.8629
2027	11.9227	15.2862	16.3878	20.1854	24.6937	32.2112	45.1114	48.9330	59.6252
2028	11.8724	15.2891	16.3911	20.1598	24.7013	32.2075	45.1583	48.9972	59.4087
2029	11.8784	15.3226	16.4030	20.2580	24.7032	32.0322	45.2203	49.0591	59.7507
2030	11.9448	15.3041	16.3946	20.1534	24.6758	31.8510	45.0750	48.9516	59.5958

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	11.6583	0.9035
2012	12.2149	1.0570
2013	11.9765	1.1479
2014	11.7268	1.2029
2015	12.0759	1.5994
2016	13.4117	1.9949
2017	14.7745	2.2260
2018	16.1648	2.3854
2019	17.3687	2.4961
2020	18.3474	2.5587

2021	19.2544	2.6353
2022	20.1379	2.6575
2023	20.7682	2.6674
2024	21.2193	2.6718
2025	21.5445	2.6754
2026	21.7765	2.6812
2027	21.9377	2.6802
2028	22.0532	2.6751
2029	22.1389	2.6739
2030	22.2004	2.6752

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	9.5887	10.2264	10.5432	11.0375	11.6314	12.2309	12.7976	13.1967	13.9331
2012	9.8154	10.5697	10.9222	11.5195	12.1703	12.8570	13.5535	14.1146	14.8822
2013	9.4269	10.1570	10.5542	11.2274	11.9383	12.6559	13.4482	14.0313	14.8189
2014	9.2308	9.9316	10.2791	10.9347	11.6365	12.4263	13.3167	13.7676	14.9405
2015	9.3302	10.0102	10.3897	11.0420	11.8556	12.8540	13.9253	14.6967	17.2982
2016	10.1189	10.8656	11.2775	12.0619	13.1210	14.4226	15.8032	16.7915	19.8264
2017	10.9718	11.8024	12.2760	13.1918	14.4768	16.0224	17.6041	18.6749	21.3775
2018	11.9154	12.8438	13.3800	14.4228	15.8924	17.5814	19.2766	20.4086	22.8633
2019	12.8079	13.7862	14.3754	15.5331	17.1268	18.9042	20.6795	21.7965	24.1734
2020	13.5291	14.5924	15.2200	16.4684	18.1273	19.9709	21.7498	22.8921	25.1795
2021	14.2350	15.3520	16.0333	17.3346	19.0324	20.9261	22.7603	23.9112	26.2662
2022	14.9486	16.1567	16.8637	18.2152	19.9392	21.8362	23.6685	24.8331	27.1101
2023	15.5210	16.7411	17.4698	18.8469	20.5719	22.4739	24.3113	25.4505	27.7567
2024	15.9508	17.1761	17.9112	19.3016	21.0257	22.9399	24.7744	25.9182	28.1697
2025	16.2688	17.4981	18.2314	19.6187	21.3544	23.2632	25.1074	26.2635	28.4498
2026	16.4731	17.7317	18.4690	19.8348	21.5739	23.5061	25.3475	26.5103	28.6774
2027	16.6532	17.8953	18.6306	20.0001	21.7404	23.6697	25.5145	26.6517	28.8537
2028	16.7877	18.0116	18.7337	20.1256	21.8572	23.7819	25.6178	26.7620	28.9492
2029	16.8774	18.0974	18.8284	20.2090	21.9489	23.8613	25.6997	26.8506	29.0748
2030	16.9441	18.1541	18.8897	20.2754	22.0011	23.9181	25.7628	26.9206	29.0917

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	15.2006	1.1215
2012	15.5251	1.2825
2013	14.9569	1.4488
2014	15.1176	1.7815
2015	16.3366	2.3386
2016	18.3539	2.7042
2017	20.0586	2.9099
2018	21.6485	3.0535
2019	22.9748	3.1582
2020	24.0392	3.2179
2021	25.0250	3.2884
2022	25.9848	3.3079
2023	26.6700	3.3163
2024	27.1614	3.3219
2025	27.5146	3.3282
2026	27.7643	3.3313
2027	27.9389	3.3262
2028	28.0672	3.3215

2029	28.1612	3.3228
2030	28.2280	3.3236

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	12.6009	13.4514	13.8397	14.4535	15.1435	15.8871	16.6590	17.1262	18.0194
2012	12.6836	13.5211	13.9484	14.6896	15.4873	16.2980	17.2265	17.7980	18.7105
2013	11.8431	12.7370	13.1696	14.0138	14.8704	15.8263	16.8951	17.4468	18.5908
2014	11.8663	12.6899	13.1572	13.9536	14.9093	16.0742	17.2376	18.0519	20.5046
2015	12.4733	13.3754	13.8764	14.7921	16.0039	17.4680	19.0506	20.2300	24.1470
2016	13.7806	14.7905	15.3671	16.4646	17.9774	19.8197	21.7348	23.0378	26.5866
2017	14.9233	16.0470	16.6955	17.9477	19.7077	21.7679	23.8287	25.2237	28.3302
2018	16.0824	17.2860	18.0134	19.4060	21.3458	23.5176	25.6929	27.0908	30.0318
2019	17.0592	18.3682	19.1340	20.6561	22.6916	24.9644	27.1713	28.5891	31.4417
2020	17.9060	19.2722	20.0983	21.6940	23.7739	26.0920	28.3282	29.7257	32.6228
2021	18.6440	20.1187	20.9881	22.6370	24.7674	27.1126	29.3917	30.8478	33.7148
2022	19.4705	21.0063	21.8980	23.6032	25.7436	28.1052	30.3721	31.7866	34.6787
2023	20.1380	21.6437	22.5627	24.2878	26.4249	28.8050	31.0790	32.4927	35.2968
2024	20.5867	22.1313	23.0468	24.7691	26.9232	29.2950	31.5777	33.0101	35.7668
2025	20.9153	22.4869	23.4127	25.1137	27.2699	29.6558	31.9380	33.3901	36.0746
2026	21.1732	22.7515	23.6565	25.3527	27.5203	29.9201	32.2016	33.6156	36.3834
2027	21.3702	22.9125	23.8322	25.5438	27.6933	30.0876	32.3819	33.8023	36.4894
2028	21.5012	23.0487	23.9535	25.6748	27.8326	30.2063	32.4790	33.9181	36.6642
2029	21.5932	23.1322	24.0555	25.7686	27.9220	30.3029	32.5859	34.0014	36.7648
2030	21.6465	23.2016	24.1075	25.8401	27.9890	30.3660	32.6660	34.0972	36.8294

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	15.6329	1.2359
2012	15.3669	1.3830
2013	14.9019	1.5910
2014	15.7281	2.2377
2015	17.6210	2.6544
2016	19.6783	2.9156
2017	21.2779	3.0758
2018	22.7750	3.1931
2019	24.0238	3.2731
2020	24.9753	3.3095
2021	25.8105	3.3579
2022	26.6252	3.3704
2023	27.2083	3.3766
2024	27.6272	3.3841
2025	27.9254	3.3891
2026	28.1341	3.3859
2027	28.2836	3.3804
2028	28.3964	3.3797
2029	28.4754	3.3812
2030	28.5318	3.3796

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	12.7990	13.6928	14.0990	14.8331	15.5765	16.3728	17.2536	17.8293	18.6528
2012	12.3276	13.1725	13.6511	14.4665	15.3035	16.1820	17.1742	17.8734	18.8122

2013	11.7500	12.5982	13.0525	13.8423	14.7630	15.8110	16.8938	17.6291	19.5561
2014	12.0602	12.9414	13.4203	14.2877	15.4046	16.7552	18.2511	19.3899	23.4054
2015	13.2336	14.2032	14.7512	15.7964	17.2158	19.0093	20.8906	22.1827	25.9010
2016	14.6277	15.7295	16.3591	17.5779	19.2987	21.3514	23.4306	24.8255	28.1324
2017	15.7354	16.9476	17.6510	19.0220	20.9467	23.1448	25.3327	26.7718	29.7800
2018	16.8702	18.1636	18.9163	20.4295	22.4715	24.7662	27.0252	28.4526	31.3864
2019	17.8436	19.1976	20.0295	21.6280	23.7453	26.1099	28.3764	29.8349	32.7741
2020	18.6099	20.0422	20.9116	22.5535	24.7050	27.0919	29.4012	30.8375	33.6987
2021	19.2534	20.7902	21.6756	23.3838	25.5586	27.9495	30.2685	31.7496	34.6487
2022	20.0059	21.5466	22.4640	24.2011	26.3672	28.7873	31.1053	32.5398	35.4447
2023	20.5540	22.1139	23.0381	24.7797	26.9639	29.3772	31.7070	33.1709	35.9860
2024	20.9321	22.5218	23.4487	25.1819	27.3873	29.8046	32.1355	33.6018	36.3606
2025	21.2490	22.8255	23.7462	25.4645	27.6679	30.1084	32.4430	33.9002	36.6837
2026	21.4649	23.0408	23.9590	25.6899	27.8777	30.3215	32.6529	34.1065	36.8928
2027	21.6205	23.1880	24.0975	25.8378	28.0337	30.4668	32.7889	34.2518	37.0476
2028	21.7311	23.2974	24.2150	25.9530	28.1475	30.5727	32.9216	34.3467	37.1718
2029	21.8178	23.3723	24.2885	26.0315	28.2312	30.6429	32.9860	34.4381	37.1993
2030	21.8334	23.4274	24.3450	26.0888	28.2890	30.7082	33.0362	34.4892	37.2927

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	1.6240	0.0000
2012	1.9220	0.0000
2013	1.5616	0.1497
2014	1.5281	0.1607
2015	1.5725	0.2087
2016	1.7512	0.2674
2017	1.9410	0.2956
2018	2.1258	0.3154
2019	2.2844	0.3288
2020	2.4084	0.3354
2021	2.5190	0.3447
2022	2.6291	0.3473
2023	2.7076	0.3484
2024	2.7638	0.3489
2025	2.8043	0.3494
2026	2.8332	0.3501
2027	2.8533	0.3500
2028	2.8677	0.3493
2029	2.8783	0.3491
2030	2.8861	0.3493

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.6240	1.6240	1.6240	1.6240	1.6240	1.6240	1.6240	1.6240	1.6240
2012	1.9220	1.9220	1.9220	1.9220	1.9220	1.9220	1.9220	1.9220	1.9220
2013	1.2315	1.3253	1.3762	1.4632	1.5566	1.6511	1.7545	1.8325	1.9378
2014	1.2019	1.2915	1.3373	1.4220	1.5154	1.6214	1.7353	1.7995	1.9886
2015	1.2138	1.3021	1.3508	1.4366	1.5444	1.6744	1.8139	1.9175	2.2526
2016	1.3152	1.4127	1.4671	1.5712	1.7118	1.8848	2.0677	2.2014	2.6240
2017	1.4362	1.5446	1.6085	1.7301	1.9010	2.1082	2.3184	2.4606	2.8147
2018	1.5637	1.6859	1.7566	1.8949	2.0898	2.3138	2.5390	2.6879	3.0110
2019	1.6822	1.8124	1.8893	2.0426	2.2522	2.4875	2.7210	2.8685	3.1767
2020	1.7763	1.9152	1.9986	2.1622	2.3800	2.6217	2.8561	3.0037	3.2999

2021	1.8620	2.0080	2.0980	2.2674	2.4899	2.7380	2.9784	3.1287	3.4336
2022	1.9517	2.1096	2.2015	2.3777	2.6032	2.8511	3.0896	3.2445	3.5427
2023	2.0237	2.1824	2.2775	2.4566	2.6814	2.9308	3.1708	3.3200	3.6215
2024	2.0767	2.2367	2.3322	2.5128	2.7380	2.9884	3.2275	3.3777	3.6706
2025	2.1171	2.2770	2.3726	2.5520	2.7791	3.0291	3.2694	3.4211	3.7065
2026	2.1425	2.3068	2.4021	2.5792	2.8061	3.0596	3.3001	3.4515	3.7357
2027	2.1663	2.3266	2.4219	2.5999	2.8265	3.0799	3.3209	3.4718	3.7585
2028	2.1813	2.3414	2.4348	2.6158	2.8414	3.0928	3.3329	3.4856	3.7689
2029	2.1934	2.3521	2.4467	2.6260	2.8522	3.1032	3.3436	3.4937	3.7844
2030	2.2006	2.3587	2.4539	2.6341	2.8601	3.1095	3.3520	3.5032	3.7869

Landings x 1000 MT

Year	Average	StdDev
2011	1.3141	0.0117
2012	1.5976	0.0155
2013	1.3320	0.1274
2014	1.3103	0.1282
2015	1.3203	0.1553
2016	1.4348	0.2051
2017	1.5751	0.2341
2018	1.7333	0.2563
2019	1.8728	0.2696
2020	1.9827	0.2776
2021	2.0898	0.2888
2022	2.1990	0.2919
2023	2.2769	0.2934
2024	2.3325	0.2940
2025	2.3726	0.2944
2026	2.4013	0.2950
2027	2.4215	0.2952
2028	2.4357	0.2947
2029	2.4461	0.2944
2030	2.4537	0.2945

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.2860	1.2948	1.2992	1.3062	1.3143	1.3220	1.3292	1.3331	1.3404
2012	1.5597	1.5711	1.5773	1.5871	1.5986	1.6084	1.6166	1.6216	1.6338
2013	1.0466	1.1307	1.1774	1.2479	1.3267	1.4097	1.4976	1.5623	1.6447
2014	1.0354	1.1104	1.1522	1.2275	1.3016	1.3877	1.4799	1.5313	1.6361
2015	1.0339	1.1070	1.1482	1.2184	1.3027	1.4043	1.5059	1.5781	1.7865
2016	1.0934	1.1739	1.2182	1.2990	1.4060	1.5345	1.6729	1.7763	2.1160
2017	1.1794	1.2661	1.3165	1.4117	1.5422	1.7019	1.8682	1.9815	2.2850
2018	1.2837	1.3819	1.4384	1.5479	1.7019	1.8820	2.0634	2.1858	2.4688
2019	1.3839	1.4888	1.5524	1.6753	1.8453	2.0365	2.2293	2.3526	2.6158
2020	1.4639	1.5776	1.6449	1.7787	1.9579	2.1574	2.3516	2.4767	2.7258
2021	1.5435	1.6643	1.7378	1.8796	2.0652	2.2718	2.4724	2.6005	2.8632
2022	1.6317	1.7616	1.8403	1.9872	2.1765	2.3851	2.5876	2.7142	2.9656
2023	1.6989	1.8346	1.9137	2.0654	2.2555	2.4652	2.6673	2.7930	3.0490
2024	1.7535	1.8867	1.9679	2.1214	2.3107	2.5217	2.7239	2.8487	3.0987
2025	1.7900	1.9265	2.0074	2.1612	2.3518	2.5615	2.7637	2.8919	3.1345
2026	1.8174	1.9553	2.0369	2.1878	2.3801	2.5916	2.7938	2.9210	3.1622
2027	1.8384	1.9764	2.0571	2.2075	2.3997	2.6125	2.8151	2.9397	3.1839
2028	1.8538	1.9908	2.0713	2.2231	2.4138	2.6259	2.8285	2.9552	3.1942

2029	1.8649	2.0013	2.0811	2.2339	2.4254	2.6356	2.8376	2.9653	3.2079
2030	1.8726	2.0073	2.0891	2.2414	2.4325	2.6440	2.8471	2.9721	3.2140

Discards x 1000 MT

Year	Average	StdDev
2011	0.3099	0.0117
2012	0.3244	0.0155
2013	0.2296	0.0269
2014	0.2177	0.0458
2015	0.2523	0.0638
2016	0.3165	0.0708
2017	0.3659	0.0712
2018	0.3926	0.0710
2019	0.4116	0.0718
2020	0.4257	0.0717
2021	0.4291	0.0716
2022	0.4301	0.0715
2023	0.4307	0.0714
2024	0.4313	0.0715
2025	0.4317	0.0719
2026	0.4319	0.0718
2027	0.4318	0.0715
2028	0.4320	0.0714
2029	0.4322	0.0715
2030	0.4324	0.0715

Discards Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.2834	0.2908	0.2947	0.3020	0.3097	0.3177	0.3248	0.3291	0.3371
2012	0.2881	0.3004	0.3054	0.3136	0.3234	0.3349	0.3445	0.3506	0.3619
2013	0.1739	0.1888	0.1966	0.2107	0.2277	0.2467	0.2646	0.2766	0.3007
2014	0.1531	0.1666	0.1744	0.1895	0.2095	0.2355	0.2661	0.2908	0.3918
2015	0.1621	0.1792	0.1896	0.2095	0.2396	0.2821	0.3256	0.3586	0.4744
2016	0.2038	0.2257	0.2392	0.2649	0.3045	0.3563	0.4081	0.4425	0.5288
2017	0.2426	0.2677	0.2827	0.3119	0.3570	0.4098	0.4625	0.4955	0.5624
2018	0.2660	0.2921	0.3079	0.3387	0.3849	0.4376	0.4896	0.5209	0.5839
2019	0.2819	0.3092	0.3255	0.3574	0.4041	0.4573	0.5090	0.5415	0.6027
2020	0.2957	0.3231	0.3401	0.3715	0.4182	0.4712	0.5232	0.5554	0.6176
2021	0.2991	0.3269	0.3435	0.3753	0.4218	0.4742	0.5262	0.5586	0.6204
2022	0.3002	0.3276	0.3443	0.3764	0.4227	0.4752	0.5274	0.5592	0.6216
2023	0.3010	0.3286	0.3452	0.3772	0.4233	0.4761	0.5277	0.5595	0.6216
2024	0.3015	0.3286	0.3454	0.3774	0.4241	0.4767	0.5289	0.5607	0.6214
2025	0.3021	0.3294	0.3454	0.3775	0.4241	0.4775	0.5299	0.5621	0.6229
2026	0.3023	0.3295	0.3459	0.3778	0.4240	0.4776	0.5302	0.5616	0.6233
2027	0.3031	0.3298	0.3462	0.3779	0.4242	0.4771	0.5291	0.5617	0.6229
2028	0.3027	0.3298	0.3462	0.3784	0.4242	0.4778	0.5289	0.5613	0.6223
2029	0.3026	0.3299	0.3463	0.3786	0.4245	0.4778	0.5299	0.5616	0.6229
2030	0.3026	0.3301	0.3464	0.3788	0.4250	0.4781	0.5295	0.5619	0.6235

Total Fishing Mortality

Year	Average	StdDev
2011	0.1432	0.0115
2012	0.1648	0.0148

2013	0.1350	0.0000
2014	0.1350	0.0000
2015	0.1350	0.0000
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000
2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.1181	0.1250	0.1291	0.1355	0.1427	0.1505	0.1577	0.1631	0.1737
2012	0.1336	0.1408	0.1468	0.1551	0.1640	0.1734	0.1835	0.1904	0.2050
2013	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2014	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2015	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

Probability Spawning Stock Biomass Exceeds Threshold 9.199 (1000 MT)

Year	Probability
2011	0.999000
2012	0.999000
2013	0.993390
2014	0.990930
2015	0.992880
2016	0.999250
2017	0.999940
2018	1.000000
2019	1.000000

2020	1.000000
2021	1.000000
2022	1.000000
2023	1.000000
2024	1.000000
2025	1.000000
2026	1.000000
2027	1.000000
2028	1.000000
2029	1.000000
2030	1.000000

Probability Threshold Exceeded at Least Once = 1.0000

Probability Jan-1 Stock Biomass Exceeds Threshold 18.398 (1000 MT)

Year	Probability
2011	0.005000
2012	0.018670
2013	0.012880
2014	0.038780
2015	0.148370
2016	0.435860
2017	0.685810
2018	0.863440
2019	0.948420
2020	0.980580
2021	0.993040
2022	0.998260
2023	0.999450
2024	0.999780
2025	0.999900
2026	0.999950
2027	0.999980
2028	0.999970
2029	0.999980
2030	0.999970

Probability Threshold Exceeded at Least Once = 1.0000

Probability Mean Biomass Exceeds Threshold 18.398 (1000 MT)

Year	Probability
2011	0.022000
2012	0.021140
2013	0.022310
2014	0.090870
2015	0.323780
2016	0.629500
2017	0.824520
2018	0.936320
2019	0.979060
2020	0.992470
2021	0.997310

2022	0.999280
2023	0.999740
2024	0.999890
2025	0.999960
2026	0.999990
2027	0.999990
2028	0.999970
2029	0.999980
2030	0.999970

Probability Threshold Exceeded at Least Once = 1.0000

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2011	0.003000
2012	0.143000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.1430

Witch Flounder

AGEPRO VERSION 4.1

WITCH 10-f SPLIT RUN 1-F GARM2012 (using 28 values)

Date & Time of Run: 12 Sep 2012 12:24

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\WITCH\PROJECT\WITCH_1069IN2011_1318IN2012_CONSTANT783.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 7
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 100

Bootstrap File Name: C:\NIT\GARM_2012_UPDATE_PROJ\WITCH\PROJECT\WITCH10-SPLIT-F-RUN1-F-BT.BSN

Number of Feasible Solutions: 100000 of 100000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Landings	1069
2012	Landings	1318
2013	Landings	783
2014	Landings	783
2015	Landings	783
2016	F-Mult	0.1700
2017	F-Mult	0.1700

Recruits 1 Fish

Year Class	Average	StdDev
2011	10011165.9416	3945718.3159
2012	10006169.6341	3960790.4689
2013	9998180.9038	3934159.6658
2014	10012374.8241	3948626.7942
2015	10014057.7609	3944619.1410
2016	10006467.4684	3950172.7745
2017	10015305.9604	3940237.0207

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	3287146.0	3794970	4353801	7005267.0	10305065	12729900	15489550.00	16119740	17335970
2012	3293011.0	3791108	4327923	6926372.0	10334285	12725120	15496040.00	16160100	17366940
2013	3294668.0	3804768	4384248	6997718.0	10172680	12695520	15484540.00	16110920	17335610
2014	3293734.0	3793072	4366410	7027539.0	10236120	12742350	15494260.00	16129040	17334520

2015	3292811.0	3794789	4364143	6977720.0	10336205	12732080	15489680.00	16111820	17339490
2016	3290537.0	3789123	4336802	6992541.0	10292125	12717100	15500220.00	16140400	17341830
2017	3288353.0	3794218	4368166	7026758.0	10373010	12729770	15481650.00	16118580	17327070

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	5.2434	0.7256
2012	5.8804	0.9357
2013	6.7308	1.3019
2014	8.2583	1.8002
2015	9.9942	2.2905
2016	11.3602	2.5226
2017	11.9453	2.3388

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	3.7138	4.1380	4.3826	4.7424	5.1748	5.7202	6.1955	6.5102	7.1090
2012	3.9741	4.4686	4.7708	5.2165	5.7674	6.4590	7.1239	7.5170	8.2738
2013	4.2266	4.8291	5.1905	5.8039	6.6161	7.4871	8.5246	9.1055	10.2694
2014	4.9756	5.7298	6.1611	6.9696	8.0280	9.2835	10.7251	11.6124	13.2995
2015	5.8525	6.7910	7.3422	8.3563	9.6838	11.3026	13.1156	14.2931	16.5237
2016	6.6809	7.7769	8.4072	9.5633	11.0510	12.8252	14.7694	16.0338	18.5074
2017	7.4182	8.5154	9.1576	10.2974	11.7140	13.3394	15.0690	16.1985	18.3972

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	8.6823	1.3004
2012	9.8812	1.7146
2013	11.0305	2.1917
2014	12.5710	2.4987
2015	14.2332	2.7908
2016	15.6874	2.9737
2017	16.2533	2.7414

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	6.1089	6.7663	7.1355	7.7637	8.5754	9.4288	10.4666	11.0364	12.2483
2012	6.7143	7.4426	7.8731	8.6568	9.6783	10.8736	12.2268	13.0429	14.6381
2013	7.0295	7.9440	8.4843	9.4677	10.7526	12.2899	14.0157	15.1216	17.2142
2014	7.9070	9.0097	9.6421	10.7901	12.2712	14.0270	15.9389	17.1935	19.5865
2015	8.9202	10.2043	10.9373	12.2607	13.9249	15.8811	17.9799	19.3512	22.0163
2016	9.8882	11.3077	12.1377	13.5946	15.4001	17.4692	19.6584	21.0761	23.8533
2017	10.6715	12.0993	12.9194	14.3367	16.0451	17.9391	19.8754	21.1199	23.5781

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	7.5701	1.2100
2012	8.5607	1.5964
2013	9.8832	2.0368
2014	11.3153	2.3226
2015	12.8576	2.5936

2016	13.8388	2.5830
2017	14.3213	2.3854

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	5.1748	5.7905	6.1324	6.7139	7.4712	8.2642	9.2324	9.7627	10.8881
2012	5.6088	6.2891	6.6907	7.4208	8.3728	9.4857	10.7445	11.5034	12.9883
2013	6.1626	7.0147	7.5167	8.4311	9.6255	11.0538	12.6572	13.6859	15.6285
2014	6.9786	8.0044	8.5936	9.6596	11.0362	12.6698	14.4463	15.6124	17.8356
2015	7.9195	9.1134	9.7947	11.0252	12.5712	14.3892	16.3390	17.6130	20.0882
2016	8.7562	10.0083	10.7439	12.0247	13.5985	15.3971	17.2792	18.4960	20.8965
2017	9.4302	10.6965	11.4103	12.6574	14.1524	15.7930	17.4714	18.5401	20.6468

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	1.0690	0.0000
2012	1.3180	0.0000
2013	0.7830	0.0000
2014	0.7830	0.0000
2015	0.7830	0.0000
2016	1.5653	0.4087
2017	1.6566	0.3713

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690
2012	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180
2013	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830
2014	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830
2015	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830
2016	0.8508	1.0072	1.1005	1.2717	1.5029	1.7950	2.1256	2.3401	2.7629
2017	0.9637	1.1264	1.2205	1.3933	1.6130	1.8733	2.1575	2.3427	2.7054

Landings x 1000 MT

Year	Average	StdDev
2011	1.0690	0.0000
2012	1.3180	0.0000
2013	0.7830	0.0000
2014	0.7830	0.0000
2015	0.7830	0.0000
2016	1.5653	0.4087
2017	1.6566	0.3713

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690	1.0690
2012	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180	1.3180
2013	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830
2014	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830
2015	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830	0.7830
2016	0.8508	1.0072	1.1005	1.2717	1.5029	1.7950	2.1256	2.3401	2.7629

2017	0.9637	1.1264	1.2205	1.3933	1.6130	1.8733	2.1575	2.3427	2.7054

Total Fishing Mortality

Year	Average	StdDev
2011	0.3036	0.0469
2012	0.3183	0.0613
2013	0.1733	0.0363
2014	0.1371	0.0317
2015	0.1108	0.0271
2016	0.1700	0.0000
2017	0.1700	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.2119	0.2333	0.2463	0.2711	0.2986	0.3305	0.3645	0.3867	0.4343
2012	0.2067	0.2291	0.2464	0.2728	0.3121	0.3549	0.3957	0.4278	0.5064
2013	0.1073	0.1228	0.1314	0.1478	0.1700	0.1939	0.2187	0.2400	0.2796
2014	0.0799	0.0914	0.0987	0.1150	0.1330	0.1554	0.1778	0.1950	0.2303
2015	0.0621	0.0717	0.0782	0.0916	0.1079	0.1266	0.1461	0.1594	0.1892
2016	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
2017	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700

Probability Spawning Stock Biomass Exceeds Threshold 10.051 (1000 MT)

Year	Probability
2011	0.000000
2012	0.000000
2013	0.016120
2014	0.158670
2015	0.434960
2016	0.670130
2017	0.789280

Probability Threshold Exceeded at Least Once = 0.7903

Probability Jan-1 Stock Biomass Exceeds Threshold 10.051 (1000 MT)

Year	Probability
2011	0.152000
2012	0.412000
2013	0.637130
2014	0.855340
2015	0.957320
2016	0.987720
2017	0.995990

Probability Threshold Exceeded at Least Once = 0.9960

Probability Mean Biomass Exceeds Threshold 10.051 (1000 MT)

Year Probability

2011	0.034000
2012	0.169560
2013	0.414000
2014	0.681420
2015	0.875380
2016	0.947720
2017	0.976390

Probability Threshold Exceeded at Least Once = 0.9768

Probability Total Fishing Mortality Exceeds Threshold 0.2700

Year	Probability
2011	0.762000
2012	0.773150
2013	0.015890
2014	0.000560
2015	0.000000
2016	0.000000
2017	0.000000

Probability Threshold Exceeded at Least Once = 0.7966

Southern New England Winter Flounder

AGEPRO VERSION 3.3

PROJECTION RUN: 2011 SARC 52 SNE WFL: CAT10 Projected FMSY

INPUT FILE:
C:\NIT\GARM_III_PDT_PROJ_EST08CAT_A16\JSNEWIN\SARC52\REBUILDPLAN\PDT_CAT10_AVG09_10_F_STATUSQUO2011_CONSTANT1675_75FMSY.IN
OUTPUT FILE:
C:\NIT\GARM_III_PDT_PROJ_EST08CAT_A16\JSNEWIN\SARC52\REBUILDPLAN\PDT_CAT10_AVG09_10_F_STATUSQUO2011_CONSTANT1675_75FMSY.OUT
NUMBER OF SIMULATIONS PER BOOTSTRAP REALIZATION: 100
TOTAL NUMBER OF SIMULATIONS: 100000
NUMBER OF FEASIBLE SIMULATIONS: 100000
PROPORTION OF SIMULATIONS THAT ARE FEASIBLE: 1.00000000000000
NUMBER OF BOOTSTRAP REALIZATIONS: 1000

NUMBER OF RECRUITMENT MODELS: 1
PROBABLE RECRUITMENT MODELS: 5
RECRUITMENT MODELS BY YEAR

YEAR	RECRUITMENT MODELS
2011	5
2012	5
2013	5
2014	5
2015	5
2016	5
2017	5
2018	5
2019	5
2020	5
2021	5
2022	5
2023	5
2024	5

RECRUITMENT MODEL PROBABILITIES BY YEAR

YEAR	MODEL PROBABILITY
2011	1.00000000000000
2012	1.00000000000000
2013	1.00000000000000
2014	1.00000000000000
2015	1.00000000000000
2016	1.00000000000000
2017	1.00000000000000
2018	1.00000000000000
2019	1.00000000000000
2020	1.00000000000000
2021	1.00000000000000
2022	1.00000000000000
2023	1.00000000000000
2024	1.00000000000000

RECRUITMENT MODEL SAMPLING FREQUENCIES BY YEAR

YEAR	MODEL SAMPLING FREQUENCIES
2011	100000
2012	100000
2013	100000
2014	100000
2015	100000
2016	100000
2017	100000
2018	100000
2019	100000
2020	100000
2021	100000
2022	100000
2023	100000
2024	100000

MIXTURE OF F AND QUOTA BASED CATCHES

YEAR	F	QUOTA (THOUSAND MT)
2011		0.363
2012		0.400
2013		1.675
2014		1.675
2015		1.675
2016	0.218	
2017	0.218	
2018	0.218	
2019	0.218	
2020	0.218	
2021	0.218	
2022	0.218	
2023	0.218	
2024	0.218	

SPAWNING STOCK BIOMASS (THOUSAND MT)

YEAR	AVG SSB (000 MT)	STD
2011	9.333	0.844
2012	9.987	0.853
2013	10.570	0.947
2014	12.854	2.449
2015	16.842	4.366
2016	20.791	5.664
2017	23.163	6.100
2018	26.197	6.951
2019	29.369	7.848
2020	32.421	8.622
2021	35.350	9.295
2022	38.170	9.917
2023	40.769	10.422
2024	43.101	10.829

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	7.604	8.111	8.310	8.736	9.268	9.870	10.462	10.848	11.557
2012	8.232	8.701	8.953	9.395	9.893	10.529	11.156	11.498	12.157
2013	8.641	9.156	9.436	9.907	10.461	11.197	11.869	12.264	12.951
2014	8.944	9.737	10.224	11.157	12.439	14.058	15.959	17.364	20.790

2015	9.798	11.195	12.062	13.776	16.120	19.079	22.487	24.965	30.586
2016	11.237	13.201	14.415	16.789	19.936	23.835	28.194	31.258	37.956
2017	12.630	14.850	16.205	18.844	22.294	26.548	31.162	34.408	41.386
2018	14.126	16.702	18.267	21.269	25.240	30.045	35.316	38.934	46.723
2019	15.647	18.601	20.387	23.770	28.315	33.756	39.657	43.731	52.680
2020	17.226	20.500	22.492	26.315	31.292	37.278	43.693	48.215	58.053
2021	18.824	22.408	24.635	28.748	34.174	40.608	47.532	52.313	62.807
2022	20.468	24.362	26.680	31.138	36.943	43.786	51.213	56.256	67.115
2023	22.014	26.137	28.670	33.355	39.474	46.770	54.448	59.734	71.107
2024	23.532	27.835	30.494	35.395	41.823	49.325	57.355	62.727	74.284

ANNUAL PROBABILITY THAT SSB EXCEEDS THRESHOLD: 43.661 THOUSAND MT

YEAR	Pr(SSB >= Threshold Value) FOR FEASIBLE SIMULATIONS
2011	0.000
2012	0.000
2013	0.000
2014	0.000
2015	0.000
2016	0.003
2017	0.006
2018	0.020
2019	0.051
2020	0.100
2021	0.170
2022	0.254
2023	0.344
2024	0.430

Pr(SSB >= Threshold Value) AT LEAST ONCE:= 0.472

MEAN BIOMASS (THOUSAND MT) FOR AGES: 1 TO 7

YEAR	AVG MEAN B (000 MT)	STD
2011	12.697	1.055
2012	15.491	2.008
2013	20.671	4.493
2014	25.476	6.147
2015	30.615	7.749
2016	35.451	9.193
2017	39.893	10.498
2018	44.626	11.795
2019	48.971	12.789
2020	53.111	13.694
2021	57.030	14.483
2022	60.640	15.135
2023	63.938	15.707
2024	66.933	16.197

PERCENTILES OF MEAN STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	10.471	11.136	11.436	11.952	12.561	13.381	14.124	14.585	15.365
2012	12.027	12.806	13.258	14.086	15.207	16.562	18.050	19.127	21.726
2013	13.543	14.950	15.830	17.545	19.900	22.898	26.426	29.021	35.126
2014	15.213	17.287	18.590	21.137	24.557	28.755	33.489	36.824	44.371
2015	17.246	20.084	21.800	25.134	29.498	34.886	40.774	44.890	53.973
2016	19.490	22.869	24.940	28.935	34.181	40.562	47.499	52.396	62.771

2017	21.550	25.512	27.928	32.431	38.464	45.754	53.651	59.173	71.114
2018	23.919	28.328	31.103	36.241	43.072	51.280	60.062	66.171	79.763
2019	26.144	31.185	34.204	39.880	47.332	56.208	65.678	72.291	86.749
2020	28.610	33.981	37.233	43.393	51.402	60.844	71.106	78.099	93.259
2021	30.923	36.718	40.190	46.733	55.250	65.322	76.004	83.430	99.060
2022	33.208	39.293	43.021	49.877	58.867	69.377	80.503	88.026	104.492
2023	35.385	41.740	45.605	52.778	62.111	72.981	84.518	92.450	109.294
2024	37.343	44.086	47.991	55.439	65.070	76.256	88.150	96.276	113.968

ANNUAL PROBABILITY THAT MEAN BIOMASS EXCEEDS THRESHOLD: 43.661 THOUSAND MT

YEAR	Pr(MEAN B >= Threshold Value) FOR FEASIBLE SIMULATIONS
2011	0.000
2012	0.000
2013	0.001
2014	0.011
2015	0.062
2016	0.169
2017	0.311
2018	0.479
2019	0.625
2020	0.742
2021	0.829
2022	0.889
2023	0.928
2024	0.954

Pr(MEAN B >= Threshold Value) AT LEAST ONCE:= 0.967

F WEIGHTED BY MEAN BIOMASS FOR AGES: 1 TO 7

YEAR	AVG F_WT_B	STD
2011	0.029	0.002
2012	0.026	0.003
2013	0.084	0.016
2014	0.069	0.016
2015	0.058	0.014
2016	0.127	0.015
2017	0.126	0.015
2018	0.125	0.014
2019	0.127	0.014
2020	0.129	0.014
2021	0.130	0.014
2022	0.131	0.014
2023	0.132	0.014
2024	0.132	0.014

PERCENTILES OF F WEIGHTED BY MEAN BIOMASS FOR AGES: 1 TO 7

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.024	0.025	0.026	0.027	0.029	0.030	0.032	0.033	0.034
2012	0.018	0.021	0.022	0.024	0.026	0.028	0.030	0.031	0.033
2013	0.048	0.058	0.063	0.073	0.084	0.095	0.106	0.112	0.124
2014	0.038	0.045	0.050	0.058	0.068	0.079	0.090	0.097	0.110
2015	0.031	0.037	0.041	0.048	0.057	0.067	0.077	0.083	0.097
2016	0.090	0.101	0.107	0.117	0.127	0.137	0.146	0.151	0.160
2017	0.090	0.101	0.107	0.116	0.127	0.137	0.145	0.149	0.158
2018	0.090	0.101	0.106	0.116	0.126	0.135	0.143	0.148	0.156

2019	0.092	0.103	0.108	0.118	0.128	0.137	0.145	0.150	0.158
2020	0.094	0.104	0.110	0.119	0.129	0.139	0.147	0.151	0.160
2021	0.095	0.105	0.111	0.121	0.131	0.140	0.148	0.152	0.161
2022	0.096	0.106	0.112	0.122	0.132	0.141	0.149	0.153	0.161
2023	0.097	0.107	0.113	0.123	0.133	0.142	0.149	0.154	0.162
2024	0.097	0.108	0.114	0.123	0.133	0.142	0.150	0.154	0.162

ANNUAL PROBABILITY THAT F WEIGHTED BY MEAN BIOMASS EXCEEDS THRESHOLD: 0.290

YEAR	Pr(F_WT_B > Threshold Value) FOR FEASIBLE SIMULATIONS
2011	0.000
2012	0.000
2013	0.000
2014	0.000
2015	0.000
2016	0.000
2017	0.000
2018	0.000
2019	0.000
2020	0.000
2021	0.000
2022	0.000
2023	0.000
2024	0.000

TOTAL STOCK BIOMASS (THOUSAND MT)

YEAR	AVG TOTAL B (000 MT)	STD
2011	12.421	1.033
2012	14.544	1.576
2013	18.513	3.045
2014	23.261	5.104
2015	28.148	6.768
2016	33.867	8.572
2017	37.921	9.635
2018	42.710	11.001
2019	47.228	12.109
2020	51.431	13.014
2021	55.466	13.849
2022	59.262	14.561
2023	62.736	15.169
2024	65.871	15.671

PERCENTILES OF TOTAL STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	10.263	10.886	11.179	11.692	12.308	13.091	13.854	14.195	15.077
2012	11.649	12.337	12.729	13.428	14.354	15.460	16.596	17.362	19.144
2013	13.434	14.511	15.156	16.390	18.049	20.089	22.419	24.131	28.064
2014	14.778	16.524	17.586	19.683	22.473	25.958	29.859	32.695	39.085
2015	16.533	18.985	20.477	23.371	27.167	31.859	37.013	40.638	48.555
2016	18.919	22.087	24.023	27.808	32.686	38.656	45.127	49.653	59.342
2017	20.923	24.607	26.862	31.086	36.652	43.365	50.606	55.489	66.285
2018	23.244	27.464	30.033	34.864	41.310	48.892	57.131	62.778	75.273
2019	25.567	30.356	33.184	38.638	45.675	54.124	63.056	69.304	82.739
2020	27.976	33.134	36.311	42.205	49.848	58.898	68.516	75.103	89.463
2021	30.363	35.987	39.309	45.644	53.834	63.367	73.667	80.607	95.526
2022	32.695	38.670	42.236	48.886	57.584	67.757	78.419	85.751	100.977

2023	34.945	41.138	44.970	51.950	61.036	71.501	82.703	90.122	106.259
2024	37.029	43.626	47.485	54.766	64.115	74.958	86.470	94.190	110.768

ANNUAL PROBABILITY THAT TOTAL STOCK BIOMASS EXCEEDS THRESHOLD: 43.661 THOUSAND MT

YEAR	Pr(B >= Threshold Value) FOR FEASIBLE SIMULATIONS
2011	0.000
2012	0.000
2013	0.000
2014	0.003
2015	0.027
2016	0.123
2017	0.241
2018	0.413
2019	0.573
2020	0.704
2021	0.804
2022	0.873
2023	0.920
2024	0.950

Pr(B >= Threshold Value) AT LEAST ONCE:= 0.959

RECRUITMENT UNITS ARE: 1000.00000000000 FISH

YEAR CLASS	AVG RECRUITMENT	STD
2011	31809.670	17219.135
2012	33396.823	17895.595
2013	34681.468	18690.105
2014	39236.230	21495.185
2015	45841.581	25616.808
2016	51141.076	28448.295
2017	53798.803	29624.655
2018	57255.343	31532.679
2019	60333.535	33057.443
2020	62724.098	34447.282
2021	64904.135	35501.539
2022	67170.869	36838.237
2023	68890.507	37510.155
2024	70060.672	37714.901

PERCENTILES OF RECRUITMENT UNITS ARE: 1000.00000000000 FISH

YEAR CLASS	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	8500.426	12159.711	14637.768	19859.978	27980.647	39393.593	53499.39	64467.61	90998.499
2012	9106.457	12796.799	15344.874	20940.292	29434.356	41395.976	56174.48	67443.04	94577.803
2013	9465.689	13336.701	16001.955	21762.909	30586.272	42841.144	58163.71	69849.97	99624.724
2014	10491.367	14861.757	17826.401	24316.910	34440.663	48547.111	66430.18	79964.56	112887.365
2015	11889.781	17020.477	20472.226	28135.822	40026.813	56857.897	78105.91	94535.89	135100.054
2016	13256.479	19010.450	22893.312	31514.661	44638.805	63537.500	86939.27	104961.84	148487.631
2017	14145.706	20090.011	24310.990	33225.062	47124.093	66753.788	91236.40	109944.69	156960.627
2018	15146.610	21530.838	25945.124	35424.960	50071.455	71023.472	96841.32	116559.13	166103.226
2019	15880.752	22790.555	27472.268	37375.751	52873.160	74775.900	102118.27	123270.00	173862.384
2020	16777.790	23672.097	28463.794	38884.496	54875.718	77860.122	106274.02	127947.64	182244.740
2021	17335.349	24577.086	29501.824	40298.682	56970.021	80504.542	109558.62	131997.30	186575.869
2022	17831.744	25302.227	30583.670	41736.902	58925.963	83140.638	113409.31	136907.80	193305.526

2023	18484.786	26269.421	31536.945	42920.316	60387.752	85287.757	116425.80	140032.30	198959.675
2024	18879.055	26667.449	32137.424	43587.062	61702.503	87031.666	118532.07	141703.54	196962.913

LANDINGS (000 MT)

YEAR	AVG LANDINGS (000 MT)	STD
2011	0.363	0.000
2012	0.400	0.000
2013	1.675	0.000
2014	1.675	0.000
2015	1.675	0.000
2016	4.485	1.252
2017	5.003	1.347
2018	5.566	1.501
2019	6.200	1.691
2020	6.818	1.853
2021	7.395	1.986
2022	7.928	2.100
2023	8.408	2.190
2024	8.841	2.270

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363
2012	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
2013	1.675	1.675	1.675	1.675	1.675	1.675	1.675	1.675	1.675
2014	1.675	1.675	1.675	1.675	1.675	1.675	1.675	1.675	1.675
2015	1.675	1.675	1.675	1.675	1.675	1.675	1.675	1.675	1.675
2016	2.359	2.803	3.073	3.600	4.299	5.167	6.128	6.796	8.275
2017	2.679	3.164	3.467	4.051	4.813	5.750	6.770	7.490	9.018
2018	2.958	3.516	3.857	4.500	5.361	6.399	7.534	8.328	10.034
2019	3.262	3.888	4.270	4.996	5.967	7.139	8.406	9.295	11.240
2020	3.573	4.271	4.697	5.505	6.570	7.859	9.239	10.214	12.352
2021	3.900	4.651	5.114	5.988	7.137	8.506	9.999	11.030	13.321
2022	4.211	5.014	5.504	6.439	7.659	9.108	10.677	11.772	14.076
2023	4.509	5.361	5.877	6.851	8.129	9.662	11.282	12.381	14.833
2024	4.793	5.672	6.215	7.225	8.563	10.128	11.821	12.973	15.490

REALIZED F SERIES

YEAR	AVG F	STD
2011	0.042	0.004
2012	0.044	0.004
2013	0.171	0.019
2014	0.138	0.029
2015	0.105	0.028
2016	0.218	0.000
2017	0.218	0.000
2018	0.218	0.000
2019	0.218	0.000
2020	0.218	0.000
2021	0.218	0.000
2022	0.218	0.000
2023	0.218	0.000
2024	0.218	0.000

PERCENTILES OF REALIZED F SERIES

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%

2011	0.034	0.036	0.038	0.040	0.042	0.045	0.047	0.048	0.051
2012	0.036	0.038	0.039	0.042	0.044	0.047	0.049	0.050	0.053
2013	0.127	0.140	0.147	0.158	0.171	0.184	0.195	0.202	0.215
2014	0.075	0.092	0.102	0.118	0.137	0.157	0.175	0.186	0.207
2015	0.052	0.064	0.072	0.085	0.103	0.122	0.142	0.154	0.180
2016	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2017	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2018	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2019	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2020	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2021	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2022	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2023	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218
2024	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218	0.218

ANNUAL PROBABILITY FULLY-RECRUITED F EXCEEDS THRESHOLD: 0.290

YEAR	Pr(F > Threshold Value) FOR FEASIBLE SIMULATIONS
2011	0.000
2012	0.000
2013	0.000
2014	0.000
2015	0.000
2016	0.000
2017	0.000
2018	0.000
2019	0.000
2020	0.000
2021	0.000
2022	0.000
2023	0.000
2024	0.000

Redfish

AGEPRO VERSION 4.1

redfish

Date & Time of Run: 19 Mar 2012 14:06

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GRED\REDFISH_2303CAT11_2999CAT12_ALT_MODEL_0.75FMSY.INP

First Age Class: 1
Number of Age Classes: 26
Number of Years in Projection: 21
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 100
Number of Simulations: 100

Bootstrap File Name: C:\NIT\GARM_2012_UPDATE_PROJ\GRED\REDFISH_2011_ALT_MODEL.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2010	Removals	1852
2011	Removals	2303
2012	Removals	2999
2013	F-Mult	0.0283
2014	F-Mult	0.0283
2015	F-Mult	0.0283
2016	F-Mult	0.0283
2017	F-Mult	0.0283
2018	F-Mult	0.0283
2019	F-Mult	0.0283
2020	F-Mult	0.0283
2021	F-Mult	0.0283
2022	F-Mult	0.0283
2023	F-Mult	0.0283
2024	F-Mult	0.0283
2025	F-Mult	0.0283
2026	F-Mult	0.0283
2027	F-Mult	0.0283
2028	F-Mult	0.0283
2029	F-Mult	0.0283
2030	F-Mult	0.0283

Recruits 1 Fish

Year Class	Average	StdDev
2010	38571015.2867	40714854.6769
2011	38465830.8061	40721059.1473

2012	38364215.1033	40660216.7592
2013	39875518.2112	41600694.5872
2014	39271514.4324	41181288.3263
2015	38486383.7851	41102229.0579
2016	38324322.9453	40464854.3265
2017	38812623.9313	40057485.1750
2018	39017024.8858	41404011.8731
2019	38754593.9745	40766250.6811
2020	38812052.8666	40874489.4100
2021	39006690.3210	40785310.2943
2022	38749136.9458	41366344.2119
2023	38464412.1136	40681354.2602
2024	38676839.1581	40793352.6766
2025	38719238.0304	40639690.3285
2026	38783372.1565	41270589.0904
2027	38932561.9280	40954402.0039
2028	38615596.9924	40879050.1150
2029	39113668.0244	41362567.4691
2030	39271132.7027	40893430.5405

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	898964.7	1051673.0	1362895.0	3936667.0	22618490.0	60684860.0	96803570.0	116255900	182775000
2011	913657.5	1043590.0	1344664.0	3779527.0	21864665.0	61000220.0	96469960.0	115777700	185846800
2012	894540.3	1042620.0	1324517.0	3642179.0	21794585.0	62352910.0	94977060.0	116102300	183527100
2013	915659.3	1091151.0	1394600.0	3757244.0	25451290.0	66615940.0	100054600.0	116654800	189136500
2014	897858.8	1073833.0	1428336.0	3926283.0	23572230.0	64394520.0	98434420.0	117346000	184798300
2015	906092.6	1043160.0	1323777.0	3530255.0	20978735.0	61913680.0	97700610.0	115992900	181011000
2016	887248.4	1076812.0	1362006.0	3564914.0	21806870.0	62304820.0	94052330.0	115783800	184021100
2017	915769.5	1111542.0	1410723.0	3973747.0	24558640.0	63388400.0	96273790.0	115999500	178174000
2018	906896.3	1084860.0	1360583.0	3697655.0	23450230.0	63037320.0	98475340.0	117059000	190979700
2019	905096.0	1074679.0	1380164.0	3930220.0	22347310.0	63315880.0	97140570.0	115415500	187336800
2020	905267.6	1074561.0	1377754.0	3607497.0	23050945.0	62719070.0	97107360.0	116170000	186245400
2021	898455.3	1058099.0	1399852.0	3999814.0	23005520.0	63430940.0	99393090.0	116460800	178924400
2022	918476.6	1061425.0	1384956.0	3823941.0	22619785.0	60677390.0	96470440.0	118001400	187421300
2023	898198.60	1046455.0	1361290.0	3812113.0	21778970.0	62103670.0	95751000.0	115392900	182603000
2024	900054.8	1044040.0	1317106.0	3371965.0	22757345.0	63918160.0	97447110.0	115669000	183084700
2025	886073.0	1041681.0	1322244.0	3616537.0	22746135.0	62790670.0	97905060.0	116036800	178119300
2026	907618.5	1094092.0	1364012.0	3813938.0	22874690.0	62149090.0	95701300.0	116500800	191204700
2027	909576.1	1043520.0	1319830.0	3711110.0	22203245.0	65940800.0	99414860.0	116340000	178741100
2028	905272.5	1088583.0	1398128.0	3775240.0	21464065.0	62594680.0	95924610.0	116073600	181090800
2029	904749.6	1043850.0	1329101.0	3484137.0	22530095.0	66229800.0	98936290.0	115981500	187386400
2030	907592.6	1044585.0	1421609.0	3898013.0	24532750.0	65464260.0	99591110.0	116488100	182052400

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2010	321.7454	22.6606
2011	348.4248	25.1168
2012	375.3604	28.3004
2013	398.5891	31.8924
2014	415.2845	35.3881
2015	428.7428	38.7827
2016	438.4308	41.7195
2017	444.4190	44.1037

2018	446.9620	45.9433
2019	446.5826	47.3219
2020	444.0013	48.3341
2021	439.7242	49.0609
2022	434.2317	49.5663
2023	427.8933	49.8995
2024	420.9928	50.0939
2025	413.7433	50.1777
2026	406.2025	50.1659
2027	398.6920	50.0948
2028	391.2293	49.9864
2029	384.0165	49.8651
2030	377.0253	49.7404

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	281.7182	287.4087	293.6744	306.9714	318.2996	333.6722	348.4163	362.9458	387.6765
2011	301.4681	311.6105	316.8471	332.7815	344.6651	362.1497	379.2400	392.5578	424.8135
2012	320.9958	336.5928	341.3163	357.6570	370.4669	395.1797	409.9237	427.3139	462.2856
2013	338.0741	353.1022	362.8976	376.7954	392.0985	421.5632	441.7737	460.5690	494.3766
2014	349.8045	363.5950	377.1700	392.0986	406.8898	439.7300	464.9447	484.8050	516.6749
2015	357.1392	370.4767	385.1936	404.9573	420.1510	453.9824	492.2810	508.2186	533.6088
2016	361.5618	375.4227	390.1293	413.2437	430.3929	462.5932	504.9410	525.2491	545.9884
2017	363.3419	378.6709	392.3063	417.0174	436.5377	467.4872	514.6207	536.7494	556.3365
2018	362.0515	377.8146	392.4047	417.9836	439.1714	469.9951	519.4776	541.8698	563.2399
2019	358.4446	375.5193	390.9256	415.9256	439.3031	470.5050	519.6648	541.9400	567.6083
2020	352.6142	371.9446	387.7358	411.9698	437.0484	469.7340	516.3568	538.7777	568.7470
2021	345.2594	366.2268	382.2567	406.5984	433.1025	466.4915	511.4644	533.8484	567.0098
2022	337.1231	360.5717	375.7616	400.2644	427.9772	462.7067	505.2579	526.8417	562.5271
2023	329.2121	353.7935	368.5761	393.4015	422.0778	457.2573	498.1500	519.9696	557.6753
2024	321.2656	346.1921	360.8600	386.4170	415.2849	451.2782	490.2248	511.8471	552.1047
2025	312.7553	338.6566	352.9549	378.5462	408.6177	444.7238	481.5800	503.5617	545.3827
2026	305.0887	331.1525	344.8323	370.9129	401.3982	437.9146	473.5920	494.7947	538.7830
2027	296.5285	322.9553	337.1701	363.5880	394.7197	430.6620	465.2455	486.3042	529.9428
2028	289.1646	315.4195	329.7372	356.1642	387.3306	423.4259	456.8388	478.1638	523.1832
2029	282.5456	307.8535	322.5012	348.9768	380.2231	416.2952	449.0928	471.0369	514.9140
2030	275.6711	300.6488	315.0275	341.8826	373.5854	409.2585	441.7814	463.5250	506.8901

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2010	369.3906	26.8186
2011	398.1849	30.2903
2012	425.4704	34.2636
2013	450.0700	38.4611
2014	463.4662	41.7010
2015	473.3345	44.5981
2016	479.6442	46.9666
2017	482.8412	48.8966
2018	483.2169	50.4156
2019	481.2368	51.5966
2020	477.4956	52.4881
2021	472.3745	53.1382
2022	466.2569	53.5872
2023	459.4377	53.8718

2024	452.1466	54.0192
2025	444.5591	54.0617
2026	436.7085	54.0239
2027	428.9116	53.9433
2028	421.1797	53.8382
2029	413.7194	53.7234
2030	406.4986	53.6031

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	318.0660	331.4810	336.6971	352.0707	364.4095	385.5767	402.2118	417.8235	450.8159
2011	339.5395	354.9305	362.0846	378.7754	392.3960	419.7592	441.0101	455.7760	489.9386
2012	361.4477	375.6911	387.0679	402.6284	417.5992	449.2888	470.3668	493.1741	526.4224
2013	377.9847	393.0328	408.3175	425.2446	441.0602	475.6176	506.1592	526.3644	558.6251
2014	385.8172	400.4260	416.3987	438.5465	454.5018	489.9266	530.3690	548.5301	575.2211
2015	390.5482	406.3756	421.2281	446.1726	464.7702	498.8892	543.9593	565.7789	588.6359
2016	392.5973	409.2896	424.0884	450.3398	471.1988	504.2085	553.8348	577.4522	598.9125
2017	391.7055	409.3880	424.8298	451.7951	474.7315	507.8481	559.3199	583.0018	606.3770
2018	388.6182	407.6091	423.8458	450.2445	475.7744	509.4268	560.2877	584.0922	611.7741
2019	383.2605	404.0888	421.0517	446.9343	473.8201	508.7658	558.1832	582.0486	613.2365
2020	375.8638	398.8142	415.8161	442.0335	470.4791	506.3088	553.9120	577.7854	612.9153
2021	368.0358	393.1963	409.7971	436.0047	465.6996	502.8167	548.5341	571.7892	610.3234
2022	359.9377	386.6027	402.5951	429.3429	460.0498	497.7619	541.7338	564.4499	605.3951
2023	352.0634	378.9544	394.9020	422.1095	453.4769	492.1741	533.8663	557.3170	600.3237
2024	343.6045	371.5484	386.5534	414.5718	446.5721	485.4021	525.6795	549.2493	593.7159
2025	335.5994	363.5626	378.5921	406.4661	439.5605	478.7106	517.4956	540.0892	586.8262
2026	326.1137	355.3797	370.5699	398.7951	432.1461	470.8596	508.5897	531.1901	578.0701
2027	318.7422	347.1682	362.5662	391.0646	424.5184	463.6742	499.8911	523.2617	570.6116
2028	310.9625	338.9287	354.8366	383.2908	416.9903	456.1418	491.4357	515.0189	562.6868
2029	303.7528	331.0928	346.9492	376.1049	409.9385	448.6091	483.8009	507.4238	554.0014
2030	296.6975	323.8994	339.8637	368.9048	403.1052	441.1439	476.3164	499.7240	546.0430

Mean Biomass x 1000 MT

Year	Average	StdDev
2010	359.3888	26.1592
2011	387.2510	29.5455
2012	413.5200	33.4214
2013	433.4354	37.0836
2014	446.2611	40.1975
2015	455.6209	42.9322
2016	461.6352	45.2058
2017	464.6730	47.0577
2018	465.0314	48.5250
2019	463.1266	49.6606
2020	459.5279	50.5172
2021	454.6025	51.1416
2022	448.7174	51.5736
2023	442.1580	51.8459
2024	435.1452	51.9870
2025	427.8474	52.0280
2026	420.2962	51.9910
2027	412.7960	51.9137
2028	405.3591	51.8128
2029	398.1831	51.7026

2030	391.2376	51.5872

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	309.3346	322.4109	327.4930	342.4956	354.5332	375.1770	391.4005	406.6368	438.8107
2011	330.0322	345.0738	352.0470	368.3166	381.6015	408.2841	429.0190	443.4266	476.7448
2012	351.0601	364.9616	376.0592	391.2492	405.8299	436.7440	457.3128	479.5819	511.9919
2013	363.9228	378.4156	393.1696	409.5003	424.7777	458.0109	487.7212	507.0458	537.9461
2014	371.4335	385.4639	400.9191	422.2778	437.6417	471.7063	510.7858	528.3031	553.8398
2015	375.8724	391.1621	405.4487	429.4743	447.4128	480.1256	523.7077	544.5610	566.5909
2016	377.8409	393.9608	408.1897	433.4227	453.5138	485.3350	532.9813	555.7420	576.4304
2017	376.9133	394.0686	408.8454	434.7633	456.8798	488.7255	538.3587	561.0125	583.5293
2018	373.9828	392.3055	407.9303	433.3026	457.8479	490.3599	539.1636	562.1222	588.7759
2019	368.8211	388.8872	405.1200	430.1353	455.9435	489.6406	537.1634	560.1891	590.2314
2020	361.6837	383.8583	400.1079	425.4301	452.7754	487.3006	533.1251	556.0401	589.9370
2021	354.1819	378.4637	394.3132	419.5468	448.1329	483.8324	527.9202	550.2411	587.4322
2022	346.4022	371.9444	387.4016	413.2546	442.7663	479.0807	521.4463	543.2794	582.7461
2023	338.8148	364.7367	380.0965	406.2632	436.4262	473.6728	513.7271	536.2793	577.7692
2024	330.8125	357.6903	372.0046	398.9489	429.8113	467.1729	505.9462	528.5073	571.3554
2025	322.9544	349.8705	364.4034	391.1596	423.0322	460.7108	498.1310	519.7297	564.7532
2026	313.7583	342.0298	356.6109	383.8251	415.8857	453.2207	489.5271	511.2374	556.4044
2027	306.7733	334.0908	348.9005	376.3845	408.5996	446.2278	481.0856	503.6368	549.1870
2028	299.3938	326.2149	341.5020	368.8625	401.2740	438.9689	472.9107	495.7515	541.4091
2029	292.3116	318.7699	333.9242	362.0322	394.6150	431.7792	465.5951	488.4631	533.4211
2030	285.5967	311.7399	327.0689	355.1023	387.9958	424.5646	458.4713	480.8975	525.5183

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2010	1.8522	0.0000
2011	2.3030	0.0000
2012	2.9990	0.0000
2013	11.1804	0.8918
2014	11.6647	0.9806
2015	12.1975	1.1595
2016	12.4784	1.2296
2017	12.6406	1.2916
2018	12.6562	1.3220
2019	12.6032	1.3546
2020	12.5014	1.3800
2021	12.3614	1.3993
2022	12.1966	1.4115
2023	12.0118	1.4218
2024	11.8129	1.4269
2025	11.6056	1.4283
2026	11.3925	1.4287
2027	11.1815	1.4260
2028	10.9714	1.4226
2029	10.7684	1.4188
2030	10.5724	1.4151

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522

2011	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030
2012	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990
2013	9.4289	9.9400	10.0804	10.5903	10.9951	11.8504	12.3815	12.7330	13.8569
2014	9.7299	10.2468	10.6319	10.9762	11.4652	12.3408	12.8939	13.5209	14.4668
2015	10.1513	10.5236	10.9109	11.4295	11.9743	12.9663	14.0710	14.5071	15.3665
2016	10.2494	10.6190	11.0489	11.7512	12.2685	13.1653	14.4710	15.0896	15.6343
2017	10.2939	10.7018	11.1154	11.8499	12.4212	13.2896	14.7322	15.3483	15.9425
2018	10.2387	10.6752	11.0823	11.8299	12.4362	13.2991	14.7855	15.4007	16.0210
2019	10.0912	10.5657	11.0122	11.7281	12.3908	13.2781	14.6914	15.3401	16.0941
2020	9.9024	10.4371	10.8901	11.5900	12.3056	13.2386	14.5698	15.1971	16.0508
2021	9.6849	10.2767	10.7262	11.4187	12.1755	13.1445	14.3951	15.0348	15.9933
2022	9.4477	10.0995	10.5293	11.2281	12.0173	13.0196	14.2071	14.8250	15.8675
2023	9.2042	9.9022	10.3270	11.0192	11.8549	12.8687	14.0118	14.6266	15.7232
2024	8.9599	9.6837	10.1050	10.8205	11.6541	12.6790	13.7872	14.3939	15.5540
2025	8.7231	9.4727	9.8788	10.6056	11.4635	12.5055	13.5367	14.1596	15.3690
2026	8.4956	9.2424	9.6493	10.3870	11.2581	12.2888	13.2979	13.9213	15.1302
2027	8.2951	9.0279	9.4299	10.1782	11.0694	12.0953	13.0709	13.6689	14.9469
2028	8.0727	8.8154	9.2194	9.9721	10.8645	11.8847	12.8385	13.4444	14.6927
2029	7.8704	8.6000	9.0225	9.7699	10.6600	11.6860	12.6219	13.2543	14.5137
2030	7.6885	8.3972	8.8210	9.5785	10.4703	11.4923	12.4147	13.0211	14.3013

Landings x 1000 MT

Year	Average	StdDev
2010	1.8522	0.0000
2011	2.3030	0.0000
2012	2.9990	0.0000
2013	11.1804	0.8918
2014	11.6647	0.9806
2015	12.1975	1.1595
2016	12.4784	1.2296
2017	12.6406	1.2916
2018	12.6562	1.3220
2019	12.6032	1.3546
2020	12.5014	1.3800
2021	12.3614	1.3993
2022	12.1966	1.4115
2023	12.0118	1.4218
2024	11.8129	1.4269
2025	11.6056	1.4283
2026	11.3925	1.4287
2027	11.1815	1.4260
2028	10.9714	1.4226
2029	10.7684	1.4188
2030	10.5724	1.4151

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522	1.8522
2011	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030	2.3030
2012	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990	2.9990
2013	9.4289	9.9400	10.0804	10.5903	10.9951	11.8504	12.3815	12.7330	13.8569
2014	9.7299	10.2468	10.6319	10.9762	11.4652	12.3408	12.8939	13.5209	14.4668
2015	10.1513	10.5236	10.9109	11.4295	11.9743	12.9663	14.0710	14.5071	15.3665
2016	10.2494	10.6190	11.0489	11.7512	12.2685	13.1653	14.4710	15.0896	15.6343

2017	10.2939	10.7018	11.1154	11.8499	12.4212	13.2896	14.7322	15.3483	15.9425
2018	10.2387	10.6752	11.0823	11.8299	12.4362	13.2991	14.7855	15.4007	16.0210
2019	10.0912	10.5657	11.0122	11.7281	12.3908	13.2781	14.6914	15.3401	16.0941
2020	9.9024	10.4371	10.8901	11.5900	12.3056	13.2386	14.5698	15.1971	16.0508
2021	9.6849	10.2767	10.7262	11.4187	12.1755	13.1445	14.3951	15.0348	15.9933
2022	9.4477	10.0995	10.5293	11.2281	12.0173	13.0196	14.2071	14.8250	15.8675
2023	9.2042	9.9022	10.3270	11.0192	11.8549	12.8687	14.0118	14.6266	15.7232
2024	8.9599	9.6837	10.1050	10.8205	11.6541	12.6790	13.7872	14.3939	15.5540
2025	8.7231	9.4727	9.8788	10.6056	11.4635	12.5055	13.5367	14.1596	15.3690
2026	8.4956	9.2424	9.6493	10.3870	11.2581	12.2888	13.2979	13.9213	15.1302
2027	8.2951	9.0279	9.4299	10.1782	11.0694	12.0953	13.0709	13.6689	14.9469
2028	8.0727	8.8154	9.2194	9.9721	10.8645	11.8847	12.8385	13.4444	14.6927
2029	7.8704	8.6000	9.0225	9.7699	10.6600	11.6860	12.6219	13.2543	14.5137
2030	7.6885	8.3972	8.8210	9.5785	10.4703	11.4923	12.4147	13.0211	14.3013

Total Fishing Mortality

Year	Average	StdDev
2010	0.0059	0.0004
2011	0.0068	0.0005
2012	0.0081	0.0006
2013	0.0283	0.0000
2014	0.0283	0.0000
2015	0.0283	0.0000
2016	0.0283	0.0000
2017	0.0283	0.0000
2018	0.0283	0.0000
2019	0.0283	0.0000
2020	0.0283	0.0000
2021	0.0283	0.0000
2022	0.0283	0.0000
2023	0.0283	0.0000
2024	0.0283	0.0000
2025	0.0283	0.0000
2026	0.0283	0.0000
2027	0.0283	0.0000
2028	0.0283	0.0000
2029	0.0283	0.0000
2030	0.0283	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	0.0048	0.0051	0.0053	0.0056	0.0059	0.0061	0.0064	0.0065	0.0066
2011	0.0055	0.0060	0.0061	0.0065	0.0068	0.0071	0.0074	0.0075	0.0076
2012	0.0065	0.0070	0.0073	0.0077	0.0082	0.0084	0.0089	0.0090	0.0093
2013	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2014	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2015	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2016	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2017	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2018	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2019	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2020	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2021	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2022	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283

2023	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2024	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2025	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2026	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2027	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2028	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2029	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
2030	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283

Probability Spawning Stock Biomass Exceeds Threshold 119.000 (1000 MT)

Year	Probability
2010	1.000000
2011	1.000000
2012	1.000000
2013	1.000000
2014	1.000000
2015	1.000000
2016	1.000000
2017	1.000000
2018	1.000000
2019	1.000000
2020	1.000000
2021	1.000000
2022	1.000000
2023	1.000000
2024	1.000000
2025	1.000000
2026	1.000000
2027	1.000000
2028	1.000000
2029	1.000000
2030	1.000000

Probability Threshold Exceeded at Least Once = 1.0000

Probability Total Fishing Mortality Exceeds Threshold 0.0400

Year	Probability
2010	0.000000
2011	0.000000
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000

2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000

Probability Threshold Exceeded at Least Once = 0.0000

Georges Bank Yellowtail Flounder (Split survey rho adjusted)

AGEPRO VERSION 4.1

Split Series SSB rho adjusted 2013 Catch = 500

Date & Time of Run: 10 Oct 2012 17:38

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GEORGES_BANK_YELLOWTAIL_FLOUNDER\2012_TRAC\PROJECTIONS_PDT\SPLIT_SERIES_SSBRHO_ADJ_CATCH_1150.INP

First Age Class: 1
Number of Age Classes: 6
Number of Years in Projection: 9
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GEORGES_BANK_YELLOWTAIL_FLOUNDER\2012_TRAC\PROJECTIONS_PDT\SPLITSERIES_BOOT.BSN

Number of Feasible Solutions: 6232 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	1150
2013	Landings	1150
2014	F-Mult	0.2500
2015	F-Mult	0.2500
2016	F-Mult	0.2500
2017	F-Mult	0.2500
2018	F-Mult	0.2500
2019	F-Mult	0.2500
2020	F-Mult	0.2500

Recruits 1 Fish

Year Class	Average	StdDev
2012	12065713.5333	5222321.9702
2013	12005788.6952	5213863.6673
2014	12142256.5143	5274365.9716
2015	17799598.5969	13807413.2267
2016	24306402.1780	16825080.9256
2017	25930349.9857	17252847.1953
2018	25923851.3691	17336376.9662
2019	25656116.6919	17129105.2064
2020	25851772.7225	17207938.9959

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2998604.0	3113218.0	6064533.0	8365821.0	11258615.0	15239450.0	20326630	22591040	22786570
2013	2993270.0	3106335.0	6083377.0	8339735.0	11225260.0	15201670.0	20262230	22581870	22788780
2014	2996426.0	3118072.0	6183182.0	8353740.0	11271900.0	15837600.0	20524740	22575070	22785200
2015	3015402.0	5099840.0	7032488.0	9249446.0	13459085.0	22300400.0	25248010	54798990	67751170
2016	5781812.0	6830807.0	8044179.0	10939330.0	22203530.0	24726900.0	54449520	63010370	69167650
2017	6631011.0	6868436.0	8473346.0	13141160.0	22406940.0	25120230.0	56566080	63773630	69238070
2018	6644031.0	6857578.0	8474161.0	12943840.0	22378990.0	25137660.0	56899310	64034080	69294240
2019	6630882.0	6869095.0	8474226.0	13006570.0	22367385.0	25032520.0	56318970	63824090	69280890
2020	6632030.0	6861455.0	8448113.0	13092620.0	22391820.0	25143060.0	56077860	63581340	69268690

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	1.2513	0.3542
2013	0.7082	0.3285
2014	2.0414	0.6752
2015	4.8162	1.4100
2016	7.2112	1.7727
2017	9.7693	2.7481
2018	13.3598	4.5834
2019	17.2566	5.8316
2020	20.5570	6.5088

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.4483	0.6826	0.8106	1.0047	1.2409	1.4918	1.7095	1.8575	2.1117
2013	0.2702	0.3061	0.3337	0.4094	0.6637	0.9623	1.1081	1.2986	1.6344
2014	0.7106	1.0081	1.2356	1.5505	1.9661	2.5067	2.9623	3.2440	3.7114
2015	2.0150	2.6211	3.0948	3.8056	4.6960	5.7550	6.8153	7.3239	8.2048
2016	3.5457	4.4568	4.9749	5.9368	7.1128	8.3975	9.5997	10.2433	11.5344
2017	4.8924	6.0116	6.6231	7.8169	9.3718	11.2688	13.5412	15.1574	17.6419
2018	6.1257	7.5972	8.4964	10.1953	12.4803	15.3868	19.5319	23.2802	27.7840
2019	7.5678	9.5869	10.7330	13.0716	15.9801	20.8350	25.6502	28.0266	33.8644
2020	9.3476	11.7085	13.1443	15.6240	19.3528	24.8849	29.4587	32.8644	38.3221

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	1.7014	0.3000
2013	0.9112	0.3411
2014	0.7268	0.3555
2015	3.5225	1.2930
2016	6.0834	1.7330
2017	8.1729	1.9668
2018	11.3321	4.1621
2019	15.3333	5.6891
2020	18.9335	6.4997

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1.0682	1.2425	1.3291	1.4893	1.6837	1.8943	2.0939	2.2335	2.4615
2013	0.2197	0.3942	0.4952	0.6636	0.8806	1.1212	1.3697	1.5142	1.8104
2014	0.3351	0.3547	0.3700	0.4093	0.6191	0.9592	1.3137	1.3618	1.4957
2015	1.0700	1.4495	2.0100	2.5917	3.3661	4.3692	5.5100	5.9309	6.5063

2016	2.6451	3.4035	3.9237	4.8229	5.9638	7.2772	8.4115	9.0991	10.3903
2017	4.0216	5.0893	5.7004	6.7866	8.0761	9.4771	10.8048	11.6028	12.9658
2018	5.4140	6.5860	7.2559	8.5884	10.3999	12.8479	16.0064	21.5166	25.0532
2019	6.5676	8.1119	9.1323	11.2944	13.8737	18.4147	24.0105	25.8678	32.4658
2020	8.1222	10.2818	11.6628	14.0337	17.4662	23.5537	27.5161	31.1334	36.8262

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	1.7549	0.3917
2013	2.6749	0.8018
2014	5.2028	1.4723
2015	8.0286	1.9369
2016	11.1513	3.2038
2017	15.2703	4.9596
2018	19.8853	6.4154
2019	23.9442	7.3015
2020	27.1280	7.7880

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.8901	1.1410	1.2777	1.4788	1.7283	1.9913	2.2745	2.4297	2.7393
2013	1.0433	1.4620	1.7200	2.1011	2.5756	3.2039	3.8032	4.1324	4.5647
2014	2.2587	2.9335	3.3761	4.1453	5.0955	6.1842	7.2177	7.7770	8.7824
2015	3.9906	4.9974	5.5857	6.6435	7.9251	9.3216	10.6251	11.3638	12.7445
2016	5.6520	6.8675	7.5647	8.8815	10.6189	12.8242	15.5092	17.6566	20.5499
2017	7.1288	8.7769	9.8439	11.8009	14.3583	17.7160	22.1344	25.2991	30.3377
2018	8.9511	11.2784	12.6316	15.2590	18.6096	23.8640	28.9955	31.8068	38.0699
2019	11.1862	13.9123	15.4983	18.4115	22.7675	28.7687	33.8331	37.5823	43.6856
2020	13.3048	16.3065	17.9814	21.0859	26.2205	32.0096	37.8844	41.5001	47.9899

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	1.1476	0.0514
2013	0.9284	0.3928
2014	0.1993	0.0767
2015	0.5955	0.1762
2016	1.1717	0.3142
2017	1.6758	0.4175
2018	2.2573	0.6593
2019	2.9880	1.0060
2020	3.7439	1.2312

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
2013	0.0006	0.0006	0.0007	0.8619	1.1500	1.1500	1.1500	1.1500	1.1500
2014	0.0733	0.0994	0.1117	0.1396	0.1851	0.2531	0.3118	0.3393	0.3874
2015	0.2430	0.3227	0.3842	0.4698	0.5765	0.7130	0.8453	0.9092	1.0130
2016	0.5457	0.6873	0.7799	0.9452	1.1484	1.3849	1.6010	1.7244	1.9301
2017	0.8523	1.0483	1.1615	1.3706	1.6435	1.9562	2.2428	2.4130	2.6889
2018	1.1001	1.3627	1.5202	1.8044	2.1603	2.5803	3.1300	3.6262	4.2358
2019	1.3620	1.7169	1.9104	2.2926	2.7842	3.4816	4.4146	5.0381	6.0783

2020	1.7060	2.1131	2.3648	2.8416	3.4776	4.5443	5.4690	6.0394	7.1820

Landings x 1000 MT

Year	Average	StdDev
2012	1.1476	0.0514
2013	0.9284	0.3928
2014	0.1993	0.0767
2015	0.5955	0.1762
2016	1.1717	0.3142
2017	1.6758	0.4175
2018	2.2573	0.6593
2019	2.9880	1.0060
2020	3.7439	1.2312

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
2013	0.0006	0.0006	0.0007	0.8619	1.1500	1.1500	1.1500	1.1500	1.1500
2014	0.0733	0.0994	0.1117	0.1396	0.1851	0.2531	0.3118	0.3393	0.3874
2015	0.2430	0.3227	0.3842	0.4698	0.5765	0.7130	0.8453	0.9092	1.0130
2016	0.5457	0.6873	0.7799	0.9452	1.1484	1.3849	1.6010	1.7244	1.9301
2017	0.8523	1.0483	1.1615	1.3706	1.6435	1.9562	2.2428	2.4130	2.6889
2018	1.1001	1.3627	1.5202	1.8044	2.1603	2.5803	3.1300	3.6262	4.2358
2019	1.3620	1.7169	1.9104	2.2926	2.7842	3.4816	4.4146	5.0381	6.0783
2020	1.7060	2.1131	2.3648	2.8416	3.4776	4.5443	5.4690	6.0394	7.1820

Total Fishing Mortality

Year	Average	StdDev
2012	1.2711	0.5023
2013	2.9063	1.7127
2014	0.2500	0.0000
2015	0.2500	0.0000
2016	0.2500	0.0000
2017	0.2500	0.0000
2018	0.2500	0.0000
2019	0.2500	0.0000
2020	0.2500	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.6401	0.7607	0.8225	0.9587	1.1599	1.4372	1.8049	2.1191	3.2457
2013	0.0010	0.0010	0.0010	1.6597	2.8434	4.9011	5.0000	5.0000	5.0000
2014	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2015	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2016	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2017	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2018	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2019	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2020	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500

Probability Spawning Stock Biomass Exceeds Threshold 43.200 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000100
2020	0.001400

Probability Threshold Exceeded at Least Once = 0.0014

Probability Total Fishing Mortality Exceeds Threshold 0.2500

Year	Probability
2012	0.998000
2013	0.865800
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

Georges Bank Yellowtail Flounder (Split survey No rho adjustment)

AGEPRO VERSION 4.1

Split Series 2013 Catch = 500

Date & Time of Run: 10 Oct 2012 17:36

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GEORGES_BANK_YELLOWTAIL_FLOUNDER\2012_TRAC\PROJECTIONS_PDT\SPLIT_SERIES_CATCH_1150.INP

First Age Class: 1
Number of Age Classes: 6
Number of Years in Projection: 9
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GEORGES_BANK_YELLOWTAIL_FLOUNDER\2012_TRAC\PROJECTIONS_PDT\SPLITSERIES_BOOT.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	1150
2013	Landings	1150
2014	F-Mult	0.2500
2015	F-Mult	0.2500
2016	F-Mult	0.2500
2017	F-Mult	0.2500
2018	F-Mult	0.2500
2019	F-Mult	0.2500
2020	F-Mult	0.2500

Recruits 1 Fish

Year Class	Average	StdDev
2012	15262522.5261	11235139.9311
2013	16086417.1278	12174981.3718
2014	22716688.9778	16435766.6790
2015	25352320.1040	17177570.0004
2016	25633496.1819	17111462.0642
2017	26076606.8530	17258673.9635
2018	25945658.0663	17350385.7948
2019	25661914.6369	17134265.4019
2020	25851772.7225	17207938.9959

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3008897.0	3725796.0	6908438.0	8730897.0	12437350	18690470	23259360	29078740	66023090
2013	3005030.0	4119983.0	6968913.0	8853845.0	12874430	20015750	24438280	51986770	66338490
2014	3086742.0	6770026.0	7616411.0	10691410.0	19656660	24562540	53763550	61546300	68556200
2015	6610884.0	6848400.0	8211492.0	12142470.0	22329665	25005740	56335270	63663910	69355420
2016	6643001.0	6867620.0	8483996.0	12618410.0	22396870	25095720	55825660	63765350	69311020
2017	6642188.0	6874537.0	8549171.0	13460460.0	22449285	25174010	56642290	63783450	69238070
2018	6644031.0	6857578.0	8484813.0	13006030.0	22381535	25147600	57015730	64064920	69294240
2019	6630882.0	6869095.0	8474226.0	13011480.0	22367665	25034060	56321990	63844770	69316970
2020	6632030.0	6861455.0	8448113.0	13092620.0	22391820	25143060	56077860	63581340	69268690

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	4.3916	0.8370
2013	4.5304	0.9760
2014	6.1531	1.8221
2015	8.9088	3.6717
2016	12.1305	4.9733
2017	16.0254	6.0901
2018	19.5771	6.6999
2019	22.3197	6.9475
2020	24.3978	7.0806

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.6176	3.1040	3.3665	3.7994	4.3449	4.9516	5.4883	5.8468	6.4989
2013	2.5105	3.0499	3.3400	3.8394	4.4446	5.1253	5.8183	6.2921	7.0942
2014	3.5127	4.0782	4.4496	5.0310	5.7509	6.7392	8.2201	9.5519	13.1212
2015	4.4359	5.2641	5.7968	6.6732	7.9102	9.7970	12.9016	17.1648	23.1304
2016	5.4455	6.6491	7.3485	8.7745	10.8131	14.1056	18.8475	22.9582	29.0033
2017	6.7854	8.4583	9.4930	11.5967	14.5074	19.5176	24.8635	27.7017	33.8362
2018	8.4210	10.5316	11.9696	14.5159	18.2057	24.0530	28.8060	31.9727	38.2203
2019	10.1284	12.7167	14.1630	16.9473	21.3986	26.7872	31.7745	34.8848	41.3204
2020	11.7719	14.4188	15.9854	18.9983	23.6983	28.8612	34.0451	37.1677	43.4675

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	4.4629	0.7870
2013	4.2318	0.9181
2014	4.8402	1.0261
2015	7.5368	3.1067
2016	10.1703	4.5842
2017	13.9835	5.9142
2018	17.9005	6.7870
2019	20.9171	7.0713
2020	23.3541	7.3026

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.8020	3.2593	3.4862	3.9065	4.4166	4.9690	5.4924	5.8586	6.4566
2013	2.3253	2.8299	3.1181	3.5816	4.1633	4.7939	5.4706	5.8378	6.6196
2014	2.7358	3.2932	3.5994	4.0996	4.7383	5.4858	6.1756	6.7070	7.4942

2015	3.6951	4.4561	4.9582	5.7597	6.7501	8.3894	10.4115	12.3208	20.8862
2016	4.7432	5.7021	6.2972	7.3644	8.8967	11.0945	15.4679	21.3344	25.6567
2017	5.7960	7.1450	7.9906	9.7629	12.3006	16.9139	22.9428	25.0466	32.6186
2018	7.2072	9.1015	10.3529	12.8089	16.2014	22.6097	26.7892	30.6557	36.6607
2019	8.8611	11.2774	12.7612	15.3997	19.8763	25.5044	30.5323	34.1048	39.6034
2020	10.5365	13.1833	14.7771	17.6894	22.6089	27.9081	33.3628	36.5746	43.2133

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	5.7217	0.9725
2013	7.4668	2.1615
2014	10.2489	3.9841
2015	14.0222	5.5450
2016	18.3877	6.7610
2017	22.6175	7.5219
2018	26.1905	7.9558
2019	28.8971	8.1401
2020	30.8638	8.2290

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.7022	4.2337	4.5369	5.0331	5.6350	6.3161	7.0127	7.4361	8.2229
2013	4.3694	5.0313	5.4671	6.1455	6.9920	8.1331	9.8880	11.4371	15.8054
2014	5.3032	6.2672	6.8248	7.7835	9.1541	11.1884	14.9444	19.4738	24.9500
2015	6.4834	7.8099	8.5995	10.1959	12.5503	16.3797	21.5526	25.7987	32.7708
2016	8.0013	9.9087	11.1013	13.4786	16.7668	22.3023	27.7794	31.3760	38.5928
2017	9.9958	12.4796	14.0364	16.8817	21.2046	27.5599	32.9453	36.4531	43.3632
2018	12.1892	15.0745	16.7943	20.0643	25.2866	31.2463	37.0513	40.5521	47.6016
2019	14.1717	17.2940	19.1057	22.7195	28.1590	34.0179	39.8920	43.3470	50.7333
2020	15.8831	19.0721	20.9673	24.6368	30.0694	36.1272	42.0549	45.8930	52.7723

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	1.1500	0.0000
2013	1.1500	0.0000
2014	0.9853	0.2484
2015	1.4138	0.4699
2016	2.0389	0.8322
2017	2.7453	1.0777
2018	3.5282	1.2842
2019	4.1773	1.3721
2020	4.6721	1.4108

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
2013	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
2014	0.5368	0.6463	0.7096	0.8134	0.9448	1.1149	1.3359	1.4677	1.7025
2015	0.7957	0.9191	0.9954	1.1274	1.2944	1.5486	1.9299	2.3075	3.2475
2016	0.9822	1.1709	1.2927	1.5138	1.8362	2.2603	3.0001	3.9438	5.1142
2017	1.2125	1.5029	1.6734	2.0054	2.4647	3.2277	4.2358	4.9275	6.3433
2018	1.5180	1.8920	2.1253	2.5800	3.2273	4.3289	5.3342	5.9941	7.1485

2019	1.8471	2.3031	2.6045	3.1356	3.9436	5.0600	6.0709	6.7495	7.8723
2020	2.1782	2.7119	3.0055	3.5803	4.5046	5.5823	6.6119	7.2016	8.5146

Landings x 1000 MT

Year	Average	StdDev
2012	1.1500	0.0000
2013	1.1500	0.0000
2014	0.9853	0.2484
2015	1.4138	0.4699
2016	2.0389	0.8322
2017	2.7453	1.0777
2018	3.5282	1.2842
2019	4.1773	1.3721
2020	4.6721	1.4108

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
2013	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
2014	0.5368	0.6463	0.7096	0.8134	0.9448	1.1149	1.3359	1.4677	1.7025
2015	0.7957	0.9191	0.9954	1.1274	1.2944	1.5486	1.9299	2.3075	3.2475
2016	0.9822	1.1709	1.2927	1.5138	1.8362	2.2603	3.0001	3.9438	5.1142
2017	1.2125	1.5029	1.6734	2.0054	2.4647	3.2277	4.2358	4.9275	6.3433
2018	1.5180	1.8920	2.1253	2.5800	3.2273	4.3289	5.3342	5.9941	7.1485
2019	1.8471	2.3031	2.6045	3.1356	3.9436	5.0600	6.0709	6.7495	7.8723
2020	2.1782	2.7119	3.0055	3.5803	4.5046	5.5823	6.6119	7.2016	8.5146

Total Fishing Mortality

Year	Average	StdDev
2012	0.3298	0.0728
2013	0.3546	0.0959
2014	0.2500	0.0000
2015	0.2500	0.0000
2016	0.2500	0.0000
2017	0.2500	0.0000
2018	0.2500	0.0000
2019	0.2500	0.0000
2020	0.2500	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.2039	0.2339	0.2478	0.2786	0.3185	0.3669	0.4218	0.4607	0.5513
2013	0.2072	0.2344	0.2516	0.2874	0.3378	0.4034	0.4718	0.5290	0.6698
2014	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2015	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2016	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2017	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2018	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2019	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
2020	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500

Probability Spawning Stock Biomass Exceeds Threshold 43.200 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000300
2018	0.002400
2019	0.005200
2020	0.010900

Probability Threshold Exceeded at Least Once = 0.0141

Probability Total Fishing Mortality Exceeds Threshold 0.2500

Year	Probability
2012	0.891000
2013	0.907500
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000

Probability Threshold Exceeded at Least Once = 0.9229

Framework Adjustment 50 to the
Northeast Multispecies FMP

Appendix V

NMFS Analysis and Discussion of FY 2013 to 2013 Unused Sector ACE Carryover
and
Proposed FY 2014 and beyond Carryover Program Clarification under Section 305(d) of the Magnuson-Stevens Conservation and Management Act

1.0 Introduction

The purposes of this appendix to the Framework Adjustment 50 Environmental Assessment (EA) are twofold: It is designed to provide NMFS-conducted analysis to support the NMFS preferred alternative to allow issuance of fishing year (FY) 2012 to FY 2013 unused sector ACE carryover. The analysis was conducted by staff from the NMFS Northeast Regional Office Sustainable Fisheries Division with support from the Northeast Fisheries Science Center. The discussion supplements the discussion already contained in the Council analysis of carryover impacts contained in the EA. Second, it outlines a section 305(d) Magnuson-Stevens Act carryover program clarification for use in FY 2014 and beyond.

2.0 FY 2012 to FY 2013 unused sector ACE

2.0.1 Background. Currently, the Northeast Multispecies Fishery Management Plan (FMP) authorizes up to 10 percent of unused sector Annual Catch Entitlements (ACE) for all stocks except GB yellowtail flounder[1] to be brought forward for use in the following fishing year. Termed 'carryover,' this provision was developed, approved, and implemented in Amendment 16 to the FMP. The provision did not specify how carried over catch should be accounted for under the annual catch limit (ACL) system concurrently implemented by Amendment 16.

In the two fishing years since the implementation of Amendment 16, NMFS has allowed up to the full 10 percent carryover of unused sector ACE, consistent with the FMP measures. To date, NMFS has accounted for carryover by first attributing catch in the next fishing year against any available carryover without deducting it from the sector sub-ACL for the next year. After the amount carried over has been fully exhausted, the sector's remaining catch for the year has been attributed to and deducted from the sector sub-ACL.

NMFS expected this accounting method could be used in a manner consistent with the overall intent of stock-level catch limits such that the risk of overfishing was minimal. To date, this accounting process has not caused any fishery level ACLs to be exceeded, even though the total potential catch (i.e., available ACLs + carryover) was higher than the fishery level ACL. There are multiple reasons for this: First, sectors have deliberately under harvested ACE to ensure carryover would be available in the subsequent fishing year. The ability to fully harvest all available stocks to the maximum amount allocated may be constrained. There are numerous possible explanations for why this may occur, including stock abundance, low catch rates, low ACE availability, market conditions and/or the ability to target the a specified stock. Other components within the fishery, such as the state waters sub-component or recreational fishery, have not fully harvested their respective sub-ACLs. This has been true even though the catch limits for some stocks have been reduced from one year to the next during the FY 2010 to FY 2012 timeframe.

[1] Any unused ACE allocated for Eastern GB cod or haddock stocks contributes to the 10-percent carry-over allowance for each but does not increase the allocation of Eastern cod or haddock during the following year.

NMFS now believes that a carryover from one fishing year to another must be fully accounted for in the second year ACLs to be consistent with the catch limit requirements established by the reauthorized Magnusson-Stevens Act and National Standard 1 (NS1) guidelines. The current carryover accounting practice of the Northeast region may be inconsistent with this conclusion to the extent it results in an ACL in one year to be exceeded due to additional carried over catch from the preceding year. It also would be inconsistent with conservation objectives of Amendment 16. On the other hand, to eliminate the carryover provision because of these concerns would potentially conflict with National Standard 10 provision of promoting safety at sea. As a result, there is a fundamental conflict between the conservation and management objectives of Amendment 16 between the need to ensure adherence to the catch limits for conservation purposes and the need to promote sector operational flexibility and safety at sea.

Carryover has been discussed and analyzed frequently since Amendment 16 was implemented in 2010 (75 FR 18262; April 9, 2010):

- As an outgrowth of an October 2011 sector workshop, the Council requested that NMFS analyze if more than 10 percent of ACE could be carried over from year-to-year. The Northeast Fisheries Science Center (NEFSC) conducted an analysis in November 2011 indicating that under harvest in year 1 would have some realized stock growth in year 2 that could permit some amount of carryover such that overfishing would not occur in year 2. This analysis was sent to the Council in late December 2012 with a request for the Council's Scientific and Statistical Committee (SSC) to provide advice on potential carryover increases above the existing 10 percent.
- The Council sent a January 20, 2012, letter to NMFS asking several clarifying questions pertaining to both the NEFSC analysis and carryover in general.
- NMFS responded on May 25, 2012. In this response, NMFS requested the Council review the existing carryover program to ensure consistency with the FMP objectives and the National Standard 1 guidelines. NMFS also explained the catch accounting process being used with respect to carryover. This process was previously outlined in this section.
- Carryover was discussed at the May 2012 Groundfish Committee meeting. The discussion followed many of the points raised in the May 25, 2012, letter to the Council.
- During the June 2012 Council meeting, a motion was passed requesting NMFS analyze the possibility of increasing the FY 2012 to FY 2013 GOM cod carryover from 10 to 50 percent. NMFS responded via letter on July 26, 2012. In this letter, NMFS relayed that a 50-percent under harvest in FY 2013 would not result in a 1-to-1 increase in FY 2013. The letter also relayed that carryover could not allow catch that would exceed annual catch limits or mortality targets that would result in overfishing.
- In the interim between these discussions, analyses, and letters, carryover continued to be discussed internally by NMFS and with the Council's Groundfish Plan Development Team.
- NMFS announced on February 14, 2013, the intent to propose the carryover amounts outlined here.
- On March 1, 2013, NMFS sent additional background and rationale in support of its preliminary determination to provide carryover amounts outlined here. This letter reiterated the need to revisit and revise the carryover program, specifying that such work must be completed and available for the FY 2014 fishing year that begins May 1, 2014.

The catch limits proposed for FY 2013 are substantial reductions for many stocks and present a complication with the existing carryover regulations. If 10 percent is carried over and is fully harvested in FY 2013 and the available ACLs are similarly fully harvested, the total catch (ACLs + carryover) will not only exceed the Council and NMFS recommended ACLs, but also the Acceptable Biological Catch (ABC) levels. For Gulf of Maine cod, the total potential catch would exceed the Overfishing Limit (OFL). NMFS now believes that a carryover from one fishing year to another must be accounted for in the second year ACLs to be consistent with the catch limit requirements established by the reauthorized Magnusson-Stevens Act and National Standard 1 (NS1) guidelines. Amendment 16 did acknowledge the potential for carryover to either increase the risk of or cause overfishing in a given year, particularly in the event that year-to-year catch limits declined steeply and available allocations and carryover were fully harvested (Amendment 16 FEIS, pp. 505-6).

Despite the extensive dialog on carryover, the Council did not develop modifications to the carryover program to be part of either Framework 48 or 50 action for May 1, 2013 implementation. There are two issues requiring resolution with respect to the current carryover program: An approach for addressing the carryover associated with the relatively high FY 2012 catch limits to the proposed lower FY 2013 limits that prevent overfishing and a long-term revision of the carryover program for consistency with the intent of Amendment 16 and the Magnuson-Stevens Act.

NMFS is proposing a 1-year transition period from FY 2012 to FY 2013 wherein carryover is permitted up to 10 percent of FY 2012 ACE for all stocks except Gulf of Maine cod. Carryover of Gulf of Maine cod is being proposed up to 1.85 percent of the FY 2012 sector ACE. NMFS proposes to use Magnuson-Stevens Act emergency rulemaking authority under section 305(c) of the act to reduce the amount of available GOM cod carryover from up to 10 percent to up to 1.85 percent. The catch accounting for this carryover would be handled as it has been in the past 2 years: Available carryover will be deducted first, and then remaining catch will be counted against the sector sub-ACL. The actual ACLs would not be modified or increased. This appendix will provide analysis and rationale to support these maximum carryover amounts and monitoring methodology with the intent of ensuring a low risk of causing overfishing should carryover be harvested in FY 2013.

2.1 FY 2012 to FY 2013 Carryover Analysis and Discussion

2.1.1 Introduction. NMFS proposes to continue allowing sectors to carry over up to 10 percent of unused FY 2012 ACE for all stocks except GOM cod. This is the status quo under the existing implementing regulations for the FMP for all carryover eligible stocks except GOM cod. NMFS proposes to use emergency authority provided to the Secretary of Commerce under section 305(c) of the Magnuson-Stevens Act to reduce the maximum carryover allowance for GOM cod so that overfishing is prevented in FY 2013. NMFS proposes to allow GOM cod to be carried over up to 1.85 percent of the FY 2012 ACE.

These carryover amounts are intended to be a 1-year transition, for the reasons that follow, while a more comprehensive long-term solution for carryover is developed. Section 3.0 of this appendix outlines NMFS' proposed carryover program clarification for FY 2014 and beyond. For FY 2013, carryover will only available for unused ACE, meaning that a sector must have under harvested available ACE in FY 2012 to be eligible to receive carryover in FY 2013.

NMFS views the primary purpose of as a way for fishermen to optimize their year-long fishing strategy which, in turn, helps fishermen operate in a safe and efficient manner. By allowing carryover, fishermen are less likely to feel forced to catch every allocated pound before the end of the fishing year, regardless of weather.

NMFS considered that an announcement to substantially reduce or eliminate carryover very late in FY 2012 could have the undesirable consequence of incentivizing a race to fish for the remainder of the year, as fishermen attempt to fully utilize available FY 2012 catch limits. Fishermen have been understandably relying on 10 percent carryover from the beginning of the 2012 fishing year. In light of these issues, NMFS is proposing to allow carryovers as previously outlined, consistent with the mandate to prevent overfishing and our past practices. This intended action would strike a balance in preserving the purpose of carryover while still ensuring that overfishing does not occur.

2.1.2 Analysis. NMFS evaluated the likelihood that stocks could be subject to overfishing if carryover was provided and fully harvested in conjunction with full utilization of all available FY 2013 catch limits. Hereafter, this is referred to as the 'total potential catch', i.e., harvest of the full fishery-level ACL and all available carryover provided.

NMFS first evaluated the offset between the proposed ACLs and their corresponding OFL. These values can be seen in Table 1, below. Next, the potential FY 2012 to FY 2013 carryover was added to the proposed ACLs (total potential catch) and the resulting value once again evaluated relative to the corresponding OFL (Table 1). It is important to note that the actual carryover values are calculated from the distributed ACE after removal of state permit banks from the total ACE. For example the FY 2012 GOM cod sector sub-ACL implemented through interim action is 3,618 mt. Within this, state permit banks were provided 83.4 mt so the 10 percent available for carryover is calculated from the 3,534.6 mt that were distributed as ACE to non-permit bank sectors. The distinction is important as it changes the potential 10 percent carryover from 361.8 mt to 353.5 mt, an 8.3 mt decrease.

Table 1. Potential unadjusted FY 2012 to FY 2013 carryover, proposed FY 2013 ACLs, OFLs, and comparison of total potential catch as a percent of OFL

	All weights are in metric tons (mt)						
Stock/Species	Maximum FY 2013 carryover if no action is taken (10% of FY 2012 sector sub-ACL)	Proposed FY 2013 Sector sub-ACLs	Proposed Total FY 2013 ACLs	FY 2013 OFLs	Proposed 2013 Total ACL as a Percent of the OFL	Total Potential Catch (carryover + ACL)	Total Potential catch as a percent of OFL
Georges Bank Cod	452	1,807	1,907	3,279	58.2%	2,359	71.9%
Georges Bank Haddock	2,735	26,196	27,936	46,185	60.5%	30,671	66.4%
Gulf of Maine Cod	354	830	1,470	1,635	89.9%	1,824	111.5%
Gulf of Maine Haddock	64	186	274	371	73.9%	338	91.1%
Southern New England Yellowtail Flounder	61	480	666	1,021	65.2%	727	71.2%
Cape Cod/Gulf of Maine Yellowtail Flounder	102	467	523	713	73.4%	625	87.7%
American Plaice	318	1,396	1,482	2,035	72.8%	1,800	88.5%
Witch Flounder	142	601	751	1,196	62.8%	893	74.7%
Georges Bank Winter Flounder	337	3,436	3,568	4,819	74.0%	3,905	81.0%
Gulf of Maine Winter Flounder	69	690	1,040	1,458	71.3%	1,109	76.1%
Acadian Redfish	822	10,091	10,462	15,468	67.6%	11,284	73.0%
White Hake	320	3,818	3,914	5,462	72.8%	4,294	78.6%
Pollock	1,230	12,810	14,921	20,060	74.4%	16,151	80.5%

This evaluation showed that for many stocks, total potential catch would be 81 percent or less of the OFL. Despite the potential to exceed the Council-recommended ACLs and SSC-recommended ABCs, NMFS believes there is a very low likelihood that overfishing could occur for these stocks if the total potential catch is realized in FY 2013. These stocks are Georges Bank cod and haddock, Southern New England Yellowtail Flounder, witch flounder, Georges Bank and Gulf of Maine winter flounder, Acadian redfish, white hake, and pollock.

For other stocks, Gulf of Maine haddock, Cape Cod/Gulf of Maine Yellowtail flounder, and American plaice, total potential catch ranged between 81 and 91 percent of the OFL. These stocks may present a higher risk that catch could approach OFL; however, for the reasons outlined in section 2.2.1 of this appendix, NMFS believes that the potential total catch is unlikely to be fully attained. This provides further mitigation against approaching the OFL for these stocks. The total potential catch available for GOM cod exceed would the OFL by 12 percent.

For this reason, the amount of carryover for GOM cod was necessary to reduce so that the risk of overfishing the stock was lowered.

2.1.3 Gulf of Maine cod. For GOM cod, NMFS considered what the FY 2012 catch limit would have been if interim measures to reduce, but not end, overfishing had not been put in place for the year. While this value would differ from what was actually provided as a FY 2012 catch limit, NMFS believes the approach has merit as it is reflective of what catch would have satisfied the requirement to immediately end overfishing in FY 2012. This value provides a factually based number that can be considered for the carryover transition year approach being proposed.

To calculate this value, NMFS relied on the GOM cod stock assessment projection resulting from the December 2012 peer reviewed stock assessment. Some may argue that it would be more appropriate to use the 2011 stock assessment, in part, because the information in the 2012 assessment was not yet known when the catch level was established for FY 2012. NMFS asserts that the 2012 assessment represents the best available scientific information consistent with National Standard 2. Several changes occurred between the 2011 and 2012 assessments, moreover, stock projections to examine fishing mortality and stock sizes in FY 2013 and beyond are conducted with the 2012 assessment methodology. If the 2011 assessment framework were used as the basis to derive this "what if" scenario for FY 2012, the results would not be directly comparable to the projections conducted using the 2012 assessment.

To derive an estimate of what the FY 2012 ABC would have been had interim measures not been used, NMFS applied the ABC control rule employed by the Council in setting catch limits to the 2012 benchmark assessment. The Council control rule currently used to establish ABCs is based on harvesting at 75 percent of the $F_{msy\text{-}proxy}$. Catch projections were conducted based on the 2012 assessment using an assumed harvest at 75% of the $F_{MSY\text{-}proxy}$ (0.135) in 2012. Under these projections the corresponding ABC for FY 2012 would have been 1,249 mt. From this ABC, sectors would have received a sub-ACL of 656 mt, 10 percent of which is 65.6 mt. This value was adjusted slightly to by removing sector permit banks from the ACE calculation as they are ineligible to receive carry over. After this adjustment, the actual carryover value becomes 65.39 mt. When applied to the actual FY 2012 GOM cod sector sub-ACL implemented through interim measures, the 65.39 mt would be 1.85 percent of the catch limit. This is the amount NMFS proposes to provide to sectors as GOM cod carryover for FY 2013. This amount of carryover, when considered as total potential catch for FY 2013 is 94 percent of the OFL, as outlined in the following table.

Table 2. NMFS revised GOM cod carryover information.

Stock/ Species	*Revised* Maximum FY 2013 carryover	Proposed FY 2013 Sector sub-ACL	Proposed Total FY 2013 ACL	FY 2013 OFL	Proposed 2013 Total ACL as a Percent of the OFL	Total Potential Catch (carryover + ACL)	Total Potential catch as a percent of OFL
Gulf of Maine Cod	65	830	1,470	1,635	89.9%	1,535	93.9%

2.2 Discussion

2.2.1 Mitigating Considerations. It is important to consider that the total potential catch represents the ‘worst case scenario’ that may not be realized for several reasons. The examination of total potential catch makes use of the maximum carryover amount possible, i.e., 10 percent for all stocks except GOM cod and 1.85 percent for that stock. Information from the FY 2011 and FY 2012 carry over shows that the full 10 percent is not always brought forward. While the majority of stocks have brought forward 7 to 10 percent, there have been a few situations where slightly less than 5 percent was carried over. It will not be known exactly how much of the potential FY 2012 carryover is brought forward until final catch accounting for the fishing year is complete. This evaluation is typically completed by the end of June. If less than the maximum carryover is brought forward, there will be a greater offset from the applicable OFL. For example, if 80 mt is carried over instead of 102 mt for Cape Cod/GOM yellowtail flounder, the total potential catch becomes 84 percent of the OFL. This is roughly a 3 percent change from the maximum carryover level. This is a likely scenario for this stock based on NMFS catch reports through April 19, 2013.

It is also uncertain how much of the total potential catch will be taken in FY 2013. Certainly, both cod stocks are commercially very important species and the expectation is that the available total potential catch will be as fully used as possible. The Quota Change Model (QCM) used to both project utilization of available quota and the resulting ex-vessel revenue may be helpful in better understanding the total potential catch utilization for FY 2013. The methods and model description can be found in Section 7.4.2.2.2 of this EA.

Table 3. QCM projected FY 2013 utilization, resulting catch, and comparison to OFLs based on preferred catch limit alternatives.

Stock/Species	Total Potential Catch (carryover + ACL)	Total Potential catch as a percent of OFL	QCM Projected Utilization	Resulting total QCM projected catch (mt)	QCM Projected catch as a percent of OFL
Georges Bank Cod **	2,359	71.9%	85.0%	2,005	61.2%
Georges Bank Haddock **	30,671	66.4%	15.0%	4,601	10.0%
Gulf of Maine Cod	1,535	93.9%	99.0%	1,520	92.9%
Gulf of Maine Haddock	338	91.1%	89.0%	301	81.1%
Southern New England Yellowtail Flounder	727	71.2%	88.0%	639	62.6%
Cape Cod/Gulf of Maine Yellowtail Flounder	625	87.7%	74.0%	463	64.9%
American Plaice	1,800	88.5%	78.0%	1,404	69.0%
Witch Flounder	893	74.7%	93.0%	830	69.4%
Georges Bank Winter Flounder	3,905	81.0%	46.0%	1,796	37.3%
Gulf of Maine Winter Flounder	1,109	76.1%	16.0%	177	12.2%
Acadian Redfish	11,284	73.0%	31.0%	3,498	22.6%
White Hake	3,782	71.3%	70.0%	2,647	49.9%
Pollock	16,151	80.5%	51.0%	8,237	41.1%

** combined total of Eastern and Western Georges Bank, including Canadian TAC, aggregate against the total stock OFL.

This information indicates the stocks with the highest likelihood of high levels of potential total catch utilization are both cod stocks, GOM haddock, Southern New England yellowtail flounder and witch flounder. In as much as the QCM can accurately predict utilization, all other stocks FY 2013 catch is projected to be very low percentages of the OFL. Thus, NMFS concludes the risk of overfishing on these stocks is quite low. NMFS maintains that the higher utilization stocks still maintain an effective buffer from the OFL, which should be sufficient to ensure overfishing does not occur.

Table 4 provides information on the utilization of available sector and fishery ACLs for FYs 2010 and 2011. This information may not be predictive of FY 2012 or 2013 utilization for several reasons: Sectors have intentionally under harvested most stocks up to 10 percent to provide subsequent year carryover; the availability of some stocks may have constrained efforts to more fully utilize other stocks; catch limits may have been set optimistically high such that finding sufficient numbers of fish to more fully attain allocations was challenging; and lastly, the FY 2013 fishery will be unlike any previous fishery given the significant reductions in catch limits and condition of the stocks. It is not known how fishing practices may change for the remainder of FY 2012 or how they may differ in FY 2013. The value of the information in Table 4 re-iterates that FY 2012 ACLs may not be fully utilized, nor will all FY 2013 ACLs be fully attained.

Table 4. Percent utilization of available catch limits, by fishing year, 2010-2011. Data listed highest to lowest utilization based on 2-year average total groundfish ACL utilization.

	2010			2011			2-Year Weighted Average		
	Total Groundfish ACL	Commercial Groundfish sub-ACL	Sector sub-ACL	Total Groundfish ACL	Commercial Groundfish sub-ACL	Sector sub-ACL	Total Groundfish ACL	Commercial Groundfish sub-ACL	Sector sub-ACL
White Hake	86.9	88.4	88.4	88.9	93.5	93.9	87.9	91.0	91.2
Witch Flounder	92.6	85.1	84.1	84.8	74.1	75.3	88.7	79.6	79.7
GB Winter Flounder	78.3	75.1	75.8	85.1	86.9	87.4	81.7	81.0	81.6
CC/GOM Yellowtail Flounder	81.7	76.6	76.8	78.9	78.3	79.4	80.3	77.4	78.1
GB cod	83.7	82.5	83.2	68.0	68.8	68.9	75.8	75.6	76.0
SNE Yellowtail Flounder	67.0	55.4	64.9	76.7	67.3	84.3	71.8	61.4	74.6
GOM cod	71.0	75.9	83.6	69.2	74.1	83.4	70.1	75.0	83.5
GOM Haddock	65.5	67.4	46.4	57.7	59.4	52.6	61.6	63.4	49.5
GOM Winter Flounder	83.8	67.2	60.7	52.4	45.0	46.5	68.1	56.1	53.6
Plaice	53.5	53.9	54.7	42.6	43.8	44.7	48.1	48.9	49.7
Pollock	39.8	33.8	33.7	46.1	43.0	42.8	42.9	38.4	38.2
Redfish	30.0	31.4	31.7	25.7	26.9	27.0	27.8	29.2	29.4
GB Haddock	20.0	20.6	20.5	13.0	12.6	12.6	16.5	16.6	16.6

Fish that are not harvested one year can, under specific circumstances, increase stock size in subsequent years due to benefits from additional spawning opportunities and somatic growth. However, this increased stock size will not normally result in a one-for-one increase in the ABC. In scenarios where a stock is substantially under harvested, the increase may well be sufficient to cover carryover issuance, if the exercise were undertaken to adjust ABC in FY 2012. GOM cod does not meet this criterion in FY 2012. To better illustrate this potential stock benefit of under harvest in FY 2012, NMFS conducted stock projections using GOM cod as the example species. While GOM cod is, in some ways, a problematic example because the FY 2012 measures were established through emergency action an allowed continued overfishing, albeit reduced. Further, available catch reporting information indicates that the FY 2012 catch will likely be substantially below the total ACL of 6,700 mt. However, as GOM cod is the stock for which the FY 2013 potential total catch is highest in relation to the overfishing limit, further examination of hypothetical examples provide some insight into the potential catch changes available for allocation in year *t*+1 resulting from under harvest of the year *t* ACL.

Three FY 2012 hypothetical catch assumption scenarios were examined:

1. Catch would be similar to the utilization 2-year average from Table 2. Thus, 73 percent of the FY 2012 total ACL of 6,700 mt would be taken resulting in total catch of 4,891 mt.
2. The entire available FY 2012 ACL of 6,700 mt except for 10 percent withheld by sectors would be taken. This scenario results in a total assumed FY 2012 catch of 6,030 mt.

3. The entire available FY 2012 ACL of 6,700 mt except for the 65 mt being provided as carryover in FY 2013 would be taken. This scenario results in a total assumed FY 2012 catch of 6,617 mt.

These under harvest scenarios result in the following potential changes to the catch advice for FY 2013. The assessment outputs for these analyses can be found later in this appendix. The increases are the amount the ABC could be increased in comparison to a 901 mt ABC from the base case model derived from an assumed FY 2012 catch of 6,700 mt (i.e., fully attained ACL). Scenario:

1. Base case: 6,700 mt caught in FY 2012, FY 2013 ABC derived from the 75 percent F_{msy} ABC control rule
2. The ABC (derived from the 75 percent F_{msy} ABC control rule) could be increased 213 mt.
3. The ABC could be increased 78 mt.
4. The ABC could be increased 9 mt.

While it is unrealistic to expect that the stock assessment projections can be re-run for all multispecies stocks to ascertain the potential changes in catch advice for FY 2013, these examples do provide some context for the potential changes that would result from such an exercise. It is noteworthy that through late March, approximately 57 percent of the FY 2012 sector and common pool GOM cod allocation has been taken. If harvest remains low, even exceeding the 73 percent utilization scenario from above, the FY 2012 under harvest would provide for a potential ABC increase in FY 2013 to sufficiently cover the provided carryover. If the ABC were increased based on this type of analysis, the additional 213 mt would increase the ABC to 1,763 mt (213 + 1,550 mt). The resulting ACL from this ABC would be 1,672 mt which is 137 mt higher than the maximum potential catch of 1,535 mt.

2.2.2 Conclusion regarding FY 2012 to FY 2013 carryover. The total potential catch with the proposed approach to carryover for FY 2013 ensures maximum catch will remain below established overfishing limits. This approach maintains some amount of uncertainty buffers to ensure that the overfishing limits are not exceeded. Furthermore, there is strong supporting information that indicates that overfishing is unlikely to occur, in summary:

- The amount of carryover available from FY 2012 to FY 2013 may be less than the maximum permitted (10 percent for all stocks except GOM cod which is 1.85 percent). Stocks for which carryover is less than the maximum provide additional buffering of total potential catch from OFLs.
- The available FY 2012 ACLs are unlikely to be fully utilized providing stock growth for FY 2013 that, if quantified through stock assessment updates, would indicate potential surplus catch that could be used to adjust the FY 2013 ABC/ACLs that maybe sufficient to fully cover the carryover amounts.
- The actual use of total available catch in FY 2013 is likely to be well below the maximum potential level for many stocks. For those that may fully harvest the total potential catch limit levels, the total catch would remain well below OFLs. In addition, if a full analysis of actual FY 2012 were conducted and FY 2013 ABC/ACL values updated, sufficient stock growth would occur from FY 2012 under harvest to ensure total potential catch would be less than the potential revised ACL values.

Based on this, NMFS believes that allowing these carryover amounts on a narrowly defined 1-year basis is not likely to result in any significant harm to these stocks or, where applicable, their rebuilding strategies. NMFS intends to use the same catch accounting method in place for previous fishing years. Carried over unused ACE will be deducted first from FY 2013 sector catch but will not be counted toward the FY 2013 sector sub-ACL. Once all available carried over catch, all remaining sector catch will be counted against the sector sub-ACL.
NMFS is aware that stock assessment retrospective evaluation of catch advice for some multispecies stocks has been overly optimistic. Fishing mortality has sometimes been higher than previously believed and population size and/or recruitment lower than expected. These issues have arisen in years when catch has remained within established limits. There is the potential risk that this scenario could be realized in retrospective evaluation of either FY 2012 or FY 2013 or both. Such information could change stock perception and allowing carryover could exacerbate the problem. NMFS has evaluated and accepted this risk, in large part, because the total potential catch for all stocks maintains a higher than 50 percent probability of preventing overfishing and the multiple mitigating considerations outlined further decrease the risk of overfishing in FY 2013.

As previously stated, the approach for FY 2013 represents a 1-time approach designed to ensure overfishing does not occur while providing a meaningful transition to a redesigned carryover program. NMFS acknowledges not only the safety-at-sea value of carryover, but also the economic benefit for the upcoming fishing year.

3.0 Proposed Carryover Program for FY 2014 and Beyond

3.0.1 Introduction. As has been stated on numerous occasions, the existing New England Multispecies carryover program, current transitional year notwithstanding, is not consistent with the intent of annual catch limit based management prescribed in National Standard 1 guidelines. NMFS has previously advised that carryover should not cause ACLs to be exceeded or to otherwise cause overfishing. NMFS has provided some guidance in past correspondence regarding more appropriate approaches for carryover. There are limited options for a functional carryover program that is consistent with ACL-based management. NMFS believes that there are two potential overarching options for carryover approaches: A *de minimus* approach that provides nominal carryover designed solely for end-of-year safety at sea considerations or a larger scale program designed to provide relatively large year-to-year carryover for safety, operational efficiency, and market optimization.

3.0.2 NMFS Recommended Approach for FY 2014 and Beyond. NMFS believes the concept of unused ACE carryover has merit, primarily to address at-sea safety concerns. In the following section, NMFS proposes the conceptual framework for a *de minimus* approach to carryover and provides some additional information to consider in the development of larger scale carryover programs. NMFS is recommending a *de minimus* approach as a clarification under section 305(d) of the Magnuson-Stevens Act for 2014 and beyond, as outlined below. The clarification component is that while the current program provides for <u>up to</u> [emphasis added] 10 percent carryover of unused ACE, NMFS will only provide a nominal carryover amount to ensure consistency with the FMP and the intent of catch limit requirements of the Magnuson-Stevens Act. It may be possible, through future analysis, to justify and provide a larger amount of carryover up to 10 percent of the prior year ACE.

3.0.3 Carryover program clarification discussion. Although NMFS believes the current accounting practice for carryovers for FY 2013 can be justified, such practice is not appropriate for FY 2014 and thereafter because there is sufficient time to alert the fishing industry of how NMFS intends to carry out the accounting for carryovers moving forward in a way that is consistent, to the extent practicable, with Magnuson-Stevens Act national standards and other provisions. This is necessary to reconcile the fundamental conflict between ensuring long-term compliance with catch limits and the need to provide at some level the safety and management benefits of carryovers. Because the Council did not specify how to account for carryovers in light of this conflict in Amendment 16 nor in proposed Frameworks 48 and 50, NMFS has determined it has the responsibility under Section 305(d) to propose regulations that ensure that the measures of Amendment 16 and Frameworks 48 and 50 can be carried out in a manner consistent with the provisions of the Magnuson-Stevens Act. NMFS has concluded it has the authority to propose such regulations because they are consistent with the authority provided the Secretary of Commerce in Section 305(d) of the Magnuson-Stevens Act. This section makes clear that the Secretary has the authority and responsibility to implement regulations to carry out existing fishery management plan provisions to ensure their function in accordance with the Act. In this case, such an approach is justified by this unusual circumstance where previously approved Council-recommended measures must now be reconciled in order to be carried out consistently with the Magnuson-Stevens Act and the National Standard guidelines NMFS proposes a two-part system to clarify carryover operations in FY 2014 and beyond. This proposed approach would provide at least a nominal (*de minimus*) amount of carryover with the potential to provide up to the full 10 percent without triggering reactive pound-for-pound accountability measure overage paybacks, dependent on the final total fishery catch relative to the total fishery ACL. The carryover accounting process used by NMFS in this proposed system is the fundamental clarification, as explained in the following paragraphs. Carryover would continue to be available only when sectors under harvest available ACE in the prior year by an amount sufficient to provide the carryover level in question. This would apply to both *de minimus* and other carryover.

First, NMFS proposes to provide an automatic *de minimus* amount of carryover. This will ensure some level of carryover that industry can count on and factor into their decision making late in the fishing year. NMFS has not yet determined what an appropriate *de minimus* amount would be. Examples may include an amount sufficient to cover an average trip's landing for the stock in question. The rationale being that if a single trip is not made late in the fishing year because of safety concerns or market conditions, the foregone catch from that trip could be carried forward. Other options include a small percentage of the following year ACE for the stock in question (e.g., 1 percent of the stock's FY 2014 ACE). This would better ensure that available *de minimus* carryover was consistent with the prevailing stock conditions and catch advice for the year in which carryover would be harvested.

The expectation is that the *de minimus* amount of carryover provided may be justified for multiple reasons. The amount provided, if taken, would not be expected to cause fishery-level ACLs to be exceeded. The analysis conducted for FY 2012 to FY 2013 carryover has illustrated that the fishery has not operated in a manner that fully utilizes available allocations. Even with the 10 percent routinely set aside from the sector sub-ACL to provide carryover, few stocks have utilized greater than 85 percent of the available stock level ACL. As previously stated, NMFS is continuing to develop *de minimus* carryover analyses and will provide completed results to the Council's Groundfish Plan Development Team and Groundfish Committee for their review and input. It is not expected that the *de minimus* carryover amount would be re-evaluated annually; however, if the ongoing analysis indicates this would be a critical component to ensure ACLs were not likely to be exceeded, then annual review could be contemplated.

Second, NMFS would allow sectors to continue fishing beyond their initially allocated ACE up to the full carryover amount for which they are eligible based on their prior year under harvest. The maximum amount would remain 10 percent, inclusive of the automatic *de minimus* carryover. At the end of the fishing year or as soon as possible thereafter, NMFS would evaluate the total fishery catch relative to the total ACL. The amount of carryover counted against the sector ACE would depend on if the total catch is above or below the ACL. Here are the proposed accounting procedures NMFS would use:

- If the total ACL for the year is not exceeded, any carryover used would not be counted against a sector's ACE. No reactive AM would be required. Essentially, because the total ACL was not exceeded, most likely because some sectors or other fishery components did not fully utilize their respective allocations for the year, there is no consequence associated with the use of carryover. This would result in accounting that is similar to the current carryover accounting practice wherein carryover use is not directly attributed to sector ACE.
- If the total ACL for the year has been exceeded and carryover was used, NMFS would only count the amount of carryover used above the total ACL against sector ACE. Individual sectors involved with the ACL overage as a result of carryover use would be subject to pound-for-pound overage repayment specified by the FMP accountability measures. It is possible that some portion of carryover use may not be attributed to sector ACE, even if the ACL is exceeded. If other fishery components contribute to the ACL overage, sectors would only be charged for the carryover ACE used.
- In the event that a situation similar to FY 2013 occurs wherein substantial catch reductions are required, NMFS would consult with the Council about modifying the allowable carryover amount in excess of the *de minimus* level so that the total potential catch did not exceed the OFL. For FY 2013, NMFS is making such a modification using section 305(c) authority in large part due to the timing considerations and lack of adequate public notice and comment; however, in future similar situations NMFS would rely on 305(d) authority and Council recommendations to effect such changes. The rationale for so doing would be clarifying the carryover amount(s) to be consistent in a given year with the annual catch limit requirements of the Magnuson-Stevens Act.

NMFS believes this proposed approach maintains the original intent of the carryover program established by Amendment 16 and improves the consistency of the program with the intent of the annual catch limit requirements of the Magnuson-Stevens Act and NS 1 guidelines. Under this proposed clarification, sectors could continue to fish beyond their initially allocated ACE, up to the amount of their eligible carryover (up to 10 percent); however, there is some risk involved with using carryover. If the fishery level ACL is exceeded, individual sectors that made use of carryover would face an accountability measure. This system would set a total potential catch above the fishery-level ACL; however, the insurance that accountability for any ACL overage that would result due to use of carryover use is sufficient to justify this approach.

NMFS recognizes that this proposed clarification is a substantial change to the existing carryover program. However, NMFS has been clear that beyond FY 2013, the existing carryover program requires revision to operate consistent with the Magnuson-Stevens Act, the FMP, and NS 1 guidelines. NMFS acknowledges that this general description of the proposed accounting change does not explicitly discuss the implications of leasing ACE. Leasing, as well as other complexities of the accounting system have not yet been closely evaluated by NMFS or discussed with the Council and public. As a result, NMFS is soliciting public comment on the overall conceptual approach proposed. After considering comments received, NMFS may further clarify any remaining details, either in collaboration with the Council or independently, for FY 2014 implementation. The Council may also take action to revise the carryover program for FY 2014.

4.0 GOM Cod Assessment Outputs used in Carryover Analyses (Section 2.2)

Base Projection

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AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 01 Mar 2013  11:57

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_75FMSY_12CAT6700.INP

First Age Class:                        1
Number of Age Classes:                  9
Number of Years in Projection:         19
Number of Fleets:                       1
Number of Recruitment Models:           1
Number of Bootstraps:                1000
Number of Simulations:                 10

Bootstrap File Name:            D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\SAW55_3BLOCK_BASE_MCMC.BSN

Number of Feasible Solutions:      10000  of      10000 Realizations

Input Harvest Scenario

Year  Type         Value

2012  Landings       6700
2013  F-Mult       0.1350
2014  F-Mult       0.1350
2015  F-Mult       0.1350
2016  F-Mult       0.1350
2017  F-Mult       0.1350
2018  F-Mult       0.1350
2019  F-Mult       0.1350
2020  F-Mult       0.1350
2021  F-Mult       0.1350
2022  F-Mult       0.1350
2023  F-Mult       0.1350
2024  F-Mult       0.1350
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2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000 Fish

Year Class	Average	StdDev
2012	6926.7937	4465.8077
2013	6923.5380	4386.4587
2014	6937.4571	4438.1684
2015	6919.2931	4527.0696
2016	6848.1821	4336.7865
2017	6927.8128	4327.1141
2018	6904.8750	4345.1040
2019	6853.8386	4341.3137
2020	6939.1845	4398.8850
2021	6952.5694	4402.3823
2022	6973.7562	4462.6114
2023	6932.3252	4365.9713
2024	7044.3441	4564.4314
2025	6897.3804	4358.1031
2026	6933.3608	4380.3428
2027	6924.7521	4452.7725
2028	7017.1113	4540.7667
2029	6852.1367	4397.8307
2030	6883.5775	4300.2626

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2013	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2014	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2015	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2016	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2017	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2018	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2019	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2020	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2021	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2022	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2023	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2024	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2025	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2026	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2027	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2028	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2029	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600

2030	1347.1080	2222.8420	3135.0670	3934.5510	5235.3460	9103.0150	11930.1300	14588.2800	23922.8900

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	8.3421	2.3918
2013	7.2783	2.6810
2014	10.0500	2.8974
2015	14.8931	3.5798
2016	21.6058	5.3624
2017	28.6115	7.1669
2018	34.6725	8.3695
2019	39.8453	9.2322
2020	45.8045	9.9438
2021	51.8793	11.2043
2022	56.2174	11.7407
2023	59.3242	12.0087
2024	61.5622	12.1824
2025	63.1762	12.2105
2026	64.3926	12.2510
2027	65.2718	12.3115
2028	65.8909	12.4036
2029	66.3606	12.4648
2030	66.6867	12.5129

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.1577	4.6894	5.3264	6.7168	8.1697	9.7514	11.4842	12.6049	14.6496
2013	2.0220	3.3134	3.9764	5.4013	6.9855	8.8429	10.7648	12.0274	14.5567
2014	4.3182	5.7556	6.5504	8.0248	9.7666	11.7369	13.8544	15.3133	17.9104
2015	7.9562	9.7198	10.6605	12.4135	14.4784	17.0082	19.5943	21.4709	25.1903
2016	12.2507	14.3536	15.5521	17.8707	20.8614	24.5051	28.5318	31.5311	38.3466
2017	16.4638	18.9882	20.5723	23.4685	27.5529	32.4312	38.0922	42.2869	50.0720
2018	20.4447	23.1957	25.1084	28.6617	33.4204	39.2037	46.1718	50.3541	59.2481
2019	23.7347	27.0746	29.1108	33.2551	38.5400	45.2349	52.3447	56.8784	66.7061
2020	28.0756	31.8883	34.1766	38.6707	44.4802	51.6589	59.1503	64.0874	74.5029
2021	31.7544	35.9814	38.7526	43.8574	50.4813	58.4978	66.9303	72.5104	83.6380
2022	34.4395	39.1381	42.2152	47.7970	54.9071	63.3100	71.7896	77.3716	89.1265
2023	36.8443	41.7503	44.9461	50.7437	58.0647	66.5819	75.1497	80.9850	92.6454
2024	38.2779	43.6589	47.0303	52.8656	60.4319	68.9056	77.7217	83.5149	95.8973
2025	39.8224	45.0879	48.3943	54.4421	62.0539	70.5079	79.4209	84.9696	96.7211
2026	40.8001	46.2817	49.5988	55.6769	63.3456	71.9574	80.7713	86.4580	97.3255
2027	41.7581	47.1878	50.3627	56.4071	64.0759	72.8733	81.9559	87.4281	98.3377
2028	42.3610	47.6628	51.0017	56.9348	64.6496	73.3928	82.5775	88.1448	99.2880
2029	43.1109	47.9654	51.2932	57.3363	65.1541	74.0516	83.1237	88.7875	100.4885
2030	43.2051	48.3273	51.6468	57.5700	65.4016	74.4031	83.5932	89.1376	100.3399

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	10.7059	3.2239
2014	15.4452	3.7906
2015	22.1547	5.2730
2016	30.1413	7.3359
2017	37.9599	9.1415
2018	44.5656	10.3001
2019	50.1871	11.0989
2020	56.6677	11.7588
2021	63.2691	13.0254
2022	67.9976	13.5786
2023	71.4015	13.8755
2024	73.8532	14.0701
2025	75.6215	14.0981
2026	76.9547	14.1426
2027	77.9002	14.2312
2028	78.5523	14.3388
2029	79.0632	14.3853
2030	79.4242	14.4249

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.2801	8.7308	9.4238	10.9381	12.5757	14.4349	16.4055	17.7124	20.3350
2013	4.3167	5.9154	6.7933	8.4507	10.4136	12.5721	14.9009	16.5455	19.3998
2014	7.9906	9.8492	10.9069	12.7981	15.0611	17.7540	20.4987	22.3281	25.7647
2015	12.6862	14.8254	16.1119	18.4860	21.4778	25.0589	29.0393	31.8008	38.1984
2016	17.5282	20.2108	21.8605	24.9474	29.0992	34.0181	39.7382	44.0453	52.4592
2017	22.3783	25.4374	27.5360	31.4008	36.6994	42.8888	50.3326	55.2363	65.3209
2018	26.7326	30.3722	32.6248	37.1819	43.1202	50.4938	58.4965	63.6624	74.4957
2019	30.4507	34.6263	37.1978	42.2012	48.7452	56.7277	65.0894	70.4613	82.7322
2020	35.4717	39.9093	42.8344	48.2972	55.2291	63.6885	72.3081	78.3793	89.8595
2021	39.2103	44.5528	47.8026	53.9858	61.8046	71.0905	80.6526	87.2284	99.3462
2022	42.4073	48.1355	51.8015	58.2641	66.5914	76.2487	86.0296	92.2583	105.6663
2023	44.9716	50.9888	54.7950	61.5452	70.0199	79.8640	89.8622	96.1288	110.0289
2024	46.6588	53.0663	56.8685	63.8510	72.6298	82.3113	92.7014	98.8778	113.2429
2025	48.5350	54.6026	58.5287	65.5437	74.3109	84.2971	94.3116	101.0491	113.9889
2026	49.4107	56.0964	59.8183	66.8869	75.6943	85.7998	96.0246	102.2809	114.4358
2027	50.5622	56.9956	60.7051	67.7300	76.5713	86.7193	97.0317	103.4275	115.5463
2028	51.3623	57.2729	61.2143	68.3286	77.1148	87.3236	97.8675	104.1836	117.3493
2029	52.0187	57.7592	61.6717	68.6730	77.7351	87.9680	98.2806	104.8636	118.3263
2030	51.7720	58.1753	62.0276	68.9507	78.0863	88.4643	98.8185	105.1974	117.6996

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	12.5945	3.4525
2013	14.0806	3.7122
2014	20.6332	4.8870
2015	29.1103	7.2371

2016	37.8213	9.5292
2017	45.5447	11.0778
2018	52.0941	12.0821
2019	57.7495	12.7725
2020	63.6419	13.2787
2021	69.2469	14.0712
2022	73.2649	14.4480
2023	76.1802	14.6742
2024	78.2957	14.8263
2025	79.8349	14.8682
2026	80.9779	14.9296
2027	81.7873	15.0362
2028	82.3326	15.1312
2029	82.7591	15.1450
2030	83.0638	15.1699

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	5.3472	7.3621	8.2813	10.2447	12.2708	14.6031	17.1045	18.6011	21.5994
2013	6.5964	8.5417	9.6127	11.4610	13.7470	16.3595	18.9828	20.7829	23.9681
2014	11.4945	13.7276	14.9679	17.2476	20.0223	23.3520	27.0224	29.5082	35.1108
2015	16.7504	19.5743	21.0265	24.0374	28.0396	32.8784	38.5116	42.7461	51.8844
2016	21.9243	25.0220	27.1167	30.9929	36.3929	42.8563	50.5072	56.0370	66.3301
2017	26.5062	30.3471	32.8301	37.5664	43.8858	51.6818	60.7041	66.2838	78.2716
2018	30.9529	35.3573	38.0269	43.4970	50.4802	59.1738	68.4468	74.3494	87.4273
2019	34.7988	39.7416	42.7356	48.5713	56.1281	65.3641	74.8872	81.2901	94.4343
2020	39.4493	44.5586	47.8923	54.1888	62.0292	71.6809	81.3386	88.2562	100.8303
2021	42.7909	48.7624	52.4802	59.2204	67.7184	77.8635	87.9312	94.8618	108.3001
2022	45.7838	52.0306	55.9824	62.9779	71.8852	82.0922	92.3559	98.9641	112.9644
2023	47.8982	54.4684	58.5215	65.7297	74.7703	84.9459	95.7880	102.2032	116.8936
2024	49.8519	56.3499	60.2856	67.6763	76.9498	87.3069	98.1454	104.8944	118.2968
2025	51.0317	57.7939	61.8122	69.2935	78.5477	89.0550	99.8048	106.4874	119.9917
2026	51.9708	59.1256	62.9043	70.3144	79.5542	90.2609	101.1171	107.6147	120.8693
2027	53.1917	59.6535	63.6296	71.0063	80.2255	90.9286	102.0755	108.7196	122.1849
2028	54.0221	60.0591	64.0219	71.4418	80.7996	91.6352	102.7972	109.7319	123.1467
2029	53.8982	60.4374	64.3871	71.8098	81.3703	92.2216	103.2039	109.8964	123.6715
2030	54.1130	60.8848	64.8232	72.0875	81.7340	92.4492	103.2939	110.1303	123.2661

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	6.7000	0.0000
2013	0.9327	0.3719
2014	1.2065	0.4018
2015	1.7456	0.4281
2016	2.6493	0.6621
2017	3.6378	0.9544
2018	4.5180	1.1456
2019	5.2853	1.2939
2020	6.0797	1.4050

2021	6.8364	1.5428
2022	7.3776	1.5988
2023	7.7614	1.6260
2024	8.0391	1.6434
2025	8.2417	1.6485
2026	8.3941	1.6571
2027	8.5040	1.6653
2028	8.5865	1.6753
2029	8.6459	1.6854
2030	8.6847	1.6920

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000
2013	0.2032	0.3832	0.4661	0.6697	0.9005	1.1584	1.4200	1.5867	1.9403
2014	0.4187	0.6165	0.7121	0.9325	1.1625	1.4426	1.7295	1.9313	2.2885
2015	0.8824	1.1088	1.2312	1.4444	1.7083	2.0120	2.3102	2.5122	2.9034
2016	1.4880	1.7598	1.9103	2.1923	2.5538	3.0019	3.4952	3.8724	4.7465
2017	2.0617	2.3933	2.5761	2.9595	3.4881	4.1244	4.8762	5.4706	6.6486
2018	2.6117	2.9748	3.2222	3.6979	4.3475	5.1264	6.0720	6.6934	7.9483
2019	3.0662	3.5149	3.7888	4.3569	5.0954	6.0248	7.0401	7.6990	9.0493
2020	3.6227	4.1272	4.4462	5.0761	5.8895	6.8992	7.9935	8.6548	10.1863
2021	4.0738	4.6492	5.0382	5.7318	6.6270	7.7528	8.8895	9.6942	11.2503
2022	4.4476	5.0731	5.4791	6.2358	7.1939	8.3440	9.4937	10.2901	11.8195
2023	4.7292	5.4016	5.8253	6.5939	7.5816	8.7453	9.9120	10.6862	12.2907
2024	4.9362	5.6480	6.0831	6.8680	7.8648	9.0283	10.2100	11.0026	12.6174
2025	5.1165	5.8253	6.2480	7.0600	8.0946	9.2285	10.4395	11.1976	12.7581
2026	5.2504	5.9328	6.3973	7.2108	8.2338	9.4124	10.6190	11.3904	12.9313
2027	5.3826	6.0636	6.4990	7.3069	8.3378	9.5199	10.7466	11.5015	12.9659
2028	5.4432	6.1478	6.5973	7.3808	8.4083	9.6003	10.8426	11.6073	13.1440
2029	5.5132	6.1759	6.6250	7.4271	8.4792	9.6608	10.9304	11.6996	13.2368
2030	5.5401	6.2218	6.6485	7.4568	8.5078	9.7394	10.9712	11.7205	13.2948

Landings x 1000 MT

Year	Average	StdDev
2012	6.7000	0.0000
2013	0.9327	0.3719
2014	1.2065	0.4018
2015	1.7456	0.4281
2016	2.6493	0.6621
2017	3.6378	0.9544
2018	4.5180	1.1456
2019	5.2853	1.2939
2020	6.0797	1.4050
2021	6.8364	1.5428
2022	7.3776	1.5988
2023	7.7614	1.6260
2024	8.0391	1.6434
2025	8.2417	1.6485

2026	8.3941	1.6571
2027	8.5040	1.6653
2028	8.5865	1.6753
2029	8.6459	1.6854
2030	8.6847	1.6920

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000	6.7000
2013	0.2032	0.3832	0.4661	0.6697	0.9005	1.1584	1.4200	1.5867	1.9403
2014	0.4187	0.6165	0.7121	0.9325	1.1625	1.4426	1.7295	1.9313	2.2885
2015	0.8824	1.1088	1.2312	1.4444	1.7083	2.0120	2.3102	2.5122	2.9034
2016	1.4880	1.7598	1.9103	2.1923	2.5538	3.0019	3.4952	3.8724	4.7465
2017	2.0617	2.3933	2.5761	2.9595	3.4881	4.1244	4.8762	5.4706	6.6486
2018	2.6117	2.9748	3.2222	3.6979	4.3475	5.1264	6.0720	6.6934	7.9483
2019	3.0662	3.5149	3.7888	4.3569	5.0954	6.0248	7.0401	7.6990	9.0493
2020	3.6227	4.1272	4.4462	5.0761	5.8895	6.8992	7.9935	8.6548	10.1863
2021	4.0738	4.6492	5.0382	5.7318	6.6270	7.7528	8.8895	9.6942	11.2503
2022	4.4476	5.0731	5.4791	6.2358	7.1939	8.3440	9.4937	10.2901	11.8195
2023	4.7292	5.4016	5.8253	6.5939	7.5816	8.7453	9.9120	10.6862	12.2907
2024	4.9362	5.6480	6.0831	6.8680	7.8648	9.0283	10.2100	11.0026	12.6174
2025	5.1165	5.8253	6.2480	7.0600	8.0946	9.2285	10.4395	11.1976	12.7581
2026	5.2504	5.9328	6.3973	7.2108	8.2338	9.4124	10.6190	11.3904	12.9313
2027	5.3826	6.0636	6.4990	7.3069	8.3378	9.5199	10.7466	11.5015	12.9659
2028	5.4432	6.1478	6.5973	7.3808	8.4083	9.6003	10.8426	11.6073	13.1440
2029	5.5132	6.1759	6.6250	7.4271	8.4792	9.6608	10.9304	11.6996	13.2368
2030	5.5401	6.2218	6.6485	7.4568	8.5078	9.7394	10.9712	11.7205	13.2948

Total Fishing Mortality

Year	Average	StdDev
2012	1.0834	0.4679
2013	0.1350	0.0000
2014	0.1350	0.0000
2015	0.1350	0.0000
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000
2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.4962	0.5957	0.6612	0.7880	0.9760	1.2361	1.6371	1.9371	2.9057
2013	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2014	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2015	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

JAN-1 Stock Numbers at Age - 1000 Fish

2012

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	3470.7100	3582.0200	3630.7900	3733.1100	3845.4000	3970.9800	4083.9300	4158.3900	4317.7200
2	238.3360	346.6600	439.6270	636.1570	927.1550	1288.8100	1707.4100	2053.8300	2637.8900
3	628.9300	792.3810	889.8900	1098.6100	1389.0900	1699.8800	2111.8400	2331.2900	2895.3200
4	924.0740	1046.1800	1143.1600	1345.3900	1586.0550	1844.7200	2088.9300	2260.2700	2689.6800
5	541.8520	638.9290	722.4190	836.8020	993.8315	1180.0600	1357.4100	1491.0000	1750.6100
6	205.2150	265.2180	300.2310	360.2070	439.7105	535.3540	637.8940	691.6980	865.0120
7	82.4731	99.1877	117.2230	146.9100	185.1170	230.8150	283.2270	314.3510	388.2850
8	13.6543	18.2450	21.2075	27.9255	37.2013	48.9121	61.3528	70.3407	89.6368
9+	8.5168	11.6466	14.5945	19.3767	26.8609	36.7221	47.8801	56.9625	73.2486

2013

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2	2772.1830	2879.4390	2925.6390	3017.5850	3116.1935	3223.7790	3321.8420	3382.5990	3514.0610
3	180.8547	276.0112	349.2224	505.0685	733.8209	1021.8920	1359.5790	1624.6980	2110.4460
4	354.5095	479.8330	563.1409	723.9744	935.5559	1169.2580	1472.9230	1648.2210	2039.1320
5	124.1835	281.6267	358.9438	525.1115	715.8858	909.3607	1117.4330	1244.0290	1557.7690
6	28.4119	92.9423	138.7101	222.4531	335.6241	465.1009	599.7590	699.4693	882.5237
7	9.6573	32.7927	49.1779	88.4598	138.5321	198.2678	270.6842	309.5335	411.4671
8	3.4180	12.3660	19.0796	35.9609	57.2525	82.8108	115.3504	141.0983	191.8985
9+	1.0871	4.1610	5.7753	11.8948	19.7171	30.5856	43.9776	53.9206	77.5181

2014

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2	1137.4290	1779.8250	2548.8050	3216.7850	4272.0765	7356.3970	10152.7000	12039.0400	20068.7800
3	2260.5060	2347.9700	2385.6430	2460.6030	2540.9835	2628.7880	2708.7010	2758.2930	2865.4580
4	144.3213	220.2589	278.6824	403.0397	585.5885	815.4635	1084.9680	1296.5170	1684.1340
5	267.3007	361.8091	424.6203	545.8841	705.4379	881.6326	1110.5730	1242.8130	1537.5600
6	89.9187	203.9263	259.9143	380.2200	518.3593	658.4572	809.1356	900.7863	1127.9530
7	20.3784	66.6647	99.4899	159.5529	240.7293	333.6033	430.1818	501.6977	632.9939
8	6.9084	23.4571	35.1780	63.2792	99.0997	141.8273	193.6319	221.4225	294.3505
9+	3.2674	11.8713	17.6902	34.3361	55.6238	81.5095	113.6713	140.3495	190.7658

2015

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2	1127.1350	1815.4210	2522.3270	3217.2680	4267.5945	7447.0390	10268.2700	12002.2300	19392.9500
3	927.4998	1451.2620	2078.4230	2623.0000	3483.5215	5998.6630	8278.1560	9817.0450	16363.8300
4	1803.8980	1873.7200	1903.7660	1963.6150	2027.6830	2097.8010	2161.5680	2201.1180	2286.7030
5	108.8216	166.0778	210.1326	303.8916	441.5414	614.8608	818.0762	977.5977	1269.8780
6	193.5426	261.9803	307.4611	395.2664	510.7921	638.3708	804.1362	899.9271	1113.3080
7	64.4967	146.2708	186.4309	272.7316	371.7994	472.2836	580.3785	646.0918	809.0830
8	14.5778	47.6893	71.1676	114.1350	172.2038	238.6419	307.7250	358.8995	452.8182
9+	7.1428	23.9588	37.4986	70.2311	110.3507	157.5919	220.5132	254.9097	353.6420

2016

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%

1	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2	1118.5380	1756.2910	2537.4690	3216.1820	4267.5195	7516.9450	10086.6300	11980.7700	20034.5600
3	919.0880	1480.2840	2056.7610	2623.4060	3479.8840	6072.5310	8373.2590	9787.0510	15813.1400
4	740.1478	1158.0960	1658.6070	2093.1400	2779.8275	4787.0090	6605.8870	7834.0910	13058.5900
5	1360.1990	1412.8050	1435.4390	1480.6060	1528.9165	1581.7600	1629.8380	1659.6550	1724.1830
6	78.7960	120.2545	152.1540	220.0376	319.7104	445.2202	592.3506	707.8616	919.4970
7	138.8275	187.9157	220.5281	283.5169	366.3587	457.8980	576.7932	645.4663	798.5613
8	46.1388	104.6340	133.3623	195.0892	265.9588	337.8476	415.1666	462.2001	578.7621
9+	15.5172	51.5546	78.9089	133.9235	202.7548	287.6169	373.6398	440.7630	573.4221

2017

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2	1107.8540	1709.4190	2474.4290	3216.2170	4271.8110	7389.9540	9971.1160	12007.5700	20674.5000
3	912.0705	1432.1380	2069.1420	2622.5340	3479.7460	6129.5450	8224.9560	9769.4530	16336.4700
4	733.4144	1181.2650	1641.3140	2093.4530	2776.8990	4845.9020	6681.9280	7809.8560	12619.1600
5	558.1019	873.2225	1250.5980	1578.2670	2096.0060	3609.5080	4980.8150	5906.8700	9846.3210
6	984.8902	1022.9730	1039.3720	1072.0970	1107.0555	1145.3120	1180.1250	1201.7190	1248.4510
7	56.5193	86.2547	109.1358	157.8302	229.3193	319.3508	424.8860	507.7226	659.5540
8	99.3207	134.4227	157.7578	202.8133	262.0764	327.5536	412.6097	461.7149	571.2518
9+	43.2642	112.0174	152.0235	242.0170	340.1456	441.6398	556.5182	627.6485	781.2962

2018

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2	1115.9240	1759.1660	2515.9590	3215.3770	4258.9025	7368.5480	9821.9490	11959.8700	19428.6500
3	903.3702	1393.9150	2017.7090	2622.5540	3483.3230	6025.9050	8130.7350	9791.2270	16858.1700
4	727.8383	1142.8350	1651.2240	2092.7840	2776.8795	4891.4610	6563.2140	7795.9790	13037.0400
5	553.0019	890.6967	1237.5440	1578.4800	2093.7790	3653.8520	5038.2250	5888.7940	9515.1940
6	404.0864	632.2822	905.5343	1142.8020	1517.7015	2613.6220	3606.4860	4277.0250	7129.6010
7	706.4553	733.7385	745.5075	768.9853	794.0588	821.4752	846.4655	861.9576	895.4931
8	40.4308	61.7024	78.0694	112.9007	164.0375	228.4432	303.9477	363.1976	471.8027
9+	119.1199	200.1465	239.0721	329.9581	438.8977	547.4876	663.9831	743.4138	893.5391

2019

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100

2	1100.2330	1853.7570	2546.4220	3219.5910	4295.6000	7460.3590	9958.5980	11978.3500	19331.8100
3	909.9492	1434.4700	2051.4950	2621.8620	3472.7550	6008.5690	8008.8830	9752.1880	15841.6400
4	720.8946	1112.3320	1610.1070	2092.8270	2779.6765	4808.5690	6488.2460	7813.2220	13452.9700
5	548.7850	861.7011	1245.0160	1577.9510	2093.7875	3688.2640	4948.5970	5878.0740	9829.8000
6	400.4097	644.9303	896.0754	1142.9560	1516.0855	2645.7210	3647.9490	4263.9800	6889.9040
7	289.8505	453.5339	649.5140	819.6927	1088.6110	1874.6280	2586.8190	3067.8090	5113.9750
8	505.3450	524.8725	533.3107	550.1013	568.0214	587.6329	605.5077	616.5921	640.5715
9+	143.5285	229.5783	265.9414	344.7631	433.1209	544.0324	647.5610	718.5444	884.8963

2020

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2	1110.3190	1819.1110	2552.7440	3219.6580	4288.2935	7373.3010	9989.3370	11961.9400	19735.8800
3	897.1829	1511.5700	2076.3240	2625.3310	3502.6825	6083.4420	8120.6390	9767.6120	15763.4300
4	726.1269	1144.7000	1637.0580	2092.2290	2771.2705	4794.8340	6391.0380	7782.1220	12641.6300
5	543.5649	838.6869	1214.0580	1578.0010	2095.8945	3625.7510	4892.1270	5891.3320	10143.4600
6	397.3667	623.9588	901.4730	1142.5420	1516.0840	2670.5180	3583.1550	4256.0880	7117.7840
7	287.1973	462.5921	642.7341	819.8184	1087.4505	1897.6700	2616.5300	3058.4810	4942.0150
8	207.3435	324.4391	464.6172	586.3600	778.7360	1341.0060	1850.4120	2194.5190	3658.2690
9+	479.9075	544.3608	582.3023	644.6083	718.6182	805.1756	889.5685	946.8920	1072.0200

2021

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2	1113.1630	1798.9530	2518.2430	3218.2750	4258.8600	7316.0820	10010.1000	11976.6700	19491.1200
3	905.4221	1483.3790	2081.5400	2625.3460	3496.8470	6012.0340	8145.3940	9754.2340	16092.9400
4	715.9504	1206.1900	1656.8960	2094.9840	2795.1080	4854.5570	6480.4340	7794.8400	12579.2700
5	547.5061	863.1365	1234.3780	1577.5440	2089.5550	3615.1990	4818.9570	5867.7190	9531.9450
6	393.5883	607.2635	879.0850	1142.5670	1517.5775	2625.2960	3542.3160	4265.6540	7344.6280
7	285.0155	447.5357	646.5931	819.5276	1087.4305	1915.3760	2570.0800	3052.6850	5105.4040
8	205.4528	330.9105	459.7776	586.4493	777.9032	1357.5000	1871.6980	2187.9410	3535.2590
9+	608.9606	738.7195	810.8935	929.5030	1112.8390	1484.4570	1880.9660	2119.7800	3114.6870

2022

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2	1122.0950	1745.8170	2496.1190	3217.7300	4285.5670	7478.6080	10129.3900	11978.3200	19826.1800

3	907.7031	1466.8820	2053.4650	2624.2580	3472.8015	5965.7690	8162.6660	9766.0380	15893.5400
4	722.5143	1183.7110	1661.0710	2095.0130	2790.4765	4797.5880	6500.2480	7783.9600	12842.6600
5	539.8292	909.4674	1249.3740	1579.6420	2107.5500	3660.2110	4886.3420	5877.4360	9484.5080
6	396.4355	624.9748	893.7929	1142.2610	1513.0145	2617.6950	3489.2880	4248.6460	6901.8430
7	282.3152	435.5614	630.5441	819.5519	1088.4860	1882.9780	2540.7810	3059.5500	5268.0820
8	203.8908	320.1367	462.5437	586.2388	777.8717	1370.1540	1838.4360	2183.6570	3652.0590
9+	795.1220	938.6173	1028.8140	1203.4410	1525.3520	1933.6800	2391.9230	2769.5760	3551.3690

2023

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2	1117.1360	1806.0780	2552.7390	3218.3690	4286.9890	7499.5600	10155.9400	11998.0200	19918.7900
3	914.9950	1423.6360	2035.3120	2623.7840	3494.5420	6098.2760	8259.7820	9767.6200	16166.9100
4	724.3465	1170.5540	1638.7150	2094.1550	2771.2765	4760.6900	6513.7770	7793.0330	12682.8900
5	544.7678	892.5291	1252.4560	1579.6570	2104.0380	3617.5190	4901.3330	5868.9660	9683.3850
6	390.8747	658.5197	904.6899	1143.7760	1526.0155	2650.3490	3538.0910	4255.8390	6867.7370
7	284.3454	448.2645	641.1104	819.3222	1085.2335	1877.5420	2502.7720	3047.4440	4950.4200
8	201.9511	311.5694	451.0427	586.2537	778.6482	1346.9920	1817.5090	2188.6270	3768.5410
9+	938.1354	1115.4850	1212.4580	1450.1420	1803.2695	2243.9260	2746.4430	3118.2310	3909.5590

2024

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2	1132.2230	1814.5720	2562.1120	3217.0910	4300.4750	7489.8460	10119.1400	12000.8200	20241.7400
3	910.9620	1472.7320	2081.5520	2624.3320	3495.7625	6115.2360	8281.0480	9783.7310	16242.4700
4	730.1470	1136.0870	1624.1820	2093.7560	2788.6430	4866.4010	6591.1230	7794.3790	12901.2900
5	546.1708	882.6226	1235.6340	1579.0210	2089.6065	3589.4960	4911.4410	5875.8230	9562.9530
6	394.4643	646.2357	906.8787	1143.7910	1523.4715	2619.3190	3548.9320	4249.6220	7011.9480
7	280.3581	472.3332	648.9195	820.3935	1094.5570	1900.9560	2537.7190	3052.6620	4926.0240
8	203.4054	320.6577	458.6080	586.0834	776.3060	1343.0700	1790.3670	2179.9810	3541.2940
9+	1053.3620	1242.3540	1365.4850	1625.9650	1998.4970	2450.4580	2982.2250	3362.4590	4174.8550

2025

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2	1135.8140	1801.6740	2589.7970	3220.9010	4293.0390	7490.7490	10050.5500	11938.5000	19692.4400
3	923.2274	1479.6400	2089.1810	2623.3180	3506.6925	6107.5390	8251.3360	9785.7750	16505.0000

4	726.9456	1175.2590	1661.0460	2094.2070	2789.6015	4879.9800	6608.3560	7807.5200	12961.7600
5	550.5285	856.6219	1224.6630	1578.7160	2102.6240	3669.4170	4969.7610	5877.0090	9727.6770
6	395.4846	639.0430	894.6831	1143.3120	1513.0245	2599.0220	3556.2970	4254.6180	6924.3350
7	282.9370	463.5243	650.4861	820.4137	1092.7505	1878.8140	2545.5600	3047.9630	5029.4130
8	200.5556	337.8791	464.1910	586.8608	782.9774	1359.8330	1815.2730	2183.7390	3523.7750
9+	1155.3890	1360.9620	1496.3570	1755.3070	2134.2535	2605.7510	3099.8520	3480.8690	4285.4190

2026

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2	1098.9910	1759.9650	2496.4440	3218.9080	4318.4955	7605.9580	10246.9400	12111.4800	20506.6100
3	926.1603	1469.1060	2111.7380	2626.4200	3500.5540	6108.1170	8195.7400	9734.3520	16057.9000
4	736.7365	1180.7020	1667.1500	2093.3880	2798.3635	4873.6630	6584.5210	7808.8900	13170.9200
5	548.1240	886.1283	1252.4160	1579.0510	2103.4375	3679.4300	4982.7430	5886.9260	9773.3310
6	398.6278	620.2747	886.7408	1143.1060	1522.4365	2656.9830	3598.7080	4255.4440	7044.0200
7	283.6747	458.3567	641.7349	820.0606	1085.2510	1864.2060	2550.8310	3051.7570	4966.4960
8	202.3875	331.5747	465.3211	586.8867	781.6811	1344.0040	1820.9740	2180.3610	3597.7070
9+	1244.9130	1453.4790	1592.8920	1865.6560	2242.3930	2704.6860	3209.8910	3596.4920	4306.1620

2027

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2	1120.4060	1814.8520	2521.6880	3216.8550	4277.0545	7400.3330	9929.0040	11966.3800	19441.2200
3	896.1530	1435.0920	2035.6250	2624.7770	3521.4825	6202.0110	8355.5180	9876.1740	16721.1500
4	739.0653	1172.3700	1685.1480	2095.8360	2793.4650	4874.1530	6539.8980	7768.1750	12814.2200
5	555.5100	890.2794	1257.0870	1578.4320	2109.9475	3674.8660	4964.6430	5888.1620	9931.0640
6	396.8872	641.6004	906.8340	1143.3280	1523.0570	2664.2110	3607.9050	4262.6050	7076.6060
7	285.9303	444.9133	636.0009	819.9162	1091.9740	1905.7540	2581.1770	3052.3190	5052.3570
8	202.9252	327.8861	459.0761	586.6375	776.3278	1333.5410	1824.6850	2183.1130	3552.7040
9+	1318.7530	1530.5770	1663.9550	1932.0320	2308.8750	2773.0190	3293.8490	3647.6770	4328.6160

2028

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2	1122.3550	1777.0520	2507.1660	3218.4690	4294.7995	7445.5530	10207.0900	11931.5200	19973.1800
3	913.6154	1479.8940	2056.3010	2623.1170	3487.6545	6034.2250	8096.5010	9757.5090	15852.4500
4	715.1183	1145.2260	1624.4070	2094.5900	2810.1935	4949.2860	6667.6650	7881.1290	13343.9300

5	557.2712	883.9569	1270.6200	1580.2900	2106.3065	3675.2150	4931.1400	5857.3480	9662.3150
6	402.2155	644.6363	910.2400	1142.9580	1527.8020	2660.8500	3594.6890	4263.4810	7190.8020
7	284.6822	460.1916	650.4455	820.0928	1092.4640	1910.9580	2587.7370	3057.3940	5075.7810
8	204.5337	318.2569	454.9625	586.5204	781.1341	1363.1900	1846.4230	2183.4810	3614.1300
9+	1333.4110	1564.6740	1707.0000	1979.4770	2364.4425	2816.2120	3321.9770	3667.5580	4458.6810

2029

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2	1146.9520	1825.8780	2533.1740	3216.0540	4273.1920	7436.8880	9982.7790	12020.5300	20087.0900
3	915.1834	1449.0300	2044.4310	2624.3870	3502.0805	6071.2660	8323.0760	9729.7040	16286.4600
4	729.0603	1180.9470	1640.9330	2093.2210	2783.1265	4815.3150	6460.9950	7786.1430	12650.3900
5	539.2058	863.5367	1224.8510	1579.3430	2118.8795	3731.7980	5027.4520	5942.4630	10061.1600
6	403.5078	640.0272	920.0044	1144.2550	1525.1530	2661.1810	3570.5820	4241.1460	6996.3680
7	288.4917	462.3770	652.8683	819.8329	1095.8280	1908.6070	2578.3970	3058.1590	5157.6910
8	203.6445	329.1968	465.2836	586.6442	781.4661	1366.9710	1851.1640	2187.0620	3630.9690
9+	1375.4580	1589.4800	1737.7940	2018.3200	2406.4485	2859.1170	3357.9380	3722.8870	4558.6730

2030

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600
2	1124.7080	1841.7020	2554.3980	3218.6290	4288.7635	7612.1460	10195.3400	12087.5800	20333.3600
3	935.2335	1488.8820	2065.5470	2622.4250	3484.4485	6064.3130	8140.2000	9801.7930	16379.3900
4	730.3032	1156.3430	1631.4780	2094.2830	2794.6895	4844.8300	6641.6250	7764.2580	12996.6700
5	549.7191	890.4454	1237.3120	1578.3320	2098.4885	3630.8150	4871.6050	5870.8170	9538.4670
6	390.4187	625.2924	886.8581	1143.5690	1534.2755	2702.0540	3640.3260	4302.7940	7284.9630
7	289.4232	459.0681	659.9237	820.7497	1093.9710	1908.8080	2561.0230	3042.0550	5018.1650
8	206.3692	330.7607	467.0243	586.4444	783.9130	1365.2560	1844.4530	2187.6730	3689.6090
9+	1412.5860	1621.1890	1761.7730	2051.7810	2430.4745	2892.0430	3407.6940	3767.6010	4554.2580

Requested Percentile Report

Percentile = 90.00 %

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Recruits	12417.3800	12558.8100	12336.3400	12195.0400	12012.8400	12179.7600	12217.6500	12242.8800	12388.5500	12421.2300	12376.0000	12291.8500	12532.5100	12143.3200	12483.8100	12208.9400	12469.8800	12089.6900	11930.1300

```
Spawning Stock Biomass        11.4842    10.7648    13.8544    19.5943    28.5318    38.0922
46.1718    52.3447    59.1503    66.9303    71.7896    75.1497    77.7217    79.4209    80.7713
81.9559    82.5775    83.1237    83.5932
Jan-1 Stock Biomass           16.4055    14.9009    20.4987    29.0393    39.7382    50.3326
58.4965    65.0894    72.3081    80.6526    86.0296    89.8622    92.7014    94.3116    96.0246
97.0317    97.8675    98.2806    98.8185
Mean Biomass                  17.1045    18.9828    27.0224    38.5116    50.5072    60.7041
68.4468    74.8872    81.3386    87.9312    92.3559    95.7880    98.1454    99.8048   101.1171
102.0755   102.7972   103.2039   103.2939
Combined Catch Biomass         6.7000     1.4200     1.7295     2.3102     3.4952     4.8762
6.0720     7.0401     7.9935     8.8895     9.4937     9.9120    10.2100    10.4395    10.6190
10.7466    10.8426    10.9304    10.9712
Landings                       6.7000     1.4200     1.7295     2.3102     3.4952     4.8762
6.0720     7.0401     7.9935     8.8895     9.4937     9.9120    10.2100    10.4395    10.6190
10.7466    10.8426    10.9304    10.9712
FMort                          1.6371     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350

Stock Numbers at Age
Age 1                        4083.9300 12417.3800 12558.8100 12336.3400 12195.0400 12012.8400
12179.7600 12217.6500 12242.8800 12388.5500 12421.2300 12376.0000 12291.8500 12532.5100
12143.3200 12483.8100 12208.9400 12469.8800 12089.6900
Age 2                        1707.4100  3321.8420 10152.7000 10268.2700 10086.6300  9971.1160
9821.9490  9958.5980  9989.3370 10010.1000 10129.3900 10155.9400 10119.1400 10050.5500 10246.9400
9929.0040 10207.0900  9982.7790 10195.3400
Age 3                        2111.8400  1359.5790  2708.7010  8278.1560  8373.2590  8224.9560
8130.7350  8008.8830  8120.6390  8145.3940  8162.6660  8259.7820  8281.0480  8251.3360  8195.7400
8355.5180  8096.5010  8323.0760  8140.2000
Age 4                        2088.9300  1472.9230  1084.9680  2161.5680  6605.8870  6681.9280
6563.2140  6488.2460  6391.0380  6480.4340  6500.2480  6513.7770  6591.1230  6608.3560  6584.5210
6539.8980  6667.6650  6460.9950  6641.6250
Age 5                        1357.4100  1117.4330  1110.5730   818.0762  1629.8380  4980.8150
5038.2250  4948.5970  4892.1270  4818.9570  4886.3420  4901.3330  4911.4410  4969.7610  4982.7430
4964.6430  4931.1400  5027.4520  4871.6050
Age 6                         637.8940   599.7590   809.1356   804.1362   592.3506  1180.1250
3606.4860  3647.9490  3583.1550  3542.3160  3489.2880  3538.0910  3548.9320  3556.2970  3598.7080
3607.9050  3594.6890  3570.5820  3640.3260
Age 7                         283.2270   270.6842   430.1818   580.3785   576.7932   424.8860
846.4655  2586.8190  2616.5300  2570.0800  2540.7810  2502.7720  2537.7190  2545.5600  2550.8310
2581.1770  2587.7370  2578.3970  2561.0230
Age 8                          61.3528   115.3504   193.6319   307.7250   415.1666   412.6097
303.9477   605.5077  1850.4120  1871.6980  1838.4360  1817.5090  1790.3670  1815.2730  1820.9740
1824.6850  1846.4230  1851.1640  1844.4530
Age 9                          47.8801    43.9776   113.6713   220.5132   373.6398   556.5182
663.9831   647.5610   889.5685  1880.9660  2391.9230  2746.4430  2982.2250  3099.8520  3209.8910
3293.8490  3321.9770  3357.9380  3407.6940
```

Scenario 1 Projection

```
AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 01 Mar 2013  11:47

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_75FMSY_12CAT4891_SCENARIO1.INP

First Age Class:                        1
Number of Age Classes:                  9
Number of Years in Projection:         19
Number of Fleets:                       1
Number of Recruitment Models:           1
Number of Bootstraps:                1000
Number of Simulations:                 10

Bootstrap File Name:           D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\SAW55_3BLOCK_BASE_MCMC.BSN

Number of Feasible Solutions:      10000  of      10000 Realizations
```

Input Harvest Scenario

Year	Type	Value
2012	Landings	4891
2013	F-Mult	0.1350
2014	F-Mult	0.1350
2015	F-Mult	0.1350
2016	F-Mult	0.1350
2017	F-Mult	0.1350
2018	F-Mult	0.1350
2019	F-Mult	0.1350
2020	F-Mult	0.1350
2021	F-Mult	0.1350
2022	F-Mult	0.1350
2023	F-Mult	0.1350
2024	F-Mult	0.1350
2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000 Fish

Year Class	Average	StdDev
2012	6926.7937	4465.8077
2013	6923.5380	4386.4587
2014	6937.4571	4438.1684
2015	6919.2931	4527.0696
2016	6848.1821	4336.7865
2017	6927.8128	4327.1141
2018	6904.8750	4345.1040
2019	6853.8386	4341.3137
2020	6939.1845	4398.8850
2021	6952.5694	4402.3823
2022	6973.7562	4462.6114
2023	6932.3252	4365.9713
2024	7044.3441	4564.4314
2025	6897.3804	4358.1031
2026	6933.3608	4380.3428
2027	6924.7521	4452.7725
2028	7017.1113	4540.7667
2029	6852.1367	4397.8307
2030	6883.5775	4300.2626

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2013	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2014	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2015	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2016	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2017	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2018	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2019	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2020	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2021	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300

2022	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2023	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2024	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2025	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2026	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2027	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2028	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2029	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600
2030	1347.1080	2222.8420	3135.0670	3934.5510	5235.3460	9103.0150	11930.1300	14588.2800	23922.8900

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	8.9021	2.3117
2013	8.7575	2.7065
2014	11.5084	2.9167
2015	16.3147	3.5951
2016	23.0019	5.3685
2017	29.8911	7.1625
2018	35.6704	8.3646
2019	40.5709	9.2297
2020	46.3324	9.9422
2021	52.2569	11.2037
2022	56.4875	11.7405
2023	59.5175	12.0086
2024	61.7005	12.1823
2025	63.2750	12.2105
2026	64.4634	12.2510
2027	65.3224	12.3115
2028	65.9271	12.4036
2029	66.3865	12.4648
2030	66.7053	12.5129

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.1678	5.4285	6.0006	7.3226	8.7077	10.2516	11.9738	13.0674	15.1028
2013	3.4059	4.7422	5.4076	6.8670	8.4704	10.3360	12.2816	13.5479	16.0741
2014	5.7224	7.1851	7.9799	9.4710	11.2264	13.2033	15.3401	16.7986	19.4106
2015	9.3367	11.1083	12.0653	13.8272	15.9051	18.4405	21.0415	22.9131	26.6633
2016	13.6287	15.7315	16.9428	19.2593	22.2549	25.9080	29.9423	32.9377	39.7487
2017	17.7848	20.2713	21.8655	24.7486	28.8365	33.7100	39.3578	43.5429	51.3747
2018	21.4505	24.1911	26.1385	29.6442	34.4317	40.1954	47.1592	51.3653	60.1968
2019	24.4693	27.8278	29.8340	33.9863	39.2731	45.9547	53.0497	57.6098	67.4360
2020	28.5820	32.4393	34.6939	39.1892	45.0192	52.1830	59.6956	64.6308	75.0036
2021	32.1116	36.3574	39.1224	44.2268	50.8662	58.8747	67.3024	72.8969	84.0571
2022	34.7165	39.4152	42.4871	48.0626	55.1775	63.5720	72.0561	77.6469	89.4084
2023	37.0272	41.9422	45.1407	50.9338	58.2572	66.7757	75.3589	81.1903	92.8392

2024	38.4214	43.7979	47.1694	52.9936	60.5729	69.0414	77.8568	83.6541	96.0376
2025	39.9149	45.1890	48.4861	54.5538	62.1563	70.6028	79.5157	85.0641	96.8173
2026	40.8669	46.3496	49.6695	55.7454	63.4142	72.0282	80.8350	86.5304	97.3902
2027	41.8038	47.2406	50.4117	56.4602	64.1267	72.9243	82.0011	87.4767	98.3907
2028	42.3962	47.6993	51.0385	56.9700	64.6850	73.4296	82.6142	88.1820	99.3243
2029	43.1380	47.9915	51.3191	57.3616	65.1801	74.0776	83.1519	88.8147	100.5131
2030	43.2225	48.3461	51.6642	57.5888	65.4209	74.4196	83.6105	89.1561	100.3581

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	12.3751	3.2424
2014	17.0505	3.8051
2015	23.7053	5.2844
2016	31.6605	7.3410
2017	39.3515	9.1376
2018	45.6508	10.2955
2019	50.9762	11.0965
2020	57.2418	11.7572
2021	63.6797	13.0248
2022	68.2914	13.5783
2023	71.6116	13.8754
2024	74.0035	14.0701
2025	75.7290	14.0980
2026	77.0316	14.1426
2027	77.9552	14.2312
2028	78.5916	14.3388
2029	79.0913	14.3852
2030	79.4444	14.4249

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.2801	8.7308	9.4238	10.9381	12.5757	14.4349	16.4055	17.7124	20.3350
2013	5.9034	7.5485	8.4374	10.1125	12.0875	14.2579	16.5899	18.2453	21.1060
2014	9.5581	11.4120	12.4903	14.3870	16.6664	19.3681	22.1197	23.9528	27.3902
2015	14.1910	16.3560	17.6399	20.0275	23.0417	26.6205	30.5988	33.3513	39.8136
2016	19.0177	21.7182	23.3702	26.4672	30.6232	35.5392	41.2802	45.5598	53.9985
2017	23.8050	26.8364	28.9454	32.7897	38.0780	44.2774	51.7082	56.6072	66.7096
2018	27.8213	31.4450	33.7296	38.2640	44.1986	51.5639	59.5691	64.7317	75.5744
2019	31.2395	35.3971	37.9984	42.9816	49.5247	57.5187	65.8662	71.2967	83.5476
2020	36.0316	40.4933	43.4060	48.8892	55.7820	64.2582	72.8714	78.9484	90.4243
2021	39.6171	44.9844	48.2154	54.3910	62.2116	71.4813	81.0644	87.6373	99.7499
2022	42.6850	48.4325	52.0892	58.5504	66.8908	76.5462	86.3035	92.5499	105.9551
2023	45.1824	51.2174	55.0083	61.7534	70.2289	80.0657	90.0687	96.3439	110.2587
2024	46.8118	53.2284	57.0164	63.9996	72.7810	82.4526	92.8440	99.0354	113.3892
2025	48.6388	54.7079	58.6327	65.6611	74.4174	84.4141	94.4231	101.1603	114.0938

2026	49.4855	56.1704	59.8903	66.9640	75.7716	85.8757	96.0991	102.3537	114.5109
2027	50.6187	57.0503	60.7591	67.7840	76.6228	86.7723	97.0861	103.4790	115.6066
2028	51.4018	57.3131	61.2505	68.3687	77.1563	87.3631	97.9042	104.2256	117.3889
2029	52.0482	57.7902	61.6989	68.7019	77.7643	87.9954	98.3078	104.8939	118.3539
2030	51.7910	58.1955	62.0478	68.9699	78.1060	88.4826	98.8398	105.2167	117.7199

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	13.6853	3.3757
2013	15.8096	3.7188
2014	22.2262	4.8918
2015	30.5896	7.2400
2016	39.1946	9.5297
2017	46.7484	11.0747
2018	53.0200	12.0793
2019	58.4214	12.7711
2020	64.1293	13.2779
2021	69.5956	14.0708
2022	73.5143	14.4479
2023	76.3586	14.6741
2024	78.4233	14.8262
2025	79.9262	14.8682
2026	81.0432	14.9295
2027	81.8340	15.0362
2028	82.3660	15.1311
2029	82.7831	15.1450
2030	83.0809	15.1699

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.8265	8.5923	9.4871	11.3661	13.3458	15.6329	18.1084	19.6050	22.5742
2013	8.3050	10.2545	11.3311	13.1851	15.4761	18.0924	20.7160	22.5266	25.7101
2014	13.0712	15.3135	16.5562	18.8366	21.6154	24.9559	28.6066	31.1108	36.7070
2015	18.2016	21.0456	22.5004	25.5182	29.5195	34.3668	39.9860	44.2273	53.3793
2016	23.2860	26.3922	28.4922	32.3604	37.7660	44.2347	51.8779	57.4171	67.7184
2017	27.7306	31.5611	34.0264	38.7670	45.0974	52.9018	61.8975	67.4891	79.4680
2018	31.8910	36.3063	38.9662	44.4281	51.3980	60.0827	69.3529	75.2811	88.3357
2019	35.4713	40.4120	43.4251	49.2377	56.8129	66.0232	75.5383	81.9771	95.1228
2020	39.9412	45.0335	48.3868	54.6798	62.5181	72.1691	81.8200	88.7610	101.3416
2021	43.1759	49.1130	52.8479	59.5665	68.0770	78.2053	88.2957	95.1955	108.6413
2022	46.0331	52.3011	56.2369	63.2211	72.1352	82.3436	92.6187	99.2172	113.2195
2023	48.0665	54.6409	58.7001	65.9016	74.9406	85.1169	95.9675	102.3783	117.0742
2024	49.9739	56.4823	60.4139	67.8046	77.0721	87.4291	98.2835	105.0158	118.4311
2025	51.1191	57.8910	61.8993	69.3882	78.6413	89.1527	99.8975	106.5789	120.0833
2026	52.0343	59.1921	62.9709	70.3844	79.6222	90.3247	101.1864	107.6834	120.9358
2027	53.2409	59.6986	63.6755	71.0570	80.2733	90.9778	102.1199	108.7640	122.2347

2028	54.0561	60.0930	64.0557	71.4728	80.8321	91.6692	102.8297	109.7640	123.1770
2029	53.9226	60.4597	64.4104	71.8347	81.3939	92.2457	103.2268	109.9214	123.6949
2030	54.1287	60.9021	64.8407	72.1044	81.7508	92.4666	103.3099	110.1475	123.2826

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	4.8910	0.0000
2013	1.1451	0.3761
2014	1.4152	0.4042
2015	1.9436	0.4295
2016	2.8344	0.6623
2017	3.8003	0.9537
2018	4.6430	1.1450
2019	5.3760	1.2936
2020	6.1455	1.4048
2021	6.8835	1.5428
2022	7.4112	1.5988
2023	7.7855	1.6260
2024	8.0564	1.6434
2025	8.2541	1.6485
2026	8.4029	1.6571
2027	8.5103	1.6653
2028	8.5910	1.6753
2029	8.6492	1.6854
2030	8.6870	1.6920

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910
2013	0.3917	0.5833	0.6740	0.8814	1.1142	1.3729	1.6360	1.8043	2.1611
2014	0.6171	0.8211	0.9174	1.1392	1.3714	1.6528	1.9409	2.1437	2.5004
2015	1.0759	1.3045	1.4273	1.6413	1.9057	2.2109	2.5096	2.7120	3.1025
2016	1.6706	1.9448	2.0954	2.3774	2.7388	3.1872	3.6799	4.0567	4.9325
2017	2.2275	2.5578	2.7386	3.1234	3.6514	4.2864	5.0384	5.6328	6.8094
2018	2.7418	3.1028	3.3470	3.8239	4.4715	5.2522	6.1985	6.8163	8.0673
2019	3.1587	3.6085	3.8824	4.4479	5.1860	6.1148	7.1323	7.7895	9.1400
2020	3.6889	4.1917	4.5110	5.1413	5.9548	6.9642	8.0580	8.7203	10.2521
2021	4.1204	4.6958	5.0845	5.7790	6.6760	7.8003	8.9377	9.7386	11.2969
2022	4.4801	5.1051	5.5120	6.2697	7.2274	8.3781	9.5293	10.3240	11.8528
2023	4.7520	5.4247	5.8490	6.6186	7.6057	8.7707	9.9358	10.7087	12.3128
2024	4.9530	5.6655	6.1006	6.8852	7.8833	9.0471	10.2267	11.0208	12.6342
2025	5.1284	5.8371	6.2601	7.0731	8.1067	9.2411	10.4525	11.2109	12.7710
2026	5.2587	5.9419	6.4061	7.2195	8.2428	9.4215	10.6277	11.3993	12.9399
2027	5.3890	6.0699	6.5055	7.3133	8.3444	9.5264	10.7533	11.5077	12.9721
2028	5.4477	6.1528	6.6015	7.3850	8.4127	9.6046	10.8470	11.6119	13.1485
2029	5.5165	6.1789	6.6282	7.4301	8.4823	9.6640	10.9337	11.7028	13.2400

2030	5.5424	6.2242	6.6509	7.4592	8.5100	9.7420	10.9733	11.7230	13.2970

Landings x 1000 MT

Year	Average	StdDev
2012	4.8910	0.0000
2013	1.1451	0.3761
2014	1.4152	0.4042
2015	1.9436	0.4295
2016	2.8344	0.6623
2017	3.8003	0.9537
2018	4.6430	1.1450
2019	5.3760	1.2936
2020	6.1455	1.4048
2021	6.8835	1.5428
2022	7.4112	1.5988
2023	7.7855	1.6260
2024	8.0564	1.6434
2025	8.2541	1.6485
2026	8.4029	1.6571
2027	8.5103	1.6653
2028	8.5910	1.6753
2029	8.6492	1.6854
2030	8.6870	1.6920

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910	4.8910
2013	0.3917	0.5833	0.6740	0.8814	1.1142	1.3729	1.6360	1.8043	2.1611
2014	0.6171	0.8211	0.9174	1.1392	1.3714	1.6528	1.9409	2.1437	2.5004
2015	1.0759	1.3045	1.4273	1.6413	1.9057	2.2109	2.5096	2.7120	3.1025
2016	1.6706	1.9448	2.0954	2.3774	2.7388	3.1872	3.6799	4.0567	4.9325
2017	2.2275	2.5578	2.7386	3.1234	3.6514	4.2864	5.0384	5.6328	6.8094
2018	2.7418	3.1028	3.3470	3.8239	4.4715	5.2522	6.1985	6.8163	8.0673
2019	3.1587	3.6085	3.8824	4.4479	5.1860	6.1148	7.1323	7.7895	9.1400
2020	3.6889	4.1917	4.5110	5.1413	5.9548	6.9642	8.0580	8.7203	10.2521
2021	4.1204	4.6958	5.0845	5.7790	6.6760	7.8003	8.9377	9.7386	11.2969
2022	4.4801	5.1051	5.5120	6.2697	7.2274	8.3781	9.5293	10.3240	11.8528
2023	4.7520	5.4247	5.8490	6.6186	7.6057	8.7707	9.9358	10.7087	12.3128
2024	4.9530	5.6655	6.1006	6.8852	7.8833	9.0471	10.2267	11.0208	12.6342
2025	5.1284	5.8371	6.2601	7.0731	8.1067	9.2411	10.4525	11.2109	12.7710
2026	5.2587	5.9419	6.4061	7.2195	8.2428	9.4215	10.6277	11.3993	12.9399
2027	5.3890	6.0699	6.5055	7.3133	8.3444	9.5264	10.7533	11.5077	12.9721
2028	5.4477	6.1528	6.6015	7.3850	8.4127	9.6046	10.8470	11.6119	13.1485
2029	5.5165	6.1789	6.6282	7.4301	8.4823	9.6640	10.9337	11.7028	13.2400
2030	5.5424	6.2242	6.6509	7.4592	8.5100	9.7420	10.9733	11.7230	13.2970

Total Fishing Mortality

Year	Average	StdDev
2012	0.6789	0.2267
2013	0.1350	0.0000
2014	0.1350	0.0000
2015	0.1350	0.0000
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000
2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.3418	0.4057	0.4463	0.5239	0.6344	0.7786	0.9816	1.1133	1.4644
2013	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2014	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2015	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

JAN-1 Stock Numbers at Age - 1000 Fish

2012

Age 1% 5% 10% 25% 50% 75% 90% 95% 99%

1	3470.7100	3582.0200	3630.7900	3733.1100	3845.4000	3970.9800	4083.9300	4158.3900	4317.7200
2	238.3360	346.6600	439.6270	636.1570	927.1550	1288.8100	1707.4100	2053.8300	2637.8900
3	628.9300	792.3810	889.8900	1098.6100	1389.0900	1699.8800	2111.8400	2331.2900	2895.3200
4	924.0740	1046.1800	1143.1600	1345.3900	1586.0550	1844.7200	2088.9300	2260.2700	2689.6800
5	541.8520	638.9290	722.4190	836.8020	993.8315	1180.0600	1357.4100	1491.0000	1750.6100
6	205.2150	265.2180	300.2310	360.2070	439.7105	535.3540	637.8940	691.6980	865.0120
7	82.4731	99.1877	117.2230	146.9100	185.1170	230.8150	283.2270	314.3510	388.2850
8	13.6543	18.2450	21.2075	27.9255	37.2013	48.9121	61.3528	70.3407	89.6368
9+	8.5168	11.6466	14.5945	19.3767	26.8609	36.7221	47.8801	56.9625	73.2486

2013

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2	2806.8590	2901.4410	2943.1780	3033.4800	3127.9890	3233.3400	3328.7360	3389.7280	3520.7220
3	188.7032	278.6798	355.1301	509.6200	745.8122	1032.3490	1373.0960	1649.8330	2126.6090
4	424.1360	540.1851	625.4232	785.7369	997.8132	1237.1980	1563.0700	1740.9680	2147.4130
5	305.1116	455.7513	529.8120	689.7334	879.5943	1075.0240	1282.0810	1409.4520	1727.3990
6	120.5544	194.4087	247.0259	335.3724	456.4754	595.0246	729.7777	830.5036	1018.3770
7	42.3652	72.3701	94.0787	138.2465	194.4438	255.9756	334.0343	371.8285	479.6443
8	15.6509	27.8583	36.6013	55.9895	80.7753	109.4153	143.8921	172.2776	221.1707
9+	5.0961	8.8103	11.2970	18.3452	27.7818	40.1316	55.4956	66.1977	90.0101

2014

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2	1137.4290	1779.8250	2548.8050	3216.7850	4272.0765	7356.3970	10152.7000	12039.0400	20068.7800
3	2288.8200	2365.9290	2399.9640	2473.5760	2550.6260	2636.5150	2714.4070	2764.1060	2870.8880
4	150.5844	222.3884	283.3983	406.6844	595.1525	823.8130	1095.7540	1316.5750	1697.0310
5	319.8090	407.2976	471.5792	592.4410	752.3444	932.8550	1178.5650	1312.7120	1619.1790
6	220.9253	329.9977	383.6290	499.4177	636.8972	778.4017	928.3032	1020.5640	1250.8050
7	86.4702	139.4467	177.1899	240.5584	327.4145	426.7978	523.4402	595.6897	730.4428
8	30.3064	51.7709	67.2959	98.8916	139.0969	183.1120	238.9498	265.9934	343.1102
9+	14.7729	25.9582	34.0677	53.7255	77.9792	106.6549	142.8169	169.2246	225.7707

2015

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900

2	1127.1350	1815.4210	2522.3270	3217.2680	4267.5945	7447.0390	10268.2700	12002.2300	19392.9500
3	927.4998	1451.2620	2078.4230	2623.0000	3483.5215	5998.6630	8278.1560	9817.0450	16363.8300
4	1826.5110	1887.9810	1915.2020	1973.9080	2035.4255	2103.9820	2166.1010	2205.7790	2291.0360
5	113.5449	167.6836	213.6872	306.6412	448.7459	621.1530	826.2097	992.7218	1279.6030
6	231.5741	294.9156	341.4695	428.9884	544.7469	675.4656	853.3691	950.5163	1172.4350
7	158.4599	236.6974	275.1694	358.2355	456.8309	558.3328	665.8448	732.0022	897.1441
8	61.8555	99.7501	126.7464	172.0800	234.2131	305.2946	374.4498	426.1253	522.5237
9+	33.6145	56.3876	72.9893	110.1880	154.7461	205.3874	272.9293	309.5812	415.7801

2016

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2	1118.5380	1756.2910	2537.4690	3216.1820	4267.5195	7516.9450	10086.6300	11980.7700	20034.5600
3	919.0880	1480.2840	2056.7610	2623.4060	3479.8840	6072.5310	8373.2590	9787.0510	15813.1400
4	740.1478	1158.0960	1658.6070	2093.1400	2779.8275	4787.0090	6605.8870	7834.0910	13058.5900
5	1377.1980	1423.5400	1444.0740	1488.3280	1534.7105	1586.4210	1633.2570	1663.1610	1727.4500
6	82.2161	121.4173	154.7278	222.0356	324.9289	449.7727	598.2402	718.8126	926.5388
7	166.0979	211.5319	244.9320	307.6982	390.7368	484.4903	612.1022	681.7743	840.9505
8	113.3551	169.3204	196.8468	256.2646	326.7878	399.3979	476.3042	523.6452	641.7858
9+	68.3060	113.3071	144.6505	205.9322	280.3944	369.7425	457.2151	526.3770	666.3360

2017

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2	1107.8540	1709.4190	2474.4290	3216.2170	4271.8110	7389.9540	9971.1160	12007.5700	20674.5000
3	912.0705	1432.1380	2069.1420	2622.5340	3479.7460	6129.5450	8224.9560	9769.4530	16336.4700
4	733.4144	1181.2650	1641.3140	2093.4530	2776.8990	4845.9020	6681.9280	7809.8560	12619.1600
5	558.1019	873.2225	1250.5980	1578.2670	2096.0060	3609.5080	4980.8150	5906.8700	9846.3210
6	997.1823	1030.7500	1045.6350	1077.6450	1111.2480	1148.7020	1182.6160	1204.3260	1250.8160
7	58.9724	87.0888	110.9820	159.2592	233.0593	322.6110	429.1105	515.5766	664.6056
8	118.8187	151.3160	175.2145	220.1223	279.5135	346.5852	437.8615	487.7239	601.5765
9+	132.3120	206.6951	248.7908	337.8307	439.1044	542.7139	656.0730	731.8077	888.3017

2018

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2	1115.9240	1759.1660	2515.9590	3215.3770	4258.9025	7368.5480	9821.9490	11959.8700	19428.6500

3	903.3702	1393.9150	2017.7090	2622.5540	3483.3230	6025.9050	8130.7350	9791.2270	16858.1700
4	727.8383	1142.8350	1651.2240	2092.7840	2776.8795	4891.4610	6563.2140	7795.9790	13037.0400
5	553.0019	890.6967	1237.5440	1578.4800	2093.7790	3653.8520	5038.2250	5888.7940	9515.1940
6	404.0864	632.2822	905.5343	1142.8020	1517.7015	2613.6220	3606.4860	4277.0250	7129.6010
7	715.2603	739.3220	750.0066	772.9680	797.0729	823.9300	848.2853	863.8092	897.1900
8	42.1855	62.2991	79.3901	113.9271	166.7178	230.7770	306.9698	368.8165	475.4163
9+	205.1427	286.3530	326.4580	416.2953	522.9001	628.9635	746.6312	824.6861	978.2823

2019

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2	1100.2330	1853.7570	2546.4220	3219.5910	4295.6000	7460.3590	9958.5980	11978.3500	19331.8100
3	909.9492	1434.4700	2051.4950	2621.8620	3472.7550	6008.5690	8008.8830	9752.1880	15841.6400
4	720.8946	1112.3320	1610.1070	2092.8270	2779.6765	4808.5690	6488.2460	7813.2220	13452.9700
5	548.7850	861.7011	1245.0160	1577.9510	2093.7875	3688.2640	4948.5970	5878.0740	9829.8000
6	400.4097	644.9303	896.0754	1142.9560	1516.0855	2645.7210	3647.9490	4263.9800	6889.9040
7	289.8505	453.5339	649.5140	819.6927	1088.6110	1874.6280	2586.8190	3067.8090	5113.9750
8	511.6602	528.8753	536.5068	552.9400	570.1737	589.3939	606.8184	617.9308	641.7853
9+	207.4515	291.9937	327.8982	408.0701	494.7770	606.6710	709.9610	781.3217	945.5805

2020

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2	1110.3190	1819.1110	2552.7440	3219.6580	4288.2935	7373.3010	9989.3370	11961.9400	19735.8800
3	897.1829	1511.5700	2076.3240	2625.3310	3502.6825	6083.4420	8120.6390	9767.6120	15763.4300
4	726.1269	1144.7000	1637.0580	2092.2290	2771.2705	4794.8340	6391.0380	7782.1220	12641.6300
5	543.5649	838.6869	1214.0580	1578.0010	2095.8945	3625.7510	4892.1270	5891.3320	10143.4600
6	397.3667	623.9588	901.4730	1142.5420	1516.0840	2670.5180	3583.1550	4256.0880	7117.7840
7	287.1973	462.5921	642.7341	819.8184	1087.4505	1897.6700	2616.5300	3058.4810	4942.0150
8	207.3435	324.4391	464.6172	586.3600	778.7360	1341.0060	1850.4120	2194.5190	3658.2690
9+	529.3505	595.0686	629.3277	690.3975	763.9665	849.5042	934.0419	989.6186	1118.3660

2021

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2	1113.1630	1798.9530	2518.2430	3218.2750	4258.8600	7316.0820	10010.1000	11976.6700	19491.1200
3	905.4221	1483.3790	2081.5400	2625.3460	3496.8470	6012.0340	8145.3940	9754.2340	16092.9400

4	715.9504	1206.1900	1656.8960	2094.9840	2795.1080	4854.5570	6480.4340	7794.8400	12579.2700
5	547.5061	863.1365	1234.3780	1577.5440	2089.5550	3615.1990	4818.9570	5867.7190	9531.9450
6	393.5883	607.2635	879.0850	1142.5670	1517.5775	2625.2960	3542.3160	4265.6540	7344.6280
7	285.0155	447.5357	646.5931	819.5276	1087.4305	1915.3760	2570.0800	3052.6850	5105.4040
8	205.4528	330.9105	459.7776	586.4493	777.9032	1357.5000	1871.6980	2187.9410	3535.2590
9+	642.3566	772.5728	844.9107	962.8043	1145.4510	1517.0030	1912.5780	2151.9180	3146.7480

2022

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2	1122.0950	1745.8170	2496.1190	3217.7300	4285.5670	7478.6080	10129.3900	11978.3200	19826.1800
3	907.7031	1466.8820	2053.4650	2624.2580	3472.8015	5965.7690	8162.6660	9766.0380	15893.5400
4	722.5143	1183.7110	1661.0710	2095.0130	2790.4765	4797.5880	6500.2480	7783.9600	12842.6600
5	539.8292	909.4674	1249.3740	1579.6420	2107.5500	3660.2110	4886.3420	5877.4360	9484.5080
6	396.4355	624.9748	893.7929	1142.2610	1513.0145	2617.6950	3489.2880	4248.6460	6901.8430
7	282.3152	435.5614	630.5441	819.5519	1088.4860	1882.9780	2540.7810	3059.5500	5268.0820
8	203.8908	320.1367	462.5437	586.2388	777.8717	1370.1540	1838.4360	2183.6570	3652.0590
9+	819.0344	962.6415	1052.5290	1227.4600	1548.6070	1956.9100	2414.6200	2792.9540	3574.9240

2023

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2	1117.1360	1806.0780	2552.7390	3218.3690	4286.9890	7499.5600	10155.9400	11998.0200	19918.7900
3	914.9950	1423.6360	2035.3120	2623.7840	3494.5420	6098.2760	8259.7820	9767.6200	16166.9100
4	724.3465	1170.5540	1638.7150	2094.1550	2771.2765	4760.6900	6513.7770	7793.0330	12682.8900
5	544.7678	892.5291	1252.4560	1579.6570	2104.0380	3617.5190	4901.3330	5868.9660	9683.3850
6	390.8747	658.5197	904.6899	1143.7760	1526.0155	2650.3490	3538.0910	4255.8390	6867.7370
7	284.3454	448.2645	641.1104	819.3222	1085.2335	1877.5420	2502.7720	3047.4440	4950.4200
8	201.9511	311.5694	451.0427	586.2537	778.6482	1346.9920	1817.5090	2188.6270	3768.5410
9+	954.3702	1132.6320	1228.7720	1467.7070	1819.3875	2261.2220	2763.1320	3134.0690	3926.0200

2024

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2	1132.2230	1814.5720	2562.1120	3217.0910	4300.4750	7489.8460	10119.1400	12000.8200	20241.7400
3	910.9620	1472.7320	2081.5520	2624.3320	3495.7625	6115.2360	8281.0480	9783.7310	16242.4700
4	730.1470	1136.0870	1624.1820	2093.7560	2788.6430	4866.4010	6591.1230	7794.3790	12901.2900

5	546.1708	882.6226	1235.6340	1579.0210	2089.6065	3589.4960	4911.4410	5875.8230	9562.9530
6	394.4643	646.2357	906.8787	1143.7910	1523.4715	2619.3190	3548.9320	4249.6220	7011.9480
7	280.3581	472.3332	648.9195	820.3935	1094.5570	1900.9560	2537.7190	3052.6620	4926.0240
8	203.4054	320.6577	458.6080	586.0834	776.3060	1343.0700	1790.3670	2179.9810	3541.2940
9+	1065.1520	1254.1460	1378.2470	1637.7420	2010.6545	2462.9880	2994.4390	3374.7030	4187.9230

2025

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2	1135.8140	1801.6740	2589.7970	3220.9010	4293.0390	7490.7490	10050.5500	11938.5000	19692.4400
3	923.2274	1479.6400	2089.1810	2623.3180	3506.6925	6107.5390	8251.3360	9785.7750	16505.0000
4	726.9456	1175.2590	1661.0460	2094.2070	2789.6015	4879.9800	6608.3560	7807.5200	12961.7600
5	550.5285	856.6219	1224.6630	1578.7160	2102.6240	3669.4170	4969.7610	5877.0090	9727.6770
6	395.4846	639.0430	894.6831	1143.3120	1513.0245	2599.0220	3556.2970	4254.6180	6924.3350
7	282.9370	463.5243	650.4861	820.4137	1092.7505	1878.8140	2545.5600	3047.9630	5029.4130
8	200.5556	337.8791	464.1910	586.8608	782.9774	1359.8330	1815.2730	2183.7390	3523.7750
9+	1163.7920	1369.2140	1504.9750	1764.4130	2142.8155	2614.0310	3108.0080	3489.2970	4294.4580

2026

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2	1098.9910	1759.9650	2496.4440	3218.9080	4318.4955	7605.9580	10246.9400	12111.4800	20506.6100
3	926.1603	1469.1060	2111.7380	2626.4200	3500.5540	6108.1170	8195.7400	9734.3520	16057.9000
4	736.7365	1180.7020	1667.1500	2093.3880	2798.3635	4873.6630	6584.5210	7808.8900	13170.9200
5	548.1240	886.1283	1252.4160	1579.0510	2103.4375	3679.4300	4982.7430	5886.9260	9773.3310
6	398.6278	620.2747	886.7408	1143.1060	1522.4365	2656.9830	3598.7080	4255.4440	7044.0200
7	283.6747	458.3567	641.7349	820.0606	1085.2510	1864.2060	2550.8310	3051.7570	4966.4960
8	202.3875	331.5747	465.3211	586.8867	781.6811	1344.0040	1820.9740	2180.3610	3597.7070
9+	1250.9680	1459.6420	1599.1270	1871.8500	2248.6605	2710.9390	3215.9130	3602.8370	4312.1350

2027

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2	1120.4060	1814.8520	2521.6880	3216.8550	4277.0545	7400.3330	9929.0040	11966.3800	19441.2200
3	896.1530	1435.0920	2035.6250	2624.7770	3521.4825	6202.0110	8355.5180	9876.1740	16721.1500
4	739.0653	1172.3700	1685.1480	2095.8360	2793.4650	4874.1530	6539.8980	7768.1750	12814.2200
5	555.5100	890.2794	1257.0870	1578.4320	2109.9475	3674.8660	4964.6430	5888.1620	9931.0640

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
6	396.8872	641.6004	906.8340	1143.3280	1523.0570	2664.2110	3607.9050	4262.6050	7076.6060
7	285.9303	444.9133	636.0009	819.9162	1091.9740	1905.7540	2581.1770	3052.3190	5052.3570
8	202.9252	327.8861	459.0761	586.6375	776.3278	1333.5410	1824.6850	2183.1130	3552.7040
9+	1323.7890	1534.8130	1668.3220	1936.4880	2313.4830	2777.5760	3298.1110	3651.9940	4333.0150

2028

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2	1122.3550	1777.0520	2507.1660	3218.4690	4294.7995	7445.5530	10207.0900	11931.5200	19973.1800
3	913.6154	1479.8940	2056.3010	2623.1170	3487.6545	6034.2250	8096.5010	9757.5090	15852.4500
4	715.1183	1145.2260	1624.4070	2094.5900	2810.1935	4949.2860	6667.6650	7881.1290	13343.9300
5	557.2712	883.9569	1270.6200	1580.2900	2106.3065	3675.2150	4931.1400	5857.3480	9662.3150
6	402.2155	644.6363	910.2400	1142.9580	1527.8020	2660.8500	3594.6890	4263.4810	7190.8020
7	284.6822	460.1916	650.4455	820.0928	1092.4640	1910.9580	2587.7370	3057.3940	5075.7810
8	204.5337	318.2569	454.9625	586.5204	781.1341	1363.1900	1846.4230	2183.4810	3614.1300
9+	1336.5380	1567.8160	1709.9380	1982.5340	2367.6785	2819.3520	3325.3000	3670.9450	4461.6250

2029

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2	1146.9520	1825.8780	2533.1740	3216.0540	4273.1920	7436.8880	9982.7790	12020.5300	20087.0900
3	915.1834	1449.0300	2044.4310	2624.3870	3502.0805	6071.2660	8323.0760	9729.7040	16286.4600
4	729.0603	1180.9470	1640.9330	2093.2210	2783.1265	4815.3150	6460.9950	7786.1430	12650.3900
5	539.2058	863.5367	1224.8510	1579.3430	2118.8795	3731.7980	5027.4520	5942.4630	10061.1600
6	403.5078	640.0272	920.0044	1144.2550	1525.1530	2661.1810	3570.5820	4241.1460	6996.3680
7	288.4917	462.3770	652.8683	819.8329	1095.8280	1908.6070	2578.3970	3058.1590	5157.6910
8	203.6445	329.1968	465.2836	586.6442	781.4661	1366.9710	1851.1640	2187.0620	3630.9690
9+	1377.6510	1591.6090	1740.0590	2020.6750	2408.6710	2861.2460	3360.1900	3725.1750	4560.8340

2030

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600
2	1124.7080	1841.7020	2554.3980	3218.6290	4288.7635	7612.1460	10195.3400	12087.5800	20333.3600
3	935.2335	1488.8820	2065.5470	2622.4250	3484.4485	6064.3130	8140.2000	9801.7930	16379.3900
4	730.3032	1156.3430	1631.4780	2094.2830	2794.6895	4844.8300	6641.6250	7764.2580	12996.6700
5	549.7191	890.4454	1237.3120	1578.3320	2098.4885	3630.8150	4871.6050	5870.8170	9538.4670
6	390.4187	625.2924	886.8581	1143.5690	1534.2755	2702.0540	3640.3260	4302.7940	7284.9630

```
7      289.4232   459.0681   659.9237   820.7497  1093.9710  1908.8080  2561.0230  3042.0550
5018.1650
8      206.3692   330.7607   467.0243   586.4444   783.9130  1365.2560  1844.4530  2187.6730
3689.6090
9+    1414.2760  1622.6910  1763.3110  2053.4220  2432.0625  2893.6350  3409.2790  3769.1420
4555.7420


Requested Percentile Report

Percentile =    90.00 %

                                 2012       2013       2014       2015       2016       2017
2018       2019       2020       2021       2022       2023       2024       2025       2026
2027       2028       2029       2030

Recruits                   12417.3800 12558.8100 12336.3400 12195.0400 12012.8400 12179.7600
12217.6500 12242.8800 12388.5500 12421.2300 12376.0000 12291.8500 12532.5100 12143.3200
12483.8100 12208.9400 12469.8800 12089.6900 11930.1300
Spawning Stock Biomass        11.9738    12.2816    15.3401    21.0415    29.9423    39.3578
47.1592    53.0497    59.6956    67.3024    72.0561    75.3589    77.8568    79.5157    80.8350
82.0011    82.6142    83.1519    83.6105
Jan-1 Stock Biomass           16.4055    16.5899    22.1197    30.5988    41.2802    51.7082
59.5691    65.8662    72.8714    81.0644    86.3035    90.0687    92.8440    94.4231    96.0991
97.0861    97.9042    98.3078    98.8398
Mean Biomass                  18.1084    20.7160    28.6066    39.9860    51.8779    61.8975
69.3529    75.5383    81.8200    88.2957    92.6187    95.9675    98.2835    99.8975   101.1864
102.1199   102.8297   103.2268   103.3099
Combined Catch Biomass         4.8910     1.6360     1.9409     2.5096     3.6799     5.0384
6.1985     7.1323     8.0580     8.9377     9.5293     9.9358    10.2267    10.4525    10.6277
10.7533    10.8470    10.9337    10.9733
Landings                       4.8910     1.6360     1.9409     2.5096     3.6799     5.0384
6.1985     7.1323     8.0580     8.9377     9.5293     9.9358    10.2267    10.4525    10.6277
10.7533    10.8470    10.9337    10.9733
FMort                          0.9816     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350

Stock Numbers at Age
Age 1                       4083.9300 12417.3800 12558.8100 12336.3400 12195.0400 12012.8400
12179.7600 12217.6500 12242.8800 12388.5500 12421.2300 12376.0000 12291.8500 12532.5100
12143.3200 12483.8100 12208.9400 12469.8800 12089.6900
Age 2                       1707.4100  3328.7360 10152.7000 10268.2700 10086.6300  9971.1160
9821.9490  9958.5980  9989.3370 10010.1000 10129.3900 10155.9400 10119.1400 10050.5500 10246.9400
9929.0040 10207.0900  9982.7790 10195.3400
Age 3                       2111.8400  1373.0960  2714.4070  8278.1560  8373.2590  8224.9560
8130.7350  8008.8830  8120.6390  8145.3940  8162.6660  8259.7820  8281.0480  8251.3360  8195.7400
8355.5180  8096.5010  8323.0760  8140.2000
Age 4                       2088.9300  1563.0700  1095.7540  2166.1010  6605.8870  6681.9280
6563.2140  6488.2460  6391.0380  6480.4340  6500.2480  6513.7770  6591.1230  6608.3560  6584.5210
6539.8980  6667.6650  6460.9950  6641.6250
Age 5                       1357.4100  1282.0810  1178.5650   826.2097  1633.2570  4980.8150
5038.2250  4948.5970  4892.1270  4818.9570  4886.3420  4901.3330  4911.4410  4969.7610  4982.7430
4964.6430  4931.1400  5027.4520  4871.6050
Age 6                        637.8940   729.7777   928.3032   853.3691   598.2402  1182.6160
3606.4860  3647.9490  3583.1550  3542.3160  3489.2880  3538.0910  3548.9320  3556.2970  3598.7080
3607.9050  3594.6890  3570.5820  3640.3260
Age 7                        283.2270   334.0343   523.4402   665.8448   612.1022   429.1105
848.2853  2586.8190  2616.5300  2570.0800  2540.7810  2502.7720  2537.7190  2545.5600  2550.8310
2581.1770  2587.7370  2578.3970  2561.0230
Age 8                         61.3528   143.8921   238.9498   374.4498   476.3042   437.8615
306.9698   606.8184  1850.4120  1871.6980  1838.4360  1817.5090  1790.3670  1815.2730  1820.9740
1824.6850  1846.4230  1851.1640  1844.4530
Age 9                         47.8801    55.4956   142.8169   272.9293   457.2151   656.0730
746.6312   709.9610   934.0419  1912.5780  2414.6200  2763.1320  2994.4390  3108.0080  3215.9130
3298.1110  3325.3000  3360.1900  3409.2790
```

Scenario 2 Projection

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 01 Mar 2013 11:50

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_75FMSY_12CAT6030_SCENARIO2.INP

First Age Class:	1
Number of Age Classes:	9
Number of Years in Projection:	19
Number of Fleets:	1
Number of Recruitment Models:	1
Number of Bootstraps:	1000
Number of Simulations:	10

Bootstrap File Name: D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\SAW55_3BLOCK_BASE_MCMC.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	6030
2013	F-Mult	0.1350
2014	F-Mult	0.1350
2015	F-Mult	0.1350
2016	F-Mult	0.1350
2017	F-Mult	0.1350
2018	F-Mult	0.1350
2019	F-Mult	0.1350
2020	F-Mult	0.1350
2021	F-Mult	0.1350
2022	F-Mult	0.1350
2023	F-Mult	0.1350
2024	F-Mult	0.1350
2025	F-Mult	0.1350
2026	F-Mult	0.1350
2027	F-Mult	0.1350
2028	F-Mult	0.1350
2029	F-Mult	0.1350
2030	F-Mult	0.1350

Recruits 1000 Fish

Year Class	Average	StdDev
2012	6926.7937	4465.8077
2013	6923.5380	4386.4587
2014	6937.4571	4438.1684
2015	6919.2931	4527.0696
2016	6848.1821	4336.7865
2017	6927.8128	4327.1141
2018	6904.8750	4345.1040
2019	6853.8386	4341.3137
2020	6939.1845	4398.8850
2021	6952.5694	4402.3823
2022	6973.7562	4462.6114
2023	6932.3252	4365.9713
2024	7044.3441	4564.4314
2025	6897.3804	4358.1031
2026	6933.3608	4380.3428
2027	6924.7521	4452.7725
2028	7017.1113	4540.7667
2029	6852.1367	4397.8307
2030	6883.5775	4300.2626

Recruits Distribution

Year Class 1% 5% 10% 25% 50% 75% 90% 95%
99%

2012	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2013	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2014	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2015	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2016	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2017	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2018	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2019	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2020	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2021	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2022	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2023	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2024	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2025	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2026	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2027	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2028	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2029	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600
2030	1347.1080	2222.8420	3135.0670	3934.5510	5235.3460	9103.0150	11930.1300	14588.2800	23922.8900

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	8.5640	2.3536
2013	7.8225	2.6923
2014	10.5877	2.9055
2015	15.4170	3.5862
2016	22.1204	5.3651
2017	29.0859	7.1652
2018	35.0448	8.3673
2019	40.1165	9.2310
2020	46.0021	9.9430
2021	52.0206	11.2040
2022	56.3185	11.7406
2023	59.3966	12.0087
2024	61.6140	12.1823
2025	63.2132	12.2105
2026	64.4191	12.2510
2027	65.2907	12.3115
2028	65.9045	12.4036
2029	66.3703	12.4648
2030	66.6937	12.5129

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.6085	4.9948	5.6017	6.9604	8.3790	9.9515	11.6725	12.7818	14.8222
2013	2.5216	3.8378	4.4998	5.9380	7.5328	9.3940	11.3256	12.5888	15.1174

2014	4.8291	6.2803	7.0755	8.5567	10.3025	12.2793	14.4005	15.8622	18.4630
2015	8.4653	10.2297	11.1763	12.9365	15.0052	17.5343	20.1319	22.0055	25.7332
2016	12.7587	14.8635	16.0669	18.3878	21.3780	25.0230	29.0548	32.0435	38.8642
2017	16.9531	19.4637	21.0531	23.9401	28.0290	32.9066	38.5566	42.7506	50.5512
2018	20.8305	23.5680	25.4922	29.0254	33.7993	39.5835	46.5508	50.7370	59.6009
2019	24.0051	27.3592	29.3823	33.5269	38.8117	45.5044	52.6069	57.1670	66.9824
2020	28.2616	32.0967	34.3699	38.8580	44.6790	51.8497	59.3474	64.2934	74.6889
2021	31.8802	36.1257	38.8849	43.9918	50.6235	58.6342	67.0697	72.6453	83.7951
2022	34.5425	39.2401	42.3168	47.8969	55.0095	63.4076	71.8890	77.4701	89.2317
2023	36.9124	41.8220	45.0147	50.8181	58.1365	66.6541	75.2281	81.0620	92.7135
2024	38.3317	43.7107	47.0822	52.9140	60.4850	68.9549	77.7721	83.5672	95.9500
2025	39.8569	45.1258	48.4285	54.4781	62.0972	70.5428	79.4562	85.0039	96.7569
2026	40.8249	46.3070	49.6249	55.7026	63.3713	71.9844	80.7948	86.4850	97.3496
2027	41.7751	47.2075	50.3812	56.4270	64.0961	72.8923	81.9727	87.4462	98.3577
2028	42.3741	47.6764	51.0155	56.9479	64.6628	73.4066	82.5912	88.1586	99.3016
2029	43.1210	47.9752	51.3036	57.3461	65.1639	74.0613	83.1331	88.7976	100.4976
2030	43.2116	48.3344	51.6533	57.5770	65.4089	74.4092	83.5996	89.1445	100.3467

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	11.3213	3.2320
2014	16.0376	3.7966
2015	22.7263	5.2777
2016	30.7013	7.3382
2017	38.4758	9.1400
2018	44.9705	10.2980
2019	50.4820	11.0978
2020	56.8826	11.7580
2021	63.4228	13.0251
2022	68.1076	13.5784
2023	71.4801	13.8754
2024	73.9095	14.0701
2025	75.6617	14.0981
2026	76.9835	14.1426
2027	77.9208	14.2312
2028	78.5670	14.3388
2029	79.0737	14.3853
2030	79.4318	14.4249

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.2801	8.7308	9.4238	10.9381	12.5757	14.4349	16.4055	17.7124	20.3350
2013	4.8967	6.5163	7.3977	9.0636	11.0303	13.1948	15.5239	17.1805	20.0307
2014	8.5613	10.4295	11.4916	13.3846	15.6533	18.3547	21.0962	22.9274	26.3651
2015	13.2392	15.3875	16.6768	19.0545	22.0509	25.6309	29.6147	32.3730	38.7952

2016	18.0757	20.7606	22.4057	25.5059	29.6626	34.5787	40.3006	44.6032	53.0230
2017	22.9061	25.9605	28.0581	31.9192	37.2084	43.4001	50.8472	55.7464	65.8283
2018	27.1478	30.7725	33.0423	37.5793	43.5225	50.8881	58.8928	64.0697	74.8969
2019	30.7460	34.9181	37.5047	42.4879	49.0374	57.0298	65.3780	70.7756	83.0361
2020	35.6770	40.1311	43.0479	48.5181	55.4338	63.8989	72.5186	78.5956	90.0711
2021	39.3631	44.7038	47.9574	54.1325	61.9556	71.2404	80.8081	87.3904	99.4976
2022	42.5106	48.2427	51.9104	58.3719	66.7006	76.3553	86.1302	92.3668	105.7738
2023	45.0502	51.0772	54.8748	61.6222	70.0992	79.9395	89.9409	96.2101	110.1156
2024	46.7159	53.1307	56.9234	63.9070	72.6867	82.3653	92.7544	98.9369	113.2973
2025	48.5737	54.6415	58.5679	65.5884	74.3504	84.3414	94.3532	101.0908	114.0282
2026	49.4385	56.1241	59.8449	66.9161	75.7218	85.8280	96.0533	102.3080	114.4638
2027	50.5835	57.0158	60.7258	67.7501	76.5900	86.7393	97.0512	103.4467	115.5719
2028	51.3776	57.2879	61.2278	68.3443	77.1305	87.3385	97.8812	104.1995	117.3641
2029	52.0297	57.7713	61.6819	68.6839	77.7460	87.9782	98.2907	104.8754	118.3366
2030	51.7791	58.1828	62.0356	68.9579	78.0936	88.4711	98.8265	105.2046	117.7071

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	13.0117	3.4171
2013	14.7196	3.7150
2014	21.2220	4.8889
2015	29.6568	7.2383
2016	38.3288	9.5295
2017	45.9916	11.0765
2018	52.4397	12.0808
2019	58.0006	12.7718
2020	63.8244	13.2783
2021	69.3775	14.0710
2022	73.3582	14.4479
2023	76.2470	14.6741
2024	78.3434	14.8262
2025	79.8691	14.8682
2026	81.0023	14.9295
2027	81.8048	15.0362
2028	82.3451	15.1311
2029	82.7681	15.1450
2030	83.0702	15.1699

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	5.9545	7.8487	8.7635	10.6741	12.6785	14.9925	17.4804	18.9788	21.9651
2013	7.2265	9.1739	10.2464	12.0988	14.3853	16.9989	19.6206	21.4272	24.6110
2014	12.0737	14.3151	15.5533	17.8355	20.6130	23.9427	27.6101	30.1007	35.7006
2015	17.2825	20.1148	21.5682	24.5845	28.5896	33.4296	39.0530	43.2933	52.4361
2016	22.4277	25.5246	27.6171	31.5007	36.9017	43.3635	51.0098	56.5475	66.8437
2017	26.9559	30.7949	33.2760	38.0129	44.3354	52.1419	61.1463	66.7308	78.7151

2018	31.3030	35.7196	38.3832	43.8432	50.8204	59.5075	68.7795	74.7028	87.7649
2019	35.0505	39.9884	42.9915	48.8199	56.3790	65.6107	75.1298	81.5489	94.6908
2020	39.6243	44.7394	48.0755	54.3645	62.2086	71.8752	81.5148	88.4427	101.0263
2021	42.9377	48.8936	52.6185	59.3503	67.8548	77.9892	88.0690	94.9862	108.4274
2022	45.8770	52.1352	56.0742	63.0699	71.9795	82.1878	92.4548	99.0543	113.0595
2023	47.9607	54.5327	58.5886	65.7933	74.8338	85.0095	95.8568	102.2635	116.9608
2024	49.8974	56.4008	60.3323	67.7252	76.9951	87.3519	98.1970	104.9402	118.3446
2025	51.0642	57.8302	61.8446	69.3301	78.5824	89.0900	99.8396	106.5215	120.0260
2026	51.9946	59.1505	62.9296	70.3408	79.5803	90.2847	101.1452	107.6405	120.8941
2027	53.2101	59.6699	63.6467	71.0254	80.2431	90.9470	102.0921	108.7361	122.2038
2028	54.0349	60.0718	64.0345	71.4534	80.8117	91.6479	102.8094	109.7439	123.1579
2029	53.9074	60.4457	64.3958	71.8192	81.3791	92.2306	103.2124	109.9058	123.6802
2030	54.1189	60.8912	64.8298	72.0938	81.7403	92.4557	103.2998	110.1368	123.2722

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	6.0300	0.0000
2013	1.0107	0.3738
2014	1.2835	0.4028
2015	1.8187	0.4287
2016	2.7177	0.6622
2017	3.6982	0.9541
2018	4.5647	1.1454
2019	5.3192	1.2937
2020	6.1043	1.4049
2021	6.8541	1.5428
2022	7.3902	1.5988
2023	7.7704	1.6260
2024	8.0456	1.6434
2025	8.2463	1.6485
2026	8.3974	1.6571
2027	8.5064	1.6653
2028	8.5882	1.6753
2029	8.6471	1.6854
2030	8.6855	1.6920

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300
2013	0.2715	0.4576	0.5424	0.7473	0.9793	1.2381	1.4997	1.6670	2.0219
2014	0.4913	0.6916	0.7876	1.0086	1.2396	1.5198	1.8076	2.0096	2.3669
2015	0.9536	1.1811	1.3036	1.5173	1.7812	2.0853	2.3842	2.5863	2.9776
2016	1.5556	1.8278	1.9786	2.2607	2.6218	3.0706	3.5650	3.9403	4.8152
2017	2.1217	2.4531	2.6362	3.0205	3.5487	4.1847	4.9344	5.5308	6.7064
2018	2.6612	3.0236	3.2677	3.7443	4.3942	5.1739	6.1189	6.7413	7.9939
2019	3.0995	3.5491	3.8259	4.3906	5.1295	6.0584	7.0745	7.7340	9.0832

2020	3.6474	4.1509	4.4702	5.1007	5.9151	6.9238	8.0180	8.6776	10.2105
2021	4.0913	4.6673	5.0550	5.7494	6.6460	7.7709	8.9071	9.7108	11.2668
2022	4.4589	5.0850	5.4915	6.2484	7.2067	8.3563	9.5062	10.3021	11.8319
2023	4.7379	5.4101	5.8342	6.6031	7.5903	8.7548	9.9211	10.6946	12.2990
2024	4.9425	5.6553	6.0891	6.8744	7.8716	9.0356	10.2162	11.0100	12.6237
2025	5.1209	5.8296	6.2525	7.0651	8.0991	9.2333	10.4445	11.2028	12.7629
2026	5.2535	5.9362	6.4008	7.2141	8.2371	9.4158	10.6223	11.3937	12.9345
2027	5.3850	6.0658	6.5015	7.3092	8.3403	9.5223	10.7491	11.5038	12.9682
2028	5.4449	6.1497	6.5988	7.3824	8.4099	9.6019	10.8442	11.6090	13.1457
2029	5.5144	6.1770	6.6262	7.4282	8.4804	9.6621	10.9317	11.7008	13.2380
2030	5.5410	6.2227	6.6494	7.4577	8.5086	9.7403	10.9720	11.7214	13.2956

Landings x 1000 MT

Year	Average	StdDev
2012	6.0300	0.0000
2013	1.0107	0.3738
2014	1.2835	0.4028
2015	1.8187	0.4287
2016	2.7177	0.6622
2017	3.6982	0.9541
2018	4.5647	1.1454
2019	5.3192	1.2937
2020	6.1043	1.4049
2021	6.8541	1.5428
2022	7.3902	1.5988
2023	7.7704	1.6260
2024	8.0456	1.6434
2025	8.2463	1.6485
2026	8.3974	1.6571
2027	8.5064	1.6653
2028	8.5882	1.6753
2029	8.6471	1.6854
2030	8.6855	1.6920

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300	6.0300
2013	0.2715	0.4576	0.5424	0.7473	0.9793	1.2381	1.4997	1.6670	2.0219
2014	0.4913	0.6916	0.7876	1.0086	1.2396	1.5198	1.8076	2.0096	2.3669
2015	0.9536	1.1811	1.3036	1.5173	1.7812	2.0853	2.3842	2.5863	2.9776
2016	1.5556	1.8278	1.9786	2.2607	2.6218	3.0706	3.5650	3.9403	4.8152
2017	2.1217	2.4531	2.6362	3.0205	3.5487	4.1847	4.9344	5.5308	6.7064
2018	2.6612	3.0236	3.2677	3.7443	4.3942	5.1739	6.1189	6.7413	7.9939
2019	3.0995	3.5491	3.8259	4.3906	5.1295	6.0584	7.0745	7.7340	9.0832
2020	3.6474	4.1509	4.4702	5.1007	5.9151	6.9238	8.0180	8.6776	10.2105
2021	4.0913	4.6673	5.0550	5.7494	6.6460	7.7709	8.9071	9.7108	11.2668

2022	4.4589	5.0850	5.4915	6.2484	7.2067	8.3563	9.5062	10.3021	11.8319
2023	4.7379	5.4101	5.8342	6.6031	7.5903	8.7548	9.9211	10.6946	12.2990
2024	4.9425	5.6553	6.0891	6.8744	7.8716	9.0356	10.2162	11.0100	12.6237
2025	5.1209	5.8296	6.2525	7.0651	8.0991	9.2333	10.4445	11.2028	12.7629
2026	5.2535	5.9362	6.4008	7.2141	8.2371	9.4158	10.6223	11.3937	12.9345
2027	5.3850	6.0658	6.5015	7.3092	8.3403	9.5223	10.7491	11.5038	12.9682
2028	5.4449	6.1497	6.5988	7.3824	8.4099	9.6019	10.8442	11.6090	13.1457
2029	5.5144	6.1770	6.6262	7.4282	8.4804	9.6621	10.9317	11.7008	13.2380
2030	5.5410	6.2227	6.6494	7.4577	8.5086	9.7403	10.9720	11.7214	13.2956

Total Fishing Mortality

Year	Average	StdDev
2012	0.9155	0.3515
2013	0.1350	0.0000
2014	0.1350	0.0000
2015	0.1350	0.0000
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000
2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.4368	0.5220	0.5774	0.6836	0.8391	1.0511	1.3624	1.5774	2.1800
2013	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2014	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2015	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

JAN-1 Stock Numbers at Age - 1000 Fish

2012

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	3470.7100	3582.0200	3630.7900	3733.1100	3845.4000	3970.9800	4083.9300	4158.3900	4317.7200
2	238.3360	346.6600	439.6270	636.1570	927.1550	1288.8100	1707.4100	2053.8300	2637.8900
3	628.9300	792.3810	889.8900	1098.6100	1389.0900	1699.8800	2111.8400	2331.2900	2895.3200
4	924.0740	1046.1800	1143.1600	1345.3900	1586.0550	1844.7200	2088.9300	2260.2700	2689.6800
5	541.8520	638.9290	722.4190	836.8020	993.8315	1180.0600	1357.4100	1491.0000	1750.6100
6	205.2150	265.2180	300.2310	360.2070	439.7105	535.3540	637.8940	691.6980	865.0120
7	82.4731	99.1877	117.2230	146.9100	185.1170	230.8150	283.2270	314.3510	388.2850
8	13.6543	18.2450	21.2075	27.9255	37.2013	48.9121	61.3528	70.3407	89.6368
9+	8.5168	11.6466	14.5945	19.3767	26.8609	36.7221	47.8801	56.9625	73.2486

2013

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2	2785.8660	2890.2660	2932.5970	3025.6630	3121.2060	3227.2890	3324.6740	3385.3720	3516.6330
3	184.5643	277.0703	352.2447	507.4327	738.4679	1025.3230	1365.7460	1635.0430	2116.7650
4	390.3950	502.7136	590.2761	748.2424	957.5693	1193.4050	1507.7990	1679.8940	2081.7780
5	192.7917	345.0017	427.1829	589.1480	779.0884	968.1386	1182.4960	1300.3890	1618.5290
6	57.6458	129.0997	176.6307	262.5188	378.9607	511.1672	652.0553	748.6684	932.4765
7	20.6916	45.6898	64.2374	106.0032	158.7828	219.4855	293.7948	331.9586	434.7196
8	8.0995	17.7509	25.1088	43.2548	65.8627	92.2074	125.8059	152.0772	202.6349
9+	2.4238	5.7553	7.6503	14.2282	22.6527	33.4936	48.1659	57.6618	81.9959

2014

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2	1137.4290	1779.8250	2548.8050	3216.7850	4272.0765	7356.3970	10152.7000	12039.0400	20068.7800

3	2271.6610	2356.8300	2391.3440	2467.2260	2545.0460	2631.6070	2711.0950	2760.5540	2867.5550
4	147.2816	221.1040	281.0958	404.9367	589.3053	818.2095	1089.9100	1304.7730	1689.1760
5	294.3642	379.0479	445.0770	564.1856	721.9982	899.8306	1136.9180	1266.6960	1569.7160
6	139.5954	249.8145	309.3156	426.6116	564.1193	701.0002	856.2113	941.5729	1171.9420
7	41.3463	92.6015	126.6944	188.2940	271.8142	366.6519	467.6931	536.9931	668.8257
8	14.8018	32.6849	45.9517	75.8276	113.5873	157.0055	210.1639	237.4641	310.9730
9+	7.7157	16.9655	23.3902	40.9673	63.6222	90.0841	125.2263	151.0995	203.5884

2015

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2	1127.1350	1815.4210	2522.3270	3217.2680	4267.5945	7447.0390	10268.2700	12002.2300	19392.9500
3	927.4998	1451.2620	2078.4230	2623.0000	3483.5215	5998.6630	8278.1560	9817.0450	16363.8300
4	1812.8030	1880.6870	1908.2770	1968.8550	2031.0045	2100.0580	2163.4570	2202.9440	2288.3770
5	111.0541	166.7151	211.9526	305.3253	444.3437	616.9401	821.7846	983.8224	1273.6800
6	213.1494	274.4605	322.2686	408.5227	522.7890	651.5488	823.2156	917.2206	1136.5910
7	100.1291	179.1805	221.8587	305.9912	404.6273	502.8089	614.1483	675.3185	840.5837
8	29.5774	66.2417	90.6288	134.7007	194.4364	262.2712	334.5703	384.1390	478.4488
9+	16.2259	35.4807	49.6928	84.2509	126.8829	174.9071	240.0716	274.1582	376.4160

2016

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2	1118.5380	1756.2910	2537.4690	3216.1820	4267.5195	7516.9450	10086.6300	11980.7700	20034.5600
3	919.0880	1480.2840	2056.7610	2623.4060	3479.8840	6072.5310	8373.2590	9787.0510	15813.1400
4	740.1478	1158.0960	1658.6070	2093.1400	2779.8275	4787.0090	6605.8870	7834.0910	13058.5900
5	1366.9130	1418.0800	1438.8970	1484.4860	1531.3885	1583.4870	1631.2630	1661.0240	1725.4440
6	80.4125	120.7159	153.4706	221.0808	321.7445	446.7176	595.0275	712.3687	922.2499
7	152.8827	196.8629	231.1544	293.0242	374.9744	467.3499	590.4597	657.8714	815.2654
8	71.6252	128.1785	158.7024	218.8939	289.4545	359.6934	439.3279	483.0974	601.3019
9+	32.7176	72.8319	100.9860	160.2657	230.2050	317.5672	403.6189	471.3065	607.5493

2017

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2	1107.8540	1709.4190	2474.4290	3216.2170	4271.8110	7389.9540	9971.1160	12007.5700	20674.5000
3	912.0705	1432.1380	2069.1420	2622.5340	3479.7460	6129.5450	8224.9560	9769.4530	16336.4700

4	733.4144	1181.2650	1641.3140	2093.4530	2776.8990	4845.9020	6681.9280	7809.8560	12619.1600
5	558.1019	873.2225	1250.5980	1578.2670	2096.0060	3609.5080	4980.8150	5906.8700	9846.3210
6	989.7515	1026.8250	1041.8880	1074.8830	1108.8355	1146.6110	1181.1730	1202.7780	1249.3640
7	57.6788	86.5858	110.0800	158.5760	230.7734	320.4155	426.7898	510.9551	661.5289
8	109.3651	140.8244	165.3569	209.6221	268.2373	334.3195	422.4051	470.5876	583.2011
9+	74.2283	147.3774	187.9992	276.7264	376.3623	478.5775	592.8047	665.9146	820.8672

2018

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2	1115.9240	1759.1660	2515.9590	3215.3770	4258.9025	7368.5480	9821.9490	11959.8700	19428.6500
3	903.3702	1393.9150	2017.7090	2622.5540	3483.3230	6025.9050	8130.7350	9791.2270	16858.1700
4	727.8383	1142.8350	1651.2240	2092.7840	2776.8795	4891.4610	6563.2140	7795.9790	13037.0400
5	553.0019	890.6967	1237.5440	1578.4800	2093.7790	3653.8520	5038.2250	5888.7940	9515.1940
6	404.0864	632.2822	905.5343	1142.8020	1517.7015	2613.6220	3606.4860	4277.0250	7129.6010
7	709.9428	736.5150	747.3233	771.0147	795.3470	822.4544	847.2475	862.6988	896.1484
8	41.2601	61.9392	78.7454	113.4395	165.0804	229.2112	305.2989	365.5102	473.2154
9+	151.2722	232.5793	271.6639	362.0256	470.8767	577.1946	695.4741	772.7332	924.9770

2019

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2	1100.2330	1853.7570	2546.4220	3219.5910	4295.6000	7460.3590	9958.5980	11978.3500	19331.8100
3	909.9492	1434.4700	2051.4950	2621.8620	3472.7550	6008.5690	8008.8830	9752.1880	15841.6400
4	720.8946	1112.3320	1610.1070	2092.8270	2779.6765	4808.5690	6488.2460	7813.2220	13452.9700
5	548.7850	861.7011	1245.0160	1577.9510	2093.7875	3688.2640	4948.5970	5878.0740	9829.8000
6	400.4097	644.9303	896.0754	1142.9560	1516.0855	2645.7210	3647.9490	4263.9800	6889.9040
7	289.8505	453.5339	649.5140	819.6927	1088.6110	1874.6280	2586.8190	3067.8090	5113.9750
8	507.8397	526.8697	534.5847	551.5381	568.9366	588.3252	606.0636	617.1365	641.0402
9+	167.9615	252.8870	288.7709	368.3816	456.0549	566.9209	670.6410	742.9395	907.9579

2020

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2	1110.3190	1819.1110	2552.7440	3219.6580	4288.2935	7373.3010	9989.3370	11961.9400	19735.8800
3	897.1829	1511.5700	2076.3240	2625.3310	3502.6825	6083.4420	8120.6390	9767.6120	15763.4300
4	726.1269	1144.7000	1637.0580	2092.2290	2771.2705	4794.8340	6391.0380	7782.1220	12641.6300

5	543.5649	838.6869	1214.0580	1578.0010	2095.8945	3625.7510	4892.1270	5891.3320	10143.4600
6	397.3667	623.9588	901.4730	1142.5420	1516.0840	2670.5180	3583.1550	4256.0880	7117.7840
7	287.1973	462.5921	642.7341	819.8184	1087.4505	1897.6700	2616.5300	3058.4810	4942.0150
8	207.3435	324.4391	464.6172	586.3600	778.7360	1341.0060	1850.4120	2194.5190	3658.2690
9+	498.8334	563.8046	599.5579	661.4438	735.6527	821.6244	906.9653	962.1893	1087.9310

2021

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2	1113.1630	1798.9530	2518.2430	3218.2750	4258.8600	7316.0820	10010.1000	11976.6700	19491.1200
3	905.4221	1483.3790	2081.5400	2625.3460	3496.8470	6012.0340	8145.3940	9754.2340	16092.9400
4	715.9504	1206.1900	1656.8960	2094.9840	2795.1080	4854.5570	6480.4340	7794.8400	12579.2700
5	547.5061	863.1365	1234.3780	1577.5440	2089.5550	3615.1990	4818.9570	5867.7190	9531.9450
6	393.5883	607.2635	879.0850	1142.5670	1517.5775	2625.2960	3542.3160	4265.6540	7344.6280
7	285.0155	447.5357	646.5931	819.5276	1087.4305	1915.3760	2570.0800	3052.6850	5105.4040
8	205.4528	330.9105	459.7776	586.4493	777.9032	1357.5000	1871.6980	2187.9410	3535.2590
9+	621.4924	751.1965	823.6085	942.1239	1124.7955	1496.7140	1892.6980	2132.3400	3125.8390

2022

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2	1122.0950	1745.8170	2496.1190	3217.7300	4285.5670	7478.6080	10129.3900	11978.3200	19826.1800
3	907.7031	1466.8820	2053.4650	2624.2580	3472.8015	5965.7690	8162.6660	9766.0380	15893.5400
4	722.5143	1183.7110	1661.0710	2095.0130	2790.4765	4797.5880	6500.2480	7783.9600	12842.6600
5	539.8292	909.4674	1249.3740	1579.6420	2107.5500	3660.2110	4886.3420	5877.4360	9484.5080
6	396.4355	624.9748	893.7929	1142.2610	1513.0145	2617.6950	3489.2880	4248.6460	6901.8430
7	282.3152	435.5614	630.5441	819.5519	1088.4860	1882.9780	2540.7810	3059.5500	5268.0820
8	203.8908	320.1367	462.5437	586.2388	777.8717	1370.1540	1838.4360	2183.6570	3652.0590
9+	804.1153	947.6711	1037.7670	1212.3980	1534.1270	1942.5310	2400.3890	2778.8260	3560.1580

2023

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2	1117.1360	1806.0780	2552.7390	3218.3690	4286.9890	7499.5600	10155.9400	11998.0200	19918.7900
3	914.9950	1423.6360	2035.3120	2623.7840	3494.5420	6098.2760	8259.7820	9767.6200	16166.9100
4	724.3465	1170.5540	1638.7150	2094.1550	2771.2765	4760.6900	6513.7770	7793.0330	12682.8900
5	544.7678	892.5291	1252.4560	1579.6570	2104.0380	3617.5190	4901.3330	5868.9660	9683.3850

6	390.8747	658.5197	904.6899	1143.7760	1526.0155	2650.3490	3538.0910	4255.8390	6867.7370
7	284.3454	448.2645	641.1104	819.3222	1085.2335	1877.5420	2502.7720	3047.4440	4950.4200
8	201.9511	311.5694	451.0427	586.2537	778.6482	1346.9920	1817.5090	2188.6270	3768.5410
9+	944.1783	1121.6860	1218.6060	1457.0310	1809.1905	2250.2750	2752.5820	3124.0040	3915.6830

2024

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2	1132.2230	1814.5720	2562.1120	3217.0910	4300.4750	7489.8460	10119.1400	12000.8200	20241.7400
3	910.9620	1472.7320	2081.5520	2624.3320	3495.7625	6115.2360	8281.0480	9783.7310	16242.4700
4	730.1470	1136.0870	1624.1820	2093.7560	2788.6430	4866.4010	6591.1230	7794.3790	12901.2900
5	546.1708	882.6226	1235.6340	1579.0210	2089.6065	3589.4960	4911.4410	5875.8230	9562.9530
6	394.4643	646.2357	906.8787	1143.7910	1523.4715	2619.3190	3548.9320	4249.6220	7011.9480
7	280.3581	472.3332	648.9195	820.3935	1094.5570	1900.9560	2537.7190	3052.6620	4926.0240
8	203.4054	320.6577	458.6080	586.0834	776.3060	1343.0700	1790.3670	2179.9810	3541.2940
9+	1057.7570	1246.5820	1369.7630	1630.3790	2003.1005	2455.2000	2986.8530	3366.7780	4179.7760

2025

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2	1135.8140	1801.6740	2589.7970	3220.9010	4293.0390	7490.7490	10050.5500	11938.5000	19692.4400
3	923.2274	1479.6400	2089.1810	2623.3180	3506.6925	6107.5390	8251.3360	9785.7750	16505.0000
4	726.9456	1175.2590	1661.0460	2094.2070	2789.6015	4879.9800	6608.3560	7807.5200	12961.7600
5	550.5285	856.6219	1224.6630	1578.7160	2102.6240	3669.4170	4969.7610	5877.0090	9727.6770
6	395.4846	639.0430	894.6831	1143.3120	1513.0245	2599.0220	3556.2970	4254.6180	6924.3350
7	282.9370	463.5243	650.4861	820.4137	1092.7505	1878.8140	2545.5600	3047.9630	5029.4130
8	200.5556	337.8791	464.1910	586.8608	782.9774	1359.8330	1815.2730	2183.7390	3523.7750
9+	1158.5260	1364.0150	1499.5100	1758.7160	2137.4775	2608.8780	3102.8910	3484.0130	4288.8060

2026

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2	1098.9910	1759.9650	2496.4440	3218.9080	4318.4955	7605.9580	10246.9400	12111.4800	20506.6100
3	926.1603	1469.1060	2111.7380	2626.4200	3500.5540	6108.1170	8195.7400	9734.3520	16057.9000
4	736.7365	1180.7020	1667.1500	2093.3880	2798.3635	4873.6630	6584.5210	7808.8900	13170.9200
5	548.1240	886.1283	1252.4160	1579.0510	2103.4375	3679.4300	4982.7430	5886.9260	9773.3310
6	398.6278	620.2747	886.7408	1143.1060	1522.4365	2656.9830	3598.7080	4255.4440	7044.0200

7	283.6747	458.3567	641.7349	820.0606	1085.2510	1864.2060	2550.8310	3051.7570	4966.4960
8	202.3875	331.5747	465.3211	586.8867	781.6811	1344.0040	1820.9740	2180.3610	3597.7070
9+	1247.1820	1455.7690	1595.1600	1867.9780	2244.8275	2707.1460	3212.1480	3598.6660	4308.3900

2027

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2	1120.4060	1814.8520	2521.6880	3216.8550	4277.0545	7400.3330	9929.0040	11966.3800	19441.2200
3	896.1530	1435.0920	2035.6250	2624.7770	3521.4825	6202.0110	8355.5180	9876.1740	16721.1500
4	739.0653	1172.3700	1685.1480	2095.8360	2793.4650	4874.1530	6539.8980	7768.1750	12814.2200
5	555.5100	890.2794	1257.0870	1578.4320	2109.9475	3674.8660	4964.6430	5888.1620	9931.0640
6	396.8872	641.6004	906.8340	1143.3280	1523.0570	2664.2110	3607.9050	4262.6050	7076.6060
7	285.9303	444.9133	636.0009	819.9162	1091.9740	1905.7540	2581.1770	3052.3190	5052.3570
8	202.9252	327.8861	459.0761	586.6375	776.3278	1333.5410	1824.6850	2183.1130	3552.7040
9+	1320.6760	1532.1160	1665.7090	1933.7160	2310.6255	2774.7100	3295.4390	3649.3180	4330.2570

2028

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2	1122.3550	1777.0520	2507.1660	3218.4690	4294.7995	7445.5530	10207.0900	11931.5200	19973.1800
3	913.6154	1479.8940	2056.3010	2623.1170	3487.6545	6034.2250	8096.5010	9757.5090	15852.4500
4	715.1183	1145.2260	1624.4070	2094.5900	2810.1935	4949.2860	6667.6650	7881.1290	13343.9300
5	557.2712	883.9569	1270.6200	1580.2900	2106.3065	3675.2150	4931.1400	5857.3480	9662.3150
6	402.2155	644.6363	910.2400	1142.9580	1527.8020	2660.8500	3594.6890	4263.4810	7190.8020
7	284.6822	460.1916	650.4455	820.0928	1092.4640	1910.9580	2587.7370	3057.3940	5075.7810
8	204.5337	318.2569	454.9625	586.5204	781.1341	1363.1900	1846.4230	2183.4810	3614.1300
9+	1334.5780	1565.8470	1708.1020	1980.6130	2365.6260	2817.3350	3323.2240	3668.8400	4459.7750

2029

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2	1146.9520	1825.8780	2533.1740	3216.0540	4273.1920	7436.8880	9982.7790	12020.5300	20087.0900
3	915.1834	1449.0300	2044.4310	2624.3870	3502.0805	6071.2660	8323.0760	9729.7040	16286.4600
4	729.0603	1180.9470	1640.9330	2093.2210	2783.1265	4815.3150	6460.9950	7786.1430	12650.3900
5	539.2058	863.5367	1224.8510	1579.3430	2118.8795	3731.7980	5027.4520	5942.4630	10061.1600
6	403.5078	640.0272	920.0044	1144.2550	1525.1530	2661.1810	3570.5820	4241.1460	6996.3680
7	288.4917	462.3770	652.8683	819.8329	1095.8280	1908.6070	2578.3970	3058.1590	5157.6910

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8      203.6445   329.1968   465.2836   586.6442   781.4661  1366.9710  1851.1640  2187.0620
3630.9690
9+    1376.2770  1590.2730  1738.6390  2019.2070  2407.2480  2859.9100  3358.7780  3723.7460
4559.4780

2030

Age        1%         5%         10%        25%        50%        75%        90%        95%
99%
1     1331.8160  2147.3870  3032.5100  3931.3430  5208.6800  8955.7610 12089.6900 14716.4400
24672.3600
2     1124.7080  1841.7020  2554.3980  3218.6290  4288.7635  7612.1460 10195.3400 12087.5800
20333.3600
3      935.2335  1488.8820  2065.5470  2622.4250  3484.4485  6064.3130  8140.2000  9801.7930
16379.3900
4      730.3032  1156.3430  1631.4780  2094.2830  2794.6895  4844.8300  6641.6250  7764.2580
12996.6700
5      549.7191   890.4454  1237.3120  1578.3320  2098.4885  3630.8150  4871.6050  5870.8170
9538.4670
6      390.4187   625.2924   886.8581  1143.5690  1534.2755  2702.0540  3640.3260  4302.7940
7284.9630
7      289.4232   459.0681   659.9237   820.7497  1093.9710  1908.8080  2561.0230  3042.0550
5018.1650
8      206.3692   330.7607   467.0243   586.4444   783.9130  1365.2560  1844.4530  2187.6730
3689.6090
9+    1413.2170  1621.7470  1762.3460  2052.3950  2431.0655  2892.6360  3408.2880  3768.1750
4554.8110


Requested Percentile Report

Percentile =    90.00 %

                              2012       2013       2014       2015       2016       2017
2018       2019       2020       2021       2022       2023       2024       2025       2026
2027       2028       2029       2030

Recruits                  12417.3800 12558.8100 12336.3400 12195.0400 12012.8400 12179.7600
12217.6500 12242.8800 12388.5500 12421.2300 12376.0000 12291.8500 12532.5100 12143.3200
12483.8100 12208.9400 12469.8800 12089.6900 11930.1300
Spawning Stock Biomass       11.6725    11.3256    14.4005    20.1319    29.0548    38.5566
46.5508    52.6069    59.3474    67.0697    71.8890    75.2281    77.7721    79.4562    80.7948
81.9727    82.5912    83.1331    83.5996
Jan-1 Stock Biomass          16.4055    15.5239    21.0962    29.6147    40.3006    50.8472
58.8928    65.3780    72.5186    80.8081    86.1302    89.9409    92.7544    94.3532    96.0533
97.0512    97.8812    98.2907    98.8265
Mean Biomass                 17.4804    19.6206    27.6101    39.0530    51.0098    61.1463
68.7795    75.1298    81.5148    88.0690    92.4548    95.8568    98.1970    99.8396   101.1452
102.0921   102.8094   103.2124   103.2998
Combined Catch Biomass        6.0300     1.4997     1.8076     2.3842     3.5650     4.9344
6.1189     7.0745     8.0180     8.9071     9.5062     9.9211    10.2162    10.4445    10.6223
10.7491    10.8442    10.9317    10.9720
Landings                      6.0300     1.4997     1.8076     2.3842     3.5650     4.9344
6.1189     7.0745     8.0180     8.9071     9.5062     9.9211    10.2162    10.4445    10.6223
10.7491    10.8442    10.9317    10.9720
FMort                         1.3624     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350

Stock Numbers at Age
Age 1                      4083.9300 12417.3800 12558.8100 12336.3400 12195.0400 12012.8400
12179.7600 12217.6500 12242.8800 12388.5500 12421.2300 12376.0000 12291.8500 12532.5100
12143.3200 12483.8100 12208.9400 12469.8800 12089.6900
Age 2                      1707.4100  3324.6740 10152.7000 10268.2700 10086.6300  9971.1160
9821.9490  9958.5980  9989.3370 10010.1000 10129.3900 10155.9400 10119.1400 10050.5500 10246.9400
9929.0040 10207.0900  9982.7790 10195.3400
Age 3                      2111.8400  1365.7460  2711.0950  8278.1560  8373.2590  8224.9560
8130.7350  8008.8830  8120.6390  8145.3940  8162.6660  8259.7820  8281.0480  8251.3360  8195.7400
8355.5180  8096.5010  8323.0760  8140.2000
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Age 4                      2088.9300  1507.7990  1089.9100  2163.4570  6605.8870  6681.9280
6563.2140  6488.2460  6391.0380  6480.4340  6500.2480  6513.7770  6591.1230  6608.3560  6584.5210
6539.8980  6667.6650  6460.9950  6641.6250
Age 5                      1357.4100  1182.4960  1136.9180   821.7846  1631.2630  4980.8150
5038.2250  4948.5970  4892.1270  4818.9570  4886.3420  4901.3330  4911.4410  4969.7610  4982.7430
4964.6430  4931.1400  5027.4520  4871.6050
Age 6                       637.8940   652.0553   856.2113   823.2156   595.0275  1181.1730
3606.4860  3647.9490  3583.1550  3542.3160  3489.2880  3538.0910  3548.9320  3556.2970  3598.7080
3607.9050  3594.6890  3570.5820  3640.3260
Age 7                       283.2270   293.7948   467.6931   614.1483   590.4597   426.7898
847.2475  2586.8190  2616.5300  2570.0800  2540.7810  2502.7720  2537.7190  2545.5600  2550.8310
2581.1770  2587.7370  2578.3970  2561.0230
Age 8                        61.3528   125.8059   210.1639   334.5703   439.3279   422.4051
305.2989   606.0636  1850.4120  1871.6980  1838.4360  1817.5090  1790.3670  1815.2730  1820.9740
1824.6850  1846.4230  1851.1640  1844.4530
Age 9                        47.8801    48.1659   125.2263   240.0716   403.6189   592.8047
695.4741   670.6410   906.9653  1892.6980  2400.3890  2752.5820  2986.8530  3102.8910  3212.1480
3295.4390  3323.2240  3358.7780  3408.2880
```

Scenario 3 Projection

```
AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 01 Mar 2013  11:52

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_75FMSY_12CAT6617_SCENARIO3.INP

First Age Class:                       1
Number of Age Classes:                 9
Number of Years in Projection:        19
Number of Fleets:                      1
Number of Recruitment Models:          1
Number of Bootstraps:               1000
Number of Simulations:                10

Bootstrap File Name:            D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\SAW55_3BLOCK_BASE_MCMC.BSN

Number of Feasible Solutions:      10000  of      10000 Realizations

Input Harvest Scenario

Year  Type         Value

2012  Landings       6617
2013  F-Mult       0.1350
2014  F-Mult       0.1350
2015  F-Mult       0.1350
2016  F-Mult       0.1350
2017  F-Mult       0.1350
2018  F-Mult       0.1350
2019  F-Mult       0.1350
2020  F-Mult       0.1350
2021  F-Mult       0.1350
2022  F-Mult       0.1350
2023  F-Mult       0.1350
2024  F-Mult       0.1350
2025  F-Mult       0.1350
2026  F-Mult       0.1350
2027  F-Mult       0.1350
2028  F-Mult       0.1350
2029  F-Mult       0.1350
2030  F-Mult       0.1350

Recruits        1000  Fish

Year Class   Average        StdDev
2012       6926.7937     4465.8077
2013       6923.5380     4386.4587
```

2014	6937.4571	4438.1684
2015	6919.2931	4527.0696
2016	6848.1821	4336.7865
2017	6927.8128	4327.1141
2018	6904.8750	4345.1040
2019	6853.8386	4341.3137
2020	6939.1845	4398.8850
2021	6952.5694	4402.3823
2022	6973.7562	4462.6114
2023	6932.3252	4365.9713
2024	7044.3441	4564.4314
2025	6897.3804	4358.1031
2026	6933.3608	4380.3428
2027	6924.7521	4452.7725
2028	7017.1113	4540.7667
2029	6852.1367	4397.8307
2030	6883.5775	4300.2626

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2013	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2014	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2015	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2016	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2017	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2018	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2019	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2020	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2021	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2022	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2023	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2024	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2025	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2026	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2027	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2028	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2029	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600
2030	1347.1080	2222.8420	3135.0670	3934.5510	5235.3460	9103.0150	11930.1300	14588.2800	23922.8900

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	8.3707	2.3863
2013	7.3455	2.6826
2014	10.1165	2.8985
2015	14.9578	3.5807
2016	21.6694	5.3628
2017	28.6703	7.1667
2018	34.7188	8.3692

2019	39.8791	9.2320
2020	45.8292	9.9437
2021	51.8969	11.2043
2022	56.2300	11.7406
2023	59.3332	12.0087
2024	61.5687	12.1824
2025	63.1808	12.2105
2026	64.3960	12.2510
2027	65.2741	12.3115
2028	65.8926	12.4036
2029	66.3618	12.4648
2030	66.6876	12.5129

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3.2207	4.7299	5.3625	6.7483	8.1958	9.7759	11.5080	12.6272	14.6713
2013	2.0827	3.3778	4.0406	5.4677	7.0529	8.9109	10.8338	12.0969	14.6260
2014	4.3813	5.8203	6.6158	8.0908	9.8331	11.8045	13.9229	15.3812	17.9780
2015	8.0185	9.7826	10.7239	12.4788	14.5442	17.0736	19.6601	21.5372	25.2573
2016	12.3138	14.4158	15.6161	17.9356	20.9256	24.5683	28.5965	31.5944	38.4106
2017	16.5244	19.0474	20.6323	23.5262	27.6123	32.4905	38.1498	42.3471	50.1313
2018	20.4957	23.2388	25.1544	28.7073	33.4673	39.2510	46.2192	50.4019	59.2919
2019	23.7680	27.1099	29.1430	33.2872	38.5753	45.2674	52.3769	56.9110	66.7404
2020	28.0985	31.9136	34.2004	38.6942	44.5027	51.6827	59.1737	64.1108	74.5260
2021	31.7703	35.9997	38.7692	43.8736	50.4985	58.5162	66.9476	72.5272	83.6576
2022	34.4524	39.1508	42.2279	47.8095	54.9200	63.3221	71.8019	77.3839	89.1396
2023	36.8528	41.7592	44.9552	50.7529	58.0737	66.5909	75.1603	80.9946	92.6538
2024	38.2846	43.6653	47.0368	52.8716	60.4391	68.9118	77.7280	83.5214	95.9039
2025	39.8267	45.0926	48.3986	54.4465	62.0595	70.5122	79.4253	84.9740	96.7255
2026	40.8031	46.2848	49.6020	55.6801	63.3489	71.9608	80.7742	86.4613	97.3285
2027	41.7602	47.1903	50.3653	56.4095	64.0785	72.8756	81.9580	87.4304	98.3402
2028	42.3626	47.6645	51.0034	56.9364	64.6512	73.3945	82.5792	88.1465	99.2897
2029	43.1121	47.9667	51.2946	57.3375	65.1554	74.0528	83.1248	88.7888	100.4897
2030	43.2059	48.3282	51.6476	57.5709	65.4025	74.4038	83.5940	89.1385	100.3408

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	10.7819	3.2250
2014	15.5185	3.7914
2015	22.2253	5.2736
2016	30.2105	7.3362
2017	38.0238	9.1413
2018	44.6160	10.2998
2019	50.2239	11.0987
2020	56.6945	11.7587
2021	63.2882	13.0253
2022	68.0113	13.5785
2023	71.4113	13.8755

2024	73.8602	14.0701
2025	75.6265	14.0981
2026	76.9583	14.1426
2027	77.9027	14.2312
2028	78.5541	14.3388
2029	79.0645	14.3853
2030	79.4252	14.4249

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.2801	8.7308	9.4238	10.9381	12.5757	14.4349	16.4055	17.7124	20.3350
2013	4.3892	5.9895	6.8679	8.5259	10.4891	12.6491	14.9778	16.6241	19.4779
2014	8.0609	9.9205	10.9790	12.8703	15.1348	17.8278	20.5732	22.4018	25.8390
2015	12.7559	14.8944	16.1807	18.5550	21.5493	25.1302	29.1105	31.8711	38.2722
2016	17.5947	20.2778	21.9270	25.0173	29.1684	34.0871	39.8059	44.1142	52.5287
2017	22.4423	25.5036	27.6012	31.4633	36.7649	42.9511	50.3985	55.2995	65.3827
2018	26.7779	30.4227	32.6767	37.2316	43.1690	50.5413	58.5456	63.7148	74.5455
2019	30.4878	34.6635	37.2377	42.2368	48.7802	56.7652	65.1248	70.5006	82.7700
2020	35.4974	39.9369	42.8605	48.3256	55.2551	63.7154	72.3343	78.4065	89.8859
2021	39.2294	44.5703	47.8206	54.0043	61.8235	71.1085	80.6706	87.2477	99.3651
2022	42.4201	48.1486	51.8154	58.2779	66.6056	76.2609	86.0421	92.2718	105.6796
2023	44.9814	51.0000	54.8049	61.5548	70.0293	79.8734	89.8720	96.1395	110.0397
2024	46.6659	53.0756	56.8750	63.8590	72.6373	82.3180	92.7080	98.8852	113.2497
2025	48.5398	54.6075	58.5340	65.5494	74.3158	84.3027	94.3168	101.0543	113.9938
2026	49.4142	56.0999	59.8216	66.8903	75.6976	85.8033	96.0285	102.2842	114.4393
2027	50.5649	56.9981	60.7077	67.7325	76.5736	86.7217	97.0341	103.4299	115.5498
2028	51.3642	57.2748	61.2160	68.3305	77.1168	87.3255	97.8692	104.1856	117.3512
2029	52.0201	57.7608	61.6730	68.6744	77.7365	87.9693	98.2819	104.8651	118.3276
2030	51.7728	58.1763	62.0287	68.9516	78.0872	88.4651	98.8195	105.1983	117.7005

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	12.6471	3.4475
2013	14.1596	3.7125
2014	20.7061	4.8873
2015	29.1779	7.2373
2016	37.8841	9.5292
2017	45.6001	11.0776
2018	52.1371	12.0819
2019	57.7808	12.7724
2020	63.6647	13.2787
2021	69.2632	14.0711
2022	73.2765	14.4480
2023	76.1885	14.6742
2024	78.3016	14.8263
2025	79.8392	14.8682
2026	80.9809	14.9296
2027	81.7894	15.0362
2028	82.3342	15.1312

2029	82.7603	15.1450
2030	83.0646	15.1699

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	5.4277	7.4256	8.3433	10.2984	12.3219	14.6519	17.1515	18.6479	21.6450
2013	6.6742	8.6207	9.6904	11.5394	13.8261	16.4388	19.0617	20.8624	24.0473
2014	11.5661	13.8003	15.0409	17.3193	20.0955	23.4258	27.0951	29.5815	35.1838
2015	16.8162	19.6411	21.0928	24.1054	28.1072	32.9465	38.5784	42.8138	51.9526
2016	21.9868	25.0860	27.1795	31.0559	36.4555	42.9171	50.5697	56.1010	66.3937
2017	26.5627	30.4000	32.8851	37.6213	43.9413	51.7389	60.7589	66.3392	78.3261
2018	30.9964	35.4041	38.0698	43.5401	50.5243	59.2142	68.4900	74.3897	87.4692
2019	34.8301	39.7733	42.7670	48.6028	56.1595	65.3948	74.9173	81.3224	94.4662
2020	39.4711	44.5804	47.9155	54.2107	62.0514	71.7027	81.3604	88.2782	100.8548
2021	42.8095	48.7784	52.4979	59.2362	67.7354	77.8804	87.9469	94.8773	108.3159
2022	45.7954	52.0441	55.9930	62.9898	71.8973	82.1041	92.3682	98.9749	112.9762
2023	47.9059	54.4766	58.5298	65.7378	74.7781	84.9538	95.7962	102.2107	116.9020
2024	49.8576	56.3562	60.2914	67.6822	76.9555	87.3126	98.1513	104.9002	118.3027
2025	51.0357	57.7984	61.8162	69.2981	78.5520	89.0591	99.8092	106.4916	119.9960
2026	51.9738	59.1287	62.9076	70.3176	79.5575	90.2639	101.1207	107.6179	120.8724
2027	53.1940	59.6555	63.6317	71.0087	80.2275	90.9309	102.0776	108.7216	122.1873
2028	54.0237	60.0607	64.0235	71.4433	80.8011	91.6368	102.7988	109.7334	123.1481
2029	53.8994	60.4384	64.3882	71.8110	81.3714	92.2227	103.2050	109.8976	123.6726
2030	54.1137	60.8856	64.8240	72.0883	81.7348	92.4500	103.2946	110.1311	123.2668

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	6.6170	0.0000
2013	0.9423	0.3722
2014	1.2160	0.4019
2015	1.7547	0.4282
2016	2.6578	0.6621
2017	3.6453	0.9544
2018	4.5238	1.1456
2019	5.2895	1.2939
2020	6.0828	1.4050
2021	6.8386	1.5428
2022	7.3791	1.5988
2023	7.7625	1.6260
2024	8.0399	1.6434
2025	8.2423	1.6485
2026	8.3945	1.6571
2027	8.5043	1.6653
2028	8.5867	1.6753
2029	8.6461	1.6854
2030	8.6848	1.6920

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170
2013	0.2117	0.3923	0.4755	0.6793	0.9102	1.1682	1.4300	1.5966	1.9504
2014	0.4276	0.6257	0.7215	0.9420	1.1720	1.4522	1.7391	1.9410	2.2982
2015	0.8911	1.1176	1.2402	1.4535	1.7172	2.0210	2.3194	2.5214	2.9126
2016	1.4963	1.7682	1.9187	2.2009	2.5622	3.0104	3.5035	3.8809	4.7550
2017	2.0691	2.4008	2.5836	2.9669	3.4955	4.1319	4.8833	5.4780	6.6558
2018	2.6182	2.9813	3.2281	3.7036	4.3533	5.1325	6.0778	6.6994	7.9537
2019	3.0702	3.5187	3.7934	4.3611	5.0998	6.0289	7.0447	7.7031	9.0535
2020	3.6258	4.1302	4.4491	5.0792	5.8928	6.9021	7.9964	8.6576	10.1893
2021	4.0760	4.6515	5.0403	5.7340	6.6293	7.7550	8.8916	9.6962	11.2523
2022	4.4490	5.0746	5.4806	6.2373	7.1954	8.3455	9.4952	10.2916	11.8210
2023	4.7304	5.4026	5.8264	6.5951	7.5826	8.7465	9.9131	10.6872	12.2917
2024	4.9370	5.6490	6.0838	6.8688	7.8656	9.0296	10.2108	11.0035	12.6181
2025	5.1170	5.8258	6.2485	7.0607	8.0952	9.2291	10.4401	11.1983	12.7587
2026	5.2508	5.9333	6.3977	7.2112	8.2342	9.4128	10.6194	11.3908	12.9317
2027	5.3829	6.0639	6.4993	7.3072	8.3381	9.5202	10.7469	11.5018	12.9662
2028	5.4434	6.1481	6.5974	7.3810	8.4085	9.6005	10.8428	11.6075	13.1442
2029	5.5133	6.1760	6.6251	7.4272	8.4794	9.6609	10.9306	11.6998	13.2369
2030	5.5402	6.2219	6.6486	7.4569	8.5079	9.7395	10.9713	11.7206	13.2949

Landings x 1000 MT

Year	Average	StdDev
2012	6.6170	0.0000
2013	0.9423	0.3722
2014	1.2160	0.4019
2015	1.7547	0.4282
2016	2.6578	0.6621
2017	3.6453	0.9544
2018	4.5238	1.1456
2019	5.2895	1.2939
2020	6.0828	1.4050
2021	6.8386	1.5428
2022	7.3791	1.5988
2023	7.7625	1.6260
2024	8.0399	1.6434
2025	8.2423	1.6485
2026	8.3945	1.6571
2027	8.5043	1.6653
2028	8.5867	1.6753
2029	8.6461	1.6854
2030	8.6848	1.6920

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170	6.6170

2013	0.2117	0.3923	0.4755	0.6793	0.9102	1.1682	1.4300	1.5966	1.9504
2014	0.4276	0.6257	0.7215	0.9420	1.1720	1.4522	1.7391	1.9410	2.2982
2015	0.8911	1.1176	1.2402	1.4535	1.7172	2.0210	2.3194	2.5214	2.9126
2016	1.4963	1.7682	1.9187	2.2009	2.5622	3.0104	3.5035	3.8809	4.7550
2017	2.0691	2.4008	2.5836	2.9669	3.4955	4.1319	4.8833	5.4780	6.6558
2018	2.6182	2.9813	3.2281	3.7036	4.3533	5.1325	6.0778	6.6994	7.9537
2019	3.0702	3.5187	3.7934	4.3611	5.0998	6.0289	7.0447	7.7031	9.0535
2020	3.6258	4.1302	4.4491	5.0792	5.8928	6.9021	7.9964	8.6576	10.1893
2021	4.0760	4.6515	5.0403	5.7340	6.6293	7.7550	8.8916	9.6962	11.2523
2022	4.4490	5.0746	5.4806	6.2373	7.1954	8.3455	9.4952	10.2916	11.8210
2023	4.7304	5.4026	5.8264	6.5951	7.5826	8.7465	9.9131	10.6872	12.2917
2024	4.9370	5.6490	6.0838	6.8688	7.8656	9.0296	10.2108	11.0035	12.6181
2025	5.1170	5.8258	6.2485	7.0607	8.0952	9.2291	10.4401	11.1983	12.7587
2026	5.2508	5.9333	6.3977	7.2112	8.2342	9.4128	10.6194	11.3908	12.9317
2027	5.3829	6.0639	6.4993	7.3072	8.3381	9.5202	10.7469	11.5018	12.9662
2028	5.4434	6.1481	6.5974	7.3810	8.4085	9.6005	10.8428	11.6075	13.1442
2029	5.5133	6.1760	6.6251	7.4272	8.4794	9.6609	10.9306	11.6998	13.2369
2030	5.5402	6.2219	6.6486	7.4569	8.5079	9.7395	10.9713	11.7206	13.2949

Total Fishing Mortality

Year	Average	StdDev
2012	1.0611	0.4506
2013	0.1350	0.0000
2014	0.1350	0.0000
2015	0.1350	0.0000
2016	0.1350	0.0000
2017	0.1350	0.0000
2018	0.1350	0.0000
2019	0.1350	0.0000
2020	0.1350	0.0000
2021	0.1350	0.0000
2022	0.1350	0.0000
2023	0.1350	0.0000
2024	0.1350	0.0000
2025	0.1350	0.0000
2026	0.1350	0.0000
2027	0.1350	0.0000
2028	0.1350	0.0000
2029	0.1350	0.0000
2030	0.1350	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.4887	0.5863	0.6505	0.7746	0.9580	1.2119	1.6003	1.8910	2.7946
2013	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2014	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

2015	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2016	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2017	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2018	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2019	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2020	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2021	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2022	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2023	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2024	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2025	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2026	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2027	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2028	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2029	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350
2030	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350	0.1350

JAN-1 Stock Numbers at Age - 1000 Fish

2012

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	3470.7100	3582.0200	3630.7900	3733.1100	3845.4000	3970.9800	4083.9300	4158.3900	4317.7200
2	238.3360	346.6600	439.6270	636.1570	927.1550	1288.8100	1707.4100	2053.8300	2637.8900
3	628.9300	792.3810	889.8900	1098.6100	1389.0900	1699.8800	2111.8400	2331.2900	2895.3200
4	924.0740	1046.1800	1143.1600	1345.3900	1586.0550	1844.7200	2088.9300	2260.2700	2689.6800
5	541.8520	638.9290	722.4190	836.8020	993.8315	1180.0600	1357.4100	1491.0000	1750.6100
6	205.2150	265.2180	300.2310	360.2070	439.7105	535.3540	637.8940	691.6980	865.0120
7	82.4731	99.1877	117.2230	146.9100	185.1170	230.8150	283.2270	314.3510	388.2850
8	13.6543	18.2450	21.2075	27.9255	37.2013	48.9121	61.3528	70.3407	89.6368
9+	8.5168	11.6466	14.5945	19.3767	26.8609	36.7221	47.8801	56.9625	73.2486

2013

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1391.0880	2176.8350	3117.3750	3934.3440	5224.9320	8997.3260	12417.3800	14724.4000	24545.3000
2	2774.1210	2880.4780	2926.2260	3018.5840	3116.7510	3224.2650	3322.3640	3382.9520	3514.3870
3	181.3974	276.1476	349.5488	505.4113	734.1711	1022.4540	1360.2740	1626.0610	2111.2530
4	356.8716	484.7175	565.7210	727.5435	937.8159	1171.9120	1477.4620	1652.2370	2044.5440

5	133.3340	290.9669	367.1557	532.2454	723.2937	917.3582	1125.7680	1252.4070	1565.2920
6	31.5879	97.1351	142.8672	227.1534	340.9115	470.9063	606.3292	705.8688	888.6876
7	10.8248	34.3083	50.9393	90.5921	140.9572	201.0187	273.4864	312.2929	414.2473
8	3.9447	12.9517	19.8196	36.7199	58.2816	83.9559	116.5031	142.4484	193.2216
9+	1.2215	4.3558	5.9807	12.1301	20.0789	30.9626	44.4976	54.3927	78.0699

2014

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1378.5500	2220.4250	3084.9370	3934.8880	5219.5770	9107.9500	12558.8100	14679.2300	23718.6500
2	1137.4290	1779.8250	2548.8050	3216.7850	4272.0765	7356.3970	10152.7000	12039.0400	20068.7800
3	2262.0860	2348.8110	2386.1210	2461.4200	2541.4375	2629.1390	2709.1360	2758.5810	2865.7240
4	144.7544	220.3677	278.9430	403.3133	585.8679	815.9260	1085.5220	1297.6050	1684.7770
5	269.0817	365.4922	426.5543	548.5775	707.1183	883.6331	1113.9960	1245.8410	1541.6410
6	96.5444	210.6896	265.8515	385.3874	523.7206	664.2330	815.1514	906.8532	1133.3990
7	22.6564	69.6697	102.4695	162.9325	244.5217	337.7673	434.8943	506.2878	637.4154
8	7.7436	24.5413	36.4379	64.8046	100.8349	143.7957	195.6345	223.3964	296.3394
9+	3.7710	12.3896	18.3306	35.1017	56.7026	82.6412	115.3082	141.8393	192.3448

2015

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1368.0180	2148.0540	3103.4100	3933.5090	5219.5095	9193.6920	12336.3400	14652.5500	24503.1900
2	1127.1350	1815.4210	2522.3270	3217.2680	4267.5945	7447.0390	10268.2700	12002.2300	19392.9500
3	927.4998	1451.2620	2078.4230	2623.0000	3483.5215	5998.6630	8278.1560	9817.0450	16363.8300
4	1805.1590	1874.3470	1904.1920	1964.1650	2028.0485	2098.0720	2161.8840	2201.3690	2286.9150
5	109.1482	166.1599	210.3290	304.0979	441.7519	615.2135	818.4941	978.4177	1270.3630
6	194.8322	264.6472	308.8556	397.2105	512.0130	639.8197	806.6140	902.1197	1116.2630
7	69.2492	151.1219	190.6868	276.4253	375.6474	476.4473	584.6835	650.4439	812.9900
8	16.2074	49.8385	73.3010	116.5530	174.9167	241.6206	311.0961	362.1831	455.9809
9+	8.1177	25.0774	38.6956	71.9107	112.4041	159.6926	223.1524	257.0918	356.4472

2016

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1354.9750	2090.6770	3026.4270	3933.6580	5224.5540	9038.6270	12195.0400	14685.9400	25285.6600
2	1118.5380	1756.2910	2537.4690	3216.1820	4267.5195	7516.9450	10086.6300	11980.7700	20034.5600
3	919.0880	1480.2840	2056.7610	2623.4060	3479.8840	6072.5310	8373.2590	9787.0510	15813.1400
4	740.1478	1158.0960	1658.6070	2093.1400	2779.8275	4787.0090	6605.8870	7834.0910	13058.5900
5	1361.1500	1413.3090	1435.7620	1481.0200	1529.1705	1581.9570	1630.0890	1659.8350	1724.3420

6	79.0325	120.3139	152.2962	220.1869	319.8642	445.4645	592.6532	708.4553	919.8483
7	139.7525	189.8287	221.5348	284.9114	367.2498	458.9371	578.5711	647.0390	800.6811
8	49.5386	108.1042	136.4052	197.7399	268.7208	340.8201	418.2470	465.3135	581.5570
9+	17.3022	53.9007	81.8519	137.1310	206.1426	291.4024	377.4065	444.6724	577.6307

2017

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1364.8090	2151.5700	3077.1790	3932.5260	5208.8510	9011.9920	12012.8400	14627.4100	23761.4300
2	1107.8540	1709.4190	2474.4290	3216.2170	4271.8110	7389.9540	9971.1160	12007.5700	20674.5000
3	912.0705	1432.1380	2069.1420	2622.5340	3479.7460	6129.5450	8224.9560	9769.4530	16336.4700
4	733.4144	1181.2650	1641.3140	2093.4530	2776.8990	4845.9020	6681.9280	7809.8560	12619.1600
5	558.1019	873.2225	1250.5980	1578.2670	2096.0060	3609.5080	4980.8150	5906.8700	9846.3210
6	985.5788	1023.3570	1039.5980	1072.3840	1107.2530	1145.4510	1180.2940	1201.8600	1248.5660
7	56.6889	86.2973	109.2379	157.9373	229.4268	319.5176	425.1031	508.1484	659.8060
8	99.9825	135.7911	158.4746	203.8064	262.7104	328.2928	413.8816	462.8398	572.7682
9+	46.8754	116.3247	156.4331	246.4233	344.7829	445.9597	561.4424	632.1784	786.1940

2018

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1345.6260	2267.1890	3114.3340	3937.7130	5253.7270	9124.6440	12179.7600	14650.4900	23644.6200
2	1115.9240	1759.1660	2515.9590	3215.3770	4258.9025	7368.5480	9821.9490	11959.8700	19428.6500
3	903.3702	1393.9150	2017.7090	2622.5540	3483.3230	6025.9050	8130.7350	9791.2270	16858.1700
4	727.8383	1142.8350	1651.2240	2092.7840	2776.8795	4891.4610	6563.2140	7795.9790	13037.0400
5	553.0019	890.6967	1237.5440	1578.4800	2093.7790	3653.8520	5038.2250	5888.7940	9515.1940
6	404.0864	632.2822	905.5343	1142.8020	1517.7015	2613.6220	3606.4860	4277.0250	7129.6010
7	706.9493	734.0347	745.6770	769.1823	794.1959	821.5948	846.5946	862.0648	895.5761
8	40.5521	61.7329	78.1424	112.9773	164.1172	228.5663	304.1030	363.5022	471.9830
9+	123.1241	204.1652	242.9808	333.9646	442.8184	551.2451	667.9756	746.9725	897.4369

2019

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1357.9650	2224.9040	3122.1830	3937.8460	5244.6860	9017.8920	12217.6500	14629.7900	24138.6100
2	1100.2330	1853.7570	2546.4220	3219.5910	4295.6000	7460.3590	9958.5980	11978.3500	19331.8100
3	909.9492	1434.4700	2051.4950	2621.8620	3472.7550	6008.5690	8008.8830	9752.1880	15841.6400
4	720.8946	1112.3320	1610.1070	2092.8270	2779.6765	4808.5690	6488.2460	7813.2220	13452.9700
5	548.7850	861.7011	1245.0160	1577.9510	2093.7875	3688.2640	4948.5970	5878.0740	9829.8000
6	400.4097	644.9303	896.0754	1142.9560	1516.0855	2645.7210	3647.9490	4263.9800	6889.9040

7	289.8505	453.5339	649.5140	819.6927	1088.6110	1874.6280	2586.8190	3067.8090	5113.9750
8	505.6984	525.0814	533.4259	550.2347	568.1199	587.7202	605.5906	616.6703	640.6309
9+	146.6517	232.4930	268.7290	347.7120	435.9282	546.9543	650.1713	721.5776	887.9285

2020

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1361.4820	2200.1370	3079.9840	3936.1300	5208.7835	8947.7190	12242.8800	14648.1400	23837.6100
2	1110.3190	1819.1110	2552.7440	3219.6580	4288.2935	7373.3010	9989.3370	11961.9400	19735.8800
3	897.1829	1511.5700	2076.3240	2625.3310	3502.6825	6083.4420	8120.6390	9767.6120	15763.4300
4	726.1269	1144.7000	1637.0580	2092.2290	2771.2705	4794.8340	6391.0380	7782.1220	12641.6300
5	543.5649	838.6869	1214.0580	1578.0010	2095.8945	3625.7510	4892.1270	5891.3320	10143.4600
6	397.3667	623.9588	901.4730	1142.5420	1516.0840	2670.5180	3583.1550	4256.0880	7117.7840
7	287.1973	462.5921	642.7341	819.8184	1087.4505	1897.6700	2616.5300	3058.4810	4942.0150
8	207.3435	324.4391	464.6172	586.3600	778.7360	1341.0060	1850.4120	2194.5190	3658.2690
9+	482.3088	546.8116	584.4402	646.7120	720.6709	807.4739	891.7974	948.7829	1073.9540

2021

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.3320	2135.2460	3052.8640	3935.4070	5241.3945	9146.7490	12388.5500	14650.0200	24248.4400
2	1113.1630	1798.9530	2518.2430	3218.2750	4258.8600	7316.0820	10010.1000	11976.6700	19491.1200
3	905.4221	1483.3790	2081.5400	2625.3460	3496.8470	6012.0340	8145.3940	9754.2340	16092.9400
4	715.9504	1206.1900	1656.8960	2094.9840	2795.1080	4854.5570	6480.4340	7794.8400	12579.2700
5	547.5061	863.1365	1234.3780	1577.5440	2089.5550	3615.1990	4818.9570	5867.7190	9531.9450
6	393.5883	607.2635	879.0850	1142.5670	1517.5775	2625.2960	3542.3160	4265.6540	7344.6280
7	285.0155	447.5357	646.5931	819.5276	1087.4305	1915.3760	2570.0800	3052.6850	5105.4040
8	205.4528	330.9105	459.7776	586.4493	777.9032	1357.5000	1871.6980	2187.9410	3535.2590
9+	610.5289	740.2203	812.4622	931.0077	1114.3230	1486.0030	1882.3470	2121.3440	3116.0710

2022

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1366.3180	2208.9180	3122.0950	3936.2350	5243.1905	9172.1780	12421.2300	14674.0700	24361.1300
2	1122.0950	1745.8170	2496.1190	3217.7300	4285.5670	7478.6080	10129.3900	11978.3200	19826.1800
3	907.7031	1466.8820	2053.4650	2624.2580	3472.8015	5965.7690	8162.6660	9766.0380	15893.5400
4	722.5143	1183.7110	1661.0710	2095.0130	2790.4765	4797.5880	6500.2480	7783.9600	12842.6600
5	539.8292	909.4674	1249.3740	1579.6420	2107.5500	3660.2110	4886.3420	5877.4360	9484.5080
6	396.4355	624.9748	893.7929	1142.2610	1513.0145	2617.6950	3489.2880	4248.6460	6901.8430
7	282.3152	435.5614	630.5441	819.5519	1088.4860	1882.9780	2540.7810	3059.5500	5268.0820

8	203.8908	320.1367	462.5437	586.2388	777.8717	1370.1540	1838.4360	2183.6570	3652.0590
9+	796.2764	939.7003	1030.0450	1204.5620	1526.4215	1934.7440	2392.9760	2770.8110	3552.4620

2023

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1384.7770	2219.3670	3133.5810	3934.6860	5259.8645	9160.4460	12376.0000	14677.6600	24755.9700
2	1117.1360	1806.0780	2552.7390	3218.3690	4286.9890	7499.5600	10155.9400	11998.0200	19918.7900
3	914.9950	1423.6360	2035.3120	2623.7840	3494.5420	6098.2760	8259.7820	9767.6200	16166.9100
4	724.3465	1170.5540	1638.7150	2094.1550	2771.2765	4760.6900	6513.7770	7793.0330	12682.8900
5	544.7678	892.5291	1252.4560	1579.6570	2104.0380	3617.5190	4901.3330	5868.9660	9683.3850
6	390.8747	658.5197	904.6899	1143.7760	1526.0155	2650.3490	3538.0910	4255.8390	6867.7370
7	284.3454	448.2645	641.1104	819.3222	1085.2335	1877.5420	2502.7720	3047.4440	4950.4200
8	201.9511	311.5694	451.0427	586.2537	778.6482	1346.9920	1817.5090	2188.6270	3768.5410
9+	938.8861	1116.2420	1213.2450	1450.9370	1804.0030	2244.6920	2747.1610	3118.9490	3910.3190

2024

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1389.1490	2203.5560	3167.4080	3939.3770	5250.5365	9161.4850	12291.8500	14601.5300	24085.3500
2	1132.2230	1814.5720	2562.1120	3217.0910	4300.4750	7489.8460	10119.1400	12000.8200	20241.7400
3	910.9620	1472.7320	2081.5520	2624.3320	3495.7625	6115.2360	8281.0480	9783.7310	16242.4700
4	730.1470	1136.0870	1624.1820	2093.7560	2788.6430	4866.4010	6591.1230	7794.3790	12901.2900
5	546.1708	882.6226	1235.6340	1579.0210	2089.6065	3589.4960	4911.4410	5875.8230	9562.9530
6	394.4643	646.2357	906.8787	1143.7910	1523.4715	2619.3190	3548.9320	4249.6220	7011.9480
7	280.3581	472.3332	648.9195	820.3935	1094.5570	1900.9560	2537.7190	3052.6620	4926.0240
8	203.4054	320.6577	458.6080	586.0834	776.3060	1343.0700	1790.3670	2179.9810	3541.2940
9+	1053.9090	1242.9220	1366.0170	1626.5130	1999.0710	2450.9820	2982.7620	3362.9960	4175.4710

2025

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1344.1080	2152.4970	3053.2420	3936.9370	5281.6595	9302.4100	12532.5100	14812.5500	25080.2100
2	1135.8140	1801.6740	2589.7970	3220.9010	4293.0390	7490.7490	10050.5500	11938.5000	19692.4400
3	923.2274	1479.6400	2089.1810	2623.3180	3506.6925	6107.5390	8251.3360	9785.7750	16505.0000
4	726.9456	1175.2590	1661.0460	2094.2070	2789.6015	4879.9800	6608.3560	7807.5200	12961.7600
5	550.5285	856.6219	1224.6630	1578.7160	2102.6240	3669.4170	4969.7610	5877.0090	9727.6770
6	395.4846	639.0430	894.6831	1143.3120	1513.0245	2599.0220	3556.2970	4254.6180	6924.3350
7	282.9370	463.5243	650.4861	820.4137	1092.7505	1878.8140	2545.5600	3047.9630	5029.4130
8	200.5556	337.8791	464.1910	586.8608	782.9774	1359.8330	1815.2730	2183.7390	3523.7750

9+	1155.7790	1361.3410	1496.7560	1755.7380	2134.6510	2606.1270	3100.2290	3481.2600	4285.8420

2026

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1370.3160	2219.7410	3084.1560	3934.4160	5231.1815	9051.3350	12143.3200	14635.6800	23778.2800
2	1098.9910	1759.9650	2496.4440	3218.9080	4318.4955	7605.9580	10246.9400	12111.4800	20506.6100
3	926.1603	1469.1060	2111.7380	2626.4200	3500.5540	6108.1170	8195.7400	9734.3520	16057.9000
4	736.7365	1180.7020	1667.1500	2093.3880	2798.3635	4873.6630	6584.5210	7808.8900	13170.9200
5	548.1240	886.1283	1252.4160	1579.0510	2103.4375	3679.4300	4982.7430	5886.9260	9773.3310
6	398.6278	620.2747	886.7408	1143.1060	1522.4365	2656.9830	3598.7080	4255.4440	7044.0200
7	283.6747	458.3567	641.7349	820.0606	1085.2510	1864.2060	2550.8310	3051.7570	4966.4960
8	202.3875	331.5747	465.3211	586.8867	781.6811	1344.0040	1820.9740	2180.3610	3597.7070
9+	1245.1960	1453.7460	1593.1750	1865.9500	2242.7025	2704.9780	3210.1720	3596.7630	4306.4390

2027

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1372.7000	2173.4110	3066.4290	3936.4800	5252.7205	9106.2090	12483.8100	14592.7200	24428.4200
2	1120.4060	1814.8520	2521.6880	3216.8550	4277.0545	7400.3330	9929.0040	11966.3800	19441.2200
3	896.1530	1435.0920	2035.6250	2624.7770	3521.4825	6202.0110	8355.5180	9876.1740	16721.1500
4	739.0653	1172.3700	1685.1480	2095.8360	2793.4650	4874.1530	6539.8980	7768.1750	12814.2200
5	555.5100	890.2794	1257.0870	1578.4320	2109.9475	3674.8660	4964.6430	5888.1620	9931.0640
6	396.8872	641.6004	906.8340	1143.3280	1523.0570	2664.2110	3607.9050	4262.6050	7076.6060
7	285.9303	444.9133	636.0009	819.9162	1091.9740	1905.7540	2581.1770	3052.3190	5052.3570
8	202.9252	327.8861	459.0761	586.6375	776.3278	1333.5410	1824.6850	2183.1130	3552.7040
9+	1318.9960	1530.7810	1664.2110	1932.2340	2309.0975	2773.2310	3294.0470	3647.8810	4328.8200

2028

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1402.7780	2233.1340	3098.2700	3933.3740	5226.2710	9095.7350	12208.9400	14701.7200	24567.2500
2	1122.3550	1777.0520	2507.1660	3218.4690	4294.7995	7445.5530	10207.0900	11931.5200	19973.1800
3	913.6154	1479.8940	2056.3010	2623.1170	3487.6545	6034.2250	8096.5010	9757.5090	15852.4500
4	715.1183	1145.2260	1624.4070	2094.5900	2810.1935	4949.2860	6667.6650	7881.1290	13343.9300
5	557.2712	883.9569	1270.6200	1580.2900	2106.3065	3675.2150	4931.1400	5857.3480	9662.3150
6	402.2155	644.6363	910.2400	1142.9580	1527.8020	2660.8500	3594.6890	4263.4810	7190.8020
7	284.6822	460.1916	650.4455	820.0928	1092.4640	1910.9580	2587.7370	3057.3940	5075.7810
8	204.5337	318.2569	454.9625	586.5204	781.1341	1363.1900	1846.4230	2183.4810	3614.1300
9+	1333.5570	1564.8200	1707.1370	1979.6160	2364.5860	2816.3520	3322.1330	3667.7190	4458.8170

2029

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1375.5750	2252.4930	3124.1640	3936.5160	5245.2180	9310.0550	12469.8800	14784.1500	24868.9800
2	1146.9520	1825.8780	2533.1740	3216.0540	4273.1920	7436.8880	9982.7790	12020.5300	20087.0900
3	915.1834	1449.0300	2044.4310	2624.3870	3502.0805	6071.2660	8323.0760	9729.7040	16286.4600
4	729.0603	1180.9470	1640.9330	2093.2210	2783.1265	4815.3150	6460.9950	7786.1430	12650.3900
5	539.2058	863.5367	1224.8510	1579.3430	2118.8795	3731.7980	5027.4520	5942.4630	10061.1600
6	403.5078	640.0272	920.0044	1144.2550	1525.1530	2661.1810	3570.5820	4241.1460	6996.3680
7	288.4917	462.3770	652.8683	819.8329	1095.8280	1908.6070	2578.3970	3058.1590	5157.6910
8	203.6445	329.1968	465.2836	586.6442	781.4661	1366.9710	1851.1640	2187.0620	3630.9690
9+	1375.5600	1589.5790	1737.8990	2018.4310	2406.5475	2859.2150	3358.0420	3722.9950	4558.7730

2030

Age	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	1331.8160	2147.3870	3032.5100	3931.3430	5208.6800	8955.7610	12089.6900	14716.4400	24672.3600
2	1124.7080	1841.7020	2554.3980	3218.6290	4288.7635	7612.1460	10195.3400	12087.5800	20333.3600
3	935.2335	1488.8820	2065.5470	2622.4250	3484.4485	6064.3130	8140.2000	9801.7930	16379.3900
4	730.3032	1156.3430	1631.4780	2094.2830	2794.6895	4844.8300	6641.6250	7764.2580	12996.6700
5	549.7191	890.4454	1237.3120	1578.3320	2098.4885	3630.8150	4871.6050	5870.8170	9538.4670
6	390.4187	625.2924	886.8581	1143.5690	1534.2755	2702.0540	3640.3260	4302.7940	7284.9630
7	289.4232	459.0681	659.9237	820.7497	1093.9710	1908.8080	2561.0230	3042.0550	5018.1650
8	206.3692	330.7607	467.0243	586.4444	783.9130	1365.2560	1844.4530	2187.6730	3689.6090
9+	1412.6640	1621.2580	1761.8440	2051.8570	2430.5480	2892.1170	3407.7690	3767.6730	4554.3270

Requested Percentile Report

Percentile = 90.00 %

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Recruits	12417.3800	12558.8100	12336.3400	12195.0400	12012.8400	12179.7600	12217.6500	12242.8800	12388.5500
Spawning Stock Biomass	11.5080	10.8338	13.9229	19.6601	28.5965	38.1498	46.2192	52.3769	59.1737
Jan-1 Stock Biomass	16.4055	14.9778	20.5732	29.1105	39.8059	50.3985	58.5456	65.1248	72.3343
Mean Biomass	17.1515	19.0617	27.0951	38.5784	50.5697	60.7589	68.4900	74.9173	81.3604
Combined Catch Biomass	6.6170	1.4300	1.7391	2.3194	3.5035	4.8833	6.0778	7.0447	7.9964

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Recruits	12421.2300	12376.0000	12291.8500	12532.5100	12143.3200	12483.8100	12208.9400	12469.8800	12089.6900	11930.1300
Spawning Stock Biomass	66.9476	71.8019	75.1603	77.7280	79.4253	80.7742	81.9580	82.5792	83.1248	83.5940
Jan-1 Stock Biomass	80.6706	86.0421	89.8720	92.7080	94.3168	96.0285	97.0341	97.8692	98.2819	98.8195
Mean Biomass	87.9469	92.3682	95.7962	98.1513	99.8092	101.1207	102.0776	102.7988	103.2050	103.2946
Combined Catch Biomass	8.8916	9.4952	9.9131	10.2108	10.4401	10.6194	10.7469	10.8428	10.9306	10.9713

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Landings                       6.6170     1.4300     1.7391     2.3194     3.5035     4.8833
6.0778     7.0447     7.9964     8.8916     9.4952     9.9131    10.2108    10.4401    10.6194
10.7469    10.8428    10.9306    10.9713
FMort                          1.6003     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350     0.1350
0.1350     0.1350     0.1350     0.1350

Stock Numbers at Age
Age 1                       4083.9300 12417.3800 12558.8100 12336.3400 12195.0400 12012.8400
12179.7600 12217.6500 12242.8800 12388.5500 12421.2300 12376.0000 12291.8500 12532.5100
12143.3200 12483.8100 12208.9400 12469.8800 12089.6900
Age 2                       1707.4100  3322.3640 10152.7000 10268.2700 10086.6300  9971.1160
9821.9490  9958.5980  9989.3370 10010.1000 10129.3900 10155.9400 10119.1400 10050.5500 10246.9400
9929.0040 10207.0900  9982.7790 10195.3400
Age 3                       2111.8400  1360.2740  2709.1360  8278.1560  8373.2590  8224.9560
8130.7350  8008.8830  8120.6390  8145.3940  8162.6660  8259.7820  8281.0480  8251.3360  8195.7400
8355.5180  8096.5010  8323.0760  8140.2000
Age 4                       2088.9300  1477.4620  1085.5220  2161.8840  6605.8870  6681.9280
6563.2140  6488.2460  6391.0380  6480.4340  6500.2480  6513.7770  6591.1230  6608.3560  6584.5210
6539.8980  6667.6650  6460.9950  6641.6250
Age 5                       1357.4100  1125.7680  1113.9960   818.4941  1630.0890  4980.8150
5038.2250  4948.5970  4892.1270  4818.9570  4886.3420  4901.3330  4911.4410  4969.7610  4982.7430
4964.6430  4931.1400  5027.4520  4871.6050
Age 6                        637.8940   606.3292   815.1514   806.6140   592.6532  1180.2940
3606.4860  3647.9490  3583.1550  3542.3160  3489.2880  3538.0910  3548.9320  3556.2970  3598.7080
3607.9050  3594.6890  3570.5820  3640.3260
Age 7                        283.2270   273.4864   434.8943   584.6835   578.5711   425.1031
846.5946  2586.8190  2616.5300  2570.0800  2540.7810  2502.7720  2537.7190  2545.5600  2550.8310
2581.1770  2587.7370  2578.3970  2561.0230
Age 8                         61.3528   116.5031   195.6345   311.0961   418.2470   413.8816
304.1030   605.5906  1850.4120  1871.6980  1838.4360  1817.5090  1790.3670  1815.2730  1820.9740
1824.6850  1846.4230  1851.1640  1844.4530
Age 9                         47.8801    44.4976   115.3082   223.1524   377.4065   561.4424
667.9756   650.1713   891.7974  1882.3470  2392.9760  2747.1610  2982.7620  3100.2290  3210.1720
3294.0470  3322.1330  3358.0420  3407.7690
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