Supplemental Environmental Assessment

Fishing Year 2014 Gulf of Maine Cod and Haddock Recreational Management Measures

Supplements the Environmental Assessment for Framework Adjustment 51 to the Northeast Multispecies Fishery Management Plan

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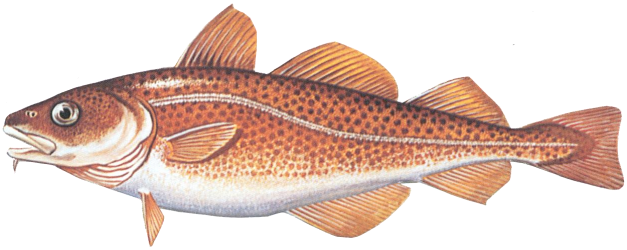

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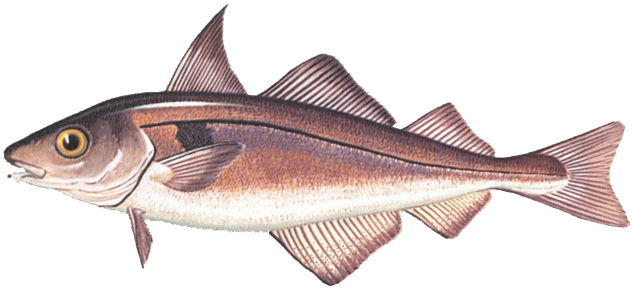

Melanogrammus aeglefinus

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1.0 INTRODUCTION

The National Marine Fisheries Service (NMFS) has prepared this supplemental analysis to evaluate potential impacts that would result from the proposed action to revise fishing year (FY) 2014 recreational management measures for Gulf of Maine (GOM) cod and haddock. The FY 2013 recreational fisheries catch for these two species exceeded the sub-annual catch limits (ACLs) established for the recreational fisheries. As outlined by the Northeast Multispecies Fishery Management Plan (FMP), recreational management measures must be adjusted moving forward to ensure FY 2014 recreational catch does not again exceed the GOM cod and haddock sub-ACLs.

In accordance with the National Environmental Policy Act (NEPA), NMFS evaluated the potential impacts of a range of catch limits and management measures, including a revised rebuilding program for the GOM cod stock, in an Environmental Assessment (EA) submitted to NMFS by the New England Fishery Management Council (Council), on February 24, 2014. However, the timing of recreational fisheries data availability is such that the Council was unable to discuss and analyze revision of recreational fishery measures until February 25, 2014. Thus no analysis of recreational measures is provided in the Framework 51 analyses.

The conclusion reached in the EA completed by the Council for Framework 51 is that the action of approving the preferred measures, including a range of catch limits and management measures including the recreational sub-ACLs for GOM cod and haddock, would not significantly impact the quality of the human environment. All beneficial and adverse impacts of the proposed FY 2014 measures are evaluated in the Framework 51 EA, resulting in the conclusion of no significant impacts. This supplemental EA presents impact information on the physical, biological, habitat, and socio-economic ecosystem components that would result from revising measures for the FY 2014 GOM cod and haddock recreational fisheries. This document is not a stand-alone document, but rather a supplemental EA, intended to be utilized in conjunction with the attached Framework 51 EA.

2.0 BACKGROUND

These two species in the GOM stock area are cooperatively managed by the Council and NMFS under the FMP. Under the FMP, recreational specific sub-ACLs are established for each fishing year for GOM cod and haddock. These sub-ACLs are a subcomponent of the overall stock catch limit for both species. The FMP also contains, in accordance with Magnuson-Stevens Fishery and Conservation Management Act (Magnuson-Stevens Act) National Standard 1 guidelines, accountability measures that are applied when catches exceed established ACLs. The multispecies fishery opens on May 1 each year and runs through April 30 of the following calendar year.

Recreational catch and effort data are estimated by the Marine Recreational Information Program (MRIP). MRIP is a comprehensive, multi-faceted survey system administered by NMFS.

MRIP information is released in 2 month 'waves' with quality control/quality assurance vetted data provided approximately 6 weeks following the end of a wave. For example, Wave 1 data for January and February would be available around mid-April. This system means that catch data for cod and haddock through wave 5 (i.e., May 1 start of the fishing year through October) is not available until mid-December. Typically, the Council concludes recommending management measures for the upcoming fishing year in November of the year preceding the start of the fishing year (i.e., November 2013 for a May 1, 2014 start of the fishing year). This means that in most years, the Council is unable to contemplate potential recreational management measure changes until January or later, often after any analyses for the upcoming fishing year have been completed and formally submitted to NMFS for review and implementation.

NMFS informed the Council in a January 17, 2014, letter that the FY 2013 recreational sub-ACLs for both cod and haddock had been exceeded[1].

Table 1. FY 2013 and 2014 Recreational Catch Information for GOM Cod and Haddock (all weights in mt).

GOM Stock	FY 2013 sub-ACL	Total Catch	% of FY 2013 sub-ACL Caught	FY 2014 sub-ACL	% reduction in landings needed for FY 2014
Cod	486	706	145%	486	31%
Haddock	74	256	246%	80	69%

The accountability measures outlined in the FMP (§ 648.89(f)(2)) indicate that the Greater Atlantic Regional Fisheries Office (GARFO) Regional Administrator may, in consultation with the Council, modify the recreational management measures for the upcoming fishing year to ensure that the sub-ACL is not exceeded again. This is the proactive accountability measure. In addition a reactive accountability measure evaluates a 3-year moving average of catch compared to sub-ACLs. It is possible, as is the case with the current situation with GOM cod, that the 3-year average catch does not exceed the 3-year average sub-ACL. However, because the status quo measures for GOM cod are not expected to constrain catch to the FY 2014 sub-ACL, the proactive accountability measure requires adjustment of cod measures. Haddock catch has exceeded both the reactive 3-year average evaluation and the FY 2013 sub-ACL necessitating change in FY 2014 to avoid again exceeding the catch limit.

The proactive accountability consultation process was developed because the timing issues with

[1] Based on the Council-recommended FY 2014 catch limits for GOM cod and the previously implemented FY 2014 catch limit for GOM haddock. These catch measures were concurrently developed and analyzed in conjunction with Framework 51 for May 1, 2014, implementation.

recreational data and the Council's process described above. The recreational GOM cod and haddock measures that may be adjusted are the minimum fish size, per angler possession limits, and seasons when these species may be kept. Based on the information provided to the Council outlining the FY 2013 overages, the recreational catch in FY 2014 for GOM cod would need to be reduced 31 percent and haddock 69 percent from FY 2013 levels to constrain catch to the recreational sub-ACL.

In response to the notification letter, the Council convened its Recreational Advisory Panel (RAP) on February 19, 2014, to recommend management measure changes for the Council's consideration at its meeting February 25. These two meetings were designed to provide the necessary consultation with NMFS outlined in the accountability measures implementing language. The RAP reviewed catch projections under various scenarios of changed measures for FY 2014 modeled by staff from the Northeast Fisheries Science Center (Center) Social Science Branch (SSB). SSB staff used a model that was peer-reviewed in 2012 by the Council's Scientific and Statistical Committee and previously described in the supplemental EA prepared to analyze FY 2012 GOM cod interim management measures prepared by NMFS. This bioeconomic simulation model predicts the expected number GOM cod and haddock that would be kept and discarded from alternative possession and size limits. The model combines economic information derived from an angler choice experiment survey with biological information about the current stock structure for both stocks with historical catchability data from recreational anglers. Ultimately, the model simulates the effects of proposed changes in possession and size limits on angler effort and the resultant mortality for recreationally caught GOM cod and haddock.

At the RAP meeting SSB staff provided the RAP a detailed examination of why the modeled catch for FY 2013 did not turn out as expected. There were three primary reasons for the divergence from the projections: 1) the preliminary MRIP data used at the time of the projection was revised (increased) in the final data meaning FY 2013 measures should have been set more restrictive; 2) the level of noncompliance with minimum fish sizes for both species was higher than usual causing assumptions in the model to be violated; and 3) angler effort increased above the amount used in the model projections. SSB staff adjusted the model to compensate for these latter two issues when conducting analysis of potential FY 2014 measures. There was also some discussion of a 4th issue. For haddock, the length-at-age information used to predict availability of fish at particularly minimum fish sizes is now quite dated (last benchmark used terminal year 2007 data, assessment update in 2012 using terminal year 2010 data). This creates a great deal of uncertainty about what size haddock will be encountered.

The RAP adopted for recommendation to the Council the most restrictive alternative in the available analysis: A possession limit of 9 cod at 22 inches with no changes to the existing season and an unlimited possession of haddock at 22 inches with an April and May (Wave 2) closure for haddock. Additional alternatives were provided by SSB for Council consideration at its February 25, 2014, meeting. The Council recommended that NMFS consider the following

measures for FY 2014: The RAP recommendation; a Wave 2 (March and April) closure for both cod and haddock, an increase in the minimum size for cod and haddock to 22 inches; and no changes to the bag limits for cod and haddock (i.e., a 9-fish bag limit for cod and no bag limit for haddock); and a Wave 5 (September and October) closure for cod and haddock, an increase in the minimum size for cod to 21 inches and adjustments to the possession limits for cod and haddock that would be needed to achieve the FY 2014 sub-ACLs.

Subsequent to the Council meeting, NMFS has conducted additional analyses of potential FY 2014 recreational measures. These measures, outlined in section 4.2, are provided along with the RAP and Council recommended measures. Ultimately, the measures identified as preferred provide at least a 50-percent probability that the FY 2014 recreational catch of both GOM cod and haddock will not be exceeded, as per the requirements of the accountability measure.

3.0 PURPOSE AND NEED

The purpose of this action is to implement management measures to set catch levels for the FY 2014 GOM cod and haddock recreational fisheries. This action is needed to reduce mortality resulting from the recreational fishery from FY 2013 levels to ensure FY 2014 GOM cod and haddock recreational sub-ACLs, as outlined in Frameworks 50 and 51 are not exceeded. Constraining catch to the sub-ACLs is needed to ensure that stocks are not subject to overfishing and, for GOM cod, to foster stock rebuilding consistent with the rebuilding program concurrently being implemented for FY 2014. The scope of this action is limited to FY 2014, and would implement a single year change in the recreational fishery measures to achieve catch targets for the fishing year.

4.0 PROPOSED ACTION AND ALTERNATIVES

The proposed action and other alternatives considered in this supplemental EA are described in the following sections and summarized in the subsequent tables. In addition to the status quo and no action alternatives, only two additional alternatives are proposed due to the narrow purpose and need for this action. Furthermore, consideration of a broader suite of alternatives at this time would undermine NMFS's ability to analyze and implement revised management measures in a timely manner. This action is narrowly focused. Alternatives necessarily must meet the objective of providing a reasonable probability that the catch resulting in FY 2014 will be below the recreational fishery catch limit. NMFS has determined, based on prior Court rulings, that the minimum acceptable probability for catch projections is the median probability, i.e., measures have a 50/50 chance of providing the catch as projected. For this reason, NMFS has elected to provide a narrow range of alternatives that achieve this objective. NMFS considered but rejected from further analysis alternatives that did not provide at least a median probability that FY 2014 recreational GOM cod and haddock catches lower than the sub-ACLs of 486 mt for cod and 87 mt for haddock.

It should be noted that none of the alternatives contemplate changes to the existing GOM Cod Spawning Protection Area, commonly known as the Whaleback Closure. This is an April 1 through June 30 seasonal area in a defined portion of the GOM where the retention of cod from hook-and-line gear (both commercial and recreational) is prohibited. For clarity, the GOM Cod Spawning Protection Area is not a recreational management measure that may be adjusted by the Regional Administrator and, as such, the area will remain closed for FY 2014 and future fishing years unless modified in a subsequent Council action.

4.1 STAUS QUO ALTERNATIVE 1

The status quo alternative would maintain the FY 2013 measures for the recreational GOM cod and haddock fishery. These are:

- Cod: A 9-fish possession limit, 19-inch minimum fish size, seasonal closure from November 1, 2014-April 15, 2015.
- Haddock: No limit on possession, 21-inch minimum fish size, no seasonal prohibition on possessing haddock (i.e., closures).

These measures were implemented through Framework 50 for FY 2013 and were designed to achieve but not exceed the sub-ACLs in place for the fishing year. These are 486 mt for cod and 87 mt for haddock. These measures are not expected to provide at median probability of reducing recreational catches to levels below these sub-ACLs.

4.2 NO ACTION ALTERNATIVE 2

If no action is taken to adjust recreational management measures, the default measures outlined in Title 50 Part 648.89(b) of the Code of Federal Regulations[2] would become effective on May 1, 2014. These are:

- Cod: A 10-fish possession limit, 24-inch minimum fish size, seasonal possession prohibition (i.e., closure) from November 1, 2014-April 15, 2015.
- Haddock: No limit on possession, 18-inch minimum fish size, no seasonal prohibition on possessing haddock (i.e., closures).

These measures are not expected to provide at median probability of reducing recreational catches to levels below the FY 2014 recreational sub-ACLs for GOM cod and haddock.

[2] http://www.ecfr.gov/cgi-bin/text-idx?SID=7f869b8ab891c7235c91b0c77fa9fbec&node=50:12.0.1.1.5.6.1.10&rgn=div8

4.3 PREFERRED ALTERNATIVE 3

In comparison to the FY 2013 measures, the preferred alternative would increase the minimum fish size for both species, change the haddock daily per-angler possession limit and modify the fishing seasons. Specifically, the preferred alternative measures for the Gulf of Maine cod and haddock recreational fishery are:

- Cod: 9-fish possession limit, 21-inch minimum size, seasonal possession prohibition (i.e., closure) from September 1, 2014-April 15, 2015.
- Haddock: 3-fish possession limit, 21-inch minimum size, seasonal prohibition on possession (i.e., closure) during Wave 5 (September 1-October, 2014) and Wave 2 (March-April 30, 2015).

These measures are expected to provide a median projected catch of 422 mt of GOM cod and 80 mt of GOM haddock. Catch of this level would be below the sub-ACLs for both stocks. The GOM cod recreational sub-ACL is 486 mt; the GOM haddock sub-ACL is 87 mt.

4.4 ALTERNATIVE 4

In comparison to the FY 2013 measures alternative 4 would increase the minimum fish size for both species, change the haddock per angler possession limit, and modify the fishing seasons. Specifically, the preferred alternative measures area:

- Cod: 9-fish possession limit, 21-inch minimum size, seasonal possession prohibition (i.e., closure) during Wave 5 (September 1-October, 2014-April 15, 2015).
- Haddock: 2-fish possession limit, 21-inch minimum size, seasonal possession prohibition (i.e., closure) during Wave 5 (September 1-October, 2014) and Wave 2 (March-April 30, 2015).

These measures are expected to provide a median projected catch of 414 mt of GOM cod and 68 mt of GOM haddock. Catch of this level would be below the sub-ACLs for both stocks but may be more restrictive than necessary, as will be further explained in the impacts analyses that follow.

5.0 AFFECTED ENVIRONMENT

The Valued Ecosystem Components (VECs) affected by the proposed action include the physical environment, Essential Fish Habitat (EFH), target species, non-target species/bycatch, protected resources, and human communities, which are described in Section 6.0 of the Framework 51 EA. Section 6.5.9.3 of the Framework 51 EA provides additional detail on the groundfish recreational fishery and is incorporated by reference. The following section provides a summary of the

Framework 51 description of the VECs as well as additional information that is specific to the proposed recreational management measure alternatives under consideration in this supplemental EA.

5.1 HUMAN COMMUNITIES AND THE FISHERY

Harvest of GOM Cod and Haddock

Catch information for both GOM cod and haddock is provided in Table 1. Within this data, the highest catch of cod occurred in FY 2011 when over 1 million fish were caught, with approximately 37 percent of the fish kept by anglers. Thirty percent of recreationally captured cod that are released instead of retained are assumed to die. For example, in FY 2012 anglers were estimated to catch 876,655 GOM cod, of which, 538,302 were released. Within the released fish, 148,506 were assumed to have died after being returned to the sea. The number of cod caught by anglers actively targeting cod has varied from roughly 4 to 6 fish over the past 3 fishing years. In that same time frame, anglers have on average kept 2 or fewer cod.

Haddock catches have increased each year since 2011, increasing from an estimated 184,709 fish in FY 2011 to a projected 654,227 fish in FY 2013. Unlike cod, the current assumption for recreationally discarded haddock is zero, meaning that all fish returned to the sea are assumed to survive. Thirty percent of angler released cod are assumed to die subsequent to release. Discard mortality estimates are taken from the most recent stock assessments and are often based on *in situ* observations, mark-recapture tagging studies, or aquarium-based experiments. Recreational anglers keep fewer haddock than cod, according to MRIP information. On average, anglers have kept less than 1 haddock per trip in the FY 2011 to 2014 time frame.

Because very few fish are sampled for weight by the MRIP survey methods, average weight information is derived by applying a length/weight relationship from stock assessments to the more plentiful length information collected through MRIP. Based on this, average cod weights in FY 2012 and 2013 were similar which should be expected given the minimum fish size was unchanged from 19 inches for both years. Average haddock weights in FY 2013 were more similar to FY 2011 weights after decreasing in FY 2012. This is more unexpected given that the minimum fish size was 18 inches in both FY 2011 and 2012 then increased in FY 2013 to 21 inches.

Table 2. Gulf of Maine Recreational Catch Estimates by Fishing Year, 2011-2013.

	FY2011	FY2012	FY2013 [2]
Angler Trips [1]	234,042	182,999	225,624
Cod Catch (numbers, a+b1+b2)	1,389,408	876,655	879,366

Cod Kept (numbers, a+b1)	509,789	338,353	325,369
Cod Released (numbers, a+b1)	879,619	538,302	553,997
Cod Removals (numbers, a+b1+(0.3*b2))	773,085	486,859	491,568
Cod Removals (weight, mt)	2,116	702	706
Cod Avg. Catch Per Trip (numbers)	5.9	4.8	3.9
Cod Avg. Kept Per Trip (numbers)	2.2	1.8	1.4
Cod Avg. Released Per Trip (numbers)	3.8	2.9	2.5
Cod Avg. Weight of Kept Fish		3.8	4.0
Haddock Catch (numbers, a+b1+b2)	184,709	369,427	654,227
Haddock Kept (numbers, a+b1)	142,410	166,610	146,976
Haddock Released (numbers, a+b1)	38,352	202,817	507,251
Haddock Removals (numbers, a+b1)	146,042	166,610	146,976
Haddock Removals (weight, mt)	231	211	256
Haddock Avg. Catch Per Trip (numbers)	0.8	2.0	2.9
Haddock Avg. Kept Per Trip (numbers)	0.6	0.9	0.7
Haddock Avg. Released Per Trip (numbers)	0.2	1.1	2.2
Haddock Avg. Weight of Kept Fish	3.6	2.8	3.8

[1] Angler trips = number of trips that targeted and/or caught cod or haddock
[2] Data available for wave's 3, 4, and 5 in FY 2013. Data from wave's 2 and 6 in FY2012 used as proxies for FY 2013.

Private boat anglers have caught more cod than the total number caught by party/charter boat anglers during the past 4 fishing seasons except 2011 (Table 2). The amount of haddock caught by the for-hire fleet and private anglers has varied as to which group caught more since FY 2010. A strong increase in private angler catch of haddock was estimated by MRIP for FY 2013 (Table 3).

Table 3. Number of Recreationally Caught Cod by Mode, Fishing Years 2011-2013.

	Harvest (a+b1)			Released (b2)			Total Catch (a+b1+b2)		
Mode	FY2011	FY2012	FY 2013[1]	FY2011	FY2012	FY 2013[1]	FY2011	FY2012	FY 2013[1]
Party	64,538	51,577	88,143	93,607	67,827	90,457	158,145	119,404	178,600
Charter	254,564	132,523	37,143	363,599	121,403	60,867	618,163	253,926	98,010
Private	192,676	154,253	200,083	420,423	349,073	402,422	613,099	503,326	602,505
Shore	0	0	0	0	0	252	0	0	252

[1] Data available for wave's 3, 4, and 5 in FY 2013. Data from wave 2 and 6 in FY2012 used as proxies for FY 2013.

Table 4. Number of Recreationally Caught Haddock by Mode, Fishing Years 2011-2013.

	Harvest (a+b1)			Released (b2)			Total Catch (a+b1+b2)		
Mode	FY2011	FY2012	FY 2013[1]	FY2011	FY2012	FY 2013[1]	FY2011	FY2012	FY [illegible]
Party	29,885	29,306	31,406	3,364	43,165	157,537	33,249	72,471	188,944
Charter	61,080	76,391	28,726	19,397	37,268	46,969	80,477	113,659	75,695
Private	54,977	60,913	86,844	15,906	122,384	302,744	70,882	183,296	389,589
Shore	0	0	0	0	0	0	0	0	0

[1]Data available for wave's 3, 4, and 5 in FY 2013. Data from wave's 2 and 6 in FY2012 used as proxies for FY 2013.

The amount of MRIP estimated effort by each fishing mode for the FY 2011-2013 time frame indicates party vessel effort has shown less variability but has increased each year since 2011 (Table 4). Charter vessel effort has decreased over the same time period. Private vessel effort remains high; however, effort in FY 2013 is not dissimilar to the effort in FY 2011.

Table 5. Recreational effort by Mode, Fishing Years 2011-2013.

	Angler Trips [1]		
Mode	FY2011	FY2012	FY 2013 [2]
Party	48,682	52,950	68,707
Charter	48,545	34,159	13,330
Private	135,996	95,890	143,336
Shore	819	0	252

[1] Angler trips = number of trips that targeted and/or caught cod or haddock

[2] Data available for wave 3, 4, and 5 in FY 2013. Data from wave 2 and 6 in FY2012 used as proxies for FY 2013.

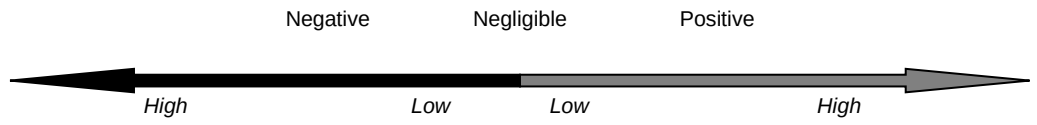
6.0 DIRECT AND INDIRECT IMPACTS OF THE ALTERNATIVES

This supplemental EA evaluates the potential impacts using the criteria outlined in Table 5. Impacts from all alternatives are compared individually and judged relative to the baseline conditions, as described in Section 4.0 and Section 6.0 of the Framework 51 EA.

Table 6. Criteria used to evaluate the direct and indirect impacts of the proposed and no-action alternatives

Impact Definition			
VEC	**Direction**		
	Positive (+)	**Negative (-)**	**Negligible (Negl)**
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:	
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



6.1 BIOLOGICAL IMPACTS

Target and Non-target Species Impacts

6.1.1 Status Quo

Under the status quo alternative, there would be no change to the recreational minimum fish size, possession limit, or closed seasons for both GOM cod and haddock. The status quo alternative would not result in the recreational mortality reductions necessary to constrain catches below the FY 2014 catch limits. This is inconsistent with the FMP and the intent of National Standard 1 guidelines. While exceeding the recreational sub-ACL alone would not cause overfishing, National Standard 1 guidelines used to implement the annual catch limit and accountability measure system contained in the 2006 revisions to the Magnuson-Stevens Act go to some length to describe a system that mitigates for uncertainties and, based on best available science, seeks to avoid exceeding catch limits designed to prevent overfishing. Providing status quo catch would grossly exceed the FY 2014 recreational catch limits for both stocks. The most recent assessment for GOM cod (NEFSC 2013) indicated the stock was overfished and subject to overfishing. FY 2014 is to be the first year of a revised rebuilding program designed to rebuild the stock following the failure of the previous program to achieve rebuilding. The most recent assessment for GOM haddock (NEFSC 2012) indicated the stock was subject to overfishing and while not overfished, the stock was approaching that condition. Therefore, similar to no action, the status quo alternative would be expected to result in high negative impacts to the GOM cod and haddock resources compared to the preferred alternative and alternative 4 given that catches would exceed established catch limits and create a higher probability that the stocks would be subject to overfishing.

6.1.2 **Alternative 2 (No Action)**

Under the no action alternative, the necessary mortality reductions needed for the GOM haddock recreational fishery would not be achieved and the sub-ACL would be exceeded. Similar to the status quo measures, exceeding the recreational sub-ACL alone would not cause overfishing, but would be inconsistent with the FMP and National Standard 1 guidelines which exist to help prevent overfishing. The most recent assessment for GOM haddock (NEFSC 2012) indicated the stock was subject to overfishing and while not overfished, the stock was approaching that condition. Therefore, similar to status quo, the no action alternative would be expected to result in high negative impacts to the GOM cod and haddock resources compared to the preferred alternative and alternative 4 given that catches would exceed established catch limits and create a higher probability that the stocks would be subject to overfishing.

6.1.3 **Alternative 3 (Preferred Alternative)**

Under the preferred alternative, the GOM cod recreational minimum fish size would be raised to 21 inches and the seasonal possession restriction (i.e., closure) for cod would increase by 2 months (September 1, 2014-April 15, 2015). The cod possession limit would remain the same (9 fish per angler per day). In addition, the possession limit for GOM haddock would decrease to 3 fish, and the seasonal possession restriction for haddock would be implemented for 2 ½ months (September 1, 2014,-April 30, 2015). The minimum size for GOM haddock would remain the same (21 inches). The measures proposed under the preferred alternative are estimated to achieve the recreational mortality reductions necessary to constrain catches below the FY 2014 catch limits. This is consistent with the FMP and the intent of National Standard 1 guidelines. Therefore, the preferred alternative would be expected to result in positive impacts to the GOM cod and haddock resources as compared to the other alternatives, given that catches would not exceed established catch limits which, in turn, is a component of the overall management system designed to prevent overfishing the stocks.

6.1.4 **Alternative 4**

Under alternative 4, the GOM cod recreational minimum fish size would be raised to 21 inches and the seasonal possession restriction for cod would increase by 2 months (September 1, 2014-April 15, 2015). The cod possession limit would remain the same (9 fish per angler per day). In addition, the possession limit for GOM haddock would decrease to 2 fish, and the a seasonal possession restriction for haddock would be implemented for 2 ½ months (September 1, 2014,-April 30, 2015). The minimum size for GOM haddock would remain the same (21 inches). Similar to the measures of the preferred alternative, the non-preferred measures are also estimated to achieve the recreational mortality reductions necessary to constrain catches below the FY 2014 catch limits. The median projected catch under this alternative is 414 mt for GOM cod and 68 mt for GOM haddock. The sub-ACLs for these stocks in 2014 are 486 mt for cod

and 87 mt for haddock. The alternative 4 measures are consistent with the FMP and the intent of National Standard 1 guidelines. Because the measures are expected to constrain catches to the recreational sub-ACL, the likelihood of overfishing is lessened which, when prevented, provides the most positive biological impacts for these two stocks as compared to the other alternatives.

6.1.5 **Biological Impacts Discussion**

A bioeconomic simulation model developed by the NEFSC was used to predict the expected number of GOM cod that would be kept and discarded from alternative possession and size limits. The model combines economic information derived from an angler choice experiment survey with biological information about the current stock structure for GOM cod and haddock stocks with historical catchability data from recreational anglers to project recreational catches. The choice experiment survey was administered in conjunction with NMFS' Marine Recreational Fisheries Statistics Survey (MRFSS) in New England during calendar year 2009. Anglers intercepted in Maine, New Hampshire, and Massachusetts for the MRFSS were asked to participate in a voluntary follow-up mail survey. Anglers that agreed to participate in the follow-up were sent mail questionnaires using a modified Dillman Tailored Design (Dillman, 2000), in which anglers were asked to simultaneously compare features (e.g., size and possession limits) of different hypothetical fishing trips and then to choose the trip they liked best or to choose not to fish at all. A total of 2,039 surveys were mailed out in New England and 775 completed mail surveys were returned for a response rate of 38%. The collection of choice responses from the various choice scenarios were used to examine tradeoffs and behavioral responses to various biological and regulatory changes.

A Random Utility Model (RUM) estimated using a conditional logic model was used as the behavioral model for anglers. In this model, the angler faces a choice among alternative saltwater fishing trips and opting out of saltwater fishing. The utility function is specified so that regulations affect an angler's utility (e.g., trip duration, kept fish) indirectly by altering an angler's expected distribution of kept and released fish. The model also attempts to adjust potential catch projections based on anglers' willingness to pay for fishing trips in relation to the number and size of fish that may be kept. The effects of changes in kept or released fish on both angler welfare (i.e., angler satisfaction) and probability of trip occurrence were evaluated using simulation methods, which attempt to replicate actual fishing behavior under different regulatory scenarios. The most recent assessment of GOM cod assumes that 30% of all recreationally discarded GOM cod (known as class "B2") die. To be consistent with the new assessment, this model also assumes a 30% cod discard mortality rate.

The model predicts that the measures proposed under the preferred alternative and alternative 4 will have greater than a 50% probability of constraining mortality of both GOM cod and haddock to below their FY 2014 catch limits (Table 6). The FY 2014 recreational sub-ACL for GOM cod and haddock is 486 mt and 87 mt, respectively. Under status quo measures, the median estimated mortality for GOM cod exceeds the ACL by 168% and for GOM haddock by

271%. Under the no action measure, the median value of GOM cod mortality is below the FY 2014 ACL, but the estimated GOM haddock mortality is 418% above the FY 2014 catch limit. Thus, the preferred and alternative 4 would be expected to have positive biological impacts compared to the status quo and no action alternatives.

Table 7. Estimated FY 2014 Mortality of GOM cod and Haddock by Management Alternative.

	Cod Mortality (mt)			Haddock Mortality (mt)		
		Percentile			Percentile	
Options	Median	25th	75th	Median	25th	75th
(1) Status quo	818	745	909	236	92	406
(2) No Action	466	444	557	364	239	547
(3) Preferred Alternative	422	396	481	80	39	152
(4) Non-Preferred Alternative	414	382	470	68	34	125

The model also predicts that the preferred alternative and alternative 4 would result in a decrease in effort in the recreational fishery for GOM cod and haddock. A reduction in GOM cod and haddock angler effort could mean an overall reduction in angler effort fishing in the GOM in FY 2014. This would translate into reduced catch of other stocks caught recreationally, like GOM pollock. However, it's likely that at least some of the cod and haddock angler effort displaced by the proposed action would shift to other species, such as pollock, thereby causing an increase in catch of other species in FY 2014. These shifts are expected to be minimal though as the number of alternative recreationally-caught groundfish species is limited.

6.2 IMPACTS ON ENDANGERED AND OTHER PROTECTED SPECIES

6.2.1 Alternative 1 (Status Quo)

Section 6.4 of the Framework 51 EA outlines in detail the protected species that are expected to be found in the GOM. In addition, the Framework 51 EA provides information on anticipated impacts to protected species resulting from commercial fisheries that operate in the GOM.

Under the status quo alternative, there would be no change to the recreational minimum fish size, possession limit, or fishing seasons for GOM cod and haddock from the FY 2013 measures. The majority of potential protected species impact information available pertains to commercial fisheries in large part because documented interaction between recreational fisheries and protected species is both rare and poorly documented. As a proxy, evaluation of the commercial Northeast/Mid-Atlantic bottom longline/hook-and-line fishery is considered here as a means to understand potential gear interaction between recreational fisheries and protected species. The bottom longline fishery is classified in the List of Fisheries as a Category III gear

for FY 2014 (79 FR 14418; March 14, 2014), which has a remote likelihood of, or no known incidental mortality and serious injury of marine mammals. There were no observed reports of interactions between longline gear and marine mammals in FY 2009 and FY 2010 (see Table 16, section 6.4.4 of the Framework 51 EA). Similarly, documented interactions of sea turtles and Atlantic sturgeon described in section 6.4.4 of the Framework 51 EA do not involve hook and line gear. Based on the available data, participants in an Atlantic States Marine Fisheries Commission (ASMFC) Atlantic sturgeon 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). Atlantic sturgeon are known to interact with recreational fisheries in the Northeast. These interactions are believed to be rare and survivability of hooked sturgeon believed to be very high. On February 6, 2012, NMFS issued two final rules (77 FR 5880-5912; 77 FR 5914-5982) listing five distinct population segments (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 was reinitiated NE multispecies fishery to analyze potential impacts to Atlantic sturgeon. The resulting December 2013 Biological Opinion (BO) concluded that the actions considered would not jeopardize the continued existence of any listed species, including all five DPSs of Atlantic sturgeon. 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 status quo alternative, impacts to protected resources would be expected to be negligible.

6.2.2 **Alternative 2 (No Action)**

Under the no action alternative, the minimum fish size would increase for cod and decrease for haddock. The possession limit for cod would also increase by 1 fish and would remain unlimited for haddock. The overall level of recreational effort might be expected to decrease for cod and increase for haddock relative to the status quo measures. However, as was outlined in the status quo discussion, interaction between the recreational fishery and endangered and protected species in the GOM is expected to be rare and associated impacts minimal. Atlantic sturgeon are known to interact with recreational fisheries in the Northeast. These interactions are believed to be rare and survivability of hooked sturgeon believed to be very high. Turtle and marine mammal interactions are expected to be rare and impacts negligible and similar to status quo under the no action alternative measures.

6.2.3 **Alternative 3 (Preferred Alternative)**

Under the preferred alternative, the GOM cod recreational minimum fish size would be increased to 21 inches and the fishing season shortened by an additional two months (i.e., September and October closure). Haddock measures would have an increase in minimum size to 21 inches, a 3-fish possession limit, and additional closures in the fall (September and October) and spring

(March-April). The combination of these measures would be expected to result in an overall reduction in mortality for both species resulting from the recreational fishery. These measures may also result in a decrease in effort when compared to the no action alternative. However, interactions between the recreational fishery and protected resources are rare as outlined under the no action alternative discussion above. Therefore, decreases in catch and effort that may result from the preferred alternative and would be expected to further lessen the potential negligible impacts to protected resources and marine mammals as compared to Alternative 1 and 2. However, Alternative 3 would lessen effort as much as Alternative 4, and as such, negative impacts may be slightly higher than Alt 4.

6.2.4 **Alternative 4**

Under Alternative 4, anglers would be able to retain 2 haddock instead of 3 as outlined in the preferred alternative. The remaining components are the same as the preferred alternative; however the 1-fish change is not trivial. The projected reduction in haddock catch resulting from this possession limit change is an additional 12 metric tons. The combination of these measures would be expected to result in an overall reduction in mortality for both species resulting from the recreational fishery. These measures may also result in a decrease in effort when compared to the no action alternative. However, interactions between the recreational fishery and protected resources are rare as outlined under the no action alternative discussion above. Therefore, changes in catch and effort that may result from the more restrictive alternative would be expected to result in negligible to low positive impacts to protected resources as compared to the preferred alternative and positive impacts as compared to no action and status quo alternatives.

6.3 PHYSICAL ENVIRONMENT/HABITAT/EFH IMPACTS

6.3.1 **Alternative 1 (Status Quo)**

Under the status quo alternative, there would be no change to the recreational minimum fish size, possession limit, or fishing seasons for GOM cod and haddock from those in place for FY 2013. Hook and line gear, in this case with rod and reels, have poorly understood interactions with EFH; however, it 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 (see section 6.1.6.2 of Framework 51). Under the status quo alternative, recreational fishing effort would not be expected to change and, consequently, associated impacts to EFH would be expected to remain negligible.

6.3.2 **Alternative 2 (No Action)**

Under the no action alternative, the minimum fish size would increase for cod and decrease for haddock. The possession limit for cod would also increase by 1 fish. Similar to the status quo alternative, hook and line gear, in this case with rod and reels, have poorly understood interactions with EFH; however, it 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 (see section 6.1.6.2 of Framework 51). Under the no action alternative, recreational fishing effort would not be expected to change appreciably and, consequently, associated impacts to EFH would be expected to remain negligible.

6.3.3 **Alternative 3 (Preferred Alternative)**

Under the preferred alternative, the GOM cod recreational minimum fish size would be increased to 21 inches and the fishing season shortened by an additional two months (i.e., September and October closure). Haddock measures would have an increase in minimum size to 21 inches, a 3-fish possession limit, and additional closures in the fall (September and October) and spring (March-April). The combination of these measures would be expected to result in an overall reduction in mortality for both species resulting from the recreational fishery. These measures may also result in a decrease in effort when compared to the no action alternative. Because rod and reel gear has minimal interaction with habitat, impacts to EFH resulting from the proposed action would be expected to be negligible.

6.3.4 **Alternative 4**

The measures under the more restrictive alternative would be the same as the preferred alternative except that 1 fewer haddock could be kept per angler per day (i.e., 2 fish possession limit instead of 3). The combination of these measures would be expected to result in an overall reduction in mortality for both species resulting from the recreational fishery. These measures may also result in a decrease in effort when compared to the no action alternative. Because rod and reel gear has minimal interaction with habitat, impacts to EFH resulting from the proposed action would be expected to be negligible.

6.4 HUMAN COMMUNITIES/ECONOMIC/SOCIAL ENVIRONMENT IMPACTS

6.4.1 **Economic Impacts by Alternative**

A more extensive qualitative analysis of the economic impacts can be found in the Regulatory Impact Review section of this document (Section 9.1)

6.4.1.1 Alternative 1 (Status Quo)

Under the status quo alternative, there would be no change to the recreational minimum fish size, possession limit, or seasonal closures for both GOM cod and haddock. Maintaining the current management measures is likely to produce similar recreational catch, effort, angler welfare, and associated revenues as in FY 2013. Thus, because the status quo alternative is associated with less restrictive measures than the no action alternative or the proposed actions, status quo measures would be expected to result in positive economic impacts to fishery participants and their communities in the short-term (during FY 2014) when compare to the other alternatives. However, under the status quo alternative, recreational fishing mortality of both GOM cod and haddock is predicted to exceed the cod FY 2014 sub-ACL by 170% and the haddock sub-ACL by 272%. If the FY 2014 recreational sub-ACLs are exceeded, more restrictive accountability measures will be implemented in future fishing years, resulting in negative economic impacts over the long term.

6.4.1.2 Alternative 2 (No Action)

Under the no action alternative, the minimum fish size would increase for cod and decrease for haddock relative to the proposed action alternatives. The possession limit for cod would increase by one fish when compared to the proposed action alternatives, and the open season to keep cod and/or haddock would be longer relative to the proposed action alternatives. In combination, the proposed action alternatives are associated with more restrictive management measures so the no action alternative would be expected to result in positive economic benefits to fishery participants and their communities in the short-term (during FY 2014) when compared to the proposed action alternatives, however slightly more negative impacts than the status quo alternative. However, under the no action alternative, recreational fishing mortality of GOM haddock is predicted to exceed the FY 2014 sub-ACL by 418%. If the FY 2014 recreational sub-ACL for haddock is actually exceeded by this amount more restrictive accountability measures will be implemented in future years resulting in lower allowable landings and negative benefits to anglers and communities over the longer term.

6.4.1.3 Alternative 3 (Preferred Alternative)

The preferred alternative would result in substantially more restrictive measures than status quo or the no action alternative, but similar to Alternative 4. The bioeconomic model predicts that angler satisfaction will decline in FY 2014 under the preferred alternative measures, thereby reducing the estimated number of angler trips that target GOM cod or haddock. A reduction in angler trips may have a negative economic impact on for-hire boat businesses and possibly the larger overall regional economy through a reduction in angler expenditures. However, the measures proposed under the preferred alternative significantly reduce the likelihood that recreational catches will exceed the FY2014 sub-ACL. The median projected mortality of both GOM cod and haddock is below their associated FY 2014 sub-ACLs under the preferred alternative measures. In contrast, the median projected mortality under the status quo or no action measures is predicted to significantly exceed FY 2014 ACLs for both GOM cod and haddock. Thus, although implementation of the preferred alternative may have negative

economic consequences in FY 2014, the likelihood of exceeding the FY 2014 sub-ACLs is significantly reduced. Over the long term, this reduces the likelihood that more restrictive accountability measures will be required in future years when compared to the no action or status quo alternatives. Therefore, the preferred alternative is expected to have negative economic consequences in the short-term as would Alternative 4, but as it will reduce the likelihood that more restrictive accountability measures will be needed in future years, it will have positive long-term economic consequences when compared to the no action or status quo alternatives.

6.4.1.4 Alternative 4

The measures proposed under Alternative 4 are the most restrictive of the four alternatives under consideration. Similar to the preferred alternative, angler satisfaction and angler effort that target GOM cod and haddock are predicted to decline in FY 2014 under the non-preferred measures – although the declines are even larger under the non-preferred measures. As previously mentioned, a reduction in angler trips may have a negative economic impact on for-hire boat businesses and possibly the larger overall regional economy through a reduction in angler expenditures. In contrast to the potential negative economic effects, the measures proposed under the non-preferred alternative have the highest likelihood that recreational mortality will not exceed the FY 2014 sub-ACLs for both GOM cod and haddock. However, the measures proposed under the preferred alternative also achieve the mortality objectives for FY 2014 and are less restrictive than the Alternative 4 measures. Therefore, the proposed preferred measures would likely result in lower economic losses to anglers, for-hire businesses, and the overall regional economy than the Alternative 4 measures, while still having a high probability of keeping mortality below the sub-ACLs for both GOM cod and haddock. In the short-term, the Alternative 4measures are estimated to have the highest negative economic consequences of the four alternatives under consideration. The likelihood of exceeding the FY 2014 sub-ACLs is significantly reduced though, so it's unlikely that more restrictive accountability measures will be required in future years. Thus, over the long term, the Alternative 4 measures are likely to have positive long-term economic benefits when compared to the no action or status quo alternatives.

6.4.2 Social Impacts by Alternative

6.4.2.1 Alternative 1 (Status Quo)

Under the status quo alternative, there would be no change to the recreational minimum fish size or possession limit for GOM cod. Maintaining the current management measures would be unlikely to change perceptions of the management program. Maintaining the current measures may alleviate concerns that some charter/party fishery participants may have that more restrictive measures will lead to fewer customers. However, maintaining the current management measures would also increase the likelihood that the recreational fishery would exceed the FY 2014 sub-ACLs for GOM cod and haddock and trigger restrictive accountability measures in future fishing

years. If the sub-ACLs are exceeded and AMs are implemented the management program may be perceived to be ineffective and fishery participants may lose faith in the management process.

6.4.2.2 Alternative 2 (No Action)

Under the no action alternative, the minimum fish size would increase for cod and decrease for haddock relative to the proposed action alternatives. The possession limit for cod would increase by one fish when compared to the proposed action alternatives, and the open season to keep cod and/or haddock would be longer relative to the proposed action alternatives. The no action measures for cod are less restrictive when compared to the status quo measures and more restrictive for the haddock measures. Implementation of the no action measures would likely alleviate concerns that some charter/party fishery participants have that more restrictive measures will lead to fewer customers. However, implementing the no action management measures would also increase the likelihood that the recreational fishery would exceed the FY 2014 sub-ACL for haddock, when compared to the proposed action alternatives, and trigger restrictive accountability measures in future fishing years. If the sub-ACL for haddock is exceeded and AMs are implemented the management program may be perceived to be ineffective and fishery participants may lose faith in the management process.

6.4.2.3 Alternative 3 (Preferred Alternative)

The preferred alternative would result in more restrictive measures for GOM cod and haddock then the status quo or no action measures. Therefore, angler satisfaction is predicted to decline under the preferred alternative measures in FY 2014, thereby reducing the estimated number of angler trips that target GOM cod or haddock. A reduction in angler trips may have a negative economic impact on for-hire boat businesses and possibly the larger overall regional economy through a reduction in angler expenditures. Nonetheless, if these management measures prove effective at achieving the FY2014 sub-ACLs, fishery participants may have a better view of the effectiveness of the management process relative to the no action and status quo alternatives.

It is expected that preferred management measures will contribute to resource sustainably and to result in positive economic benefits to anglers and to businesses that support marine recreational activities in the long-term. As indicated, there may be some effects of short-term negative consequences for anglers and business that support recreational fishermen. These effects could be regional (depending on how measures relate to fish availability/distributions) and could result in structural changes to local economies and the physical composition of fishing communities that are accompanied by delocalization, or the loss of localized community character and culture (Hall-Arber et al. 2001). Long-standing traditions and close-knit alliances that unite fishing communities and families may be altered.

The management alternatives proposed for FY 2014 do not introduce measures that specifically seek to mitigate these problems of infrastructure loss and the changing culture of fishing communities. However, if the catch and landings limits established in the FMP continue to be

achieved over the long-term, it is not expected that recreational fishing opportunities for GOM cod or haddock would be significantly impacted.

6.4.2.4 Alternative 4

The measures proposed under Alternative 4 are the most restrictive of the four alternatives under considerations. Angler satisfaction and angler effort that target GOM cod and haddock in FY 2014 are predicted to decline more than any of the other alternatives under consideration. As previously mentioned, a reduction in angler trips may have a negative economic impact on for-hire boat businesses and possibly the larger overall regional economy through a reduction in angler expenditures. These measures also have the highest likelihood though that recreational mortality will not exceed the FY 2014 sub-ACLs for both GOM cod and haddock. However, the measures proposed under Alternative 4 also achieve the mortality objectives for FY 2014 and are less restrictive than the non-preferred measures. Therefore, the Alternative 4 measures may be perceived as being overly restrictive and unnecessary by fishery participants. If these measures restrict catches well beyond what is allowed under the FY 2014 sub-ACLs, fishery participants may doubt the effectiveness of the management process.

7.0 CUMULATIVE EFFECTS ANALYSIS

7.1 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 this supplemental EA 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.

This CEA assesses the combined impact of the direct and indirect effects of the proposed recreational measures with the impact from the past, present, and reasonably foreseeable future fishing actions, as well as factors external to the multispecies fishery that affect the physical, biological, and socioeconomic resource components of the groundfish environment. This analysis is focused on the VECs (see below) and because this action is supplementing the final Framework 51 EA, it relies heavily and incorporates by reference the analysis contained in the attached final Framework 51 EA.

Valued Ecosystem Components (VECs): As noted in section 4.0 (Affected Environment), the VECs that exist within the groundfish fishery are identified and include the following:

- Target species
- Other species (incidental catch and bycatch);
- Habitat, including non-fishing effects; and
- Endangered and other protected species;
- Human Communities (includes economic and social effects on the fishery and fishing communities).

Temporal Scope of the VECs

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 these recreational measures and Framework 51 is the start of FY 2014 (May 1, 2014) and 2019.

Geographic Scope of the VECs

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, Framework 51 EA). 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, Framework 51 EA).

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, Framework 51 EA) 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 for the actions outlined in this supplemental EA. 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.

7.2 PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS

A summary of the effects of past, present and reasonably foreseeable future actions is presented immediately below. A thorough summary of the primary past, present, and reasonably foreseeable future actions effecting this action can be found in Section 7.6 of the Framework 51 EA (NEFMC 2014), including other previous actions taken in the NE Multispecies FMP. The baseline conditions of the resources and human community are also summarized here, 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 supplemental EA is included. The culmination of all these factors is considered when making the cumulative effects assessment.

Most of the actions affecting this supplemental EA come from fishery-related activities (e.g., Federal fishery management actions). 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 Magnuson-Stevens 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, and impacts from climate change such as 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 8. Summary effects of past, present and reasonably foreseeable future actions on the VECs (based on actions listed in the Framework 51 CEA, Section 7.6)

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+
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.	+	+	+	+	-

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
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
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 -
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 streamlined 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	-
Secretarial Amendment to Establish Annual Catch Limits and Accountability Measures for the Small-Mesh Multispecies Fishery This amendment established the mechanism for implementing ACLs and AMs.	Negl to L+	Negl	Negl	Negl	Negl to +
Amendment 3 to the Spiny Dogfish FMP This amendment established 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 set specifications for scallop FY 2013 and 2014. It is also considered 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 modified 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
FW50 to the Multispecies FMP This FW adopted FY 2013-2015 ACLs and specifications for the U.S./Canada Total Allowable Catches (TACs)	+	+	+	Negl	-
Reasonably Foreseeable Future Fishing Actions					

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
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 -
Framework 25 to the Atlantic Sea Scallop FMP This framework sets specifications for scallop FY 2014 and 2015. It is also considering accountability measures for windowpane flounder stocks.	Likely Negl	Likely Negl to L+	Likely Negl to L+	Likely Negl	Likely - to +

Impact Definitions:
-Groundfish (Target species), Non-Groundfish (other 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

Baseline Conditions for Resources and Human Communities

For the purposes of a CEA, 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. Table 8 below illustrates the baseline conditions found as part of the final Framework 51 EA cumulative effects analysis. Please refer to the cumulative effects assessment in Section 7.6.3 of the final Framework 51 EA (NEFMC 2014) to review a complete summary of the baseline conditions for each VEC.

Table 9. Summary of Baseline Conditions for each VEC

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	**Mixed** Fishery resources	**Short-term Negative** As effort controls are	**Short-term Negative** Revenues would likely

	supported profitable industries and communities but increasing effort and catch limit controls have curtailed fishing opportunities	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	maintained or strengthened, economic impacts will be negative **Long-term Positive** As stocks improve, effort will likely increase which would have a positive impact	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

7.3 SUMMARY OF THE IMPACTS FROM THE PROPOSED ACTIONS

Under the preferred alternative, the GOM cod recreational minimum fish size would be increased to 21 inches and the fishing season shortened by an additional two months (i.e., September and October closure). Haddock measures would have an increase in minimum size to 21 inches, a 3-fish possession limit, and additional closures in the fall (September and October) and spring (April 16 – April 30). The measures proposed under the non-preferred alternative are identical to the preferred alternative except the haddock possession limit is reduced to two fish. Both the preferred and non-preferred alternatives are estimated to have greater than a 50% probability of keeping recreational mortality of GOM cod and haddock below their respective FY 2014 ACLs. Given that both of the proposed actions have greater than a 50% probability of keeping , the proposed alternative with the larger haddock possession limit (i.e., 3 fish) is preferred as it has potentially lower social and economic impacts than the non-preferred alternative.

The expected reductions in catch and associated mortality are expected to have positive benefits on the two stocks in question by helping ensure the overall catch limit is not exceeded. The overall ACLs for both GOM cod and haddock are established at levels that are designed to prevent overfishing and, for cod beginning in FY 2014, designed to promote stock rebuilding. Comparatively, the proposed action would be expected to have net positive biological impacts compared to the no action alternative. Under the no action, there is a strong likelihood that the recreational sub-ACLs for both species would be exceeded which, in turn, could cause the aforementioned overall ACL to be exceeded. The preferred alternative would likely decrease angler effort, particularly given the additional closure periods. Changes in fishing effort under the proposed action or similar effort levels under the no action alternative would not be expected to increase interactions of recreational fishing gear with protected resources or habitat, because the recreational fishery does not interact with these VECs like other groundfish gear. Finally, the decrease in effort may result in a decrease in revenue for charter/party operators and associated businesses. The action alterative decreases in revenue would be a short-term negative impact on the human communities VEC. The no action alternative would be expected to have neutral to

slight positive economic and social impacts on the human communities VEC if effort and catch levels were similar to those in FY 2013 under the no action management measures

7.4 SUMMARY OF THE CUMULATIVE EFFECTS

The following analysis summarizes the cumulative effects on the VECs identified in this section through the consideration of past, present, and reasonably foreseeable future actions in combination with the baseline condition for resources and human communities and impacts from the proposed action.

7.4.1.1 Target and Other Species

As found in the cumulative effects analysis for the final Framework 51 EA (NEFMC 2014), the long-term trend in this fishery has been positive for cumulative impacts to target species. While several groundfish species remain overfished or overfishing is occurring, substantial effort reductions since implementation of the NE Multispecies FMP have allowed several stocks to rebuild and the rebuilding process for others is underway. Thus, the cumulative effect of this action is expected to provide stock growth for both species, with no anticipated significant impacts. Therefore, the combination of past actions with the proposed action would continue the sustainable harvest of other regulated species and would not be expected to result in any significant cumulative effects.

7.4.1.2 Endangered and Other Protected Species

Historically, the implementation of FMPs has resulted in reductions in fishing effort and as a result, past fishery management actions are thought to have had a slightly positive impact on strategies to protect protected species. Gear entanglement continues to be a source of injury or mortality, resulting in some adverse effects on most protected species to varying degrees. As summarized in Section 7.6.5 of Framework 51, the current management measures, including those implemented through Amendment 16 and expected to continue to control effort and catch and, as a result, to reduce interactions with protected resources. The actions proposed in Framework 51 are expected to continue this trend. As stocks rebuild to sustainable levels, future actions may lead to increased effort, which may increase potential interactions with protected resources in the fishery overall. However, interactions between the recreational fishery and protected resources are rare, so the cumulative result of these actions to meet mortality objectives, in combination with past, present, and reasonably foreseeable future actions, would not be expected to result in any significant cumulative effects.

7.4.1.3 Habitat Including Non-fishing Effects

While the impact analysis in this action is focused on direct and indirect impacts to habitat and EFH, there are a number of non-fishing impacts that must be considered when assessing cumulative impacts. Many of these activities are concentrated near-shore and likely work either

additively or synergistically to decrease habitat quality. Other non-fishing factors such as climate change and ocean acidification are also thought to play a role in the degradation of habitat. The effects of these actions, combined with impacts resulting from years of commercial fishing activity, have negatively affected habitat and EFH. However, the general trend in fisheries management toward effort reductions, particularly with the implementation of Amendment 16, has yielded positive impacts to habitat and EFH. Furthermore, gear used in the recreational fishery does not interact with habitat as other groundfish gears do and thus, impacts from the proposed action were found to be negligible. Based on this rationale, when considered with past, present and reasonably foreseeable future actions, the cumulative impacts from the proposed action would not be significant.

7.4.1.4 Human Communities

Past management actions have had significant negative impacts on communities that depend on the groundfish fishery, particularly as a result of decreases in revenue. Although special programs implemented through Amendment 13 and subsequent framework actions have provided the industry additional opportunities to target healthier groundfish stocks, substantial increases in landings and revenue will likely not take place until further stock rebuilding occurs under the various rebuilding plans implemented for individual stocks in Amendment 16 and Frameworks 50 and 51. Current management measures 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 proposed in Framework 51 are expected to have log-term positive impacts to human communities as they promote stock rebuilding, but in the short-term revenues are mixed compared to what would otherwise be expected. Slightly increased ACLs for some stocks could have positive social impacts, however, these may be offset by reductions in ACLs for other stocks and overall greater fishing effort is not likely. Given decreases or generally low catch limits for many key stocks that resulted in a fishery disaster declaration for FY 2013, the overall impact on human communities is expected to be negative as the result of decreased revenue. Framework 51 is expected to result in slightly decreased revenue in the short term that will compound the significant negative economic impact on the fishing industry from past actions, though not beyond levels anticipated in Amendment 16.

The proposed action analyzed in this supplemental EA would be expected to result in a reduction in catch and effort in the recreational fishery, which may result in a decrease in revenue for associated businesses, including charter/party operators, and their communities (see section 9.1 below for a detailed assessment of revenue impacts). Therefore, the cumulative impact of this action in conjunction with other past, present and reasonably future actions would likely do little to offset the trend of significant negative impacts on communities until future stock rebuilding occurs.

8.0 LIST OF PREPARERS AND PERSONS/AGENCIES CONSULTED

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9.0 COMPLIANCE WITH APPLICABLE LAWS AND EXECUTIVE ORDERS

9.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT (MAGNUSON-STEVENTS ACT)

Section 301 of the Magnuson-Stevens Act requires that FMPs contain conservation and management measures that are consistent with the ten National Standards. The most recent FMP changes implemented by Amendment 16 address how the proposed management actions comply with the National Standards. Under Amendment 16, the NEFMC adopted conservation and management measures that would end overfishing and rebuild NE multispecies stocks to achieve, on a continuing basis, the optimum yield for NE multispecies stocks and the U.S. fishing industry using the best scientific information available consistent with National Standards 1 and 2. The NE Multispecies FMP and implementing regulations manage all 20 groundfish stocks (13 species) throughout their entire range, as required by National Standard 3. Section 9.1.1 of Amendment 16 describes how the sector measures implemented under that action do not discriminate among residents of different states consistent with National Standard 4, do not have economic allocation as their sole purpose (National Standard 5), account for variations in these

fisheries (National Standard 6), avoid unnecessary duplication (National Standard 7), take into account fishing communities (National Standard 8), addresses bycatch in fisheries (National Standard 9), and promote safety at sea (National Standard 10). By proposing to meet the National Standards requirements of the Magnuson-Stevens Act through future FMP amendments and framework actions, the NEFMC will ensure that overfishing is prevented, overfished stocks are rebuilt, and the maximum benefits possible accrue to the ports and communities that depend on these fisheries and the Nation as a whole.

The proposed action would comply with all elements of the Magnuson-Stevens Act, including the National Standards, and the NE Multispecies FMP. This action is being taken to put in place recreational management measures that will better ensure the FY 2014 recreational sub-ACL is met but not exceeded, consistent with both the FMP and National Standard 1 guidelines (74 FR 3178; January 16, 2009). The final Framework 51 EA, completed prior to the development of revised recreational management measures, and prior to the Framework 51 proposed rule, which is expected to be published in the Federal Register in March 2014, did not contain an analysis of the revised recreational fishery measures that would be necessary to constrain catches to the GOM cod and haddock recreational sub-ACLs. Therefore, this supplemental EA analyzes the impacts of the revised recreational fishery measures, in compliance with applicable laws requiring an analysis of proposed measures.

9.2 ESSENTIAL FISH HABITAT (EFH)

An EFH assessment was provided in section 6.3 of this document which concluded that there are no adverse impacts to EFH.

9.3 ENDANGERED SPECIES ACT (ESA)

As outlined in the impacts analysis of Framework 51's EA and in sections 6.2 and 7.4 of this supplement, the fishing activities anticipated to occur under this action are not expected to affect endangered and threatened species or critical habitat in any manner not considered in prior consultations on this fishery

9.4 MARINE MAMMAL PROTECTION ACT (MMPA)

As outlined in the impacts analysis of Framework 51's EA and in sections 6.2 and 7.4 of this supplement, the FY 2014 recreational management measures have been determined to be consistent with the provisions of the MMPA and would not alter existing measures to protect the species likely to inhabit the management unit of the NE multispecies FMP. For further

information on the potential impacts of the proposed management action on marine mammals, see Section 6.2.

9.5 NATIONAL ENVIRONMENTAL POLICY ACT

9.5.1 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration (NOAA) Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 C.F.R. 1508.27 states that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant in making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1. *Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?*

Response: The proposed action described in the supplemental EA would not jeopardize the sustainability of the target species affected by the action (GOM cod and haddock), because the measures are designed to reduce mortality resulting from the recreational fishery and, thus, are expected to result positive biological impacts, as discussed in Section 6.1.

2. *Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?*

Response: The proposed action described in the supplemental EA is not expected to jeopardize the sustainability of any non- target species. Additional stocks taken incidentally during the GOM recreational cod and haddock fisheries would be mitigated by mortality controls in place for these species and would be expected to be minimal. The biological impacts of the proposed action are analyzed in Section 6.1.

3. *Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?*

Response: The proposed action described in the supplemental EA is not expected to allow substantial damage to the ocean and coastal habitats and/or Essential Fish Habitat (EFH) as defined under the Magnuson-Stevens Act and identified in the FMP. Because rod and reel gear is believed to have minimal interaction with habitat, impacts to EFH resulting from the proposed

action would be expected to be negligible. The physical environmental/habitat impacts of the proposed action are analyzed in Section 6.3.

4. *Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?*

Response: The proposed action described in the supplemental EA is not expected to have a substantial adverse impact on public health and safety. Open ocean recreational fishing is an activity with some inherent safety risks; however, the measures contained in the proposed action are not expected to fundamentally change how recreational fisheries operate in the Gulf of Maine. As such, no adverse impact beyond those already present in recreational fishing activities is expected by the proposed action.

5. *Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?*

Response: As discussed in Section 6.2 in this supplemental EA, hook and line gear used in the recreational multispecies fishery rarely interacts with protected resources or habitat, if at all, and, as a result, impacts of the proposed action on protected resources are expected to be negligible.

6. *Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

Response: The proposed action described in the supplemental EA is not expected to have a substantial impact on biodiversity and ecosystem function within the Gulf of Maine. The use of ACLs are designed to 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 for those stocks established by of Amendment 16 and modified through subsequent frameworks, including Framework 51. The proposed action will not have a substantial impact on predator-prey relationships or biodiversity. This action will have no more than minimal adverse impacts to EFH, because recreational hook and line gear do not interact with habitat. 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 supplemental EA documents that no significant natural or physical effects will result from the implementation of the proposed action. The proposed action is designed to reduce recreational fishing mortality to be consistent with the FY 2014 recreational sub-ACL to better ensure overfishing does not occur and to provide continued stock growth and rebuilding for

GOM cod. As described in Section 6.1, the action is expected to result in a low positive biological impact by reducing mortality and would not be expected to more than minimally increase mortality on other stocks caught recreationally. The action cannot be reasonably expected to have a substantial impact on protected species or habitat (see Sections 6.2 and 6.3), as the impacts are expected to fall within the range of those resulting from Amendment 16. The action's potential economic and social impacts are also addressed in the supplemental EA (see Section 6.4).

NMFS has determined that despite the potential socio-economic impacts resulting from this action, there is no need to prepare an EIS. This supplemental EA describes and analyzes the proposed measures and alternatives and concludes 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 supplemental EA demonstrates that the action's potential natural and physical impacts are not significant, the execution of a FONSI remains appropriate under Criteria 7.

8. *Are the effects on the quality of the human environment likely to be highly controversial?*

Response: The effects of the proposed action for the supplemental EA on the quality of human environment are not expected to be highly controversial. The public is aware of the revised recreational measures contemplated in the proposed action for the supplemental EA, as they were openly discussed at public meetings held New England Fishery Management Council in February 2014. The data used for recreational fisheries management, MRIP estimates of effort and catch derived from a multi-faceted survey system, remains somewhat controversial. The data are survey derived estimates, not a total census of catch and effort. As such, there are uncertainties contained with the estimation process that, in some cases, results in large confidence intervals around the estimates available. NMFS has reviewed the available FY 2013 catch and effort information used to evaluate the necessary catch reductions and finds the MRIP data to have been appropriately generated, quality inspected, and made available for use, consistent with National Standard 2 of the Magnuson-Stevens Act. Plainly stated, there are no other alternate data available for recreational fisheries management. The economic impacts associated with the action may be substantial and, as such, are somewhat controversial. NMFS and the Council are obligated under the FMP and National Standard 1 provisions of the Magnuson-Stevens Act to implement measures with a high probability of ensuring catch limits are not exceeded in the overarching effort to prevent overfishing. The measures of the proposed action are intended to ensure the FY 2014 recreational sub-ACLs for GOM cod and haddock are not exceeded. As such, they are consistent with both the FMP and the Magnuson-Stevens Act requirements. They provide a reasonable probability of being effective at their designed objective of constraining GOM cod and haddock catch below the FY 2014 catch limits. The

proposed action is not expected to negatively impact habitat, target and non-target species, protected resources, or the human environment as described in Sections 6.1 through 6.4.

9. *Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, parkland, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?*

Response: The proposed action cannot be reasonably expected to result in substantial impacts to unique areas or ecological critical areas. Although it is possible that historic or cultural resources such as shipwrecks could be present in the area where the recreational fishery is prosecuted, impacts to habitat or ship wrecks from recreational gear are minimal (see Section 6.3). Further, vessels try to avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is not likely that the proposed action would result in substantial impacts to unique areas.

10. *Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?*

Response: The effects of the proposed action described in the supplemental EA on the human environment are not expected to be highly uncertain or involve unique or unknown risks. Anglers fishing for GOM cod and haddock will primarily use hook and line gear and maintain traditional fishing practices which will have no greater impact on habitat, protected species, and limit bycatch species as those conditions existing currently. The measures contemplated 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. Overall, the impacts of the proposed action can be, and are, described with a relative amount of certainty. Therefore, the effects on the human environment are not uncertain or involve unique or unknown risks.

11. *Is the proposed action, related to other actions with individually insignificant, but cumulatively significant impacts?*

Response: The cumulative effects analysis presented in Section 7.0 of this supplemental EA considers the impacts of the proposed action in combination with relevant past, present, and reasonably foreseeable future actions and concludes that no significant cumulative impacts are expected from the approval of the revised recreational fishery measures for GOM cod and haddock. Since none of the cumulative impacts of the preferred alternatives in the final

Framework 51 EA or the supplemental proposed action in this supplemental EA are considered significant, and the measures under Amendment 16 are environmentally preferred, Section 7.0 of this document concluded there are no significant cumulative impacts among these related actions. Further, the proposed action would not have any significant impacts when considered individually or in conjunction with any of the other actions presented in Section 7.0 (fishing related and non-fishing related).

12. *Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?*

Response: The fishing operations would take place on ocean waters and would not affect any human communities on the adjacent shorelines. , Although there are shipwrecks present in areas where fishing occurs, including some registered on the National Register of Historic Places. Due to the minimal impact on the human environment, the effect of the approval of the revised recreational fishery measures would not be significant on scientific, cultural, or historical resources.

13. *Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?*

Response: No non-indigenous species would be introduced during the proposed action because the action is not expected to expand the scope of current fishing practices and is not expected to introduce new fishing methods. No non-indigenous species would be expected to be used or transported during fishing activities

14. *Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?*

Response: No, the proposed action is not likely to establish precedent for future actions with significant effects. The proposed action adopts measures that are designed to react to the necessity to reduce fishing mortality for GOM cod and haddock in order to achieve mortality targets adopted for FY 2014. 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 proposed action reasonably be expected to threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment?*

Response: The proposed action is not expected to threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment. Vessels fishing in the GOM are required to comply with all local, regional, and national laws and permitting requirements.

Response: The proposed action is not expected to threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment. Vessels fishing in the GOM are required to comply with all local, regional, and national laws and permitting requirements.

16. *Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species*?

Response: The proposed action is not expected to result in cumulative adverse effects that could have a substantial effect on target or non-target species. As stated in Section 6.1, impacts on GOM cod and haddock are expected to be low positive and impacts to other stocks are expected to be minimal.

9.5.2 DETERMINATION

In view of the information presented in the Framework 51 EA and this document, the analysis contained in the supporting EA prepared for the approval of revised recreational measures for GOM cod and haddock, it is hereby determined that the approval of the revised GOM cod and haddock recreational minimum size restrictions, possession limits, and fishing seasons will not significantly impact the quality of the human environment as described above and in the supporting EA. 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 Environmental Impact Statement (EIS) for this action is not necessary.

4/9/14

for John K. Bullard — Date

Regional Administrator, Greater Atlantic Regional Fisheries Office, NMFS

9.6 ADMINISTRATIVE PROCEDURE ACT (APA)

Section 553 of the APA establishes procedural requirements applicable to 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. Pursuant to 5 U.S.C. 553(b)(B) and 5 U.S.C. 553(d)(3), the Assistant Administrator for Fisheries finds good cause to waive the otherwise applicable requirements for both notice and comment rulemaking and a 30 day delay in effectiveness for this interim final action implementing FY 2014 recreational GOM cod and haddock management measures. As explained in further detail hereafter, the availability of information necessary to ensure that measures were in place for the May 1, 2014, start of the fishing year made it impracticable to provide prior notice-and-comment

summer months. Delaying implementation of FY 2014 measures until sometime after May 1, 2014, could require the implementation of even more stringent measures with possibly more social and economic impacts to fishery participants to ensure total catch for the year are not exceeded. Doing so would be contrary to the public interest. Development of measures was publicly discussed at a RAP and Council meeting in February 2014 and NMFS is soliciting public comment on the interim measures contained in this rule.

Recreational fisheries data are available from NMFS's MRIP survey program approximately 45 days after each two month sampling wave. The necessary information to evaluate FY 2013 fishery performance through October 2014 was not available until mid-December 2014. An initial evaluation of this data occurred shortly thereafter and NMFS notified the Council by letter on January 17, 2014, that the FY 2013 recreational sub-ACLs for both GOM cod and haddock had been exceeded and that changes were needed for FY 2014 to constrain catch to sub-ACLs, both the Council and NMFS acted as quickly as possible to analyze potential NMFS's intended to adjust FY 2014 measures in accordance with requirements in regulations for implementing accountability measures to address the overage. These requirements require that NMFS consult with the Council before setting new ACLs. As part of this consultation process for FY 2014, the Council had to convene its RAP and consider possible recommendations for NMFS. The earliest that the Council could consider these recommendations was at its February 25, 2014, meeting. The Council, in turn, forwarded recommendations to NMFS to consider as measures for FY 2014.

These timing-related issues paired with the need to complete analyses and the rulemaking processes make it impossible to propose recreational measures through notice-and-comment rulemaking before the start of the fishing year, May 1, 2014. By implementing these measures through an interim final rule, NMFS can provide some advance notice to the public and receive comments on the interim final rule before its effective date. These comments will be considered and any necessary changes to measures put forward in a final rule later in the fishing year.
For the reasons outlined, NMFS finds it impracticable and contrary to the public interest to provide prior opportunity to comment on FY 2014 recreational management measures and provide a 30-day delay in implementation. Therefore there exists good cause to waive both of those requirements.

9.7 PAPERWORK REDUCTION ACT (PRA)

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by, or for, the Federal Government. This action contains no new information collection requirements and, as such, no review under the PRA is necessary.

9.8 COASTAL ZONE MANAGEMENT ACT (CZMA)

Section 307(c)(1) of the CZMA requires that all Federal activities which affect any coastal use or resource be consistent with approved state coastal zone management programs (CZMP) to the maximum extent practicable. NMFS has reviewed the relevant enforceable policies of each coastal state in the NE region for this action and has determined that this action is incremental and repetitive, without any cumulative effects, and is consistent to the maximum extent practicable with the enforceable policies of the CZMP of the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, and North Carolina. NMFS finds this action to be consistent with the enforceable policies to manage, preserve, and protect the coastal natural resources, including fish and wildlife, and to provide recreational opportunities through public access to waters off the coastal areas. Pursuant to the general consistency determination provision codified at 15 CFR 930.36(c), NMFS sent a general consistency determination applying to the current NE Multispecies FMP, and all routine Federal actions carried out in accordance with the FMP, to the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, and North Carolina on October 21, 2009. North Carolina, Rhode Island, Virginia, Connecticut, New Hampshire, New Jersey, Delaware, and Pennsylvania have concurred with the general consistency determination. Consistency was inferred for those states that did not respond.

9.9 INFORMATION QUALITY ACT (IQA)

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.

Utility

The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications.

This action is intended to describe and implement measures that reduce recreational Gulf of Maine cod and haddock catches in the fishing year that begins on May 1, 2014 (i.e., Fishing year (FY) 2014). The action is necessary to reduce catches so that recreational catches do not exceed established recreational catch limits for these two stocks which, in turn, is part of the Northeast Multispecies Fishery Management Plan (FMP) requirements to prevent overfishing consistent

with Magnuson-Stevens Fishery Conservation and Management Act National Standard 1 guidelines

The public had the opportunity to review and comment on the development of management measures during the a Recreational Advisors Panel meeting on February 19, 2014, and again during a New England Fishery Management Council (Council) meeting on February 25, 2014. Analytical and information documents for these meetings were posted and remain accessible on the Council's website: www.nefmc.org

The public will have further opportunity to comment once NMFS publishes a request for comments on the interim rule measures in the Federal Register. The Federal Register notice will include a description of the measures and an abbreviated description of the agency's reasons for selecting the interim measures. The Federal Register notice that announces the interim rule, supporting analytical documents, and compliance guides will be made available in printed publication, on the website for the Greater Atlantic Regional Fisheries Office (GARFO), and on Regulations.gov. These documents use consistent attribute naming and unit conventions. Technical jargon is avoided where possible, but when it must be included, it is familiar to the affected and interested public.

Integrity

Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NMFS adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the United States Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

For the purposes of the Pre-Dissemination Review, this supplemental EA 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 EFH Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the NEPA.

The catch levels established for FY 2014 are based on assessments conducted by experts and specialists familiar with the core data sets, life history of the species, population dynamics, and

statistical modeling as well as having extensive knowledge of the fishery. As such, the information used to develop the catch levels, of which a component is set aside as a recreational-specific amount, represents the best available, most recent information for the GOM cod and haddock populations.

Estimates of recreational data are provided by the Marine Recreational Information Program (MRIP), a multi-faceted survey conducted by NMFS. The survey system and underlying methodology have been extensively peer reviewed and provide a robust, unbiased estimation of recreational catch and effort. Data produced by MRIP undergo both internal and external quality assurance and quality control procedures before being made available to the public. This action makes extensive use of MRIP data to characterize FY 2013 catch and effort and evaluate potential FY 2014 recreational management measures. Analyses of potential FY 2014 measures are evaluated using a peer-reviewed model developed and run by staff from the NMFS Northeast Fisheries Science Center (Center).

Clear distinctions have been drawn between policy choices and the supporting science upon which they are based. Supporting materials, information, data and analyses used for the recreational management measures action are properly referenced. Many of these supporting documents are readily available on the Council or GARFO web sites. 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 for development of this action and associated documents involves staff from the Council, NMFS, Center, and NMFS headquarters. The Center's technical review is conducted by senior level scientists with specialties in fisheries ecology, population dynamics, and biology, as well as economics and social anthropology. Review by GARFO is conducted by those with expertise in fisheries management and policy, habitat conservation, protected resources, and compliance with the applicable law. Final approval of the documents and clearance of the rule is conducted by staff at NMFS Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

9.10 REGULATORY IMPACT REVIEW

The National Marine Fisheries Service (NMFS) requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement a new Fishery Management Plan (FMP) or significantly amend an existing plan. This RIR provides a comprehensive review of the changes economic benefits associated with proposed regulatory actions. This analysis also provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems. The purpose of this analysis is to ensure that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most

efficient and cost-effective way. This RIR addresses many items in the regulatory philosophy and principles of Executive Order (EO) 12866.

9.10.1 Description of the Management Objectives

A complete description of the purpose and need and objectives of this action is found under section 3.0. This action is taken under the authority of the Magnuson-Stevens Act and regulations at 50 CFR part 648.

9.10.2 Description of the Fishery

A description of the GOM cod and haddock fisheries is presented in section 6.0 and 6.5.9.3 of the Framework 51 EA. A description of recreational catch statistics is presented in 5.1 of this EA. An analysis of permit data is found below.

9.10.3 A Statement of the Problem

A statement of the problem for resolution is presented under section's 2.0 and 3.0.

9.10.4 Regulatory Impact Review Impacts

Net Economic Benefits

Table 9 shows estimated angler welfare (i.e., angler consumer surplus) in FY 2014 for each of the alternatives under consideration. Angler welfare is highest under the status quo measures ($17.8 million), followed by the no action measures ($14.2 million), the preferred measures ($9.0 million), and lastly, the non-preferred measures ($8.3 million). Although angler welfare is estimated to be considerably higher under the status quo and no action alternatives than for the preferred and non-preferred alternatives in FY 2014, angler welfare in subsequent fishing years under both the status quo and no action alternatives is likely to decline relative to the preferred and non-preferred measures. Under the no action alternative, recreational fishing mortality of GOM haddock is predicted to exceed the FY 2014 sub-ACL by 418%, and under status quo measures, recreational fishing mortality of both GOM cod and haddock are predicted to exceed the cod FY 2014 sub-ACL by 170% and the haddock sub-ACL by 272%. If the FY 2014 recreational sub-ACLs are exceeded, more restrictive accountability measures will be implemented in future fishing years, resulting in declining angler welfare over the long term.

An attempt was made to calculate producer surplus for the for-hire fishing fleet in FY 2014 under each of the alternatives, but assumptions regarding how the proposed regulations would affect net changes in the number of for-hire boat trips in FY 2014 were questionable so the

analysis is not included here. As a result, total net benefits to the Nation for FY 2014 or for subsequent years could not be calculated for each alternative. However, estimated changes in gross revenues for each of the for-hire fishing businesses estimated to be impacted by the proposed regulations is shown below.

Table 10. Estimated Angler Net Benefits in FY 2014

	Angler Consumer Surplus ($ Millions)
Status Quo	17.8
No Action	14.2
Preferred	9.0
Non-Preferred	8.3

Short-Term Regional Economic Impacts

An input-output model was employed to assess the potential multiplier effects (sales, income, and employment) associated with implementation of the proposed management alternatives to businesses that support marine recreational fishing activities in New England. Anglers' trip-related purchases have a direct effect on the sales, income, and employment of businesses that supply goods and services to saltwater fishermen. Businesses providing these goods and services must also purchase goods and services and hire employees, which in turn, affects the sales, income, and employment of many additional businesses.

Three levels of economic impacts result from purchases by saltwater fishermen: (1) direct, (2) indirect, and (3) induced. Direct effects occur when anglers spend money at retail and service-oriented fishing businesses (e.g., purchases of ice at convenience stores or access fees paid to owners of for-hire vessels). Indirect effects occur as the retail and service sectors purchase fishing supplies from wholesale trade businesses and manufacturers and pay operating expenditures (e.g., the retailer must purchase fishing rods from the manufacturer or wholesaler and pay electric bills). These secondary industries must then, in turn, purchase additional supplies and this cycle of industry to industry purchasing continues until the amount remaining within the region of interest is negligible. Finally, induced effects result when employees of the direct and indirect sectors make purchases from retailers and service establishments in the normal course of household consumption (e.g., convenience store employees spend money on groceries and pay federal and state taxes). The summation of direct, indirect, and induced effects are total effects.

Input-output (I/O) analysis is the most common approach available for determining the direct, indirect, and induced effects associated with an overall change in economic activity in a

particular region. For the analysis presented here, a ready-made regional I/O modeling system called IMPLAN Pro (Impact Analysis for Planning) was used to estimate the economic impacts associated with each of the four alternatives under consideration. The IMPLAN Pro system is a widely used, nationally recognized tool that provides detailed purchasing information for 440 industrial sectors and a user-friendly media for customizing I/O models to specific applications (IMPLAN Group LLC, 2013).

Angler expenditures in New England for marine fishing were obtained from Lovell, Steinback, and Hilger (2013). These expenditure data were produced from extensive surveys of marine recreational fishermen in the New England in 2011 (Table 10). The surveys were conducted as part of MRIP. Average fishing trip expenditures were provided for each state and mode of fishing (i.e., private boat, party/charter, and shore) in the New England in 2011. Trip-related expenditure categories shown in the report included auto fuel, auto rental, bait, boat rental, charter fees, crew tips, fish processing, food from grocery stores, food from restaurants, gifts and souvenirs, ice lodging, parking and site access fees, public transportation, and tournament fees. In addition to trip-related expenditures, the report also shows estimated anglers' expenditures for semi-durable items (e.g., rods, reels, lines, clothing, etc.) and durable goods (e.g., motor boats, vehicles, etc.). However, expenditures for these items are assumed to remain the same in the I/O model since semi-durable and durable items can be used for many fishing trips.

Table 11. Average daily trip expenditures by recreational fishermen in the New England by mode, in 2011.

Expenditures	$		
	For-Hire	Private/Rental	Shore
Auto Fuel	24.92	13.50	13.25
Auto Rental	0.43	0.00	0.09
Bait	0.47	4.98	5.09
Boat Rental	0.52	18.40	0.00
Charter Fees	113.44	0.05	0.00
Crew Tips	9.95	0.00	0.00
Fish Processing	0.01	0.00	0.00
Food from Grocery Stores	12.09	6.11	6.22
Food from Restaurants	11.25	2.28	4.07
Gifts & Souvenirs	3.57	0.03	0.57

Ice	0.56	1.04	0.57
Lodging	17.42	1.35	7.69
Parking & Site Access	0.67	0.82	1.27
Public Transportation	1.56	0.05	0.15
Tournament Fees	3.77	0.00	0.00
Total	200.63	48.62	38.96

Source: Lovell et al. 2013.

The economic impacts associated with each of the alternatives were estimated by applying the product of the model-generated number of angler trips that are predicted to occur and the average trip expenditure estimates from Lovell et al. (2013), to the appropriate IMPLAN sector multipliers in each state. The multipliers measure the direct, indirect, and induced relationships between industries and households. Input-output models require all values to be in producer prices (manufacturer prices) so each of the angler expenditure categories was associated with its corresponding IMPLAN producing sector. In IMPLAN, margins are used to convert the retail-level prices paid by anglers into the appropriate producer values. Margins ensure that the correct value is assigned to products as they move from producers, to wholesalers, through the transportation sectors, and finally on to retail establishments.

Potential economic impacts are estimated for sales, income, and employment. Sales reflect the aggregate total dollar sales generated from expenditures by anglers in New England. Income represents aggregate wages, salaries, benefits, and proprietary income generated from angler expenditures in the coastal New England states. Employment includes both full-time and part-time workers and is expressed as total New England jobs.
The first step was to determine the estimated number of angler trips that are predicted to occur under each alternative. These estimates are produced from the bioeconomic model simulations, but the model is unable to distinguish between private boat angler-trips and for-hire boat angler-trips which is needed to appropriately assign costs to each type of trip. Thus, the proportion of angler effort by mode in FY 2013 (see Table 4) was used to apportion the model-generated number of angler trips that will take place in FY 2014 to private boats and for-hire boats, under each alternative (Table 11).

Table 12. Predicted Number of Angler Trips that will Target or Catch GOM Cod or Haddock in FY 2014, by Mode.

	Private Boat	For-Hire
	(thousands)	
Status Quo	143	80
No Action	123	69

Preferred	83	46
Non-Preferred	80	45

The second step was to multiply the average trip expenditure estimates shown in Table 10 for private boat anglers and for-hire anglers by the predicted angler trips shown in Table 11. Total angler expenditures by category and mode were then applied to the appropriate IMPLAN sector multipliers to estimate the total economic impacts associated with implementation of each of the proposed management alternatives to the overall economy in New England (Table 12).

Table 13. New England Regional Economic Impacts [3]

	Sales	Income	Employment
	($ Millions)		(Jobs)
Status Quo	38.9	13.6	422
No Action	35.4	12.4	383
Preferred	22.5	7.9	243
Non-Preferred	21.8	7.7	237

The sales, income, and employment generated from the status quo and no action measures are considerably higher than the proposed action alternatives. The status quo measures are estimated to result in $38.9 million in sales, $13.6 million in income, and support 422 jobs across the coastal New England states in FY 2014. The economic activity supported by the no action measures is only slightly lower at $35.4 million in sales, $12.4 million in income, and 383 jobs. The preferred and non-preferred measures result in economic impacts that are over 40% lower for sales and over 30% lower for income and employment when compared to the no action and status quo alternatives.

9.10.5 Evaluation of Significance Under E.O. 12866

The purpose of Executive Order (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 9.1 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 may be a "significant regulatory action"

[3] The sales and income impacts were adjusted to their 2014 equivalents using the Bureau of Labor's Consumer Price Index.

under E.O. 12866 because there's a high likelihood that it will affect a sector of the economy in a material way.

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.

The following discussion is limited to a determination of significance of the proposed action based solely on economic criteria.

The measures considered in this regulatory action will not affect gross revenues or indirect and induced effects generated by the for-hire, private boat, or supporting sectors offering goods and services to anglers engaged in the GOM cod or haddock fisheries to the extent that an annual $100 million economic impact will occur in these fisheries individually or combined. Table 12 shows that the measures proposed under the preferred alternative are estimated to result in a total decline of $12.9 million in sales to directly and indirectly affected industries, relative to the no action measures. Implementation of the non-preferred measures is predicted to result in a decline of $13.6 million in sales, relative to the no action measures.

The long-term biological effects of the proposed rule alternatives are clear: GOM cod and haddock will continue to be managed sustainably as a result of the accumulated effects of these measures applied over time. Although the long-term effects of these alternatives are less clear or quantifiable from a social and economic perspective, rebuilt stocks would presumably provide anglers with the ability to increase catch and possibly keep rates resulting in higher overall welfare benefits to anglers and the Nation as a whole. Therefore, this action should not adversely affect, in the long-term, competition, jobs, the environment, public health or safety, or state, local, or tribal government communities. Second, this action should not create a serious inconsistency or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans an action that will affect the GOM cod and haddock fisheries in the EEZ. Third, this action will not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of their participants. Lastly, the proposed action does not raise novel legal or policy issues arising out of legal mandates or the President's priorities.

Impacts on For-Hire Businesses

Although an Initial Regulatory Flexibility Analysis (IRFA) is not required for this action, this section provides an assessment of the impacts of the proposed measures on for-hire business entities in FY 2014. If the model-projected decline in angler effort aboard for-hire boats under the proposed rule alternatives actually happens in FY 2014, revenue received by for-hire boats participating in the GOM cod and haddock fisheries will decline. An assessment of the impacts of the proposed measures on for-hire businesses is usually contained in an IRFA, where NMFS is required to examine the impacts of the proposed measures on small businesses. However, it was not clear if the estimated decline in angler trips aboard for-hire boats in FY 2014 would have a measurable effect on the overall revenues received by the affected for-hire businesses in FY 2014. One of the significance determination requirements of E.O. 12866 is to determine whether or not the proposed regulations will adversely affect a sector of the economy in a material way. Thus, this section provides an assessment of how total revenues obtained by for-hire businesses that participate in the GOM cod and haddock fisheries could be impacted in FY 2014.

For-hire fishing businesses are required to obtain a federal for-hire multispecies fishing permit for their passengers to catch GOM cod or haddock. Thus, the affected businesses entities of concern are businesses that hold federal multispecies for-hire fishing permits. While all business entities that hold for-hire permits could be affected by changes in recreational fishing restrictions, not all business that hold for-hire permits actively participate in a given year. Those who actively participate, i.e., land fish, would be the group of business entities that are impacted by the regulations. Latent fishing power (in the form of unfished permits) has the potential to alter the impacts on a fishery, but it's not possible to predict how many of these latent business entities will or will not participate in these fisheries in FY 2014. The Northeast federal landings database (i.e., vessel trip report data) indicates that a total of 702 party/charter vessels held a multispecies for-hire fishing permit in 2012 (the most recent full year of available data). Of the 702 for-hire permitted vessels, however, only 218 actively participated in the for-hire Atlantic cod and haddock fisheries in FY 2012 (i.e., reported catch of cod or haddock).

Using vessel ownership information that was recently developed from Northeast federal permit data and Northeast vessel trip report data, it was determined that the 218 actively participating for-hire vessels are owned by 201 unique fishing business entities. The vast majority of the 201 fishing businesses were solely engaged in for-hire fishing, but some also earned revenue from shellfish and/or finfish fishing. The highest percentage of annual gross revenues though for all but 17 of the fishing businesses was from for-hire fishing. In other words, the revenue from for-hire fishing was greater than the revenue from shellfishing and the revenue from finfish fishing for all but 17 of the business entities.

Estimates of potential changes in overall business entity revenues are provided in this assessment. Estimates of impacts upon profitability are not examined because of data

limitations. Potential changes in gross revenues during FY 2014 are shown relative to the status quo alternative, since the measures proposed under the status quo alternative were in place during FY 2013 and provide the best indication of the immediate short-term effect of changes to the regulations during FY 2014 on business entities that engage in for-hire fishing for GOM cod or haddock.

Impacts were examined by first calculating the total estimated gross revenue that will be received by businesses engaged in GOM cod and haddock for-hire fishing in FY 2014, under each of the alternatives. This was calculated by multiplying the estimated average access fee paid by for-hire anglers in FY 2014 ($117.98)[4] by the predicted number of for-hire angler trips that will target or catch GOM cod or haddock in FY 2014 under each alternative (see Table 11). Total estimated gross revenue under each alternative was then assigned to the 201 business entities identified as being actively engaged in for-hire fishing for GOM cod and haddock. Instead of assigning the revenue equally across all of the 201 business entities, the assignment was made based on each business entity's share of total for-hire gross revenue contained in the ownership database. This approach attempts to account for disproportional revenue effects across business entities.

The estimated revenue received by each business entity from anglers that target or catch GOM cod or haddock in FY 2014 could then compared across alternatives. Revenue estimates under the no action alternative, the preferred alternative, and the non-preferred alternative were subtracted from the estimated revenue received under the status quo alternative to determine projected for-hire revenue declines for each business entity in FY 2014. However, since some of the affected business entities also receive revenue from commercial shellfishing and finfishing activities, actual revenue losses for the business entity as a whole needs to be calculated from total fishing activity, not just for-hire fishing activity. Therefore, the estimated for-hire revenue losses were then subtracted from each business entities total average annual gross revenue (i.e., gross revenues from all fishing activities averaged over 2010-2012 – the most recent complete data available) contained in the ownership data to determine the potential change in total gross revenue for each fishing business. Table 13 shows the business entity revenue impacts under the no action, preferred, and non-preferred alternatives when compared to the estimated revenue received by for-hire businesses under the status quo measures in FY 2014.

Table 14. Estimated Percent Decline in Business Entity Gross Revenue in FY 2014 Relative to Keeping Status Quo Measures in Place for FY 2014

[4] Average access fees paid by for-hire anglers in the Northeast Region were obtained from Lovell, Steinback, and Hilger (2013). The 2011 average access fee ($113) was adjusted to its 2014 equivalent ($118) using the Bureau of Labor's Consumer Price Index.

		Percent Decline in Business Entity Revenue				
	Number of Affected Business Entities	<1	1-5	6-10	11-15	>15
No Action	201	18	183			
Preferred	201	3	17	32	149	
Non-Preferred	201	3	17	27	154	

All three recreational management alternatives that propose changes to the status quo measures are estimated to affect business entity revenue to some extent in FY 2014. The no action alternative has the lowest impact on business entity revenue in FY 2014 since the regulations under this alternative are only slightly more constraining than under the status quo measures. Under the no action measures, 18 businesses are estimated to lose less than 1% of their total gross revenue in FY 2014 and 183 are estimated to lose between 1-5%. In contrast, the measures proposed under the preferred and non-preferred alternatives are much more constraining than under the status quo measures so the estimated declines in gross revenue under the preferred and non-preferred alternatives are much higher. Under the preferred alternative measures, 3 businesses are estimated to lose less than 1% of their total gross revenue in FY 2014, 17 businesses are estimated to lose between 1-5%, 32 businesses are estimated to lose between 6-10%, and 149 businesses are estimated to lose between 11-15% of their total gross revenue in FY 2014. This translates into approximately 74% of the affected fishing businesses losing between 11-15% of their total gross fishing revenue in FY 2014 under the preferred alternative measures. This percentage increases to 77% under the non-preferred alternative measures.

The ownership data used for this assessment indicate that 71 out of the 201 affected fishing businesses receive a portion of their total business revenue from commercial shellfishing and/or finfishing, so there's at least a chance that these 71 businesses can offset some of their losses by increasing their commercial fishing activities in FY 2014. However, all but 17 of the 71 businesses received the majority of their gross revenue from their for-hire activities so it's unclear, given the reliance on for-hire revenues, to what extent these businesses will be able to offset their losses with additional commercial revenues. In addition, the 130 fishing businesses that were solely engaged in for-hire activities will likely have no ability to offset for-hire fishing revenue losses with commercial fishing activity.

Although it's possible that angler effort aboard for-hire boats will not decline to the extent projected in FY 2014, and hence estimated gross revenue losses may be lower than shown here, there's a high likelihood that the proposed measures will significantly impact fishing businesses

that engage in for-hire fishing for GOM cod and haddock. Thus, although the measures considered in this regulatory action will not have an effect on New England's economy to the extent that an annual $100 million economic impact will occur, this action has a high likelihood of adversely affecting a sector of the economy (i.e., fishing businesses engaged in for-hire fishing) in a material way. Therefore, this action may be a "significant regulatory action" under E.O. 12866.

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Framework Adjustment 51
To the Northeast Multispecies FMP

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

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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 FMPs have been updated through a series of amendments and framework adjustments. The most recent multispecies amendment, published as Amendment 16, was submitted for review by the National Marine Fisheries Service in October 2009 and 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 specification for the fishery and updating measures through framework actions.

Seven 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 (FW 48) was partial implemented on May 1, 2014; some measures in FW 48 are still in review. 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 50 was also implemented on September 30, 2013 which set specifications for many groundfish stocks and modified the rebuilding program for SNE/MA winter flounder. 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 was implemented on May 20, 2013.

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 Measure (AMs) that are designed to ensure catches remain below desired targets.

This framework (Framework Adjustment 51, FW51) is primarily intended to meet regulatory requirements by modifying the rebuilding programs and setting specifications for some of the groundfish stocks. 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. FW51 also would establish additional management measures related to U.S./Canada shared stocks and yellowtail flounder in the groundfish and scallop fisheries.

The *need* for this action is to set specifications for FY 2014 – 2016 that are consistent with the best available science, to modify the rebuilding programs for Gulf of Maine cod and American plaice, and to modify management measures in order to ensure that overfishing does not occur consistent with the status of stocks, and the requirements of MSA of 2006. There are several *purposes*: to adopt specifications, to adopt the U.S./Canada Total Allowable Catches (TACs), to modify the formal rebuilding program for Gulf of Maine cod and American plaice, establish an administrative measure to outline the steps to review the revised Gulf of Maine cod rebuilding plan, to establish an administrative measure to outline the steps to review the revised American plaice rebuilding plan, to establish an accountability measure for the Georges Bank yellowtail flounder sub-ACL in small-mesh fisheries, to provide a mechanism to transfer quota between US and Canada shared stocks, to establish a mechanism to transfer Eastern Georges Bank haddock quota to Western Georges Bank haddock quota, to revise the discard strata for Georges Bank yellowtail flounder, and to address the possession of GB and SNEMA yellowtail flounder in the limited access scallop fishery.

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, 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 Gulf of Maine cod*. The preferred alternative would rebuild the stock in 10 years, with a 50 percent (median) probability of success by 2024. This strategy is based on a fishing mortality that is above 75% F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16. The net effect of this rebuilding strategy is to accelerate the rebuilding timeline and increase the likelihood of success. In addition, it would establish a rebuilding plan review analysis for use during the new rebuilding period for Gulf of Maine cod, as an administrative measure.
    - *Revised rebuilding strategy for American plaice*. The preferred alternative would rebuild the stock in 10 years, with a 50 percent (median) probability of success by 2024. This strategy is based on a fishing mortality that is above 75% F_{MSY}; $F_{rebuild}$ is not allowed to

be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16. The net effect of this rebuilding strategy is to accelerate the rebuilding timeline and increase the likelihood of success. In addition, it would establish a rebuilding plan review analysis for use during the new rebuilding period for American plaice, as an administrative measure.

- *Revised Annual Catch Limit Specifications*. The preferred alternative would adopt new Overfishing Limits (OFLs), Acceptable Biological Catches (ABCs), and Annual Catch Limits (ACLs) for Georges Bank yellowtail flounder and white hake, and in addition Eastern Georges Bank cod and Eastern Georges Bank haddock total allowable catches (TACs) would be as specified. This alternative would also distribute the ABCs to the various components of the fishery. The OFLs, ABCs, and ACLs included in this preferred alternative for all of the other groundfish stocks would be the same as those specified in FW50.

- *Commercial and Recreational Fishery Measures.* These measures, based on the Preferred Alternatives, would affect commercial fishing.
  - *Small-mesh Fishery Accountability Measures for Georges Bank Yellowtail Flounder*. The preferred alternative would establish a gear-based accountability measure (AM) that would be implemented if the small-mesh fishery sub-ACL of Georges Bank yellowtail flounder is exceeded. The AM would require that vessels fishing with bottom otter trawl gear with a cod-end mesh size of less than 5 inches to use approved selective trawl gear that reduces the catch of Georges Bank yellowtail flounder. This would be a reactive AM.

  - *Management Measures for US/CA TACs*. The preferred alternative would allow the Regional Administrator to adjust the US/CA quotas during the FY, i.e. after allocations were made. Additional quota would be allocated consistent with the current ABC distribution, which would include both groundfish and non-groundfish vessels (i.e., scallops and small-mesh fisheries). The RA would not have the authority to change the allocations to the sub-ACLs during the FY. The RA's authority would be time limited and only exist for trades made by or before the end of the 2014 fishing year. In addition, a sector, or state-operated permit bank, would be able to convert its Eastern GB haddock ACE to Western GB haddock ACE at any time during the fishing year, and up to 2 weeks into the following fishing year (unless otherwise instructed by NMFS) to cover any overage during the previous fishing year. These preferred alternatives are intended to increase flexibility and create additional fishing opportunities.

  - *Georges Bank Yellowtail Flounder Management Measures.* The preferred alternative would modify the stratification used for estimating discards of GB yellowtail flounder for in-season quota monitoring of sector catches. It would not change the stratification used in assessments, nor would it change the stratification used to monitor common pool fishing trips. GB yellowtail flounder discards on groundfish trips would be calculated for two different areas: statistical area 522 and all other GB yellowtail flounder statistical areas (525, 561, and 562).

  - *Prohibition on the Possession of Yellowtail Flounder by the Limited Access Scallop Fishery*. The preferred alternative would prohibit possession of yellowtail flounder stocks

(GB and SNE/MA) for the limited access scallop fishery vessels. Yellowtail flounder could not be landed or sold by the limited access scallop fishery. This would not change existing regulations for the General Category/IFQ vessels that are already prohibited from possessing yellowtail flounder.

Summary of Environmental Consequences

The environmental impacts of all of the alternatives under consideration are described in Section 1.0. 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 the social impacts are described in Section 7.5. Cumulative effects are described in Section 7.6. Summaries of the impacts should the Proposed Action be based on 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 FY 2013 as appropriate.

Biological Impacts
The extension of the GOM cod and American plaice rebuilding plans will result in increased fishing mortality and slower stock rebuilding than would be the case under the No Action alternative. The revised specifications for white hake and GB yellowtail flounder 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 management measures to reduce catches of GB yellowtail flounder by small-mesh fisheries should their AM be triggered and prohibition on the landing of yellowtail flounder by LA scallop vessel.

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 GOM cod and American plaice rebuilding strategies and the specifications that would be higher under the preferred alternative than under No Action. The small-mesh fishery AM for GB yellowtail flounder could reduce fishing effort if triggered and reduce impacts to habitat.

Impacts on Endangered and Other Protected Species
When compared to recent fishing activity, the specifications that result from the preferred alternatives are likely to lead to negligible 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 these stocks that would not have any specifications under the No Action alternative, which could reduce fishing effort. The revised GOM cod and American plaice rebuilding strategies 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. The small-mesh fishery AM for GB yellowtail flounder could reduce fishing effort if triggered and reduce impacts to endangered and 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 several stocks and so most groundfish fishing activity would be curtailed. The preferred alternative would be expected to result in gross groundfish revenues for FY2014 predicted to be just over $55 million and all gross revenues on groundfish trips are predicted to be just under $71 million. This represents approximately a 26% reduction in all gross revenues on groundfish trips relative to

FY2012 and a 4% reduction relative to those predicted in FY2013. The economic impacts will not be uniformly distributed. The preferred alternatives for the management measures would lead to some positive economic benefits.

Social Impacts
In general, the preferred alternatives are likely to result in positive social benefits when compared to the No Action alternative and when compared to previous fishing years. The revised GOM cod and American plaice rebuilding strategies and preferred alternatives for the management measures would lead to some positive social benefits.

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 Gulf of Maine cod*. The No Action alternative would maintain fishing mortality (set at 75% FMSY) as implemented in FW 50 for FY 2014. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on incidental bycatch (i.e.., set as close to zero as possible) starting in 2015. The No Action alternative would not address this Magnuson-Stevens Act requirement to revise the rebuilding program because the stock was not making adequate rebuilding progress. In addition, the No Action alternative would maintain the current biennial review process.
    - *Rebuilding Strategy for American plaice*. The No Action alternative would maintain fishing mortality (set at 75% FMSY) as implemented in FW 50 for FY 2014. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on incidental bycatch (i.e.., set as close to zero as possible) starting in 2015. The No Action alternative would not address this Magnuson-Stevens Act requirement to revise the rebuilding program because the stock was not making adequate rebuilding progress. In addition, the No Action alternative would maintain the current biennial review process.
    - *Annual Catch Limit Specifications*. The No Action alternative would not adopt new specifications for Georges Bank yellowtail flounder and white hake. 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, FY 2014 quotas would not be specified for the transboundary Georges Bank stocks (Georges Bank yellowtail flounder, Eastern Georges Bank cod, and Eastern Georges Bank haddock), which are managed through the US/CA Resource Sharing Understanding.

- *Commercial and Recreational Fishery Measures:*
    - *Small-mesh Fishery Accountability Measures for Georges Bank Yellowtail Flounder*. The No Action alternative would not establish additional accountability measures (AMs) for the small-mesh fishery for Georges Bank (GB) yellowtail flounder under the Multispecies FMP. This alternative would not address the requirement to adopt sufficient AMs that would help prevent the small-mesh fishery from exceeding its allocation of GB yellowtail flounder, or that would mitigate an overage should one occur.

- *Management Measures for US/CA TACs*. The No Action alternative would not establish any changes to the management of US/CA TACs

- *Georges Bank Yellowtail Flounder Management Measures.* The No Action alternative would not make changes to the management measures for GB yellowtail flounder for estimating discards.

- *Possession of Yellowtail Flounder by the Limited Access Scallop Fishery.* The No Action alternative would maintain in the limited access scallop fishery that there be no trip limit for yellowtail flounder stocks (GB and SNE/MA) and limited access scallop vessels would continue to be required to land all legal-sized yellowtail flounder that is caught, as established in FW44 to the Groundfish FMP. Note that the retention does not apply to General Category/IFQ vessels.

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 significant impacts are highlighted below.

Biological Impacts
Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the GOM cod and American plaice strategies, 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
Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the GOM cod and American plaice strategies, 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 GOM cod and American plaice strategies, 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 GOM cod and American plaice strategies or adopt additional management measures. As a result, fishing vessel revenues on groundfish fishing trips would decline dramatically when compared to the preferred alternative or recent fishing years.

Social Impacts
Because the No Action alternatives would not adopt specifications for several stocks, and would not adjust the GOM cod and American plaice strategies or adopt additional management measures, 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.

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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
GARFO	Greater Atlantic Regional Fisheries Office
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

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, was the most recent amendment to adopt 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 are challenging various provisions of Amendment 16, including the amendment’s provisions related to sectors and some of the accountability measures.

Seven 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 (FW 48) was partially implemented on September 30, 2013; some measures in FW 48 are still in review. 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 50 was also implemented on September 30, 2013 which set specifications for many groundfish stocks and modified the rebuilding program for SNE/MA winter flounder. 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 was implemented on May 20, 2013.

This framework (Framework Adjustment 51, FW51) is primarily intended to meet regulatory requirements by modifying the rebuilding programs and setting specifications for some of the groundfish stocks. FW51 also would establish additional management measures related to U.S./Canada shared stocks and yellowtail flounder in the groundfish and scallop fisheries.

3.2 Purpose and Need for the Action

Under the Northeast Multispecies FMP the National Marine Fisheries Service (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 (Framework Adjustment 51, FW51) is primarily intended to meet regulatory requirements by modifying the rebuilding programs for Gulf of Maine cod and American plaice and setting specifications for white hake and stocks managed by the U.S./Canada Resource Sharing agreement (Eastern Georges Bank cod, Eastern Georges Bank haddock, and Georges Bank yellowtail flounder). FW51 also would establish an accountability measure for the Georges Bank yellowtail flounder sub-ACL in small-mesh fisheries, a mechanism to transfer quota between US and Canada shared stocks, a mechanism to transfer Eastern Georges Bank haddock quota to Western Georges Bank haddock quota, a revised discard strata for Georges Bank yellowtail flounder, and possession of yellowtail flounder in the scallop fisheries.

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.

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 51	***Corresponding Purpose for Framework 51***
Ensure that Gulf of Maine cod and American plaice are managed consistent with the status of stocks, the National Standard guidelines, and the requirements of the MSA	• Modification of the formal rebuilding program for Gulf of Maine cod • Modification of the formal rebuilding program for American plaice • Administrative measure to outline the steps to review the revised Gulf of Maine cod rebuilding plan • Administrative measure to outline the steps to review the revised American plaice rebuilding plan
Ensure that levels of catch for Fishing Years 2014-2016 are 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
Ensure that overfishing does not occur consistent with the status of stocks, and the requirements of MSA of 2006	• Measures to establish an accountability measure for the Georges Bank yellowtail flounder sub-ACL in small-mesh fisheries • Measure to provide a mechanism to transfer quota between US and Canada shared stocks, • Measures to establish a mechanism to transfer Eastern Georges Bank haddock quota to Western Georges Bank haddock quota, • Measures to revise the discard strata for Georges Bank yellowtail flounder • Measure to address the possession of GB and SNEMA yellowtail flounder in the limited access scallop fishery.

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 used 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. A detailed discussion of the history of the FMP up to 1994 can be found in Amendment 5 (NEFMC 1993).

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. Amendment 7 (NEFMC 1996), adopted in 1996, expanded the DAS program and accelerated the reduction in DAS first adopted in Amendment 5. After Amendment 7, there was a series of amendments and smaller changes (framework adjustments, FW) that are detailed in Amendment 13 (NEFMC 2003).

Amendment 13 was developed over a four-year period to meet MSA requirements such as adopting rebuilding programs for stocks that are overfished and ending overfishing. 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 had major changes to the FMP. It greatly expanded the sector program and implemented Annual Catch Limits in compliance with 2006 revisions to the M-S Act. There were 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 authorizes NOAA-sponsored state-operated permit banks and 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 was partially implemented on September 30, 2013; some measures are still in review. 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 50 was also implemented on May 1, 2013, and set specifications for many groundfish stocks and modified the rebuilding program for SNE/MA winter flounder. Framework 49 is a joint Northeast

Multispecies/Atlantic Sea Scallop action that modified the dates for scallop vessel access to the year-round groundfish closed areas; this action was implemented on May 20, 2013.

All prior 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.

3.5 Fishery Data Sources

This document includes fishery data from FY2009 to FY2012. This approach informs the analysis and provides a baseline for the public to better understand the operation of the r fishery. Some differences in totals between this analysis and prior analyses exist. These are due to updates to the source data and a minor modification to the sector membership algorithm. Sector membership is now based on MRI rather than vessel permit number. The MRIs within a sector do not change during a 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.

A "groundfish trip" is defined here as a trip where groundfish is landed, and either applied to a sector Annual Catch Entitlement (ACE) or to the common pool ACL. This definition differs from other methods of defining a groundfish trip that use a sector VMS declaration 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 here from VTRs, because it contains effort, gear, and positional data. Some of the data in this document, such as that concerning protected resources, is from the Northeast Fisheries Observer Program data set. It is important to note 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 NEFSC.

The EA analysis uses complete data sources. As such, trips with undefined gear, missing land dates, missing sector membership, and trips that did not submit a VTR were excluded. 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 four 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.

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4.0 Alternatives Under Consideration

4.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

4.1.1 Gulf of Maine Cod Rebuilding Strategy

4.1.1.1 Option 1: No Action

The current rebuilding strategy for Gulf of Maine (GOM) cod, adopted in Amendment 13, uses a fishing mortality target that is calculated to rebuild the stock by 2014 with a 50 percent (median) probability of success. The stock is unlikely to rebuild by that date in the absence of all fishing mortality and in 2012, the Council was notified that the current rebuilding strategy had not resulted in adequate progress towards rebuilding. As a result, section 304(e)(3) of the Magnuson-Stevens Act requires that a revised rebuilding program be implemented within 2 years for GOM cod. This No Action alternative would not address this Magnuson-Stevens Act requirement. If this option is adopted fishing mortality (set at 75% F_{MSY}) as implemented in FW 50 would be maintained in 2014. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on incidental bycatch (i.e.., set as close to zero as possible) starting in 2015.

4.1.1.2 Option 2: Revised Rebuilding Strategy for Gulf of Maine Cod (*Preferred Alternative*)

Two options are being considered for a revised rebuilding strategy for GOM cod. Both rebuilding options assume no changes to the FY 2014-2015 ABC (1,550 mt) that was previously recommended by the SSC, and adopted by FW 50.

<u>Sub-Option A</u>: This strategy would rebuild the stock in 8 years, with a 50 percent (median) probability of success by 2022. This strategy is developed to be more conservative compared to sub-Option B. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16.

<u>Sub-Option B (*Preferred Alternative*)</u>: This strategy would rebuild the stock in 10 years, with a 50 percent (median) probability of success by 2024. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16.

Rationale: Long-term projections have often proven to be unreliable and tend to be optimistic. There is also considerable uncertainty surrounding $F_{rebuild}$ estimates (and other reference points such as 75%F_{MSY}) due to the estimate's dependence on future recruitment, which is difficult to predict. As a result, basing an ABC on $F_{rebuild}$ is not desirable since it can quickly lead to dramatic reductions in the ABCs. As $F_{rebuild}$ approaches zero, it is less likely to be used for ABC determinations. To avoid the uncertainties associated with $F_{rebuild}$-based ABCs, the rebuilding strategies were designed so that $F_{rebuild}$ is greater than 75% F_{MSY}. $F_{rebuild}$ is defined as the constant harvest rate that will allow the stock to have a 50% chance of rebuilding within the specified time frame. During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16, which requires fishing at $F_{rebuild}$ or 75% F_{MSY}, whichever is lower. GOM cod requires at least eight years for $F_{rebuild}$ to remain above 75%F_{msy}. $F_{rebuild}$ was estimated to be below F_{MSY} with the maximum 10 year rebuilding plan. This program is designed to

use 75%F_{MSY} initially. However, if progress is not made, it is possible that $F_{rebuild}$ would become lower than 75% F_{MSY}, and catches would be set based on $F_{rebuild}$. There is little difference in the rebuilding time needed under the accepted base case or M-ramp model (M=0.2 in projections) for GOM cod; no reference points are available for the M-ramp model. However the catches estimated in the out years and the SSB_{MSY} are different between the models. The M-ramp projection assumes a change in M back to 0.2. The SARC 55 Panel concluded that if M is currently 0.4 then it seemed more reasonable to assume that in the short-term M would remain at 0.4 rather than reduce to 0.2. However, a change back to 0.2 is required to rebuild the stock. It is not known when M will change back to 0.2 in the future for the M-ramp formulation so interpretation and development of rebuilding plans using the M-ramp model is more difficult. For informational purposes if F=0, it would take 6 years to rebuild Gulf of Maine cod.

4.1.1.3 Option 3: Rebuilding Plan Review Analysis for Gulf of Maine Cod (*Preferred Alternative*)

If this option is selected, it must be selected in conjunction with an above option under 4.1.1.2 Option 2.

Sub-Option A: No Action: Under the current biennial review process, the PDT would use the most recent scientific information available to develop ABC recommendations based on the ABC control rule, the fishing mortality rate necessary to rebuild the stock, guidance from the SSC, and any other available information. In addition to developing ACLs for the upcoming fishing years, the PDT would also recommend other management options necessary to achieve the goals and objectives of the FMP.

Sub-Option B (*Preferred Alternative*): If this option is adopted, it would establish a rebuilding plan review analysis for use during the new rebuilding period for Gulf of Maine cod. This option is an administrative measure. The review analysis would occur only if all three of the following conditions are met: 1) the total ACL for the Gulf of Maine cod stock has not been exceeded during the new rebuilding plan, 2) new information indicates the Gulf of Maine cod stock is below its rebuilding trajectory, and subsequently 3) $F_{rebuild}$ falls below 75% F_{MSY}.

Under these conditions, the Council would task its appropriate body (e.g., Groundfish PDT, SSC) with providing new catch advice options for Gulf of Maine cod to aid decision-making, in priority order, that:

1) Consider extending the rebuilding program to the maximum 10 years if a shorter time frame was initially adopted;
2) Review biomass reference points; and
3) Provide F-rebuild ACLs under 1 and 2 (directly above), in addition to those based on the rebuilding plan adopted in FW51. However since biomass reference points would be reviewed but not necessarily changed, F-rebuild ACLs under 2 (directly above) may also remain unchanged.

Rationale: This measure outlines the administrative steps that would be taken to review the GOM cod rebuilding plan, should the specified conditions be met, in order to investigate why rebuilding has not occurred as expected. These types of analyses would likely already be completed under the current biennial review process, and not necessarily only when the above conditions are met. However, the administrative steps are not explicitly identified in the current biennial review process. The basis for such a review would be an assessment benchmark or update.

4.1.2 American Plaice Rebuilding Strategy

4.1.2.1 Option 1: No Action

The current rebuilding strategy for American plaice, adopted in Amendment 13, uses a fishing mortality target that is calculated to rebuild the stock by 2014 with a 50 percent probability of success. The stock is unlikely to rebuild by that date in the absence of all fishing mortality, and in 2012, the Council was notified that the current rebuilding strategy had not resulted in adequate progress towards rebuilding. As a result, section 304(e)(3) of the Magnuson-Stevens Act requires that a revised rebuilding program be implemented within 2 years for American plaice. This No Action alternative would not address this Magnuson-Stevens Act requirement. If this option is adopted fishing mortality (set at 75% F_{MSY}) as implemented in FW 50 would be maintained in 2014. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on incidental bycatch (i.e.., set as close to zero as possible) starting in 2015.

4.1.2.2 Option 2: Revised Rebuilding Strategy for American Plaice (*Preferred Alternative*)

Three options are being considered for a revised rebuilding strategy for American plaice. All three rebuilding options assume no changes to the FY 2014-2015 ABCs that were previously recommended by the SSC, and adopted by FW 50.

Sub-Option A: The rebuilding strategy would be to rebuild the stock in 7 years with a 50 percent (median) probability of success by 2021. This strategy is the most conservative compared to sub-Options B and C. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16.

Sub-Option B: The rebuilding strategy would be to rebuild the stock in 8 years with a 50 percent (median) probability of success by 2022. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16.

Sub-Option C (*Preferred Alternative*): The rebuilding strategy would be to rebuild the stock in 10 years with a 50 percent (median) probability of success by 2024. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ is greater than 75% F_{MSY}). During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16.

Rationale: Long-term projections have often proven to be unreliable and tend to be optimistic. There is also considerable uncertainty surrounding $F_{rebuild}$ estimates (and other reference points such as 75%F_{MSY}) due to the estimate's dependence on future recruitment, which is difficult to predict. As a result, basing an ABC on $F_{rebuild}$ is not desirable since it can quickly lead to dramatic reductions in the ABCs. As $F_{rebuild}$ approaches zero, it is less likely to be used for ABC determinations. To avoid the uncertainties associated with $F_{rebuild}$-based ABCs, the rebuilding strategies were designed so that $F_{rebuild}$ is greater than 75% F_{MSY}. $F_{rebuild}$ is defined as the constant harvest rate that will allow the stock to have a 50% chance of rebuilding within the specified time frame. During the rebuilding time period, catch advice would continue to be set consistent with the ABC Control Rule adopted in A16, which requires fishing at $F_{rebuild}$ or 75% F_{MSY} whichever is lower. American plaice requires at least seven years for $F_{rebuild}$ to remain above 75%F_{msy}. $F_{rebuild}$ was estimated to be below F_{MSY} with the maximum 10 year rebuilding plan. This program is designed to use 75%F_{MSY} initially. However, if progress is not made, it is possible that $F_{rebuild}$ would become lower than 75% F_{MSY}, and catches would be set based on $F_{rebuild}$. For informational purposes if F=0, it would take 4 years to rebuild American plaice.

4.1.2.3 Option 3: Rebuilding Plan Review Analysis for American Plaice (*Preferred Alternative*)

If this option is selected it must be selected in conjunction with an above option under 4.1.2.2 Option 2.

Sub-Option A: No Action: Under the current biennial review process, the PDT would use the most recent scientific information available to develop ABC recommendations based on the ABC control rule, the fishing mortality rate necessary to rebuild the stock, guidance from the SSC, and any other available information. In addition to developing ACLs for the upcoming fishing years, the PDT would also recommend other management options necessary to achieve the goals and objectives of the FMP.

Sub-Option B (*Preferred Alternative*): If this option is adopted, it would establish a rebuilding plan review analysis for use during the new rebuilding period for American plaice. This option is an administrative measure. The review analysis would occur only if three conditions were met: 1) the total ACL for the American plaice stock has not been exceeded during the new rebuilding plan, 2) new information indicates the American plaice stock is below its rebuilding trajectory, and subsequently 3) $F_{rebuild}$ falls below 75% F_{MSY}.

Under these conditions , the Council would task its appropriate body (e.g., Groundfish PDT, SSC) with providing new catch advice options for American plaice to aid decision-making, in priority order, that:

1) Consider extending the rebuilding program to the maximum 10 years if a shorter time frame was initially adopted;
2) Review biomass reference points; and
3) Provide F-rebuild ACLs under 1 and 2 (directly above), in addition to those based on the rebuilding plan adopted in FW51. However since biomass reference points would be reviewed but not necessarily changed, F-rebuild ACLs under 2 (directly above) may also remain unchanged.

Rationale: This measure outlines the administrative steps that would be taken to review the American plaice rebuilding plan, should the specified conditions be met, in order to investigate why rebuilding has not occurred as expected. These types of analyses would likely already be completed under the current biennial review process, and not necessarily only when the above conditions are met. However, the administrative steps are not explicitly identified in the current biennial review process. The basis for such a review would be an assessment benchmark or update.

4.1.3 Annual Catch Limits

4.1.3.1 Option 1: No Action

If the No Action is selected, the specifications for FY 2014-FY 2015 would remain as adopted by FW 50. For white hake, there would not be any specifications for these years. The FY 2014 - FY 2015 ABCs would be as specified in Table 1.

If this option is selected, there would be no FY 2014 quotas specified for the transboundary Georges Bank stocks, which are managed through the US/CA Resource Sharing Understanding. These quotas are specified annually.

Rationale: Because there would not be any specifications for some stocks under this action, 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 (4)	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non-Sector Ground-fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
GB Cod	2014	3,570	1,960	20	78	0	1,769		0	1,738	31	0	1,867
	2015	4,191	2,506	25	100	0	2,262		0	2,223	39	0	2,387
	2016												
GOM Cod	2014	1,917	1,550	103	51	0		830	486	812	18	0	1,470
	2015	2,639	1,550	103	51	0		830	486	812	18	0	1,470
	2016												
GB Haddock	2014	46,268	19,229	192	769	0	17,171		0	17,116	56	179	18,312
	2015	56,293	43,606	436	1,744	0	38,940		0	38,814	126	406	41,526
	2016												
GOM Haddock	2014	440	341	5	7	0		220	87	218	2	3	323
	2015	561	435	6	9	0		280	111	278	2	4	412
	2016												
GB Yellowtail Flounder	2014												
	2015												
	2016												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non_ Sector Ground-fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
SNE/MA Yellowtail Flounder	2014	1,042	700	7	28	66	564		0	469	95	0	665
	2015	1,056	700	7	28	64	566		0	471	95	0	665
	2016												
CC/GOM Yellowtail Flounder	2014	936	548	33	11	0	479		0	466	13	0	523
	2015	1,194	548	33	11	0	479		0	466	13	0	523
	2016												
American Plaice	2014	1,981	1,515	30	30	0	1,382		0	1,382	24	0	1,442
	2015	2,021	1,544	31	31	0	1,408		0	1,408	25	0	1,470
	2016												
Witch Flounder	2014	1,512	783	23	117	0	610		0	599	11	0	751
	2015	1,846	783	23	117	0	610		0	599	11	0	751
	2016												
GB Winter Flounder	2014	4,626	3,598	0	108	0	3,385		0	3,364	21	0	3,493
	2015												
	2016												
GOM Winter Flounder	2014	1,458	1,078	272	54	0	714.7		0	688.3	26.4	0	1,040
	2015												
	2016												
SNE/MA Winter Flounder	2014	3,372	1,676	235	168	0	1,210		0	1,074	136	0	1,612
	2015	4,439	1,676	235	168	0	1,210		0	1,074	136	0	1,612
	2016												
Redfish	2014	16,130	11,465	115	229	0	10,565		0	10,523	42	0	10,909
	2015	16,845	11,974	120	239	0	11,034		0	10,990	44	0	11,393
	2016												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non_ Sector Ground fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
White Hake	2014												
	2015												
	2016												
Pollock	2014	20,554	16,000	960	1,120	0	13,224		0	13,131	93	0	15,304
	2015												
	2016												
N. Window-pane Flounder	2014	202	151	2	44	0	98		0	0	98	0	144
	2015	202	151	2	44	0	98		0	0	98	0	144
	2016												
S. Window-pane Flounder	2014	730	548	55	186	183	102		0	0	102	0	527
	2015	730	548	55	186	183	102		0	0	102	0	527
	2016												
Ocean Pout	2014	313	235	2	21	0	197		0	0	197	0	220
	2015	313	235	2	21	0	197		0	0	197	0	220
	2016												
Atlantic Halibut	2014	180	109	44	5	0	57		0	0	57	0	106
	2015	198	119	48	6	0	62		0	0	62	0	116
	2016												
Atlantic Wolffish	2014	94	70	1	3	0	62		0	0	62	0	65
	2015	94	70	1	3	0	62		0	0	62	0	65
	2016												

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

If Option 2 is selected, the annual specifications for FY2014 through FY2015, and FY 2014 through FY 2016 for white hake would be as specified in Table 4. For all stocks, except white hake and the transboundary Georges Bank stocks, the specifications included in Table 4 are the values previously adopted in FW 50 and would be the same as those included in the No Action Alternative. Table 5 provides the preliminary common pool incidental catch TACs for Special Management Programs, based on the ACLs provided in Table 4, and Table 6 provides the Closed Area I Hook Gear Haddock SAP.

U.S./Canada TACs

This alternative would specify TACs for the U.S./Canada Management Area for FY 2014 as indicated in Table 2 below. If NMFS determines that FY 2013 catch of GB cod, haddock, or yellowtail flounder from the U.S./Canada Management Area exceeded the respective 2013 TAC, the U.S./Canada Resource Sharing Understanding and the regulations require that the 2014 TAC is reduced by the amount of the overage. Any overage reduction would be applied to the components of the fishery that caused the overage of the U.S. TAC in 2013. 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.

Table 2 – Proposed FY 2014 U.S./Canada TACs (mt) and Country Shares

TAC	Eastern GB Cod	Eastern GB Haddock	GB Yellowtail Flounder
Total Shared TAC	700 mt	27,000 mt	400 mt (Total ABC)
U.S. TAC	154 mt	10,530 mt	328 mt (US ABC)
Canada TAC	546 mt	16,470 mt	72 mt

A comparison of the proposed FY 2014 U.S. TACs and the FY 2013 U.S. TACs is shown in Table 3. Changes to the U.S. TACs reflect changes to the percentage shares, stock status, and the Transboundary Management Guidance Committee (TMGC) recommendations.

Table 3 – Comparison of the Proposed FY 2014 U.S. TACs and the FY 2013 U.S. TACs (mt)

Stock	U.S. TAC		Percent Change
	FY 2014	FY 2013	
Eastern GB cod	154 mt	96 mt	+ 60%
Eastern GB haddock	10,530 mt	3,952 mt	+166%
GB yellowtail flounder	328 mt	215 mt	+53%

Rationale: This measure would adopt new specifications for groundfish stocks that are consistent with the most recent assessment information. For all 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. Any catches below these levels would not mitigate economic impact on fishing communities.

The U.S. and Canada coordinate management of three stocks that overlap the boundary between the two countries on Georges Bank. Agreement on the amount to be caught is reached each year by the TMGC. This measure considers the recommendations of the TMGC that are consistent with the most recent assessments of those stocks.

Table 4 – Option 2 Northeast Multispecies OFLs, ABCs, ACLs and other ACL sub-components for FY 2014 – FY 2015 (metric tons, live weight). Values are rounded to the nearest metric ton. Sector shares based on 2013 PSCs. Only stocks that are underlined are proposed to be adjusted. Other stocks are provided for informational purposes. Grayed out values will be adjusted as a result of future recommendations of the TMGC.

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components (4)	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non-Sector Ground-fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
GB Cod	2014	3,570	1,960	20	78	0	1,769		0	1,738	31	0	1,867
	2015	4,191	2,506	25	100	0	2,262		0	2,223	39	0	2,387
	2016												
GOM Cod	2014	1,917	1,550	103	51	0		830	486	812	18	0	1,470
	2015	2,639	1,550	103	51	0		830	486	812	18	0	1,470
	2016												
GB Haddock	2014	46,268	19,229	192	769	0	17,171		0	17,116	56	179	18,312
	2015	56,293	43,606	436	1,744	0	38,940		0	38,814	126	406	41,526
	2016												
GOM Haddock	2014	440	341	5	7	0		220	87	218	2	3	323
	2015	561	435	6	9	0		280	111	278	2	4	412
	2016												
GB Yellowtail Flounder	2014	unknown	328		6.6	50.9	254.5		0	251.5	3.1	6.1	318.1
	2015												
	2016												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non_ Sector Ground-fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
SNE/MA Yellowtail Flounder	2014	1,042	700	7	28	66	564		0	469	95	0	665
	2015	1,056	700	7	28	64	566		0	471	95	0	665
	2016												
CC/GOM Yellowtail Flounder	2014	936	548	33	11	0	479		0	466	13	0	523
	2015	1,194	548	33	11	0	479		0	466	13	0	523
	2016												
American Plaice	2014	1,981	1,515	30	30	0	1,382		0	1,357	24	0	1,442
	2015	2,021	1,544	31	31	0	1,408		0	1,383	25	0	1,470
	2016												
Witch Flounder	2014	1,512	783	23	117	0	610		0	599	11	0	751
	2015	1,846	783	23	117	0	610		0	599	11	0	751
	2016												
GB Winter Flounder	2014	4,626	3,598	0	108	0	3,385		0	3,364	21	0	3,493
	2015												
	2016												
GOM Winter Flounder	2014	1,458	1,078	272	54	0	714.7		0	688.3	26.4	0	1,040
	2015												
	2016												
SNE/MA Winter Flounder	2014	3,372	1,676	235	168	0	1,210		0	1,074	136	0	1,612
	2015	4,439	1,676	235	168	0	1,210		0	1,074	136	0	1,612
	2016												
Redfish	2014	16,130	11,465	115	229	0	10,565		0	10,523	42	0	10,909
	2015	16,845	11,974	120	239	0	11,034		0	10,990	44	0	11,393
	2016												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non_ Sector Ground fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
White Hake	2014	6,082	4,642	46	93	0	4,278	-	0	4,247	30	0	4,417
	2015	6,237	4,713	47	94	0	4,343		0	4,312	31	0	4,484
	2016	6,314	4,645	46	93	0	4,280		0	4,250	30	0	4,420
Pollock	2014	20,554	16,000	960	1,120	0	13,224		0	13,131	93	0	15,304
	2015												
	2016												
N. Window-pane Flounder	2014	202	151	2	44	0	98		0	0	98	0	144
	2015	202	151	2	44	0	98		0	0	98	0	144
	2016												
S. Window-pane Flounder	2014	730	548	55	186	183	102		0	0	102	0	527
	2015	730	548	55	186	183	102		0	0	102	0	527
	2016												
Ocean Pout	2014	313	235	2	21	0	197		0	0	197	0	220
	2015	313	235	2	21	0	197		0	0	197	0	220
	2016												
Atlantic Halibut	2014	180	109	44	5	0	57		0	0	57	0	106
	2015	198	119	48	6	0	62		0	0	62	0	116
	2016												
Atlantic Wolffish	2014	94	70	1	3	0	62		0	0	62	0	65
	2015	94	70	1	3	0	62		0	0	62	0	65
	2016												

Table 5 – Option 2 Preliminary Common Pool Incidental Catch TACs for Special Management Programs (metric tons, live weight). These values may change as a result of changes in sector membership. White hake is no longer a stock of concern and has been removed.

Stock	Regular B DAS Program		Closed Area I Hook Gear Haddock SAP		Eastern U.S./Canada Haddock SAP	
	2014	2015	2014	2015	2014	2015
GB cod	0.3	0.4	0.1	0.1	0.2	0.3
GOM cod	0.2	0.2				
GB yellowtail flounder	0.03	-			0.03	-
CC/GOM yellowtail flounder	0.1	0.1				
American Plaice	1.2	1.2				
Witch Flounder	0.5	0.5				
SNE/MA winter flounder	1.4	1.4				

Table 6 – FY 2014-2015 CAI Hook Gear Haddock SAP TACs

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

4.2 Commercial and Recreational Fishery Measures

4.2.1 Small-Mesh Fishery Accountability Measures

4.2.1.1 Option 1: No Action

This option would not establish additional accountability measures (AMs) for the small-mesh fishery for Georges Bank (GB) yellowtail flounder under the Multispecies FMP. FW 48 adopted a sub-ACL of GB yellowtail flounder beginning in FY 2013. If the U.S. TAC (equal to the U.S. ABC) for GB yellowtail flounder is exceeded, the U.S./Canada Resource Sharing Understanding requires that the U.S. TAC for the following fishing year be reduced by the amount of the overage. The current regulations specify that this overage deduction would be applied to the component of the fishery that caused the overage. Under this option, if the small-mesh fisheries exceeded their allocation of GB yellowtail flounder, which caused an overage of the U.S. TAC, the small-mesh fishery sub-ACL would be reduced by the amount of the overage the following fishing year. However, because the small-mesh fisheries are prohibited from landing GB yellowtail flounder (discards only), a pound-for-pound reduction of the small-mesh fishery sub-ACL, by itself, may not appropriately correct an overage, or prevent future overages from occurring. Under this option, no corresponding measures would be triggered along with the pound-for-pound payback to constrain GB yellowtail flounder catches by the small-mesh fisheries. If the small-mesh fishery allocation was reduced to zero as a result of an overage payback, or if a quota was not specified for GB yellowtail flounder, there are no restrictions in place under this option that would prevent the small-mesh fisheries from fishing in the Georges Bank yellowtail flounder stock area (statistical areas 522, 525, 561, and 562). Under this option, there would also be no gear modification requirements for the small-mesh fishery in the Georges Bank yellowtail flounder stock area.

4.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder Sub-ACL (*Preferred Alternative*)

Two options (one with two sub-options) are being considered for the small-mesh fishery AM. None of these options alter the existing U.S./Canada Resource Sharing Understanding.

Sub-Option A: If the sub-ACL is zero (e.g., due to the pound-for-pound reduction under the US/Canada Understanding as described in Option 1/No Action) for the small-mesh fishery, or a sub-ACL is not specified, then vessels fishing with bottom otter trawl gear with a cod-end mesh size of less than 5 inches would be prohibited from fishing in the Georges Bank yellowtail flounder stock area (Statistical Areas 522, 525, 561 and 562). Because of the timing of availability of data for this fishery, the AM would be implemented in the fishing year following the notification of the overage.

Sub-Option B1: The AM would be implemented if both the total ACL and the small-mesh fishery sub-ACL for Georges Bank yellowtail flounder are exceeded. The AM would require that vessels fishing with bottom otter trawl gear with a cod-end mesh size of less than 5 inches to use approved selective trawl gear that reduces the catch of Georges Bank yellowtail flounder. Approved gears include the raised footrope trawl, separator trawl, rope trawl, Ruhle trawl, mini Ruhle trawl, or any 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). If the AM is implemented, selective trawl gear would be required in the Georges Bank yellowtail flounder stock area (Statistical Areas 522, 525, 561 and 562). The AM would not be implemented in the middle of a fishing year. Should reliable information be available that the total ACL and small-mesh fishery sub-ACL has been exceeded during a fishing year, this AM would be implemented at the start of the next fishing year (Fishing Year 2). However, if the information on an

overage for Fishing Year 1 is not available until after the start of Fishing Year 2, then the AM would be implemented at the start of Fishing Year 3. This would be a reactive AM.

Sub-Option B2 (*Preferred Alternative*): The AM would be implemented if the small-mesh fishery sub-ACL of Georges Bank yellowtail flounder is exceeded. The AM would require that vessels fishing with bottom otter trawl gear with a cod-end mesh size of less than 5 inches to use approved selective trawl gear that reduces the catch of Georges Bank yellowtail flounder. Approved gears include the raised footrope trawl, separator trawl, rope trawl, Ruhle trawl, mini Ruhle trawl, or any other gear authorized by the Council in a management action, or approved by the Regional Administrator through the gear-approval process defined in 50 CFR 648.85 (b)(6). If the AM is implemented, selective trawl gear would be required in the Georges Bank yellowtail flounder stock area (Statistical Areas 522, 525, 561 and 562). The AM would not be implemented in the middle of a fishing year. Should reliable information be available that small-mesh fishery sub-ACL has been exceeded during a fishing year, this AM would be implemented at the start of the next fishing year (Fishing Year 2). However, if the information on an overage for Fishing Year 1 is not available until after the start of Fishing Year 2, then the AM would be implemented at the start of Fishing Year 3. This would be a reactive AM.

Rationale: This AM would ensure that there are sufficient measures in place to reduce catch of GB yellowtail flounder in the small-mesh fisheries in order to mitigate an overage, and help prevent future overages from occurring. Adopting an AM for the small-mesh fisheries also ensures that overages caused by the small-mesh fisheries would not negatively impact other components of the fishery. Triggering the small-mesh fisheries AM based on an overage of the sub-ACL, regardless of whether the total ACL is exceeded, is consistent with how other fisheries are treated (with the exception of the scallop fishery's AM for GB yellowtail flounder). AMs linked to each sub-ACL of the fishery ensures that each component is held responsible for its catch of GB yellowtail flounder.

4.2.2 Management Measures for US/CA TACs

This section considers changing fishery management measures as necessary to adjust catches of US/CA stocks. More than one option can be selected.

4.2.2.1 Option 1: No Action

If this option is adopted, the U.S./Canada TACs would be specified at the beginning of the fishing year, and there would be no in-season adjustments to the U.S./Canada TACs. This option would not consider the quota trading mechanism established by the TMGC and U.S./Canada Steering Committee, and would not allow additional quota to be distributed to the U.S. at the end of the Canadian fishing year (December). Under this option, there would also be no adjustment to the amount of the U.S. TAC for eastern GB haddock that is allocated to the Eastern U.S./Canada Management Area. Eastern GB haddock is a sub-unit of the total GB haddock stock. The amount of the shared U.S./Canada TAC for eastern GB haddock is deducted from the total ABC for GB haddock. Under the current regulations, the U.S. share of eastern GB haddock can only be caught in the eastern U.S./Canada Management Area, and the remaining portion of the total ABC is only available outside of the eastern U.S./Canada Management Area.

4.2.2.2 Option 2: Revised in-season adjustment for US/CA TACs (*Preferred Alternative*)

If this option is adopted, the Regional Administrator would be allowed to adjust the US/CA quotas during the FY, i.e. after allocations were made. Additional quota would be allocated consistent with the current ABC distribution, which would include both groundfish and non-groundfish vessels (i.e., scallops and small-mesh fisheries). The RA would not have the authority to change the allocations to the sub-ACLs

during the FY. The RA's authority would be time limited and only exist for trades made by or before the end of the 2014 fishing year.

Prior to changing measures, the NMFS would consult with the Council and would advise the Council what measures were under consideration.

Rationale: The difference in fishing years between the two countries would require adjustments to occur in adjacent years. This measure would allow an adjustment to occur as soon as possible to the end of the Canadian fishing year, potentially providing additional quota for limiting US/CA stocks. The RA's authority would be time limited and only exist for trades made by or before the end of the 2014 fishing year, in order to determine if trades between the US and Canada are practical under this approach.

4.2.2.3 Option 3: Distribution of US TACs for Eastern/Western Georges Bank Haddock (*Preferred Alternative*)

Sub-Option A: If this option is adopted, the Regional Administrator, in consultation with the Council, would be allowed to adjust the portion of the U.S. TAC for Eastern GB haddock that is available in the Eastern U.S./Canada Area. To the extent possible, changes to the amount of GB haddock available in the Eastern U.S./Canada Area would be made prior to the start of the fishing year, and the Council would provide any recommendation concurrent with its recommendations for U.S./Canada TACs for the upcoming fishing year. Any changes would be adopted consistent with the Administrative Procedures Act. This option does not change how Eastern GB haddock stocks is allocated to sectors, or the requirement that vessels can only harvest Eastern GB haddock allocation from the Eastern U.S./Canada Area, while the remaining allocation may only be harvested outside of the Eastern U.S./Canada Area.

Rationale: GB haddock is a subset of the overall GB haddock stock. The total ABC for GB haddock includes the shared U.S./Canada TAC for the Eastern U.S./Canada Area. Under the current approach, only the amount of the GB haddock ABC remaining after deducting the shared TAC for Eastern GB haddock is available to be caught outside of the Eastern U.S./Canada Area. This reduces operational flexibility for commercial groundfish vessels, and could potentially limit fishing outside of the Eastern U.S./Canada Area even if the total GB haddock ACL has not been fully caught. This measure would help increase the use of the GB haddock ACL and improve flexibility for commercial groundfish vessels. Both common pool and sector vessels could be affected.

Sub-Option B (*Preferred Alternative*): A sector, or state-operated permit bank, may convert its Eastern GB haddock ACE to Western GB haddock ACE at any time during the fishing year, and up to 2 weeks into the following fishing year (unless otherwise instructed by NMFS) to cover any overage during the previous fishing year. The proposed ACE conversion will be referred to, and approved by, NMFS based on general issues, such as whether the applicant is complying with reporting or other administrative requirements, and, based on these factors, would notify the applicant if the conversion is approved or disapproved. The responsibility for ensuring that sufficient ACE is available to cover the conversion is the responsibility of the sector or permit bank. A GB haddock ACE conversion from the Eastern to Western U.S./Canada Area may only be made within a sector or permit bank, and not between sectors or permit banks. Once a portion of Eastern GB haddock ACE has been converted to Western GB haddock ACE by a sector or permit bank, that portion of ACE remains Western GB haddock ACE for the remainder of the fishing year. Western GB ACE may not be transferred to the Eastern US/Canada Area at any time.

Rationale: This measure provides additional flexibility to harvest GB haddock allocation. Eastern GB haddock is a sub-unit of the overall GB haddock stock, and the total ABC for GB haddock includes the

shared U.S./Canada TAC for the Eastern U.S./Canada Area. Sectors and state-operated permit banks receive two allocations of GB haddock ACE, an Eastern GB haddock ACE and a Western GB haddock ACE. Currently, Eastern GB haddock ACE can only be harvested in the Eastern U.S./Canada Area, and the remaining portion of a sector's total GB haddock allocation can only be caught in the Western U.S./Canada Area. This caps the amount of GB haddock that a sector can catch in the Eastern Area to ensure that the U.S. does not exceed its TAC for Eastern GB haddock. However, limiting the amount of haddock that could be caught in the Western area may unnecessarily reduce flexibility, and potentially limits fishing in the Western U.S./Canada Area even if a sector has not caught its entire allocation of GB haddock.

This measure does not jeopardize the total ACL for GB haddock, or the Eastern U.S. TAC. This measure does not change any existing sector requirements that a sector must cease operations in a stock area once its ACE is caught until it can acquire additional ACE through a transfer. This measure also does not change the existing ACE transfer provisions. Permit banks would also be allowed the same flexibility, consistent with how the Council has authorized permit banks to transfer ACE.

4.2.3 Georges Bank Yellowtail Flounder Management Measures

4.2.3.1 Option 1: No Action

If this option would be adopted, there would be no changes to the management measures for GB yellowtail flounder for estimating discards. When estimating discards of GB yellowtail flounder for the purposes of groundfish quota monitoring, if this option is adopted there would be one area used as the basis for discard monitoring. This area would match the existing stock boundaries for the stock. Further stratification would only be for sector, gear and mesh.

Rationale: This No Action option would not make any changes to existing measures that address GB yellowtail flounder. The area stratification scheme used for monitoring discards would be consistent with that used in the assessment of this stock.

4.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail Flounder (*Preferred Alternative*)

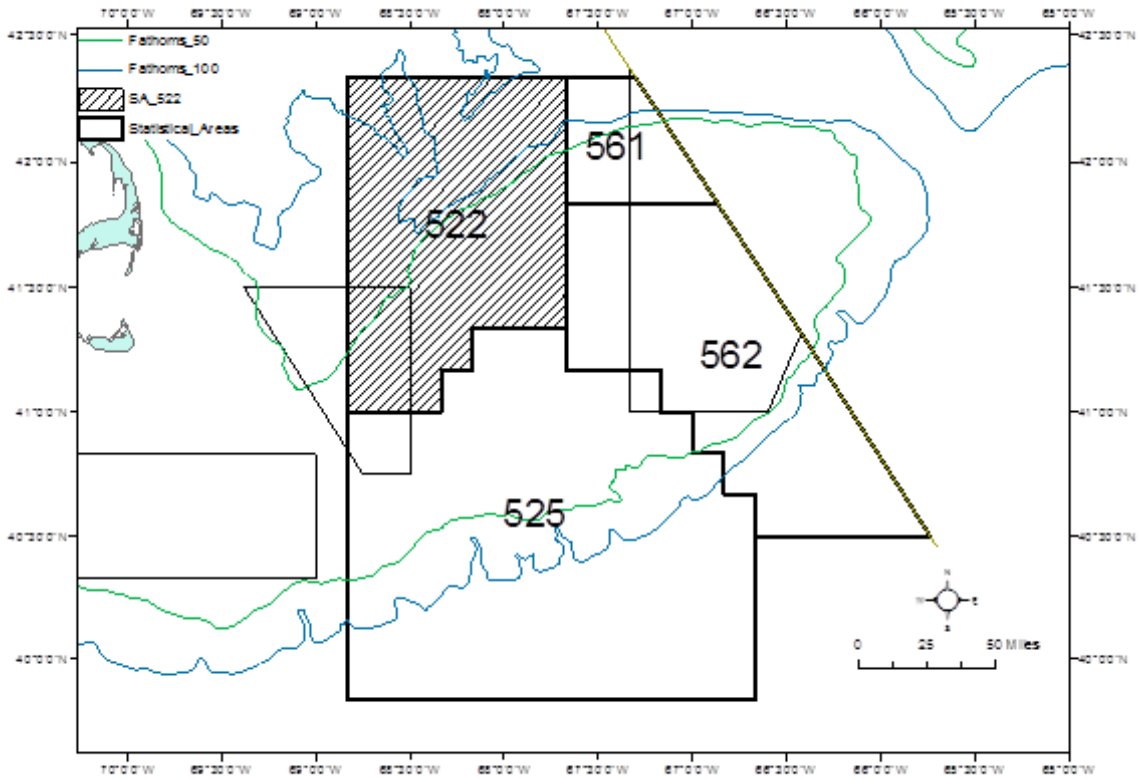
This option would modify the stratification used for estimating discards of GB yellowtail flounder for in-season quota monitoring of sector catches. It would not change the stratification used in assessments, nor would it change the stratification used to monitor common pool fishing trips. If adopted, yellowtail flounder discards on groundfish trips would be calculated for two different areas: statistical area 522 and all other GB yellowtail flounder statistical areas. The areas are shown in Figure 1.

This approach would be used for all groundfish gear. It would not change the stratification method for other groundfish stocks. Yellowtail flounder is primarily caught by trawl gear. If the Regional Administrator determines that this additional stratification is not needed for other, non-trawl gears, then the stratification method can be modified to exclude those gears using procedures consistent with the APA.

Rationale: Yellowtail flounder are primarily caught in the shallower waters of GB. SA 522 includes a large area of deeper water where groundfish vessels target haddock and other species. Catch rates of yellowtail flounder are lower in this area than in the other statistical areas. By treating this as a different discard stratum for yellowtail flounder, the discard rate of GB yellowtail flounder that is applied to unobserved trips will more accurately reflect what occurs in this area, and will not be

influenced by fishing activity in the other areas. This should allow more fishing in this area without exceeding allocations of GB yellowtail flounder. This is primarily an issue for trawl vessels, and the Regional Administrator can choose not to apply this approach to other gears if deemed unnecessary. This stratification scheme would not be adopted for common pool fishing trips because the small number of these trips would lead to inadequate trips to estimate an in-season discard rate.

Figure 1 – Proposed Change in Discard Strata for GB Yellowtail Flounder



4.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

4.2.4.1 Option 1: No Action

For limited access scallop fishery vessels, there would be no trip limit for yellowtail flounder stocks (GB and SNE/MA) and limited access scallop vessels will be required to land all legal-sized yellowtail flounder that is caught, as established in FW44 to the Groundfish FMP. Note that the retention does not apply to General Category/IFQ vessels.

Rationale: Due to concerns about discarding yellowtail flounder, this option would maintain accountability for catches of this stock and the disincentive to target yellowtail flounder.

4.2.4.2 Option 2: Prohibition on possession of yellowtail flounder (*Preferred Alternative*)

For limited access scallop fishery vessels, there would be zero possession of yellowtail flounder stocks (GB and SNE/MA). Under this option, yellowtail flounder could not be landed or sold by the limited access scallop fishery. This option would not change existing regulations for the General Category/IFQ vessels.

Rationale: Because of expected low quotas for GB yellowtail flounder, creating a prohibition on the possession of yellowtail flounder by the limited access scallop fishery would remove the incentive to target flounders since they could not be retained and sold. Compliance in the limited access fishery with respect to Option 1/No Action has been low thus expected beneficial impacts such as reduced yellowtail bycatch and improved data have likely been limited. In addition, there is some evidence that a very small number of limited access scallop vessels actually targeted yellowtail flounder under the requirement to land legal size yellowtail flounder.

5.0 Alternatives Considered and Rejected

5.1 Commercial and Recreational Fishery Measures

5.1.1 Commercial Fishery Restrictions

5.1.1.1 Option 1: No Action

If this action is adopted, there will be no revision to the regulations regarding landings of the allocated regulated groundfish currently managed. The following minimum fish size regulations would apply unless changed in this or a future action.

Table 7 - No Action Minimum Fish Sizes (TL) for Commercial Vessels

Species	Size (inches)
Cod	19 in. (48.3 cm)
Haddock	16 in. (40.6 cm)
Pollock	19 in. (48.3 cm)
Witch Flounder (gray sole)	13 in. (33 cm)
Yellowtail Flounder	12 in. (30.5 cm)
American Plaice (dab)	12 in. (30.5 cm)
Atlantic Halibut	41 in. (104.1 cm)
Winter Flounder (blackback)	12 in. (30.5 cm)
Redfish	7 in. (17.8 cm)

Rationale: Since implementation in 1986, the Northeast Multispecies FMP has used minimum size limits in conjunction with gear requirements to reduce catches of sub-adult fish. When adopted the purpose of this measure was to provide opportunities for fish to spawn before harvest, as well as to reduce the incentive to use illegal mesh to increase catches.

5.1.1.2 Option 2: Full Retention

If this action is adopted all allocated, currently regulated groundfish of all sizes, including cod, haddock, white hake, pollock, Acadian redfish, yellowtail flounder, Georges Bank and Gulf of Maine winter flounder, witch flounder, and American plaice, must be retained by sector vessels, i.e. no discarding of non-prohibited fish. Discarding of non-allocated groundfish species, including those that require no-retention as part of a rebuilding program would continue. Allocated regulated groundfish that are physically damaged, e.g. by predation, must be retained. This action would not alter regulated mesh areas or restrictions on gear and methods of fishing. This measure would not change possession requirements for other species that are regulated by other Fishery Management Plans.

This option would facilitate a reduction in the dependence on the assumed discard rate applied to sector vessels before a calculated discard rate is available. To ensure this option would convert discards to landings, catch accountability should be maximized. This could include one hundred percent dockside monitoring and one hundred percent at-sea monitoring in the form of at-sea monitors and/or electronic monitoring, if electronic monitoring is deemed sufficient.

It should be noted that this change would be made to reduce regulatory discards, not to facilitate targeting of smaller fish. As a result, while sectors would not be prohibited from requesting exemptions from minimum mesh requirements, the expectation is that before such a request would be approved a sector

would have to explain why such an exemption would not lead to increased targeting of juvenile groundfish.

Sub-Option A: If this sub-option is adopted it would establish full retention as outlined above on a subset of fishing vessels based on gear type. This program would require one hundred percent dockside monitoring and one hundred percent at-sea monitoring in the form of electronic monitoring and/or at-sea monitors.

Rationale: Electronic monitoring is considered an economical tool to monitor fishing activities but requires testing before broad scale application across gear types. This program would help to evaluate electronic monitoring as a primary tool for observing on a smaller portion of the fleet.

5.2 Small-Mesh Fishery Measures

5.2.1.1 Option 1: No Action

This option would not change existing pre-trip call-in requirements for small-mesh fisheries. Currently, the long-fin squid fishery (on trips landing more than 2,500 lbs) is required to use the Pre-Trip Notification System (PTNS). Beginning in January 2014, the mackerel fishery (through Amendment 14 to the Squid, Mackerel, and Butterfish Fishery Management Plan) would also be required to make a 48-hr pre-trip notification for all trips landing more than 20,000 lbs of mackerel). However, under this option, no other small-mesh fisheries (e.g., whiting) have any pre-trip notification requirements. Trips that target a mix of stocks (e.g., a mixed trip for whiting and greater than 2,500 lbs of long-fin squid) would be subject to a pre-trip notification requirement.

5.2.1.2 Option 2: Call-in Requirement for Small-Mesh Fisheries

This option would require small-mesh fisheries in the Georges Bank yellowtail flounder stock area (522, 525, 561,or 562) to request an observer prior to leaving the dock for a trip. This option would be in addition to any existing pre-trip call-in requirements for small-mesh fisheries.

Rationale: Small-mesh bottom trawl vessels fishing in the Georges Bank yellowtail flounder stock area would be subject to similar requirements of other fisheries being prosecuted in the same area. Requesting an observer prior to the start of a trip could be accomplished through PTNS. The vessel could not leave the dock until the vessel notified of intent to fish in the GB yellowtail flounder stock area, and received a response as to whether or not an observer would potentially be assigned to the trip. This option was considered to be more appropriately developed under the Whiting FMP.

5.3 Management Measures for US/CA TACs

5.3.1.1 Option 3: Revised in-season adjustment for US/CA TACs

If this option is adopted, the Regional Administrator would be allowed to adjust the US/CA quotas during the FY, i.e. after allocations were made. Additional quota would be distributed consistent with the sector sub-ACL distribution.

Prior to changing measures, the NMFS would consult with the Council and would advise the Council what measures were under consideration.

Rationale: The difference in fishing years between the two countries would require adjustments to occur in adjacent years. This measure would allow an adjustment to occur as soon as possible to the end of the Canadian fishing year, potentially providing additional quota for limiting US/CA stocks. This distribution scheme would consider traded quota as additional groundfish quota that contributes to solely to sector ACE. This Option would require an amendment and cannot be completed in this framework; the Council expects to address this under Amendment 18 to the Multispecies FMP.

5.3.1.2 Option 4: Revised in-season adjustment for US/CA TACs

If this option is adopted, the Regional Administrator would be allowed to make transboundary quota trades of groundfish quota only with components of the fishery trading away their quota. Any groundfish quota resulting from a trade with Canada would go only to the groundfish fishery.

Rationale: This option would ensure that individuals trading quota would directly receive quota in return. Both common pool and sector vessels could be affected by this trade. This Option would require an amendment and cannot be completed in this framework; the Council expects to address this under Amendment 18 to the Multispecies FMP.

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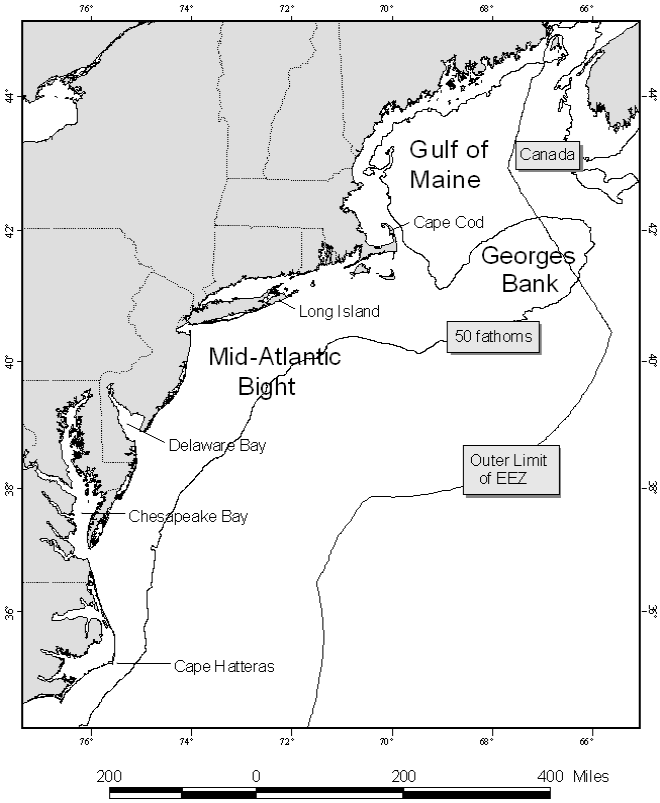
6.0 Affected Environment

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).

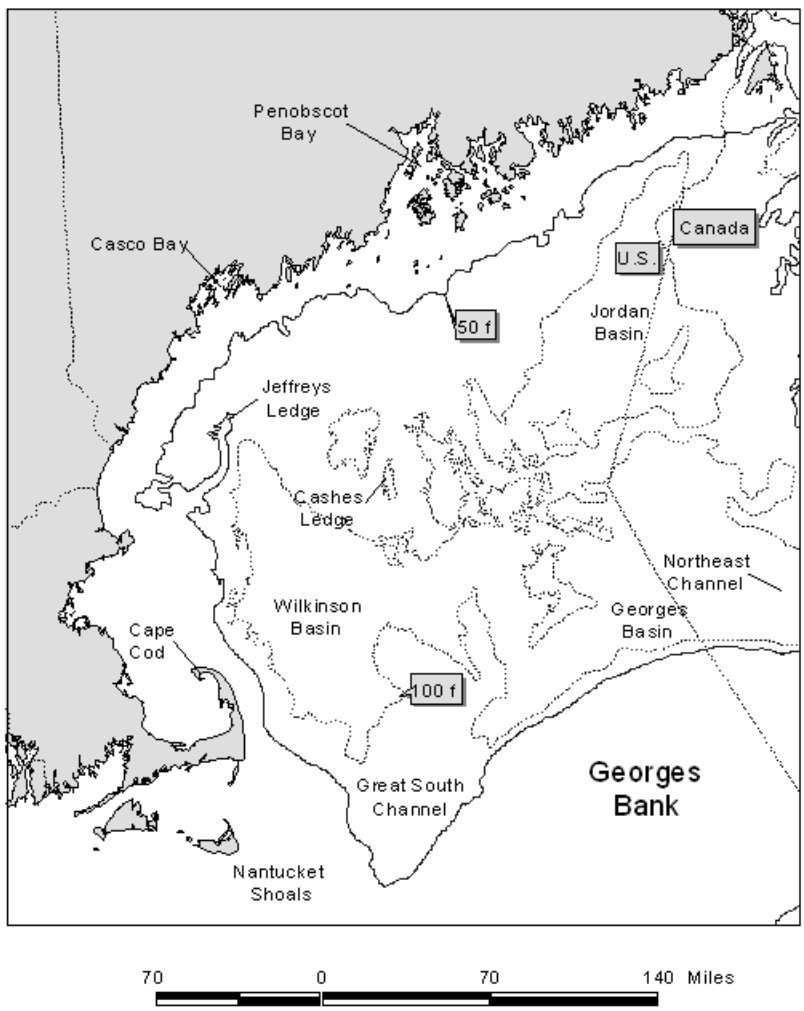
Figure 2 – Northeast U.S. Shelf Ecosystem



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. 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,[1] 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:[2] 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
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.

[1] 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.

[2] 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.

Two studies (Gabriel 1992; Overholtz & Tyler 1985) reported common[3] 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 & 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 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:

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

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 & 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 polychaetes 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.[4]

- 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.

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

6.1.4 Habitat requirements of groundfish (focus on demersal life stages)

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 8 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. EFH information for egg, juvenile, and adult life stages for these species was compiled from Stevenson et al. 2004 (Table 8). 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 8.

Table 8 – 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) (A): 33-492 ft. (10-150 m)	(J): Cobble or gravel bottom substrates (A): Rocks, pebbles, or gravel bottom substrate	Otter trawl, bottom longlines, gillnets
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) (A): 131-492 ft. (40-150 m)	(J): Pebble and gravel bottom substrates (A): Broken ground, pebbles, smooth hard sand, smooth areas between rocky patches	Otter trawl, bottom longlines, gillnets
Acadian redfish	Gulf of Maine, deep portions of Georges Bank and Great South Channel	Crustaceans	(J): 82-1,312 ft. (25-400 m) (A): 164-1,148 ft. (50-350 m)	(J): Bottom habitats with a substrate of silt, mud or hard bottom (A): Same as for (J)	Otter trawl
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) (A): 49-1,198 ft. (5-365 m)	(J): Bottom habitats with aquatic vegetation or substrate of sand, mud or rocks (A): Hard bottom habitats including artificial reefs	Otter trawl, gillnets
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) (A): 328-2,297 ft. (100-700 m)	(J): Bottom habitat with a substrate of sand, gravel or clay (A): Same as for (J)	Otter trawl bottom longlines
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, mollusks & 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 find 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)	
Winter flounder	Gulf of Maine, Georges Bank, Mid-Atlantic Bight/Southern New England	Polychaetes, crustaceans	(E): 16 ft. (<5 m) (J): 0.3-32 ft. (0.1-10 m) (3-164 age 1+) (1-50 m) (A): 3.2-328 ft. (1-100 m)	(J): Bottom habitats with a substrate of mud or fine grained sand (A): Bottom habitats including estuaries with substrates of mud, sand, gravel	Otter trawl, gillnets
Atlantic wolffish	Gulf of Maine &	Mollusks, brittle	(J): 131,2-787.4	(J): Rocky	Otter trawl,

	Georges Bank	stars, crabs, and sea urchins	ft. (40-240 m) (A): 131.2-787.4 ft. (40-240 m)	bottom and coarse sediments (A): Same as for (J)	bottom longlines, and gillnets
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) (A): 3.2-574 ft. (1-75 m)	(J): Bottom habitats with substrate of mud or fine grained sand (A): Same as for (J)	Otter trawl

6.1.5 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 surf clam 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 8 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.

6.1.6 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 2013 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.

6.1.6.1 Gear Types

Table 9 - Description of the gear types used by the multispecies fishery

	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/ Use Duration	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

6.1.6.1.1 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 2009).

6.1.6.1.2 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.

6.1.6.1.3 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.

6.1.6.1.4 Hook and Line Gear

6.1.6.1.4.1 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. Handlines 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.

6.1.6.1.4.2 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.

6.1.6.1.4.3 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.

6.1.6.2 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(ICES 2000). This report identified a number of possible effects of bottom otter trawls on benthic habitats and 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 <u>changes that are always permanent</u> 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 <u>changes that may be permanent</u> 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 (NRC 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 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 & Chuenpagdee 2003). This group evaluated the habitat effects of ten 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, so mobile gear vulnerability scores are the focus here in the exemption area analyses below.

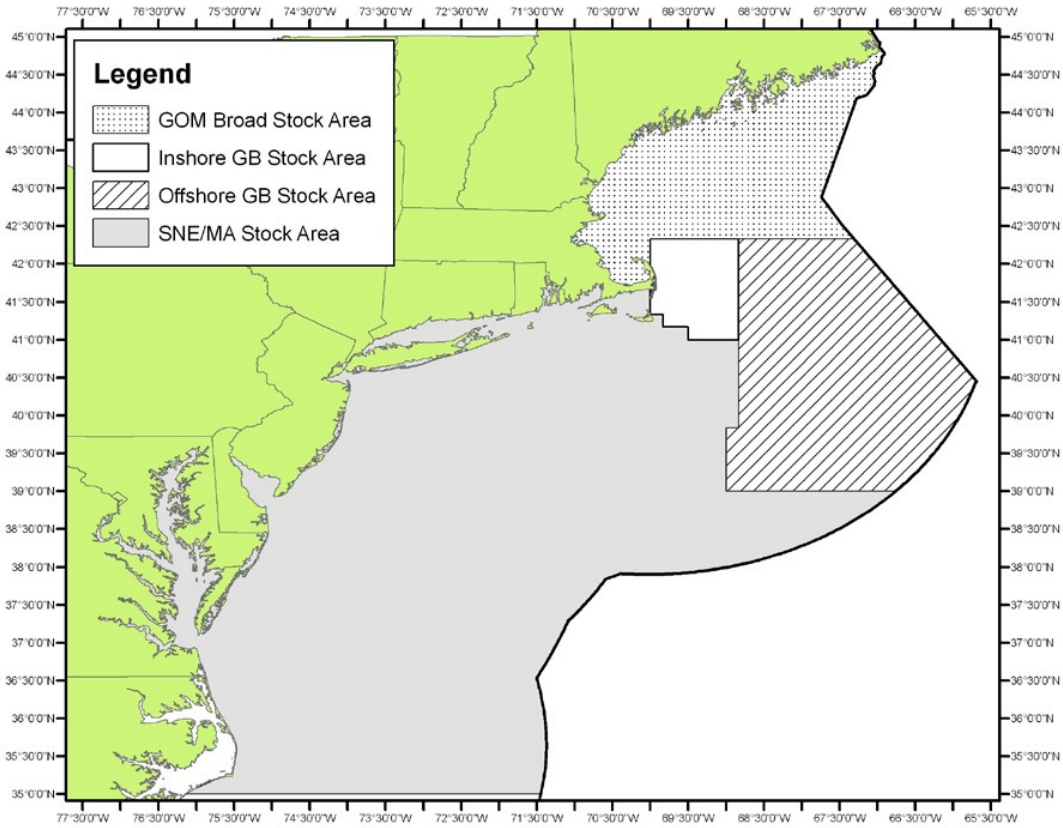
6.2 Groundfish Species

This section describes the life history and stock population status for each allocated fish stock the sectors harvest under the Northeast Multispecies FMP. Figure 16 identifies the four broad stock areas used in the fishery. Please refer to the species habitat associations described in Section 6.1.6 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 6.1.6.1) 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.noaa.gov/nefsc/habitat/efh/.

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 6.3. The Northeast Multispecies FMP does not 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 2009) 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. Currently, 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 10ºC).

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 (15ºC) 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 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°C) and peaks when temperatures are approximately 40 to 43 °F (4.5 to 6°C). 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 2013 assessment for white hake concluded the stock is not overfished and overfishing is not occurring (NEFSC 2013a).

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°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 2011b).

6.2.1.16 GOM/GB 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.

6.2.1.17 SNE/MAB 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.

6.2.1.18 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).

6.2.1.19 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).

6.2.1.20 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.

6.2.2 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 10 (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 10 vary slightly between the two studies. For further information on fish habitat relationships, see Table 8.

Table 10 - 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

6.2.3 Stock Status Trends

The most recent stock assessments for the 20 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 8 summarizes the status of the northeast groundfish stocks.

Table 11 - Status of the Northeast Groundfish Stocks for fishing year 2014

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) White Hake (GARM III,) Witch Flounder (assessment update) Northern Windowpane (operational assessment) GB Yellowtail Flounder (2012 TRAC)
Overfished but not Overfishing Biomass < ½ B_{MSY} and F ≤ 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 ≥ ½ B_{MSY} and F >	GOM Haddock (assessment update)
Not Overfished and not Overfishing Biomass ≥ ½ B_{MSY} and F ≤ 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)

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

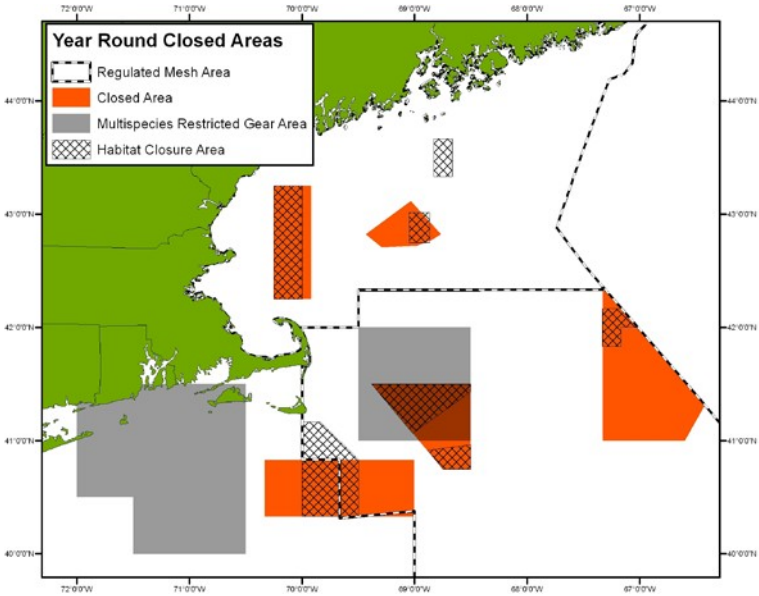
6.2.4 Areas Closed to Fishing

Select areas are closed to some level of fishing to protect the sustainability of fishery resources. Long- term closures result in the removal or reduction of fishing effort from important fishing grounds. Therefore, fishery related mortalities to stocks utilizing the closed areas should decrease. Figure 5 shows the Closed Areas for FY 2013.

Amendment 13 to the Northeast Multispecies FMP and Amendment 10 of the Atlantic Sea Scallop FMP established year-round habitat closed areas which are off-limits to all mobile, bottom-tending gear like trawls and dredges. These closures were designed to minimize the adverse effects of fishing on EFH for species managed by the NEFMC (Table 8). In many cases, these closed areas overlap portions of the groundfish mortality closures (see Figure 5). However, in other cases (Jeffreys Bank in the Gulf of Maine and the area southeast of Nantucket Island) they do not. NEFMC Omnibus EFH Amendment 2 is currently evaluating the closed habitat areas. Therefore, these areas may be changed or eliminated in the future. FW 48 allowed

sectors to request exemptions to the closed areas. In addition, portions of four submarine canyons on the outer continental shelf are closed to all bottom trawling in order to protect vulnerable habitats for tilefish. Detailed descriptions and maps of these areas are available in Amendment 1 to the MAFMC Tilefish FMP.

Figure 5 - Northeast Multispecies Closed Areas and U.S./Canada



6.2.5 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, fluke, whiting and 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.

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 (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 ("non-regulated 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). Amendment 19 established Annual Catch Limits, Accountability Measures, and updated stock status definitions. Both stocks of silver hake are not overfished and are not experiencing overfishing (NEFSC 2011a).

6.3.7 Longfin 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 longfin 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 20ºC (68ºF). 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 6.5.10.

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 the sectors. Table 16 shows that otter trawl gear caught the majority of non-allocated target species and bycatch between FY 1996 to FY 2006.

Table 12 – Landings (mt) for non-allocated target species and bycatch by gear type[a]

	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	2,646 [d]	151,505	491,280
Dogfish	24,368	61,914	72,712	39,852	--	--			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 1996-2006
[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 Porr 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 13, 17 marine mammal, sea turtle, and fish species are classified as endangered or threatened under the ESA, one other is a candidate species under the ESA. The remaining species in Table 13 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 document.

6.4.1 Species Present in the Area

Table 13 lists the species, protected either by the ESA, the MMPA, or both, that may be found in the environment utilized by sectors. Table 13 also includes one candidate fish species, as identified under the ESA.

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 13 - Species Protected Under the Endangered Species Act and/or Marine Mammal Protection Act that May Occur in the Operations Area for the FY 2014 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
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
Pinnipeds	
Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandicus*)	Protected
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.

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, 2013), 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. 2013), covering the time period between 2006 and 2010, 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 2.6 percent per year between 1990 and 2009. The total number of North Atlantic right whales is estimated to be at least 444 animals in 2009. The minimum rate of

annual human-caused mortality and serious injury to right whales averaged 3.0 mortality or serious injury incidents per year during 2006 to 2010. Of these, fishery interactions resulted in an average of 2.4 mortality or serious injury incidents per year, all in U.S. waters. The potential biological removal (PBR) level for this stock is 0.9 animals per year (Waring et al. 2013). The Potential Biological Removal (PBR) level is the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

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. The best estimate for the GOM stock of humpback whale population is 823 whales and current data suggest that the Gulf of Maine humpback whale stock is steadily increasing in size. The minimum rate of annual human-caused mortality and serious injury to humpback whales averaged 7.8 mortality or serious injury incidents per year during 2006 to 2010. Of these, fishery interactions resulted in an average of 5.8 mortality or serious injury incidents per year (5.2 from U.S. waters and 0.6 from Canadian waters). The PBR for this stock is 2.7 animals per year (Waring et al. 2013).

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 3,522 fin whales and 357 sei whales (Nova Scotia stock) (Waring et al. 2013) The best recent abundance estimate for sperm whales is the result of the 2011 survey – 1,593 (CV=0.36). The minimum population estimate for the western North Atlantic sperm whale is 1,187 (Waring et al. 2013). 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 2.0 mortality or serious injury incidents per year during 2006 to 2010. 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; Waring et al. 2013). The PBR for this stock is 5.6 animals per year. 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 (Waring et al. 2013). PBR for the Nova Scotia sei whale stock is 0.5 (Waring et al. 2013). For both fin and sei whales, these estimates are likely biased low due to the low detection rate for these species. During 2006-2010, annual average human caused mortality was 0.6 (Waring et al. 2013); sperm whales have not been documented as bycatch in the observed US Atlantic commercial fisheries. PBR for this stock is 2.4 animals per year (Waring et al. 2013).

Minke whales are not ESA-listed but are protected under the MMPA, with a minimum population estimate of 20,741 animals for the Canadian east coast stock (Waring et al. 2013). The minimum rate of annual human-caused mortality and serious injury averaged 5.0 per year during 2006 to 2010, and of these, 2.6 animals per year were recorded through observed fisheries and 1.0 per year were attributed to U.S. fisheries using stranding and entanglement data (Waring et al. 2013). PBR for this stock is 162 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. (2013) 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. 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. 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, they 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. Since pilot whales are difficult to differentiate at sea, they are generally considered *Globicephala* sp. when they are recorded at sea (Waring et al. 2013).

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. 2013). Their approximate year-round range extends from Nova Scotia, through the Bay of Fundy, and south through Maine to northern Massachusetts. 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. 2013). 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. 2013) year-round from Maine through southern Massachusetts. 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. 2013). 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; Waring et al. 2013). 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. 2013).

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).

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 (ASMFC 2007; Stein et al. 2004). Of these gear types, sink gillnet gear poses the greatest known risk of mortality for bycaught sturgeon. Sturgeon deaths were rarely reported in the otter trawl observer dataset , as well as sink gillnet and drift gillnet gear (ASMFC 2007).

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). 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 near shore 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% of the sturgeon in the water column along the tow path. Efficiencies less than 100% 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% are common for most species. The NEFSC's analysis also calculated estimates based on an assumption of 50% 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 scientific information for the status of Atlantic sturgeon at this time are the population estimates derived from NEAMAP swept area biomass (Kocik et al. 2013) because the estimates are derived directly from empirical data with few assumptions. NMFS has determined that using the median value of the 50% 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/uploads/file/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 (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 sectors 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 & 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).

Blue whales do not regularly occur in waters of the U.S. EEZ (Waring et al. 2011). 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 are no recent confirmed records of mortality or serious injury to blue whales in the IS Atlantic EEZ (Waring et al. 2011). 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 Preferred Alternatives 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. 2013). 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. 2013). 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. 2013). 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 in US Atlantic commercial fisheries between 2006 and 2010 (Waring et al. 2013). 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 14 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.

Table 14 – 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.

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.

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 15 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. 2013). Sink gillnets have the greatest potential for interaction with protected resources, followed by bottom trawls. There are no observed reports of interactions between groundfish bottom longline gear 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 15 - Marine Mammal Species and Stocks Incidentally Killed or Injured Based on Northeast Multispecies Fishing Areas and Gear Types (based on 2013 List of Fisheries)

Fishery Category	Fishery Type	Estimated Number of Vessels/Person	Marine Mammal Species and Stocks Incidentally Killed or Injured
Category I	Mid-Atlantic gillnet	5,509	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 Risso's dolphin, WNA Short-finned pilot whale, WNA White-sided dolphin, WNA
	Northeast sink gillnet	4,375	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 Long-finned Pilot whale, WNA Minke whale, Canadian east coast North Atlantic right whale, WNA Risso's dolphin, WNA Short-finned Pilot whale, WNA White-sided dolphin, WNA
Category II	Mid-Atlantic bottom trawl	631	Bottlenose dolphin, WNA offshore Common dolphin, WNA [a] Gray seal, WNA Harbor seal, WNA Long-finned pilot whale, WNA [a] Risso's dolphin, WNA Short-finned pilot whale, WNA [a] White-sided dolphin, WNA
	Northeast bottom trawl	2,987	Bottlenose dolphin, WNA

			offshore Common dolphin, WNA Gray seal, WNA Harbor porpoise, GOM/ Bay of Fundy Harbor seal, WNA Harp seal, WNA Long-finned pilot whale, WNA Minke whale, Canadian East Coast Short-finned pilot whale, WNA White-sided dolphin, WNA [a]
	Atlantic mixed species trap/pot [c]	3,467	Fin whale, WNA Humpback whale, GOM
Category III	Northeast/Mid-Atlantic bottom longline/hook-and-line	>1,207	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 16 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 16 - 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 - FY 2011 (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
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 17 and Table 18 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 19 and Table 20 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 17 - Estimated Marine Mammals Mortalities in the Northeast Sink Gillnet Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Harbor porpoise	06-10	511 (0.17)	706
Atlantic white-sided dolphin	06-10	38 (0.46)	304
Common dolphin (short-beaked)	06-10	30 (0.42)	529
Risso's dolphin	06-10	0	95
Western North Atlantic Offshore bottlenose dolphin	02-06	Unknown+	566
Harbor seal	06-10	280 (0.17)	Undetermined
Gray seal	06-10	794 (0.13)	Undetermined
Harp seal	06-10	218 (0.20)	Unknown
Hooded seal	01-05	25 (0.82)	Unknown

Source: Waring et al. (2009, 2011, 2013)

+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 18 - Estimated Marine Mammal Mortalities in the Mid-Atlantic Gillnet Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Harbor porpoise	06-10	275 (0.29)	706
Common dolphin (short-beaked)	06-10	8.4 (0.55)	529
Risso's dolphin	06-10	6.4 (0.73)	95
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 3.47 (0.30) min; 19.79 (0.11) max	7.9
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	0.61 (0.22) min; 1.22 (0.18 max Unknown+	566
Harbor seal	06-10	50 (0.34)	Undetermined
Harp seal	06-10	63 (0.46)	Unknown

Source: Waring et al. (2009, 2011, 2012, 2013)
+ 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 19 - Estimated Marine Mammal Mortalities in the Northeast Bottom Trawl Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Minke whale	06-10	2.6 (0.46)	162
Harbor porpoise	06-10	4.5 (0.30)	706
Atlantic white-sided dolphin	06-10	12 (0.45)	304
Common dolphin (short-beaked)	06-10	20 (0.13)	529
Pilot whales*	05-09	12 (0.14)	93 (long-finned); 172 (short-finned)
Harbor seal	06-10	0.8 (4 animals/5 years)	Undetermined
Gray seal	06-10	6 (30 animals/5 years)	Undetermined
Harp seal	06-08	0	Unknown

Source: Waring et al. (2012, 2013)

*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.

Table 20 - Estimated Marine Mammal Mortalities in the Mid-Atlantic Bottom Trawl Fishery

Species	Years Observed	Mean Annual Mortality (CV)	Total PBR
Atlantic white-sided dolphin	06-10	20 (0.09)	304
Common dolphin (short-beaked)	06-10	103 (0.13)	529
Pilot whales*	05-09	30 (0.16)	93 (long-finned); 172 (short-finned)

Source: Waring et al. (2012, 2013)

*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 2.6 (CV = 0.46) between 2006 and 2010 (Waring et al. 2013). 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 (Kocik et al. 2013) 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 was reinitiated NE multispecies fishery to analyze potential impacts to Atlantic sturgeon. The resulting December 2013 Biological Opinion (BO) concluded that the actions considered would not jeopardize the continued existence of any listed species, including all five DPSs of Atlantic sturgeon.

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 economic and social impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While it is possible that these impacts could be solely experienced by individual fishermen, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes.

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 and their homeports. Table 21 contains a summary of major trends in the groundfish fishery. Additional information may be found in the FY2010, FY2011, and FY2012 performance reports for this fishery by the NEFSC (Kitts et al. 2011; Murphy et al. 2014; Murphy et al. 2012).

Table 21 - Summary of major trends in the Northeast multispecies fishery

	FY2009	FY2010			FY2011			FY2012		
	Total	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool	Total	Sector Vessels	Common Pool
Groundfish Gross Nominal Revenue	$82,510,132	$83,177,330	$81,123,145	$2,054,184	$90,453,455	$89,603,929	$849,526	$69,778,174	$69,135,759	$642,414
Non-groundfish Gross Nominal Revenue	$180,396,477	$210,631,484	$115,682,739	$94,948,745	$240,364,488	$144,718,459	$95,646,029	$235,730,686	$140,108,099	$95,622,587
Total Gross Nominal Revenue	$262,906,608	$293,808,814	$196,805,885	$97,002,930	$330,817,943	$234,322,388	$96,495,555	$305,508,860	$209,243,859	$96,265,001
Groundfish average price	$1.21/lb	$1.43/lb	$1.43/lb	$1.58/lb	$1.47/lb	$1.47/lb	$1.64/lb	$1.51/lb	$1.51/lb	$1.79/lb
Non-groundfish average price	$0.97/lb	$1.21/lb	$1.19/lb	$1.24/lb	$1.14/lb	$1.13/lb	$1.16/lb	$1.11/lb	$1.07/lb	$1.17/lb
Number of active vessels	916	854	435	419	776	442	337	764	446	320
Number of active vessels that took a groundfish trip	566	445	303	142	419	302	117	401	304	97
Number of groundfish trips	25,897	13,474	11,190	2,284	15,958	13,679	2,279	14,496	12,943	1,553
Number of non-groundfish trips	37,173	38,489	16,527	21,962	33,675	16,795	16,880	32,523	17,090	15,433
Number of days absent on groundfish trips	24,605	18,401	16,796	1,605	21,465	19,963	1,502	19,935	18,964	971
Number of days absent on non-groundfish trip	31,606	31,352	16,022	15,330	27,997	15,484	12,513	28,632	16,189	12,442
Total Crew Positions	2,416	2,255			2,161			2,136		
Total Crew-trips	148,153	123,885			122,003			116,334		
Total Crew-days	187,219	169,939			169,417			167,620		

Notes: Data includes all vessels with a valid limited access multispecies permit. Sector plus common pool vessel counts may exceed the total vessel count because vessels may switch between sector and common pool eligibilities during the fishing year. "Trips" refer to commercial trips in the northeast Exclusive Economic Zone (EEZ). Past reports included party/charter trips. From Murphy et al. (2014).

6.5.1 The 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 caught primarily cod and haddock. Today, the Northeast Multispecies FMP (large-mesh and small-mesh) includes 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 shoreside 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) (NOAA 2007).

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 (NOAA 2007).

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 rule 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 FY2010, the NMFS Regional Administrator announced that, in addition to a previously stated 18% reduction in DAS, interim rules would be implemented to reduce fishing mortality during FY2009. 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
- Reduction in some groundfish allocations (NOAA 2009).

In 2007, the Northeast multispecies fishery included 2,515 permits. Of these, about 1,400 were limited access. There were about 660 vessels that actively fished. Those vessels include a range of gear types: hook, bottom longline, gillnet, and trawl (NEFMC 2009a). In FY2009, between 40 and 50 of these vessels were members of the GB Cod Sectors. The passage of Amendment 16, implemented in FY2010, ushered in a new era of sector management in the New England groundfish fishery. Since FY2010, over 50% of eligible northeast groundfish multispecies permits and over 90% of landings history has been associated. The remaining vessels were common pool groundfish fishing vessels.

Amendment 16 to the Northeast Multispecies FMP was implemented for the New England groundfish fishery starting on May 1, 2010, the start of the 2010 fishing year. There were 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.[5] Sectors received ACE for nine of 13 groundfish species (14 stocks + quotas for Eastern US/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, 17 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 enrolled in one of 16 sectors or one of two 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 FY2011, 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.

[5] 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.

In FY12, 60% of limited access permits enrolled in sectors. From FY2011 to FY2012, the number of groundfish limited access eligibilities belonging to a sector increased by 22, while the number of these permits in the common pool decreased by 36. 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 reflect the current system of catch share management.

6.5.2 Fleet Characteristics

The overall trend since the start of sector management has been a decline in the number of vessels with a limited access groundfish permit, at a low of 1,177 in FY2012 (Table 22). Of those vessels, those with revenue from at least one groundfish trip have also declined, with 401 in FY2012. The proportion of vessels affiliated with a sector has increased each year since FY2010. A key aspect of Amendment 16 is the ability of a sector to jointly decide how its ACE will be harvested, through redistribution within a sector and/or transferring ACE between sectors. Because inactive sector vessels may benefit if other sector vessels harvest their allocation, changes in the number of inactive vessels may result from a transfer of allocation and not necessarily vessels exiting the fishery. Since FY2010, 35-37% of the vessels were inactive (no landings). Of these inactive vessels, 64-69% were affiliated with sectors.

Table 22 - Number of vessels by fishing year

	FY2009	FY2010	FY2011	FY2012
	As of May 1 each Fishing Year:			
Total groundfish limited access eligibilities	1,464	1,441	1,422	1,408
Eligibilities held as Confirmation of Permit History	81	94	168	228
	During any part of the fishing year*:			
Total eligible vessels	1,459	1,409	1,321	1,223
Eligible vessels that did not renew a limited access groundfish permit	28	26	42	46
Vessels with a limited access groundfish permit	1,431	1,383	1,279	1,177
	While under a limited access groundfish permit:			
... those with revenue from any species**	916	854	776	764
... those with revenue from at least one groundfish trip	566	445	419	401
... those with no landings	515	529	503	413
Percent of inactive (no landings) vessels	(36%)	(38%)	(39%)	(35%)

Source: Murphy et al (2014, Table 10).
* On May 1st of the fishing year the number of vessels will equal to the number of eligibilities not in Confirmation of Permit History (CPH). Over time the number of vessels will differ from the number of eligibilities because these eligibilities can be transferred from vessel to vessel during the fishing year. These numbers exclude groundfish limited access eligibilities held as 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 data for either Sector or Common Pool.
**Active vessels in this report received revenue from any species while fishing under a limited access groundfish permit.

6.5.3 Effort

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 number of active vessels has declined each year since at least FY2009. This decline has occurred across all vessel size categories (Table 23). Since FY2009, the 30' to < 50' vessel size category, which has the largest number of active groundfish vessels, experienced a 32% decline (305 to 206 active vessels). The <30' vessel size category, containing the least number of active groundfish vessels, experienced the largest (53%) reduction since FY2009 (34 to 16 vessels). The vessels in the largest (≥75') vessel size category experienced the least reduction (9%) since FY2009.

Table 23 - Vessel activity by size class

	FY2009	FY2010	FY2011	FY2012
Vessels with landings from any species				
Less than 30	73	65	51	48
30 to < 50	478	455	398	396
50 to < 75	236	217	211	205
75 and above	129	117	116	115
Total	**916**	**854**	**776**	**764**
Vessels with at least one groundfish trip				
Less than 30	34	24	20	16
30 to < 50	305	240	216	206
50 to < 75	157	118	117	115
75 and above	70	63	66	64
Total	**566**	**445**	**419**	**401**

Source: Murphy et al. (2014, Tables 13 and 14).

Some of the proposed benefits of a catch share system of management are the potential efficiency gains associated with increasing operational flexibility (NOAA 2010). Being released from the former effort controls, but being held to ACLs, sector vessels were expected to increase their catch per unit effort by decreasing effort. Between 2009 and FY2010, the number of groundfish fishing trips[6] and total days absent on groundfish trips declined by 48% and 27%, respectively (Table 24).[7] During the second year of sector management, 2011, the number of groundfish fishing trips and total days absent on groundfish trips increased. Effort on groundfish trips generally decreased in FY2012. Vessels took fewer groundfish trips, with fewer total days absent of groundfish trips, though average trip length increased slightly over FY2011.

The groundfish fleet overall took fewer non-groundfish trips in FY2012 than they did in FY2009-FY2011, but those trips are longer than they were in FY2010 and FY2011 (Table 24). The total number of non-groundfish trips taken by the fleet in FY2012 was 32,523 trips, a four year low and 3.4% lower than in FY2011. However, for the fleet overall, the total number of days absent on non-groundfish trips in FY2012 was higher than it was in 2011, with 635 (2.3%) more days absent. Furthermore, although the

[6] "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.
[7] The data is taken from different source materials (VMS, etc.) than other data in this document, and thus, may be slightly different than.

total number of days absent was 9.4% fewer than 2009, the average trip length in 2012 was the same as 2009 (0.92 days per trip) and higher than in 2010 and 2011 (0.86 days per trip).

Table 24 - Effort by active vessels

	FY2009	FY2010	FY2011	FY2012
Number of trips				
groundfish	25,897	13,474	15,958	14,496
non-groundfish	37,173	38,489	33,675	32,523
Number of days absent on trips				
groundfish	24,605	18,401	21,465	19,935
non-groundfish	31,606	31,352	27,997	28,632
Average trip length*				
groundfish	0.96	1.37	1.35	1.38
(std. dev.)	(1.74)	(2.14)	(2.20)	(2.19)
non-groundfish	0.92	0.86	0.86	0.92
(std. dev.)	(1.66)	(1.56)	(1.52)	(1.62)

Source: Murphy et al. (2014, Table 15).

***This is the average trip length of all individual trips that have non-missing values for days absent. Since some trip records have missing values for days absent, average trip length reported here may be higher than what is obtained by dividing the overall number of days absent by the overall number of trips.

6.5.4 Landings and Revenue

Total groundfish landings on trips made by vessels possessing a limited access groundfish permit in FY2012 were 46.3M pounds, which is the lowest landings since at least FY2009 (Table 25, Table 26). 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 178.1M pounds in FY2010 to 213.8M pounds in FY2011, and remained fairly steady at 212.0M pounds in FY2012. Total landings of all species made by limited access vessels in the Northeast multispecies fishery was 258.3M pounds in FY2012. This compares to landings ranging from 236.4M – 272.9M pounds in the 2009–2011 fishing years. In FY2012, sector vessels accounted for 68% of all landings, 99% of groundfish landings, and 62% of non-groundfish landings.

Table 25 – Total landings and revenue from all trips by fishing year

	FY2009	FY2010	FY2011	FY2012
Landed Pounds				
Groundfish	68,416,222	58,178,065	61,661,450	46,295,753
Non-Groundfish	185,631,323	174,269,060	211,226,012	211,983,492
Total Pounds	254,047,546	232,447,125	272,887,462	258,279,245
Gross Revenue				
Groundfish	$82,510,132	$83,177,330	$90,453,455	$69,778,174
(in 2010 dollars*)	($83,386,467)	($83,177,330)	($88,658,472)	($67,252,170)
Non-Groundfish	$180,396,477	$210,631,484	$240,364,488	$235,730,686
(in 2010 dollars*)	($182,312,457)	($210,631,484)	($235,594,629)	($227,197,123)
Total Revenue	$262,906,608	$293,808,814	$330,817,943	$305,508,860
(in 2010 dollars*)	($265,698,924)	($293,808,814)	($324,253,101)	($294,449,293)

Source: Murphy et al. (2014, Table 2).
* Deflated by the calendar year 2010 Q2 GDP Implicit Price Deflator.

Table 26 - Total landings and nominal revenue from groundfish trips by fishing year

	FY2009	FY2010	FY2011	FY2012
Landed Pounds				
Groundfish	68,362,567	58,067,026	61,520,629	46,238,230
Non-Groundfish	30,965,367	23,147,600	28,781,804	27,527,755
Total Pounds	99,327,934	81,214,627	90,302,433	73,765,985
Gross Revenue				
Groundfish	$82,456,833	$82,964,771	$90,237,532	$69,669,582
Non-Groundfish	$25,862,188	$22,339,660	$31,826,744	$25,768,848
Total Revenue	$108,319,021	$105,304,431	$122,064,276	$95,438,430

Source: Murphy et al. (2014, Table 3).
* Deflated by the calendar year 2010 Q2 GDP Implicit Price Deflator.

During the first year of sector management, groundfish revenues from vessels with limited access groundfish permits in FY2010, were $83.2M (Table 25, Table 26). This was slightly lower than FY2009 revenues. In FY2011, the groundfish revenues from vessels with limited access groundfish permits were $90.4M. Groundfish revenue in FY2012 decreased to a four-year low of $69.8 million (22.9% lower than in 2011). Non-groundfish revenue decreased to $235.7 million (2% lower than in FY2011), but was still higher than in FY2009 and FY2010. In FY2012, sector vessels accounted for about 69% of all revenue earned by limited access permitted vessels. Sector vessels also earned 99% of revenue from groundfish landings and 59% of non-groundfish revenue.

6.5.5 ACE Leasing

Starting with allocations in FY2010, each sector was given an initial ACE determined by the pooled potential sector contribution (PSC) from each entity joining that sector. Every limited access groundfish permit also has a tracking identification number called a Moratorium Right Identifier (MRI). PSC is technically allocated to MRIs, which are subsequently linked to vessels through Northeast Multispecies limited access fishing permits. 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 FY2010, 282 sector-affiliated MRIs had catch that exceeded their individual PSC allocations for at least one stock. These vessels are then assumed to have leased in an additional 22M pounds of ACE and/or PSC with an approximate value of $13.5M. In FY2011, 256 sector-affiliated vessels had catch that exceeded their individual PSC allocations. These vessels are then assumed to have leased in 31M pounds of quota. Although the number of vessels leasing ACE fell by 9% the estimated number of pounds leased was almost 41% greater in FY2011 than in FY2010 (Murphy, et al. 2012). There were 241 sector-affiliated MRIs had catch that exceeded individual PSC allocations for at least one stock. These MRIs leased in >23M pounds of ACE and/or PSC in FY2012 (Murphy, et al. 2014)

6.5.6 Fishing Communities

There are over 100 communities that are homeport to one or more Northeast groundfish fishing vessels. These ports occur throughout the New England and Mid-Atlantic. Consideration of the economic and social impacts on these communities from proposed fishery regulations is required by the National Environmental Policy Act (NEPA 1970) and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA 2007). 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.

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 ports that may only have a small number of active vessels.

6.5.6.1 Primary and Secondary Fishing Ports

In recent amendments to the FMP (e.g., NEFMC 2009), communities dependent on the groundfish resource have been categorized into primary and secondary port groups, so that community data can be cross-referenced with other demographic information .

- ***Primary ports*** are those communities that are substantially engaged in the groundfish fishery, and which are likely to be the most impacted by groundfish management measures. Primary ports were selected based on groundfish landings greater than 1,000,000 lbs annually since FY1994 and/or the presence of significant groundfish infrastructure (e.g., auctions and co-ops). They have demonstrated a continued substantial engagement in the groundfish fishery.
- ***Secondary ports*** are those communities that may not be substantially dependent or engaged in the groundfish fishery, but have demonstrated some participation in the groundfish fishery since FY1994. Because of the size and diversity of the groundfish fishery, it is not practical to examine each secondary port individually, which is why most secondary ports are grouped with others in the same county or in geographically adjacent counties.

Using the above definitions provides a way to consider the impacts of management measures on every port in which some amount of groundfish has been landed since 1994, and identifies place-based fishing communities based on level of engagement. Because significant geographical shifts in the distribution of groundfish fishing activity have occurred, the characterization of some ports as "primary" or "secondary" may not reflect their historical participation in and dependence on the groundfish fishery. Descriptions of communities involved in the multispecies fishery, and further descriptions of Northeast fishing communities in general, can be found on Northeast Fisheries Science Center's website (NEFSC 2013b).

This action contains several alternatives that are specific to Gulf of Maine cod, plaice, white hake and the Georges Bank stocks (cod, haddock, yellowtail flounder). To help describe which port communities could be most affected by the stock-specific alternatives, Table 28 identifies the landings by homeport for FY2012, using the primary ports identified in Table 27. Gulf of Maine cod, plaice, and white hake are important to homeports throughout the Northeast, where as the Georges Bank stocks are important to the larger port communities, such as Portland, Boston, Gloucester, and New Bedford.

Table 27 - Primary and secondary multispecies port communities

Region	Multispecies Port Community	
	Primary	**Secondary**
Downeast ME	-	Jonesport, West Jonesport, Beals Island, Milbridge, Machias, Eastport, Dyers Bay
Upper Mid-Coast ME 1	-	Winter Harbor, Southwest Harbor, Bar Harbor, Northeast Harbor, Northwest Harbor
Upper Mid-Coast ME 2	-	Stonington, Sunshine/Deer Isle
Upper Mid-Coast ME 3	-	Rockland, St. George (Port Clyde), South Thomaston (Sprucehead), Owls Head, Friendship, Camden, Vinalhaven
Lower Mid-Coast ME 1	-	Bristol, South Bristol, Boothbay Harbor, East Boothbay (Boothbay), Breman (Medomak), Southport, Westport Island
Lower Mid-Coast ME 2	-	Sebasco Estates, Small Point, West Point, Five Islands, Phippsburg
Lower Mid-Coast ME 3	Portland	Cundys Harbor, Orrs Island, Yarmouth, Harpswell, East Harpswell, South Harpswell, Bailey Island, Cape Elizabeth
Southern Maine	-	York, York Harbor, Camp Ellis, Kennebunkport, Kittery, Cape Porpoise, Ogunquit, Saco, Wells
New Hampshire	Portsmouth	Rye, Hampton, Seabrook
North Shore MA	Gloucester	Rockport, Newburyport, Beverly, Salem, Marblehead, Manchester, Swampscott
South Shore MA	Boston	Scituate, Plymouth, Marshfield (Green Harbor)
Cape Cod MA	Chatham/ Harwichport	Provincetown, Sandwich, Barnstable, Wellfleet, Woods Hole, Yarmouth, Orleans, Eastham
Islands MA	-	Nantucket, Oak Bluffs, Tisbury, Edgartown
South Coast MA	New Bedford/ Fairhaven	Dartmouth, Westport
Western RI	Point Judith	Charlestown, Westerly, South Kingstown (Wakefield), North Kingstown (Wickford)
Eastern RI	-	Newport, Tiverton, Portsmouth, Jamestown, Middletown, Little Compton
Connecticut	-	Stonington, New London, Noank, Lyme, Old Lyme, East Lyme, Groton, Waterford
Long Island NY	Montauk/ Hampton Bays/ Shinnecock/ Greenport	Mattituck, Islip, Freeport, Brooklyn, Other Nassau and Suffolk Counties
Northern NJ	-	Point Pleasant, Belford, Long Beach/Barnegat Light, Barnegat, Highlands, Belmar, Sea Bright, Manasquan
Southern NJ	-	Cape May, Wildwood, Burleigh, Sea Isle City, Ocean City, Stone Harbor, Avalon

Table 28 - FY2012 landings (lbs.) of selected groundfish stocks by homeports

State	Port	GOM Cod	GB Cod East	GB Haddock East	GB Yellowtail Flounder	Plaice	White Hake
ME	Portland	172,610	6,126	126,510	254	574,938	1,290,823
	Other	441,965	0	0	0	256,778	766,516
NH	Portsmouth	170,360	c	c	0	6,098	129,001
	Other	451,550	0	0	0	27,928	84,527
MA	Boston	692,359	15,471	161,870	30,126	921,301	1,269,153
	Chatham/Harwichport	c	0	0	c	8,808	74,672
	Gloucester	1,646,086	5,357	54,581	3,073	305,527	973,713
	New Bedford/Fairhaven	105,227	45,504	178,859	284,578	571,794	448,681
	Other	744,294	c	85,902	c	179,792	158,355
RI	Point Judith	c	306	728	25,915	35,649	15,856
	Other	c	c	c	35,139	18,377	6,716
NY	Eastern Long Island	0	c	c	c	2,761	2,193
	Other	c	0	c	0	1,758	18,902
**Other		105,023	391	25,101	11,194	102,161	119,263
Total		***4,529,474**	***73,155**	***633,551**	***390,279**	**3,013,670**	**5,358,371**

Notes:
** = Includes states not listed and landings from CPH permits not attributed to a state.
c = Confidential, because less than three ownership groups are included.
* = Total does not include confidential data.
Data from NEFSC, November 2013.

6.5.6.2 Vessel Activity in Primary Ports

All states have shown a decline in the number of active vessels with revenue from any species since at least FY2009 (Table 29). In FY2012, Massachusetts had the highest number of active vessels with a limited access groundfish permit and also the highest number of active vessels with revenue from at least one groundfish trip (52%, 207 vessels) (Table 30). From FY2009 to FY2012, the total number of active vessels with revenue from at least one groundfish trip declined 29% (566 to 401). While all states showed a decline in the number of vessels making groundfish trips, the largest percentage decline occurred in New Jersey (-57%).

Table 29 - Number of vessels with revenue from any species (all trips) by homeport and state

Home Port State/City		FY2009	FY2010	FY2011	FY2012
CT		12	11	11	10
MA		459	423	378	375
	Boston	62	52	49	47
	Chatham	42	43	39	38
	Gloucester	110	105	91	92
	New Bedford	86	69	70	69
ME		112	102	88	95
	Portland	17	17	16	18
NH		53	50	46	41
NJ		61	56	49	47
NY		95	93	91	88
RI		93	86	83	77
	Point Judith	48	45	44	44
Other Northeast		34	36	34	37
Grand Total*		**916**	**854**	**776**	**764**

* Note: State vessel counts may exceed the grand total vessel count because vessels may change home port during the fishing year.

Table 30 - Number of vessels with revenue from at least one groundfish trip by homeport and state

Home Port State/City		FY2009	FY2010	FY2011	FY2012
CT		8	7	5	5
MA		310	238	224	207
	Boston	46	35	34	28
	Chatham	28	26	26	23
	Gloucester	97	74	70	61
	New Bedford	51	33	37	36
ME		64	43	47	51
	Portland	15	15	15	16
NH		40	32	29	25
NJ		26	21	17	11
NY		47	40	42	43
RI		61	55	49	54
	Point Judith	33	31	28	33
Other Northeast		12	10	8	6
Grand Total*		**566**	**445**	**419**	**401**

* Note state vessel counts may exceed the grand total vessel count because vessels may change home port during the fishing year.

6.5.6.3 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 (Clay et al. 2007; NMFS 2010; Olson & Clay 2001a; b; Thunberg 2007).

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.[8] 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. In FY2012, vessels with limited access groundfish permits provided 2,146 crew positions, with 49% coming from vessels with homeports in Massachusetts (Table 31). Since at least FY2009, the total number of crew positions provided by limited access groundfish vessels has declined by. Changes in crew positions vary across homeport states, with Maine adding a few positions in FY2012.

Table 31 - Number of crew positions and crew days on active vessels by homeport and state

Home Port State		FY2009	FY2010	FY2011	FY2012
CT	Total crew positions	40	36	42	39
	Total crew days	3,700	3,996	3,001	4,312
MA	Total crew positions	1,231	1,132	1,067	1,053
	Total crew days	95,685	82,066	84,119	81,430
ME	Total crew positions	266	247	221	242
	Total crew days	15,539	15,541	14,783	16,252
NH	Total crew positions	110	107	105	96
	Total crew days	5,407	3,909	4,974	5,085
NJ	Total crew positions	162	149	145	148
	Total crew days	10,865	10,086	9,898	10,292
NY	Total crew positions	219	209	217	209
	Total crew days	16,997	15,772	16,031	14,908
RI	Total crew positions	267	253	248	232
	Total crew days	26,411	26,786	25,130	24,017
Other Northeast	Total crew positions	129	130	128	128
	Total crew days	12,615	11,784	11,480	11,322
Total	**Total crew positions**	**2,424**	**2,262**	**2,173**	**2,146**
	Total crew days	**187,219**	**169,939**	**169,417**	**167,620**

A crew day[9] is another measure of employment opportunity that incorporates information about the time spent at sea earning a share of the revenue. 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 FY2012, vessels with limited access groundfish permits used 167,620 crew days, with 48% coming from vessels with homeports in Massachusetts (Table 31). Since at least FY2009, the total number of crew days used by limited access groundfish vessels across the Northeast has declined, though some states had an increase in crew days in FY2012.

[8] Crew positions are measured by summing the average crew size of all active vessels on all trips.
[9] Similar to a "man-hour," a "crew day" is calculated by multiplying a vessel's crew size by the days absent from port. Since the number of trips affects the crew-days indicator, the indicator is also a measure of work opportunity.

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 Consolidation and Redirection

The multiple regulatory constraints placed on common pool groundfish fishermen 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, 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 US 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 & 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 & Edwards 2009). The scope of consolidation and redirection of effort that may be expected to result from sector operations in FY2014 is difficult to predict.

6.5.8 Regulated Groundfish Stock Catch

The Northeast Multispecies FMP specifies Annual Catch Limits (ACLs) for 20 stocks. Exceeding an ACL for a stock 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 32 to Table 34 compare FY2012 catches to ACLs. As shown in Table 33, 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 FY2010 and FY2011. AMs for those stocks were modified in FW47. Table 34 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.

Table 32 - FY2012 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	1,724.1	1,621.7	1,593.0	28.656				21.5	80.9
GOM Cod	3,903.8	3,854.9	2,181.1	29.9	1,644.0			44.6	4.3
GB Haddock	1,525.5	1,197.6	1,197.1	0.5		288.6		14.2	25.1
GOM Haddock	530.0	526.7	245.1	0.9	280.7	0.1		1.7	1.6
GB Yellowtail Flounder	384.9	215.5	215.2	0.3			164.0	0.0	5.4
SNE/MA Yellowtail Flounder	593.5	463.0	425.6	37.4			54.0	12.0	64.6
CC/GOM Yellowtail Flounder	1,012.3	957.6	954.3	3.2				33.7	20.9
Plaice	1,642.8	1,604.7	1,601.4	3.3				15.3	22.8
Witch Flounder	1,174.0	983.3	981.0	2.3				28.2	162.5
GB Winter Flounder	2,057.6	1,931.7	1,930.9	0.8				0.0	125.9
GOM Winter Flounder	322.8	260.0	258.0	2.0				60.2	2.6
SNE/MA Winter Flounder	315.9	106.0	104.8	1.1				58.9	151.0
Redfish	4,445.4	4,429.0	4,423.4	5.6				13.4	3.1
White Hake	2,485.4	2,470.6	2,446.8	23.8				2.8	12.0
Pollock	8,092.4	6,462.5	6,394.7	67.8				532.3	1,097.6
Northern Windowpane	208.9	129.6	129.5	0.1				2.3	77.0
Southern Windowpane	520.9	106.5	95.9	10.6				34.4	380.0
Ocean Pout	53.2	39.1	35.4	3.6				1.2	13.0
Halibut	75.7	60.7	57.4	3.3				13.3	1.7
Wolffish	32.4	30.2	30.0	0.1				1.0	1.2

Notes:
Catch includes any FY2011 carryover caught by sectors in FY2012. Data as of Nov. 5, 2013, Northeast Regional Office. Values for a non-allocated species may include landings of that stock; misreporting of species and/or stock area; and/or estimated landings (in lieu of missing reports) based on vessel histories.
*Recreational estimates based on Marine Recreational Information Program (MRIP) data. **Landings extrapolated from observer data.

Table 33 – FY2012 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	26.9	26.1	26.0	35.4				42.2	39.7
GOM Cod	58.3	60.4	47.4	37.3	74.2			17.6	6.9
GB Haddock	1.1	0.0	-	0.6		100.9		4.6	2.0
GOM Haddock	47.3	49.3	25.9	18.6	108.4	0.6		11.1	7.1
GB Yellowtail Flounder	70.3	58.5	59.1	6.1			104.5	n/a	23.9
SNE Yellowtail Flounder	59.3	55.8	63.7	24.4			42.5	120.2	161.5
CC/GOM YTF	83.5	82.9	84.7	13.0				96.4	91.0
Plaice	38.8	39.7	40.3	6.1				42.5	15.7
Witch Flounder	67.4	59.6	60.3	10.5				57.5	246.2
GB Winter Flounder	53.4	52.6	52.9	3.9				n/a	67.0
GOM Winter Flounder	28.1	32.0	32.9	7.8				22.1	4.9
SNE/MA Winter Flounder	52.4	35.0	n/a	n/a				33.7	120.8
Redfish	42.1	44.2	44.3	16.6				14.5	0.8
White Hake	67.2	70.5	70.3	91.6				3.8	11.0
Pollock	45.5	40.3	40.0	82.7				70.6	80.1
Northern Windowpane	128.2	100.5	n/a	n/a				115.9	233.2
Southern Windowpane	136.7	147.9	n/a	n/a				88.3	140.7
Ocean Pout	22.2	18.3	n/a	n/a				38.5	56.3
Halibut	91.2	168.7	n/a	n/a				30.8	42.2
Wolffish	42.0	41.3	n/a	n/a				99.2	40.6

Notes:
Data as of Nov. 5, 2013, Northeast Regional Office.
* With the exception of GOM cod the percent of the FY 2012 catch limits caught does not include any FY 2011 carryover caught by sectors in FY 2012. FY 2011 carryover caught is not applied to the FY 2012 ACL. For 2012 year-end accounting, all sector carryover for GOM cod should be counted against the groundfish sub-ACL. As with all other stocks, do not apply sector carryover for GOM cod against a sector's ACE or the sector sub-ACL for in-season monitoring.
** To determine if recreational AM is triggered, the Regional Administrator must use the 3-year average catch compared to the 3-year average of the recreational sub-ACL for a stock.

Table 34 - FY2012 Catches by Non-Groundfish FMPs (Metric Tons, Live Weight)

Stock	Total	Scallop[1]	Fluke	Hagfish	Herring	Lobster/ Crab	Menhaden	Monkfish	Red Crab	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	-	-	-	-	-	-	-

Notes:
[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 FY2011 quotas.

Table 34– Cont.

Stock	Scup	Shrimp	Squid	Squid/ Whiting	Surf Clam	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	N/A*
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	

6.5.9 Fishery Sub-Components

6.5.9.1 Sector Harvesting Component

In FY2010, the sector vessels landed the overwhelming majority of the groundfish ACL. Each sector receives a total amount of fish it can harvest for each stock, its Annual Catch Entitlement (ACE). Since the ACE is dependent on the amount of the ACL in a given fishing year, the ACE may be higher or lower from year to year even if the sector's membership remains the same. There are substantial shifts in ACE for various stocks between FY2009 and FY2012 (Table 35). There has been a general decrease in trips, and catch for sector vessels, and 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.

Combined, 161M (live) pounds of ACE was allotted to the sectors in FY2011, but only 70M (live) pounds were landed. Of the 16 stocks allocated to sectors, the catch of 7 stocks approached (>80% conversion) the catch limit set by the ACE (Table 36). By comparison, the catch of only five stocks approached the catch limit set by the total allocated ACE in FY2010. The catch of white hake in FY2011 was particularly close to reaching the limit, with 98% of the white hake ACE being realized. As was the case in FY2010, 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 63M pounds (62%) of the uncaught ACE in FY2011.

Table 35 - Commercial groundfish sub-ACL, FY 2009 to FY 2012

Groundfish Stock	FY2009 TAC (lbs)	FY2010 ACL (lbs)	% Change 2009 to 2010	FY2011 ACL (lbs)	% Change 2010 to 2011	FY2012 ACL (lbs)	% Change 2011 to 2012
GB cod W	10,965,793	6,816,693	-37.84%	9,041,157	32.63%	9,795,138	8.34%
GB cod E	1,161,836	745,162	-35.86%	440,925	-40.83%	357,149	-19.00%
GOM Cod	23,642,373	10,068,512	-57.41%	10,637,304	5.65%	4,310,037	-59.48%
GB haddock W	171,861,356	62,725,923	-63.50%	46,164,798	-26.40%	45,322,632	-1.82%
GB haddock E	24,471,311	26,429,016	8.00%	21,252,562	-19.59%	15,167,804	-28.63%
GOM Haddock	3,448,030	1,818,814	-47.25%	1,715,196	-5.70%	1,439,619	-16.07
GB Yellowtail Flounder	3,564,875	1,814,404	-49.10%	2,517,679	38.76%	479,946	80.94%
SNE/MA Yellowtail Fl.	857,598	683,433	-20.31%	1,155,222	69.03%	1,675,513	45.04%
CC/GOM Yellowtail Fl.	1,895,975	1,717,401	-9.42%	2,072,345	20.67%	2,306,035	11.28%
Plaice	7,085,657	6,278,765	-11.39%	6,851,967	9.13%	7,226,753	5.47%
Witch Flounder	2,489,019	1,878,338	-24.53%	2,724,914	45.07%	3,192,294	8.34%
GB Winter Flounder	4,418,064	4,082,961	-7.58%	4,424,678	8.37%	7,467,057	68.76%
GOM Winter Flounder	835,552	348,330	-58.31%	348,330	0.00%	1,576,305	352.53%
Redfish	18,990,619	15,092,846	-20.52%	16,625,059	10.15%	18,653,483	10.40
White Hake	5,238,183	5,635,015	7.58%	6,556,548	16.35%	7,237,776	10.39%
Pollock	13,990,535	36,493,118	160.84%	30,758,895	-15.71%	27,804,700	-9.60%
Totals	**294,916,777**	**182,628,733**	**-38.07%**	**163,287,579**	**-10.59%**	**153,712,242**	**-5.86%**

Table 36 - Annual Catch Entitlement (ACE) and catch (Live lbs.)

	2010			2011			2012		
	Allocated ACE	**Catch**	**% caught**	**Allocated ACE***	**Catch**	**% caught**	**Allocated ACE***	**Catch**	**% caught**
Cod, GB East	717,441	562,610	*78%*	**431,334**	**357,578**	***83%***	350,835	148,576	*42%*
Cod, GB West	**6,563,099**	**5,492,557**	***84%***	9,604,207	6,727,837	*70%*	10,542,407	3,363,415	*32%*
Cod, GOM	**9,540,389**	**7,991,172**	***84%***	**11,242,220**	**9,561,153**	***85%***	9,008,557	4,808,408	*53%*
Haddock, GB East	26,262,695	4,122,910	*16%*	21,122,565	2,336,964	*11%*	15,126,216	806,562	*5%*
Haddock, GB West	62,331,182	13,982,173	*22%*	50,507,974	6,101,400	*12%*	51,898,296	1,832,577	*4%*
Haddock, GOM	1,761,206	819,069	*47%*	1,796,740	1,061,841	*59%*	1,599,136	540,299	*34%*
Plaice	6,058,149	3,305,950	*55%*	7,084,289	3,587,356	*51%*	7,771,254	3,530,494	*45%*
Pollock	35,666,741	11,842,969	*33%*	32,350,451	16,297,273	*50%*	30,670,586	14,097,873	*46%*
Redfish	14,894,618	4,647,978	*31%*	17,369,940	5,951,045	*34%*	19,933,122	9,751,824	*49%*
White hake	**5,522,677**	**4,687,905**	***85%***	**6,708,641**	**6,598,273**	***98%***	7,527,513	5,394,273	*72%*
Winter flounder, GB	4,018,496	3,036,352	*76%*	**4,679,039**	**4,241,177**	***91%***	7,752,484	4,256,996	*55%*
Winter flounder, GOM	293,736	178,183	*61%*	750,606	343,152	*46%*	1,590,301	568,828	*36%*
Witch flounder	**1,824,125**	**1,528,215**	***84%***	2,839,697	2,178,941	*77%*	3,409,459	2,162,678	*63%*
Yellowtail flounder, CC/GOM	1,608,084	1,268,961	*79%*	**2,185,802**	**1,743,168**	***80%***	**2,448,240**	**2,103,947**	***86%***
Yellowtail flounder, GB	**1,770,451**	**1,625,963**	***92%***	**2,474,662**	**2,176,921**	***88%***	802,654	474,540	*59%*
Yellowtail flounder, SNE	517,372	340,662	*66%*	**963,033**	**795,267**	***83%***	1,422,815	938,303	*66%*
Total	179,350,461	65,433,630	*36%*	172,111,201	70,059,346	*41%*	171,853,874	54,779,592	*32%*

Notes:
*includes carryover from the prior fishing year.
Stocks with > 80% ACE conversion highlighted in bold.
2010 and 2011 data from Murphy et al (Table 37, 2012). FY12 data from NERO.

6.5.9.2 Common Pool Harvesting Component

With the adoption of Amendment 16, most commercial 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 FY2012 (Table 32). The largest common pool catch (pollock, 67.8 mt) was only 0.8% of the total groundfish fishery catch of this stock. Common pool vessels caught 0.8% of the GOM cod and 0.2% of the GOM haddock groundfish fishery catch.

Common pool vessels with limited access permits landed 1.3M lbs. (landed lbs.) of regulated groundfish in FY2010, worth over $2M in ex-vessel revenues (Table 37). Landings declined to 518K lbs., worth about $850,000 in FY2011and declined again in FY2012 to 358K lbs., worth $642,000. Most common pool vessel groundfish fishing activity takes place in the state of Massachusetts. From FY2010 to FY2011, the activity from Maine ports declined dramatically and from FY2011 to FY2012 the decline can be seen in Massachusetts (Table 38). The primary ports for this activity over the last 4 years (FY2009-2012) are Gloucester, Portland, and New Bedford (Table 39)

Table 37 - Summary of common pool fishing activity

		A	C	D	E	HA	Total
FY2010	Permits landing groundfish	78	4	6	5	33	**126**
	Groundfish lbs. landed	1,256,311	1,843	2,012	596	35,367	**1,296,129**
	Groundfish revenues	$1,981,076	$4,727	$3,643	$682	$64,056	**$2,054,184**
FY2011	Permits landing groundfish	61	6	3	12	32	**115**
	Groundfish lbs. landed	401,715	31,844	2,836	1,990	80,441	**518,831**
	Groundfish revenues	$601,506	$62,408	$7,042	$2,634	$175,929	**$849,526**
FY2012	Permits landing groundfish	56	6		8	25	**98**
	Groundfish lbs. landed	281,212	52,955		1,954	22,251	**358,414**
	Groundfish revenues	$479,051	$109,630		$2,522	$51,132	**$642,414**

Notes: Confidential data excluded.

Table 38 - Common pool groundfish landings by state of trip (landed lbs.)

	FY2010	FY2011	FY2012
CT	1,574	2,561	1,579
MA	809,231	372,282	169,662
MD		88	375
ME	344,783	49,559	49,260
NC	315		
NH	6,547	25,912	26,634
NJ	13,128	19,060	20,628
NY	94,900	37,115	58,331
RI	24,712	12,248	31,944
VA	916		
Total	**1,296,106**	**518,825**	**358,414**

Note: Confidential data removed

Table 39 - Common pool groundfish landings by port (landed lbs.)

Port	FY2010	FY2011	FY2012
Gloucester, MA	372,481	260,347	150,405
Portland, ME	333,852	40,520	34,054
New Bedford, MA	278,221	39,884	8,248
Provincetown, MA	100,952	51,561	2,116
Montauk, NY	75,460	17,894	54,212
Sandwich, MA	40,385	2,666	0
Point Judith, RI	3,478	4,708	13,161
Little Compton, NY	20,787	7,478	15,952
Hampton Bays, NY	13,512	6,807	3,770
Plymouth, MA	4,527	4,444	0
Rye, NH	1,491	20,304	21,845
Point Pleasant, NJ	9,043	16,932	15,195

The primary groundfish stocks landed by common pool vessels include GOM cod, GB cod, and pollock (Table 40). GB haddock was an important component in FY2010 but not in FY2011 or FY2012. 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 FY2010 or FY2011, groundfish revenues were a major portion of revenues on groundfish fishing trips. Groundfish revenues were 80% or more of the trip revenues for 49% of these vessels; they were 60% of the revenues for 61.5% of these vessels. Dependence on groundfish was greatest for HA permitted vessels, with 70% of these vessels earning all revenues on these trips from regulated groundfish.

Table 40 - Common pool landings (landed lbs.) by permit category and stock

FY2010 Landings	A	C	D	E	HA	Total
GB Cod W	109,582	1,120	1,269		6,179	118,150
GOM Cod	350,947	651			17,048	368,646
GB Haddock W	177,033				202	177,235
GOM Haddock	12,257				995	13,252
GB Yellowtail Flounder	17,260					17,260
SNE Yellowtail Flounder	32,901			596		33,497
CC/GOM Yellowtail Flounder	35,969				245	36,214
Plaice	48,020				112	48,133
Witch Flounder	57,158					57,158
GB Winter Flounder	13,011					13,011
GOM Winter Flounder	45,172				250	45,423
SNE Winter Flounder	4,646					4,646
Redfish	14,007				763	14,769
White Hake	68,756				139	68,894
Pollock	265,840		730		9,156	275,726
Southern Windowpane	3,566					3,566
Halibut	162				255	417
Wolffish	3					3
Total	**1,256,290**	**1,771**	**1,999**	**596**	**35,344**	**1,296,000**
FY2011 Landings	**A**	**C**	**D**	**E**	**HA**	**Total**
GB Cod W	102,450	3,186	168		15,577	121,382
GB Cod E	3,340					3,340
GOM Cod	53,984	18,816	2,666		54,982	130,448
GB Haddock W	33,053				85	33,138
GOM Haddock	1,945	161			763	2,869
GB Yellowtail Flounder	3,944			1,521		5,465
SNE Yellowtail Flounder	25,272					25,272
CC/GOM Yellowtail Flounder	23,408	66		19		23,493
Plaice	10,213	686				10,899
Witch Flounder	9,448	972				10,420
GB Winter Flounder	2,411					2,411
GOM Winter Flounder	5,257	374				5,631
SNE/MA Winter Flounder	816					816
Redfish	7,208	38			147	7,393
White Hake	19,901	2,890			177	22,968
Pollock	89,533	4,653			7,644	101,830
Northern Windowpane	850					850
Southern Windowpane	8,607					8,607
Halibut					1,065	1,065
Total	**401,640**	**31,842**	**2,834**	**1,540**	**80,441**	**518,297**

FY2012 Landings	A	C	D	E	HA	Total
GB Cod W	38,725	266			9,428	48,419
GOM Cod	13,209	22,379	16		8,983	44,587
GB Haddock W	13,373					13,373
GOM Haddock	1,117	420			470	2,007
GB Yellowtail Flounder	758			1,550		2,308
SNE Yellowtail Flounder	77,293			285		77,578
CC/GOM Yellowtail Flounder	876	799				1,675
Plaice	4,028	1,443				5,471
Witch Flounder	3,671	795				4,466
GB Winter Flounder	1,626					1,626
GOM Winter Flounder	669	1,775				2,444
SNE Winter Flounder	278					278
Redfish	11,678	253			25	11,956
White Hake	19,936	10,586			160	30,682
Pollock	92,614	14,221			3,122	109,957
Southern Windowpane	940					940
Ocean Pout		18				18
Halibut	218					218
Total	**281,010**	**52,955**	**16**	**1,835**	**22,188**	**358,004**

6.5.9.3 Recreational Harvesting Component

The recreational fishery includes private anglers, party boat operators, and charter vessel operators. Several groundfish stocks are targeted by the recreational fishery, including GOM cod, GOM haddock, pollock, and GOM winter flounder. GB cod and haddock are targeted as well, but to a lesser extent. 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.

Recreational removals of GOM cod declined by 72% from FY2011 to FY2012, but then increased slightly in FY2013. Removals of GOM haddock were more equivalent through the time series. The number of angler trips also declined by about 30% (Table 41). There were 122 active party or charter vessels catching cod or haddock in the Gulf of Maine in 2013, down from of 188-195 vessels between 2004-2010.

Table 41 - Recent recreational fishing activity for GOM cod and GOM haddock

	FY2011	**FY2012**	**FY2013**
Angler Trips	235,343	182,999	225,624
Cod Total Catch (numbers, a+b1+b2)	1,389,408	846,655	879,366
Cod Removals (numbers, a+b1+(0.3*b2)))	773,085	410,231	491,568
Cod Removals (weight, mt)	2,116	596	706
Haddock Total Catch (numbers, a+b1+b2)	184,709	369,427	654,227
Haddock Total removals (numbers, a+b1)	146,042	166,610	146,976
Haddock Total Removal (weight, mt)	231	211	256

Note: FY2013 catches are an estimate since not all data are available.

Table 42 - Recreational vessels catching cod or haddock from the Gulf of Maine

Calendar Year	Party	Charter	Total
1999	53	100	153
2000	48	103	151
2001	59	116	175
2002	43	130	173
2003	53	128	181
2004	64	124	188
2005	60	135	195
2006	62	126	188
2007	52	133	185
2008	54	128	182
2009	48	131	179
2010	60	135	195
2011	47	128	175
2012	44	108	152
2013	31	89	120

Notes: Includes catch (kept and discarded) from any of the Gulf of Maine statistical areas.
Source: NERO, January 2014.

6.5.10 Atlantic Sea Scallop Fishery

Framework 51 includes an alternative that would prohibit the possession of yellowtail flounder by the limited access scallop fishery. This section provides background information in terms of landings, revenues, permits, vessels and various ports and coastal communities in the Northeast sea scallop fishery. See Appendix I of Framework 24 to the Scallop FMP for more information. Unless otherwise indicated, all the tables included are sourced from that document.

The Scallop FMP was implemented in 1982 and limited entry followed in 1994 (Amendment 4). In the FY2002-2011, the landings from the northeast sea scallop fishery stayed above 50M pounds, surpassing the levels observed historically (Figure 6). The recovery of the scallop resource and consequent increase in landings and revenues was striking given that average scallop landings per year were below 16M pounds during the 1994-1998 fishing years, less than one-third of the present level of landings.

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 43).

Table 43 - Scallop permits by unique right-id and category by application year

Permit category	2009-2012
Full-time	250
Full-time small dredge	52
Full-time net boat	11
Total full-time	**313**
Part-time	2
Part-time small dredge	32
Part-time trawl	0
Total part-time	**34**
Occasional	0
Total Limited access	**347**

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 2012, there were 278 LAGC IFQ permits, 96 NGOM and 279 incidental catch permits in the fishery totaling 653 permits including those LA vessels that also have a limited access general category permit (Table 44). 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, FW 24).

Table 44 - LAGC permits, 2009-2012

Permit Category	Application Year	LA and LAGC permit	LAGC permit only	Grand Total
IFQ	2009	41	303	344
	2010	40	293	333
	2011	41	247	288
	2012	41	237	278
NGOM	2009	28	99	127
	2010	28	94	122
	2011	27	76	103
	2012	27	69	96
Incidental	2009	116	185	301
	2010	113	172	285
	2011	114	165	279
	2012	117	162	279
Grand Total		**733**	**2102**	**2835**

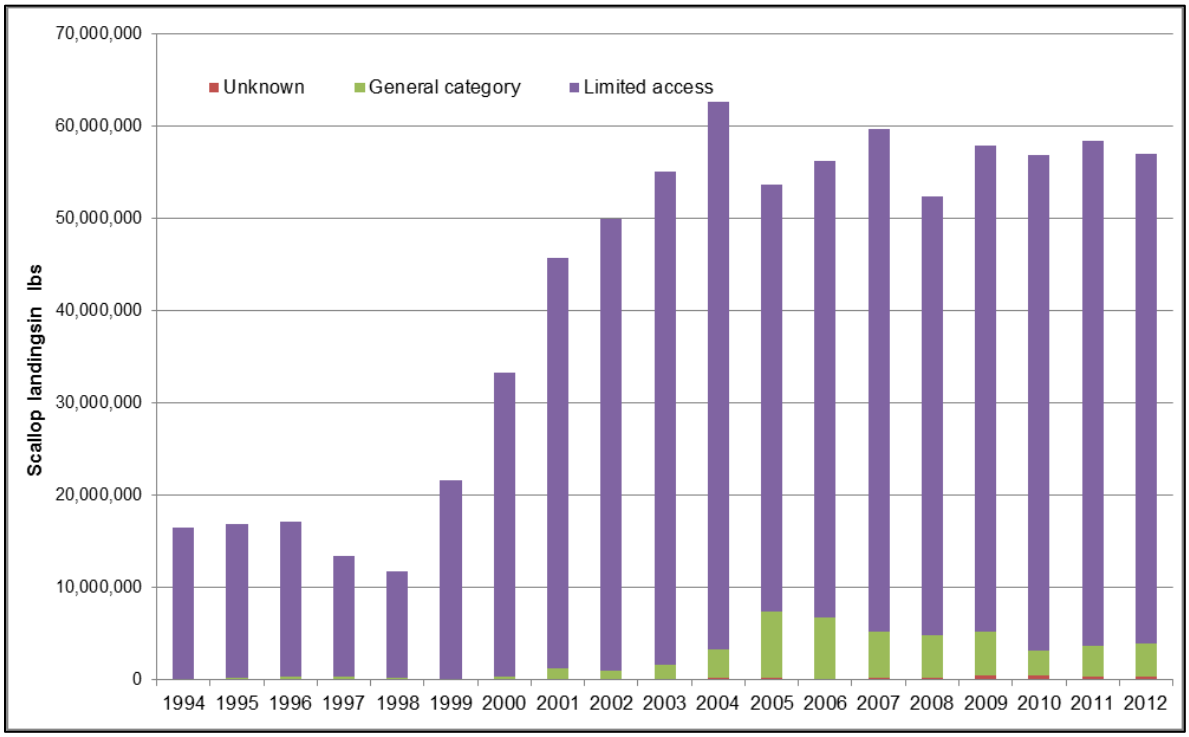
Notes:
May include duplicate records for replaced vessels with different permit numbers.

Total fleet revenues more than quadrupled, from about $120M in 1994 to almost $516M in 2011 (in inflation-adjusted 2012 dollars) (Figure 6). 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 FY1994 to FY2011 as a result of the effort-reduction measures since Amendment 4 (1994) (Figure 7). The impact of the decline in effort below 30,000 DAS 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 lbs. per DAS in 2007 to over 2,300 pounds per day-at-sea in 2011.

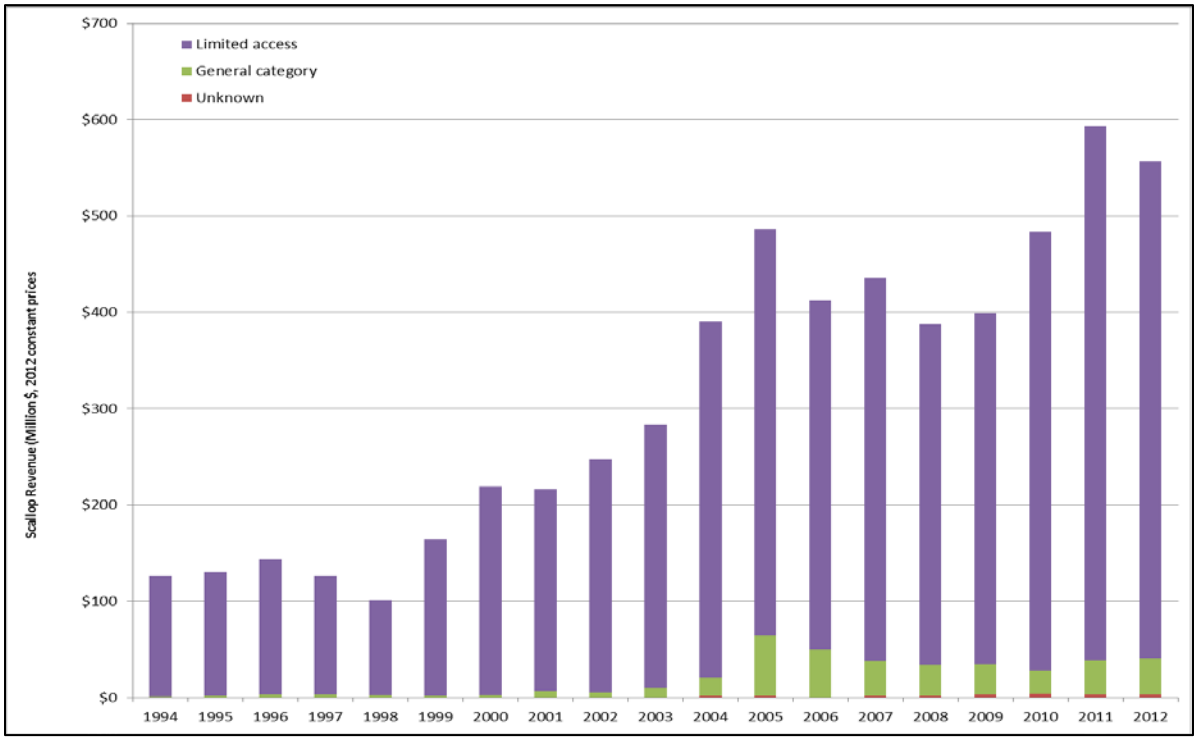
The scallop fishery is facing a decline in 2013. Recruitment has been below average for several years on Georges Bank and overall biomass is lower than previous years. Most of the scallop access areas have lower biomass than years past, and several areas in the Mid-Atlantic will be closed in 2013 to 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 50M lbs.) starting in 2016, if the high levels of recruitment in the Mid-Atlantic grow as projected (Figure 8).

Figure 6 – Scallop landings by permit category and fishing years 1994 – 2012



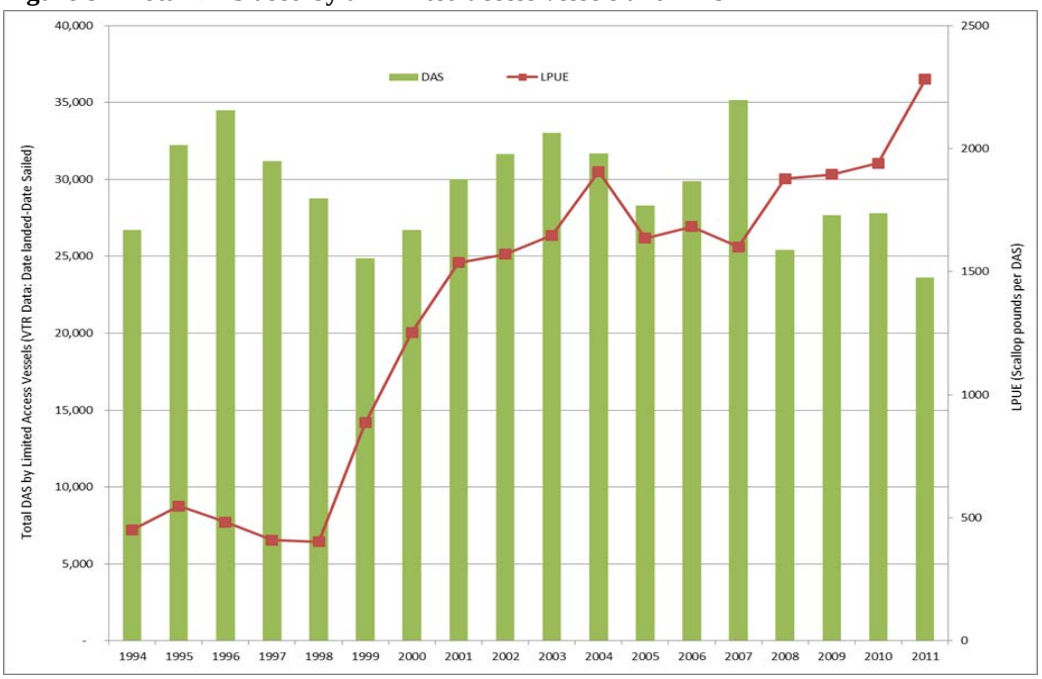
Source: Dealer data.

Figure 7 – Scallop revenue by permit category and fishing year



Note: Data in Million$, 2012 constant prices. Source: dealer data.

Figure 8 – Total DAS used by all limited access vessels and LPUE



Note: date landed – date sailed from VTR data

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, Appx. I, FW 24). Furthermore, according to the 2009-2012 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, FW 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, FW 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).

General category permit holders (IFQ and NGOM) are less dependent on scallops compared to vessels with limited access permits. In 2011, 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, FW 24). For NGOM vessels (that did not also have a limited access permit) scallop landings accounted for less than 1% of revenue in 2011 (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, FW 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, FW 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, FW 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, FW 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, FW 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).

Retention of yellowtail flounder in the Limited Access Scallop Fishery

The minimum legal size for landing yellowtail flounder is 12 inches (30.5cm). Limited access scallop vessels have been required to retain legal sized yellowtail flounder since Groundfish Framework Adjustment 44, about May 2010. In the past, limited access vessels were restricted to a total possession limit of 300 lb per trip for all groundfish species combined. The last scallop assessment evaluated the full retention length of yellowtail flounder in scallop dredge gear, which was found to be 30-35cm. Therefore, yellowtail flounder less than 30cm are not fully retained in the dredge gear.

Analyses were conducted in order to:

1) summarize observer data on scallop trips since full retention of legal size yellowtail flounder has been required (2011-2013) to get a better idea of the size distribution of yellowtail bycatch and reason for discard in recent years;
2) summarize dealer data for scallop dredge gear landings of yellowtail flounder to get a better sense of the total level of yellowtail flounder landings and potential impacts on the scallop fishery if this framework (FW51) prohibits possession of yellowtail flounder.

Disposition of yellowtail flounder catch from observed hauls (2011-2013)
In general, most yellowtail flounder is discarded on observed hauls in the scallop fishery. Even fish that are required to be retained (i.e., yellowtail flounder larger than 30.5 cm) are discarded for a variety of reasons (Figure 9). The distribution of yellowtail flounder catch on observed hauls suggests that smaller yellowtail flounder are not retained in the dredge gear. Including all sizes observed, over 130,000 yellowtail flounder were measured on observed hauls in the scallop fishery between 2011 and August 2013 (Table 45). Over 75% of those measured fish were discarded, and about 23% were kept.

Since the majority of these fish were legal size and if observer data is reflective of fleet behavior then it can be inferred that the majority of the scallop fishery has not been landing legal sized yellowtail flounder. Therefore, the potential benefits of the current requirement to land legal sized yellowtail flounder, in terms of reducing discards and improving estimates, has probably been lower than expected based on the relatively low level of compliance suggested by these data.

Figure 9 - YT length data from one haul per watch on all observed scallop trips

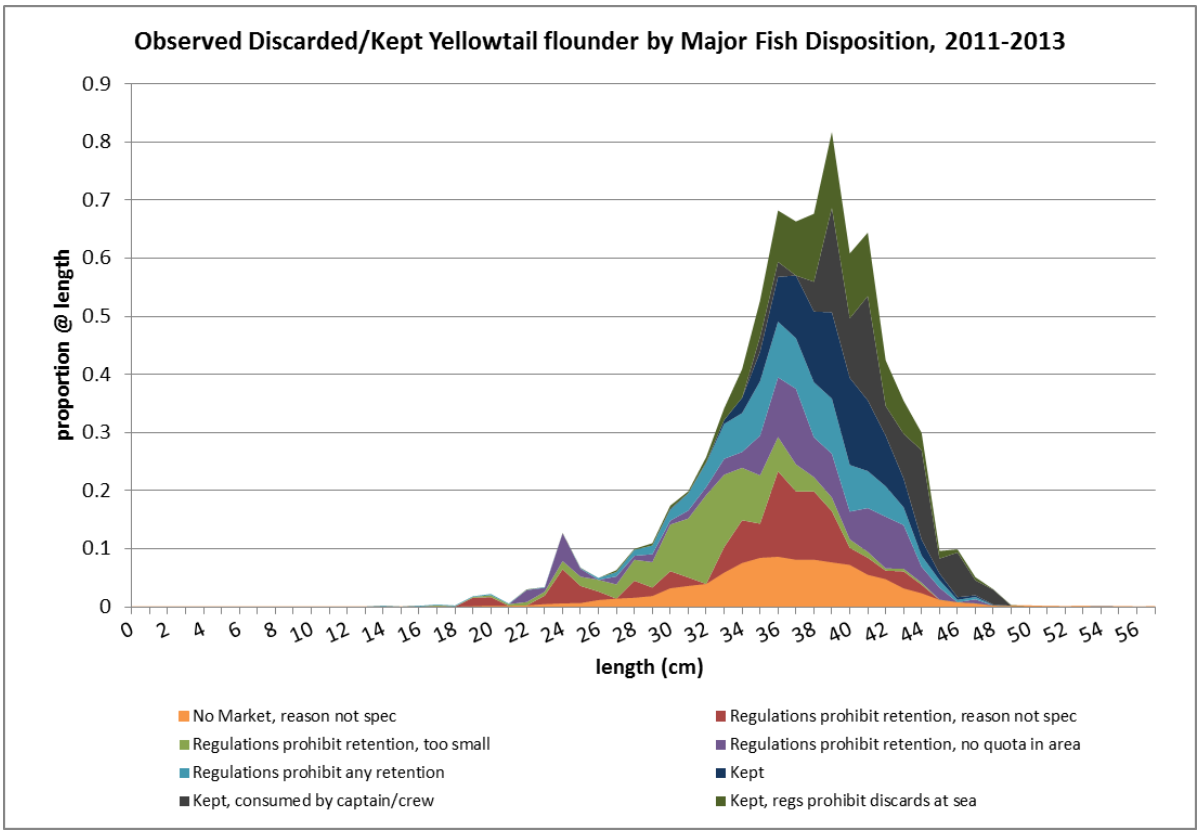
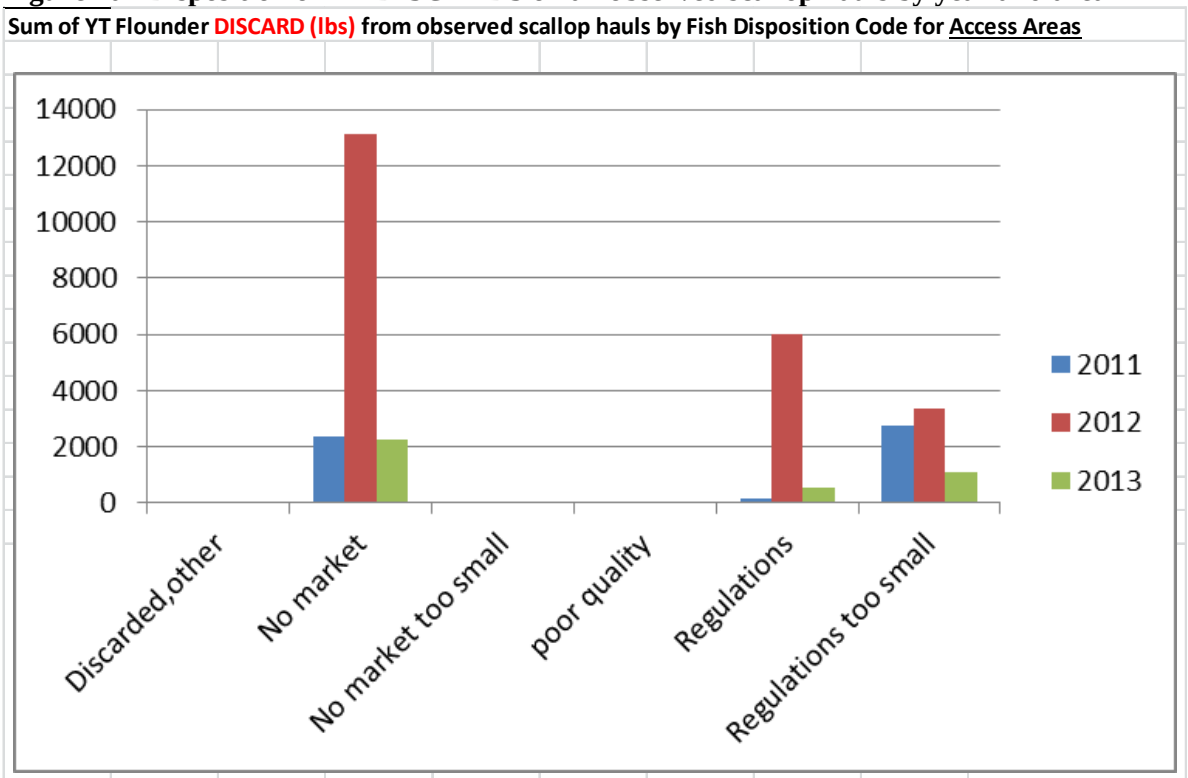


Table 45 – Number of YT measured by disposition category for all hauls where YT measured

Observer Data - Number of Yellowtail flounder Measured by Major Fish Disposition, 2011-2013									
YEAR	No Market, reason not spec	Regulations prohibit retention, reason not spec	Regulations prohibit retention, too small	Regulations prohibit retention, no quota in area	Regulations prohibit any retention	Kept	Kept, consumed by captain/crew	Kept, regs prohibit discards at sea	Grand Total
2011	1531	60	582	146	585	690	2	589	4185
2012	2763		1202		975	923	24	530	6417
2013	1803	8	299		371	122	13	181	2797
Grand Total	6097	68	2083	146	1931	1735	39	1300	13399

Figure 10 - Disposition of YT DISCARDS on all observed scallop hauls by year and area



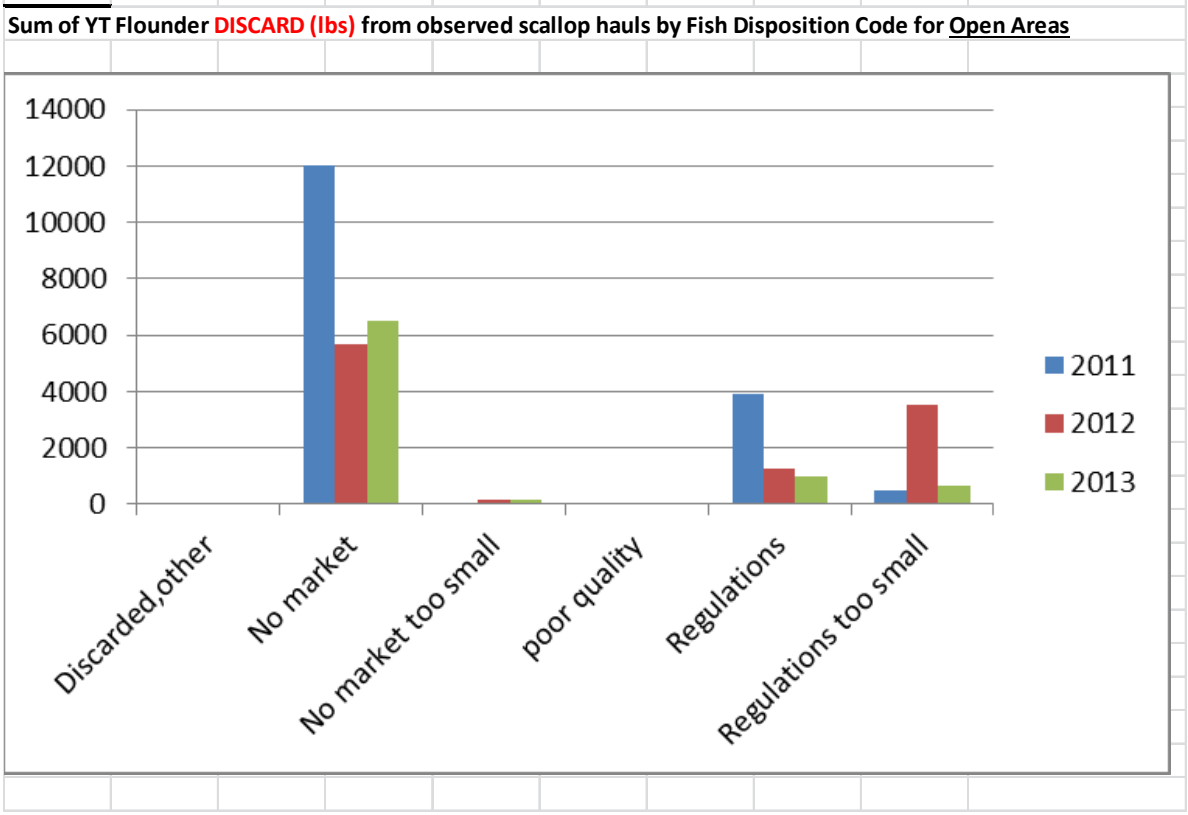
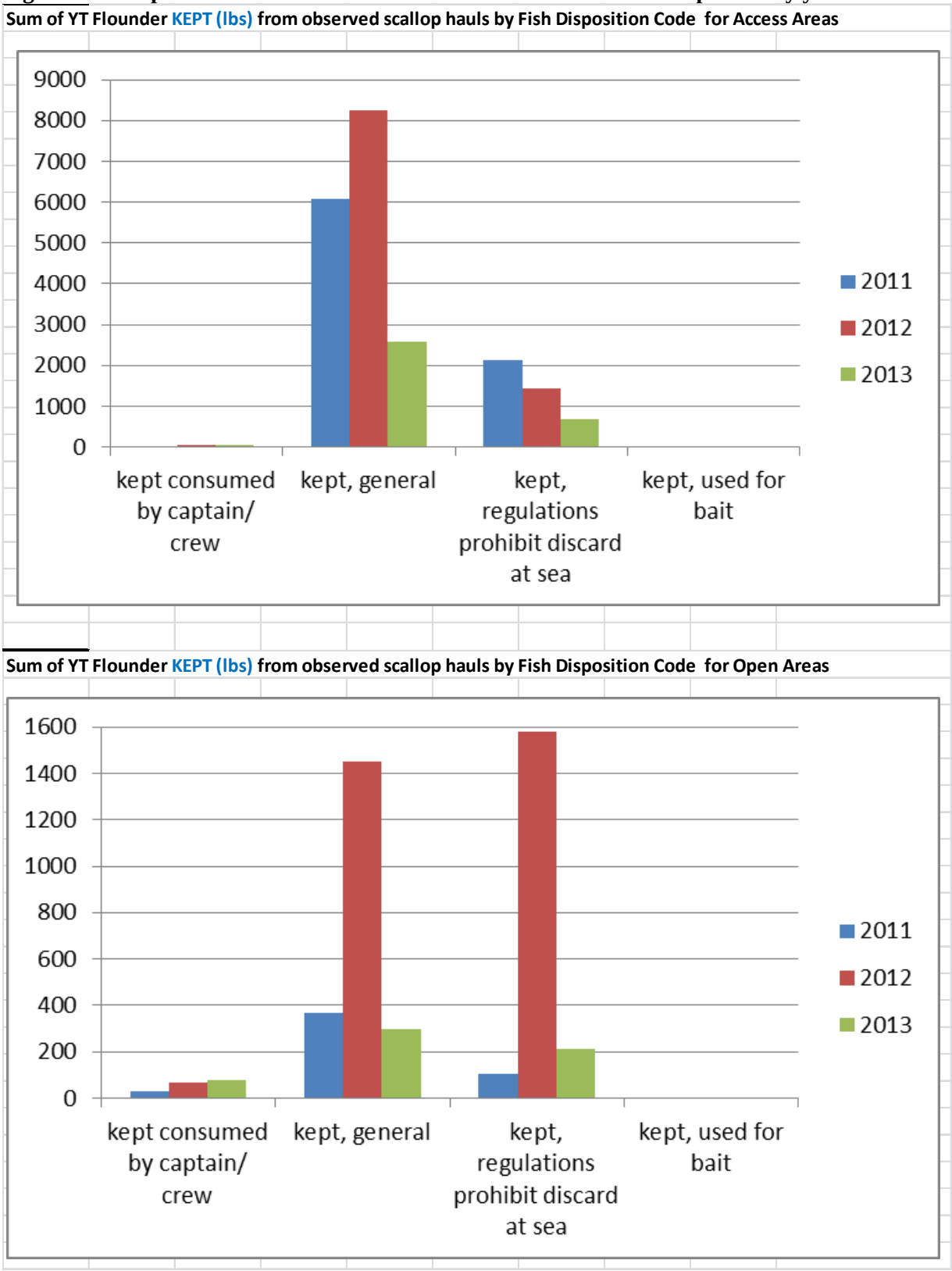


Figure 11 – Disposition of all observed YT KEPT on all observed scallop hauls by year and area



Yellowtail flounder landings for limited access scallop vessels

The following tables summarize *landings*, or kept catch, in the scallop fishery of scallop and yellowtail flounder, and include all trips by limited access scallop vessels from all areas. A small subset of these vessels landed yellowtail flounder in the 2009-2011 fishing years. The majority of the vessels that landed yellowtail flounder had full-time permits (including FTSD and FTTRW permits). However, yellowtail flounder landings more than tripled in 2011 even though the number of vessels that landed yellowtail flounder remained the same. However, yellowtail flounder landings declined in the 2012 fishing year by almost 30%, even though number of LA vessels with yellowtail flounder landings increased from 61 in 2011 to 81 in 2012. Preliminary numbers suggest that yellowtail flounder catch was relatively low so far in the 2013 scallop fishing year (Table 46).

Table 46. Scallop and yellowtail landings by scallop limited access vessels (Dealer data)

Fishyear	Values	Vessels with Yellowtail landings	No yellowtail landings	Grand Total
2009	Scallop lb.	2,752,848	49,348,949	52,101,797
	Yellowtail lb.	36,989	-	36,989
	Number of vessels	19	325	344
2010	Scallop lb.	9,604,501	43,879,121	53,483,622
	Yellowtail lb.	95,246	-	95,246
	Number of vessels	60	289	349
2011	Scallop lb.	10,057,520	44,317,622	54,375,142
	Yellowtail lb.	319,910	-	319,910
	Number of vessels	61	289	350
2012	Scallop lb.	13,855,255	39,269,166	53,124,421
	Yellowtail lb.	226,748	-	226,748
	Number of vessels	81	267	348
2013	Scallop lb.	4,593,347	29,744,058	34,337,405
(Preliminary)	Yellowtail lb.	34,045	-	34,045
(Mar-Nov)	Number of vessels	43	296	339

The trend in yellowtail flounder revenue for limited access vessels was similar to the trend in landings, such that total revenue almost tripled from $136,952 in 2010 to $361,068 in 2011, but declined in 2012 and 2013 (Table 47). Table 48 shows the average landing and revenues by limited access vessels that landed yellowtail flounder. Average yellowtail flounder revenue constituted less than 0.5% of the average scallop revenue in 2009-2013 fishing years, and averaged about $2,000 to 6,000 dollars per vessel depending on the year.

Composition of yellowtail flounder landings and revenue by annual yellowtail flounder catch groups provides further insight about the scallop fishery limited access vessels landing yellowtail flounder (Table

49 to Table 52). A major proportion, 85% to 90% since 2010 fishing year, of the yellowtail flounder landings in the scallop fishery were caught by less than ten vessels with annual yellowtail landings of 10,000 lb. or more. Recently, even fewer vessels with landings of 50,000 lb. or more landed about 45% to 50% of all yellowtail flounder landings while fishing for scallops (Table 50 and Table 51).

Out of the total 60 to 80 scallop vessels that landed any yellowtail flounder since 2010, about 25 to 36 landed 100 lb. or less in a given fishing year and earned, on the average, less than $100 from yellowtail revenue (Table 51 and Table 52). Another 24 to 39 vessels caught greater than 100 lbs to 1,000 lb. since 2010 and on the average earned $300 to $500 per year from yellowtail flounder landings. However, for some scallop vessels, such as those 6 to 11 vessels that landed on the average 3,500 lb. to 4,600 lb., and another handful of vessels (4 to 6) that landed more than 10,000 lb., average annual revenue from yellowtail flounder landings ranged from $3,500 to over $30,000 in 2011 and 2012 fishing years, respectively (Table 52).

Table 47. Scallop and yellowtail revenues for the scallop limited access vessels (Dealer data)

Fishyear	Values	Vessels with Yellowtail landings	No yellowtail landings	Grand Total
2009	Scallop Rev.	17,940,970	317,898,267	335,839,237
	Yellowtail Rev.	52,377	-	52,377
2010	Scallop Rev.	78,844,629	352,319,683	431,164,312
	Yellowtail Rev.	136,952	-	136,952
2011	Scallop Rev.	101,366,017	439,281,278	540,647,295
	Yellowtail Rev.	361,068	-	361,068
2012	Scallop Rev.	138,911,631	378,971,301	517,882,932
	Yellowtail Rev.	283,076	-	283,076
2013*	Scallop Rev.	52,819,011	333,755,591	386,574,602
	Yellowtail Rev.	45,039	-	45,039

*FY not complete

Table 48. Average Scallop and yellowtail landings and revenues (limited access vessels that landed yellowtail, Dealer data)

Fishyear	Number of vessels	Avg.Scal.lb.	Avg.yel. Lb.	Avg.scal. rev.	Avg.yel. rev.	% of yel.rev.
2009	19	144,887	1,947	944,262	2,757	0.3%
2010	60	160,075	1,587	1,314,077	2,283	0.2%
2011	61	164,877	5,244	1,661,738	5,919	0.4%
2012	81	171,053	2,799	1,714,958	3,495	0.2%
2013*	43	106,822	792	1,228,349	1,047	0.1%

*FY not complete

Table 49. Total yellowtail revenue by yellowtail catch group (limited access vessels that landed yellowtail, Dealer data)

Yellowtail lb.	2009	2010	2011	2012	2013
1 to 100 lb.	218	1464	1633	1277	1645
101-1000 lb.	6997	4749	9511	17785	6664
1001 to 10K	NA	NA	21575	51168	NA
10.1K to 50K	NA	122195	NA	NA	NA
GT 50K lb.			NA	NA	
Grand Total	**53190**	**136952**	**361068**	**283076**	**45039**

Table 50. Yellowtail landings by yellowtail lb. group as a percentage of total yellowtail landings (limited access vessels that landed yellowtail, Dealer data)

Yellowtail lb.	2009	2010	2011	2012	2013
1 to 100 lb.	0%	1%	0%	0%	4%
101-1000 lb.	13%	3%	3%	6%	15%
1001 to 10K	54%	6%	6%	18%	34%
10.1K to 50K	32%	89%	41%	30%	47%
GT 50K lb.	0%	0%	50%	45%	0%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**

Table 51. Number of limited access vessels by yellowtail catch group (limited access vessels that landed yellowtail, Dealer data)

Yellowtail lb.	2009	2010	2011	2012	2013
1 to 100 lb.	6	36	25	27	24
101-1000 lb.	9	18	24	39	16
1001 to 10K	NA	NA	6	11	NA
10.1K to 50K	NA	5	4	NA	NA
GT 50K lb.	NA	NA	NA	NA	NA
Grand Total	**20**	**65 or less**	**65 or less**	**81**	**45 or less**

Note: NA indicates that the actual data cannot be shown in order protect confidentiality of data.

Table 52. Average yellowtail revenue by yellowtail catch group (limited access vessels that landed yellowtail, Dealer data)

Yellowtail lb.	2009	2010	2011	2012	2013
1 to 100 lb.	36	41	65	47	69
101-1000 lb.	777	264	396	456	417
1001 to 10K	NA	NA	3,596	4,652	NA
10.1K to 50K	NA	24,439	37,130	NA	NA
GT 50K lb.			NA	NA	NA

Note: NA indicates that the actual data cannot be shown in order protect confidentiality of data.

6.5.11 Small-Mesh Bottom Trawl Fishing on Georges Bank

This action considers measures that could affect fisheries that use small-mesh bottom trawls on Georges Bank. The two primary fisheries that use small-mesh on GB are the longfin 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.

Longfin 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 a specific 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 (GBYFS) area in 2010 and 2011 (Table 53). Most longfin squid landings in 2010 and 2011 were taken in the SNE/MA area, with <10% of the landings taken in the GBYTFS area (Table 54). Over 95% of the longfin squid caught in the GBYTFS area is caught in SAs 525 and 562 (Table 56). With respect to whiting, however, the GBYTFS area provided between 44% and 48% of total whiting landings (Table 55). Whiting is more broadly distributed in the GBYTFS area, with 25-30% taken in SAs 522 and 525, with most of the remainder from SA 562 (Table 57). The directed small-mesh whiting fishery is restricted to fishing in the Cultivator Shoal Exemption Area, as defined in 50 CFR 648.80(a)(6), from June 15-October 31 of each year.

Table 53 - Number of vessels landing whiting or longfin squid by broad stock area

Stock Area	CY2010	CY2011
Gulf of Maine	32	34
521	8	7
GBYTF Area	34	30
SNE/MA	320	296
Other	30	47
Total	**424**	**414**

Table 54 - Landings of longfin squid by broad stock area (pounds, live weight)

Stock Area	CY2010	CY2011
Gulf of Maine	38,806	17,112
521	4,154	647
GBYTF Area	1,385,159	1,315,051
SNE/MA	15,700,205	20,888,013
Other	60,315	117,520
Total	**17,188,639**	**22,338,343**
GBYTF Area as %	8%	6%

Squid and whiting revenues from the GBYFS area accounted for 24% of the revenues from these species on 2010, and 17% in 2011. For the trips that caught whiting or squid in the GBYTFS area, revenues from these two species accounted for over 60% of trip revenues. Whiting revenues were larger than squid revenues on these trips – squid accounted for 24-33% of the revenues from these two species (

Table 58). Most of the landings from this area were in Massachusetts, with 57% of the revenues in 2010 and 72% of the revenues in 2011. Connecticut, Rhode Island, and New York were other states with most of the revenues from this area (Table 59).

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

Stock Area	CY2010	CY2011
Gulf of Maine	1,664,758	1,549,340
521	74,296	96,190
GBYTF Area	8,747,531	7,717,515
SNE/MA	7,684,438	7,979,919
Other	183,539	220,894
Total	18,354,562	17,563,858
GB Yellowtail Flounder Area as %	48%	44%

Table 56 - Percent of longfin squid landings from each statistical area in the GB Yellowtail Flounder Stock Area

Statistical Area	CY2010	CY2011	Total
522	4%	1%	3%
525	57%	74%	66%
543	0%	0%	0%
561	0%	0%	0%
562	39%	24%	32%
Total	**100%**	**100%**	**100%**

Table 57 - Percent of whiting landings from each statistical area in the GB Yellowtail Flounder Stock Area

Statistical Area	CY2010	CY2011	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%
Total	**100.00%**	**100.00%**	**100.00%**

Table 58 - Revenue on squid and/or whiting trips by broad stock areas

Year	Stock Area	Squid Trips	Whiting Trips	Total Revenue
CY2010	Gulf of Maine	$42,269	$1,078,620	$6,849,033
	521	$6,770	$32,410	$1,369,161
	GBYTF Area	$1,638,859	$5,275,521	$10,172,184
	SNE/MA	$16,286,126	$4,780,527	$49,141,364
	Other	$58,925	$93,645	$600,828
	Total	**$18,032,950**	**$11,260,722**	**$68,132,570**
CY2011	Gulf of Maine	$17,318	$999,571	$10,533,557
	521	$952	$77,317	$1,877,336
	GBYTF Area	$1,636,814	$4,725,911	$9,930,530
	SNE/MA	$24,443,913	$5,302,990	$70,296,182
	Other	$155,012	$110,631	$1,104,848

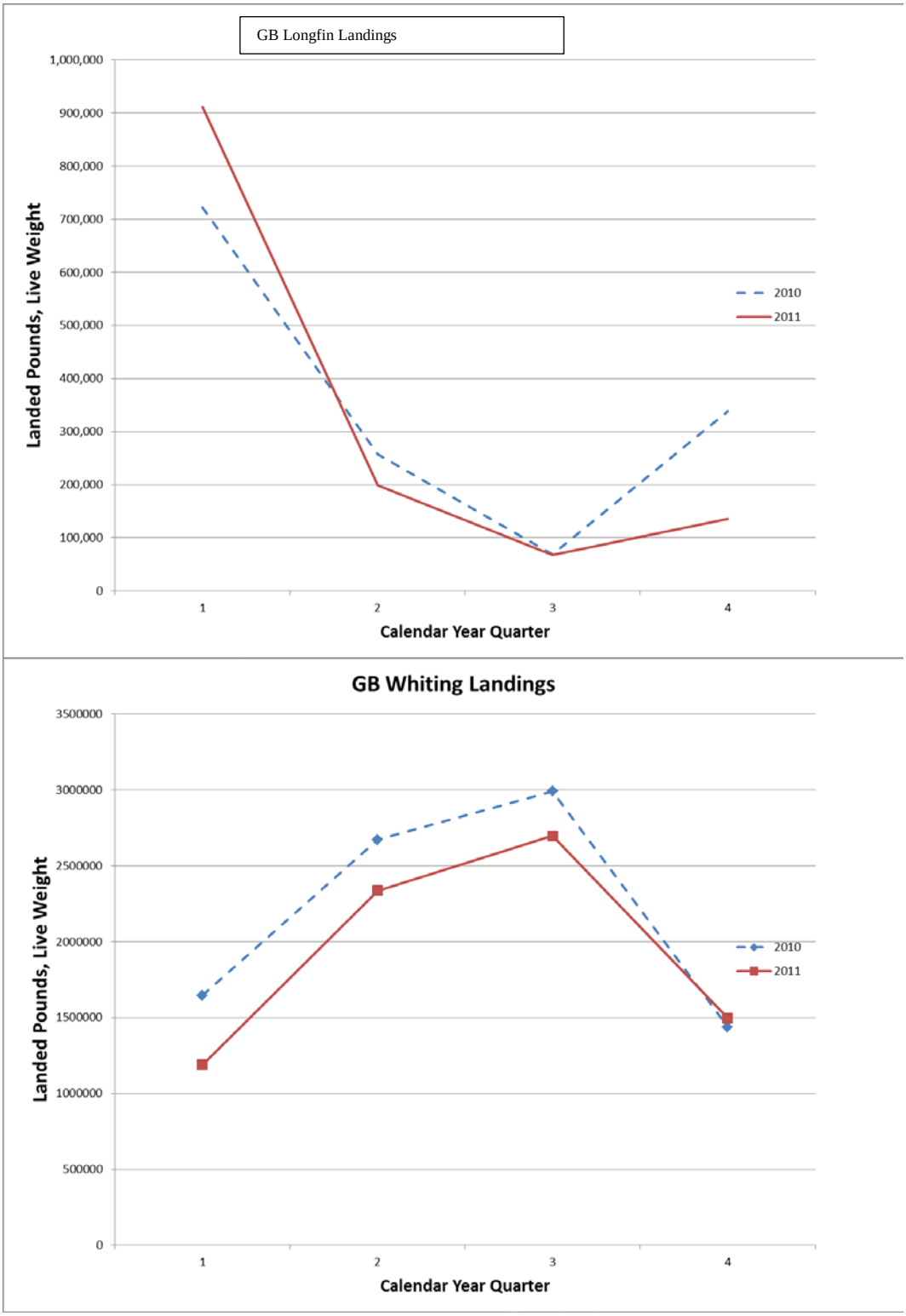
Total	**$26,254,009**	**$11,216,421**	**$93,742,453**

Table 59 - Revenue from squid and whiting trips by state

Year	State	Squid Trips	Whiting Trips	Total Revenue
2010	Other	$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
	Total	**$1,638,859**	**$5,275,521**	**$10,172,184**
2011	Other	$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
	Total	**$1,636,814**	**$4,725,912**	**$9,930,530**

Both longfin and whiting landings have a distinct seasonal component (Figure 12). Longfin landings are high in the fall and winter (first and fourth calendar year quarters) and decline in the spring and summer. Whiting landings have the opposite pattern.

Figure 12 – Seasonal pattern of longfin and whiting landings from Georges Bank



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. The impacts associated with the measures are anticipated to be minor and not significant.

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 have proven unsuccessful. These factors should be considered when reviewing impacts that use this tool.

7.1.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

7.1.1.1 Gulf of Maine Cod Rebuilding Strategy

7.1.1.1.1 Option 1: No Action

Impacts on regulated groundfish

This option would keep the current rebuilding strategy for Gulf of Maine cod, which targets rebuilding by 2014 with a 50% (median) probability of success. The direct biological impacts of this measure would be on Gulf of Maine cod. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on 75% F_{MSY} in 2014 and subsequently on incidental bycatch (i.e., set as close to zero as possible) starting in 2015. Option 1 would result in a fishing mortality that would be lower than in Option 2, and thus Option 1 would be expected to result in more rapid rebuilding of the stock.

Three year projections from the two assessment models (base case and m-ramp) are provided (Figure 13 and Figure 14). Differences between the two models are discussed in detail under Option 2.

If F=0, it would take 6 years to rebuild the Gulf of Maine cod stock, which is 2 years earlier than Option 2/Sub-Option A and 4 years earlier than Option 2/Sub-Option B. Under No Action, the stock would not rebuild by 2014 but would rebuild by 2020 if F=0 (Figure 19and Figure 20).

This option could also have indirect effects on other regulated groundfish stocks, since Gulf of Maine cod is only part of a complex fishery. For example, during some times of the year, Gulf of Maine cod and Gulf of Maine haddock are caught on the same fishing trips. Limiting Gulf of Maine cod catches may reduce catches of Gulf of Maine haddock 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 Gulf of Maine cod stock area. Counter to this possibility is the chance that vessels that would fish for Gulf of Maine cod 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 stocks, however, should prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 13 - Projected GOM cod stock size under Option 1 base case scenario

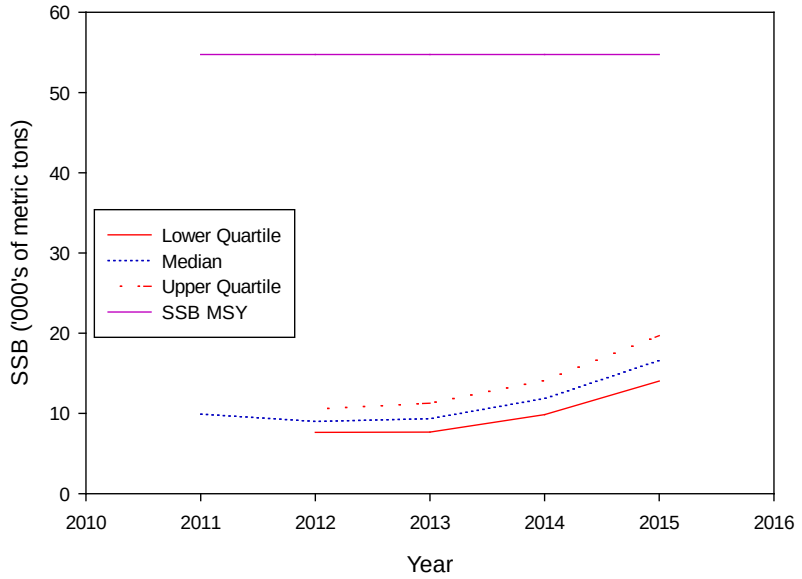
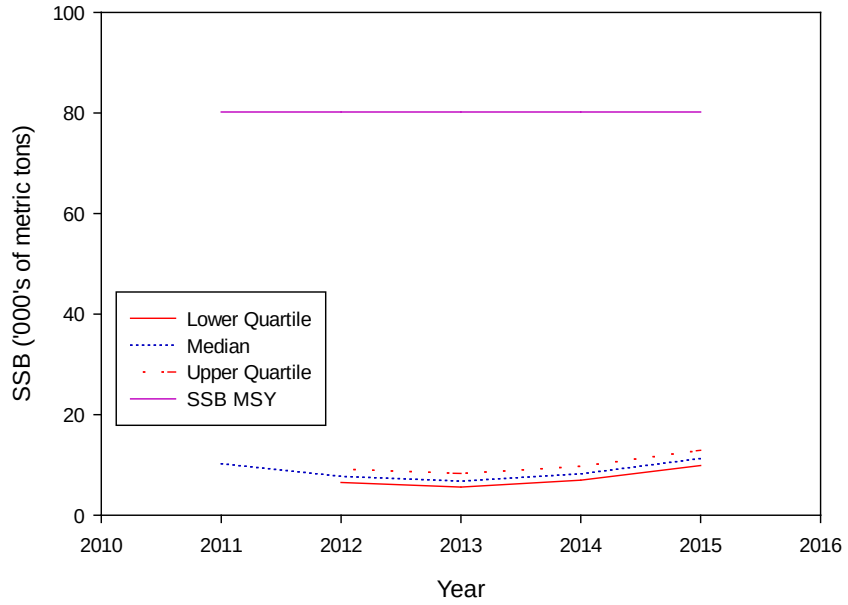


Figure 14 - Projected GOM cod stock size under Option 1 M ramp scenario



7.1.1.1.2 Option 2: Revised Rebuilding Strategy for Gulf of Maine Cod

Sub-Option A

Impacts on regulated groundfish

This option would adopt a new rebuilding strategy for Gulf of Maine cod and would target rebuilding by 2022 with a 50% (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 Gulf of Maine cod. The fishing mortality (initially greater than 75% F_{MSY}, but reduced after 2014 would be consistent with the ABC Control Rule adopted in A16) necessary to rebuild by 2022 would be greater than would be expected under Option 1/No Action. This would be expected to result in slower rebuilding of the stock. Under Option 2/Sub-Option A, the stock would rebuild by 2022 (Figure 15 and Figure 16). The rebuilding trajectory for this option is compared to the trajectory for F=0 and No Action (Option 1) in Figure 19 and Figure 20.The stock would rebuild two years later than the rebuilding date expected under Option 1/No Action, and two years earlier than the rebuilding date expected under Option 2/Sub-Option B. This strategy is developed to be more conservative compared to Option 2/Sub-Option B, and have minor negative impacts on GOM cod relative to Option1/No Action.

This option could also have indirect effects on other regulated groundfish stocks, since Gulf of Maine cod is only part of a complex fishery. During some times of the year, Gulf of Maine cod and Gulf of Maine haddock are caught on the same fishing trips. Increasing Gulf of Maine cod catches (as compared to Option 1/No Action) may increase catches of Gulf of Maine haddock 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.

Several provisions of this measure may slow the pace of rebuilding. First, this program is designed to use 75%F_{MSY} initially; however, if progress is not made, it is possible that $F_{rebuild}$ may become necessary. Second, there is little difference in the rebuilding time needed under the accepted base case or M-ramp model (M=0.2 in projections) for GOM cod; no reference points are available for the M-ramp model. However the catches estimated in the out years and the SSB_{MSY} are different between the models. The M-ramp projection assumes a change in M back to 0.2. The SARC 55 Panel concluded that if M is currently 0.4 then it seemed more reasonable to assume that in the short-term M would remain at 0.4 rather than reduce to 0.2. However, a change back to 0.2 is required to rebuild the stock. It is not known when M will change back to 0.2 in the future for the M-ramp formulation so interpretation and development of rebuilding plans using the M-ramp model is more difficult. This option would not rebuild as quickly and would have very low negative impacts when compared to Option 1/No Action.

Impacts on other species

When compared to Option 1/No Action, this option may indirectly increase negative 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, which would negatively impact these species. Counter to this possibility is the chance that vessels that would fish for other species under Option 1/No Action may target Gulf of Maine cod 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 stocks, however, would prevent overfishing from occurring in either case and so the possible impacts would not

be expected to compromise mortality targets. Therefore, the anticipated impacts are expected to be negligible.

Figure 15 - Projected GOM cod stock size under Option 2, 8 year rebuilding base case scenario

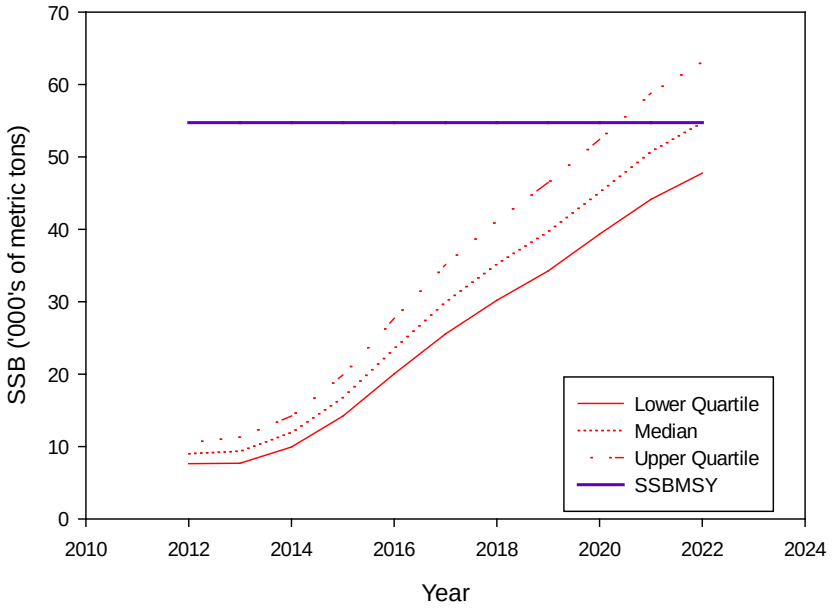
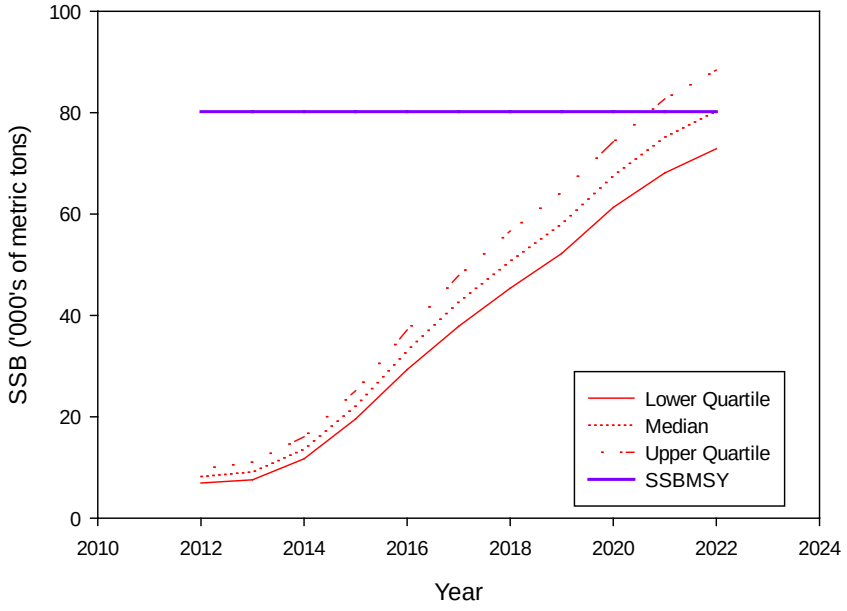


Figure 16 - Projected GOM cod stock size under Option 2, 8 year rebuilding M ramp scenario



Sub-Option B

Impacts on regulated groundfish

This option would adopt a new rebuilding strategy for Gulf of Maine cod and would target rebuilding by 2024 with a 50% (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 Gulf of Maine cod. The fishing mortality (initially greater than 75% F_{MSY}, but reduced after 2014 would be consistent with the ABC Control Rule adopted in A16) necessary to rebuild by 2024 would be greater than would be expected under Option 1/No Action. This would be expected to result in slower rebuilding of the stock. Under Option 2/Sub-Option B, the stock would rebuild by 2024 (Figure 17 and Figure 18). The rebuilding trajectory for this option is compared to the trajectory for F=0 and No Action (Option 1) in Figure 19 and Figure 20.The stock would rebuild four years later than the rebuilding date expected under Option 1/No Action, and two years later than the rebuilding date expected under Option 2/Sub-Option A. This option represents the maximum rebuilding period of 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 7.5.1.1.2.

This option could also have indirect effects on other regulated groundfish stocks, since Gulf of Maine cod is only part of a complex fishery. During some times of the year, Gulf of Maine cod and Gulf of Maine haddock are caught on the same fishing trips. Increasing Gulf of Maine cod catches (as compared to Option 1/No Action) may increase catches of Gulf of Maine haddock 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.

Several provisions of this measure may slow the pace of rebuilding. First, this program is designed to use 75%F_{MSY} initially; however, if progress is not made, it is possible that $F_{rebuild}$ may become necessary. Second, there is little difference in the rebuilding time needed under the accepted base case or M-ramp model (M=0.2 in projections) for GOM cod; no reference points are available for the M-ramp model. However the catches estimated in the out years and the SSB_{MSY} are different between the models. The M-ramp projection assumes a change in M back to 0.2. The SARC 55 Panel concluded that if M is currently 0.4 then it seemed more reasonable to assume that in the short-term M would remain at 0.4 rather than reduce to 0.2. However, a change back to 0.2 is required to rebuild the stock. It is not known when M will change back to 0.2 in the future for the M-ramp formulation so interpretation and development of rebuilding plans using the M-ramp model is more difficult. This strategy is less conservative compared to Option 2/Sub-Option A. This option would not rebuild as quickly and would have very low negative impacts when compared to Option 1/No Action.

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 1/No Action may target Gulf of Maine cod 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 stocks, however, would prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 17 - Projected GOM cod stock size under Option 2, 10 year rebuilding base case scenario

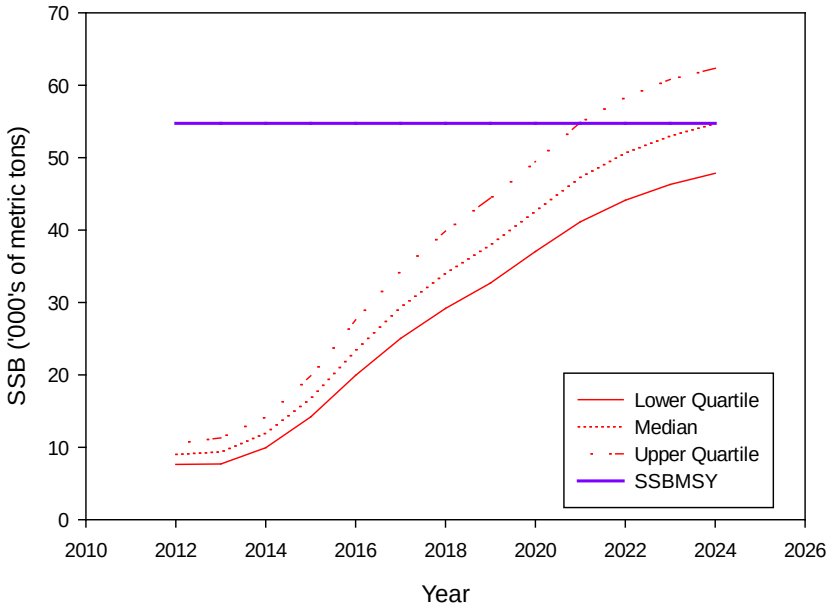


Figure 18 - Projected GOM cod stock size under Option 2, 10 year rebuilding M ramp scenario

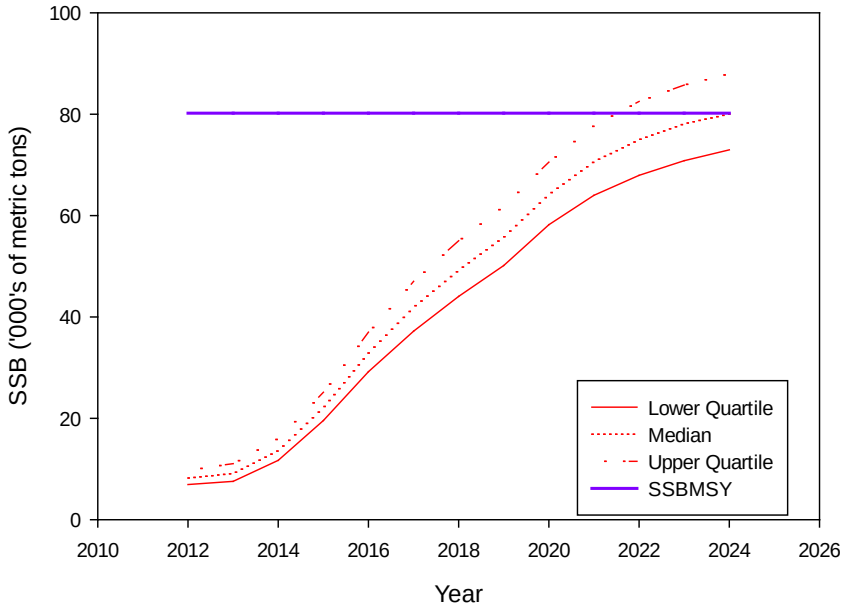


Figure 19 – Projected median SSB_{MSY} for GOM cod rebuilding strategies, using the base case model

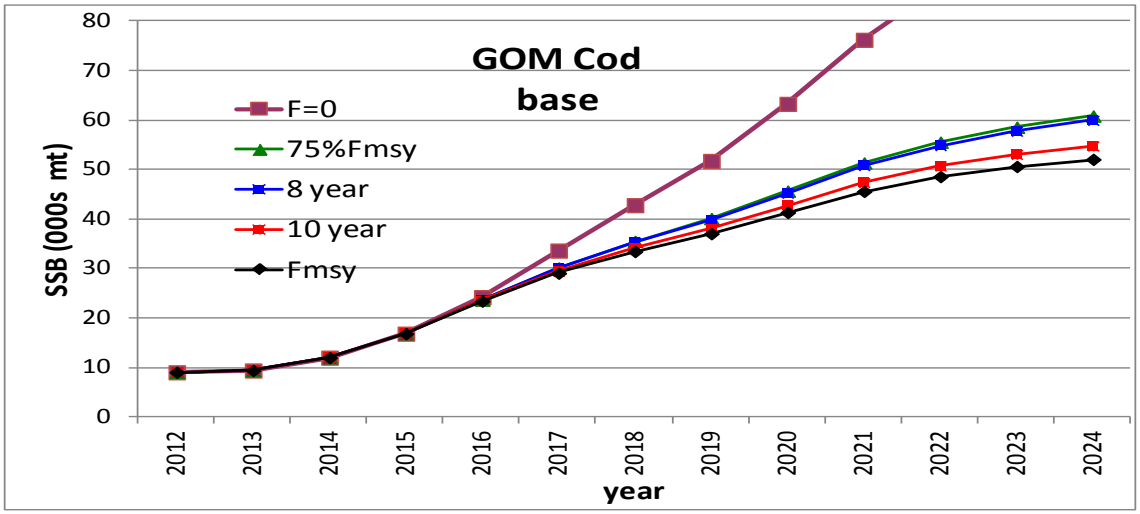
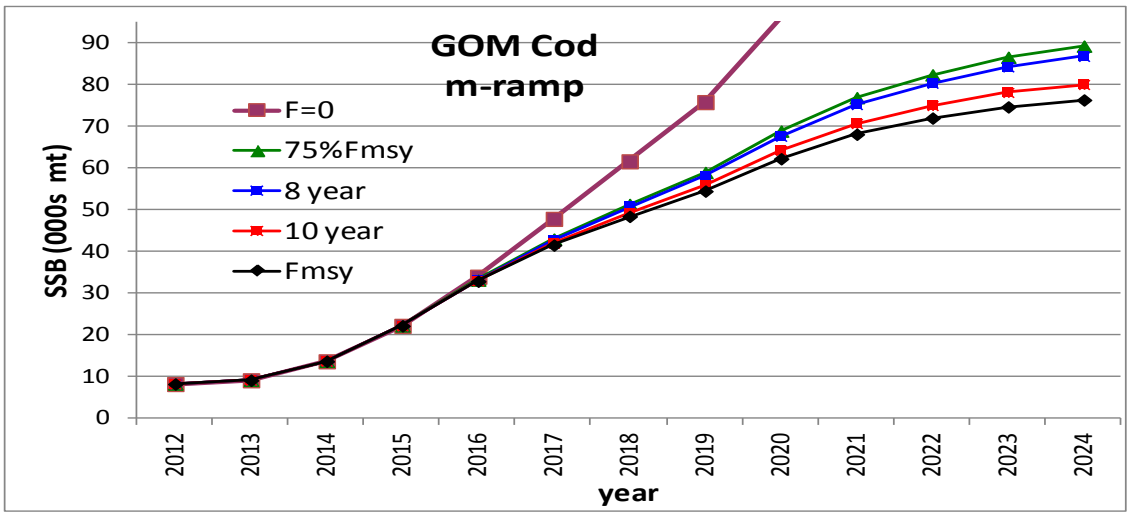


Figure 20- Projected median SSB_{MSY} for GOM cod rebuilding strategies, using the m-ramp model



7.1.1.1.3 Option 3: Rebuilding Plan Review Analysis for Gulf of Maine Cod

Impacts on regulated groundfish

Option 3 would require an analysis of the rebuilding plan using the described criteria. This is an administrative alternative and is not expected to impact Gulf of Maine cod or other species. Compared to the No Action alternative and Option 2, this alternative would not impact Gulf of Maine cod or other regulated groundfish species.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species.

7.1.1.2 Revised American Plaice Rebuilding Strategy

7.1.1.2.1 Option 1: No Action

Impacts on regulated groundfish

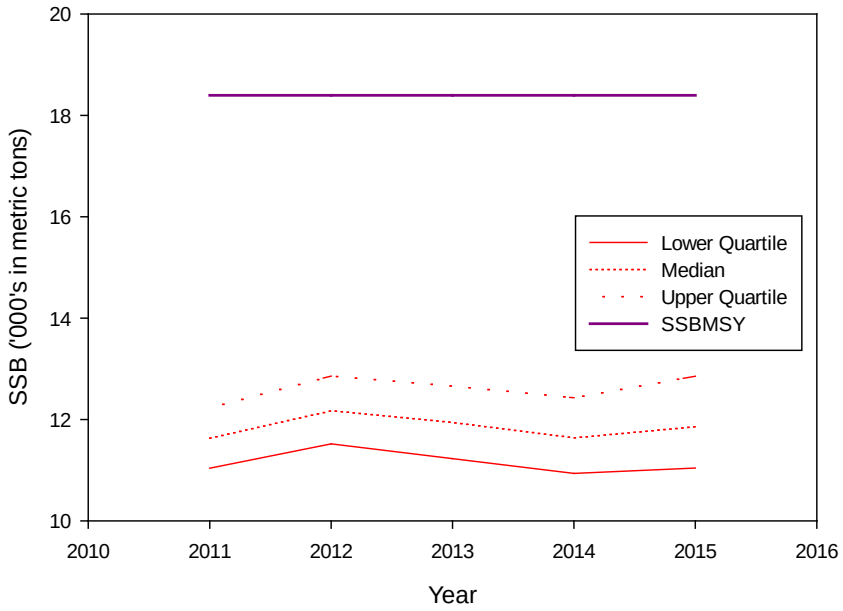
This option would keep the current rebuilding strategy for American plaice, which targets rebuilding by 2014 with a 50% (median) probability of success. The direct biological impacts of this measure would be on American plaice. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on 75% F_{MSY} in 2014 and subsequently on incidental bycatch (i.e., set as close to zero as possible) starting in 2015. Three year projections from the assessment model are provided (Figure 21). Option 1 would result in a fishing mortality that would be lower than in Option 2, and thus Option 1 would be expected to result in more rapid rebuilding of the stock. If F=0, it would take 4 years to rebuild the Gulf of Maine cod stock, which is 3 years earlier than Option 2/Sub-Option A, 4 years earlier than Option 2/Sub-Option B, and 6 years earlier than Option 2/Sub-Option C. Under Option 1/No Action, the stock would not rebuild by 2014, but the stock would rebuild by 2018 if F=0 (Figure 25).

This option could also have indirect effects on other regulated groundfish stocks, since American plaice is only part of a complex fishery. For example, during some times of the year, American plaice and witch flounder are caught on the same fishing trips. Limiting American plaice catches may reduce catches of witch 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 American plaice stock area. Counter to this possibility is the chance that vessels that would fish for American plaice 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 stocks, however, should prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 21 - Projected American Plaice stock size under Option 1



7.1.1.2.2 Option 2: Revised Rebuilding Strategy for American Plaice

<u>Sub-Option A</u>

Impacts on regulated groundfish

This option would adopt a new rebuilding strategy for American plaice and would target rebuilding by 2021 with a 50% (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 American plaice. The fishing mortality (initially greater than 75% F_{MSY}, but reduced after 2014 would be consistent with the ABC Control Rule adopted in A16) necessary to rebuild by 2021 would be greater than would be expected under Option 1/No Action. This would be expected to result in slower rebuilding of the stock. Under Option 2/Sub-Option A, the stock would rebuild by 2021 Figure 22. The rebuilding trajectory for this option is compared to the trajectory for F=0 and No Action (Option 1) in Figure 25.The stock would rebuild three years later than the rebuilding date expected under Option 1/No Action, one year earlier than the rebuilding date expected under Option 2/Sub-Option B, and three years earlier than the rebuilding date expected under Option 2/Sub-Option C. This strategy is the most conservative compared to Option 2/Sub-Option B and Option2/Sub-Option C.

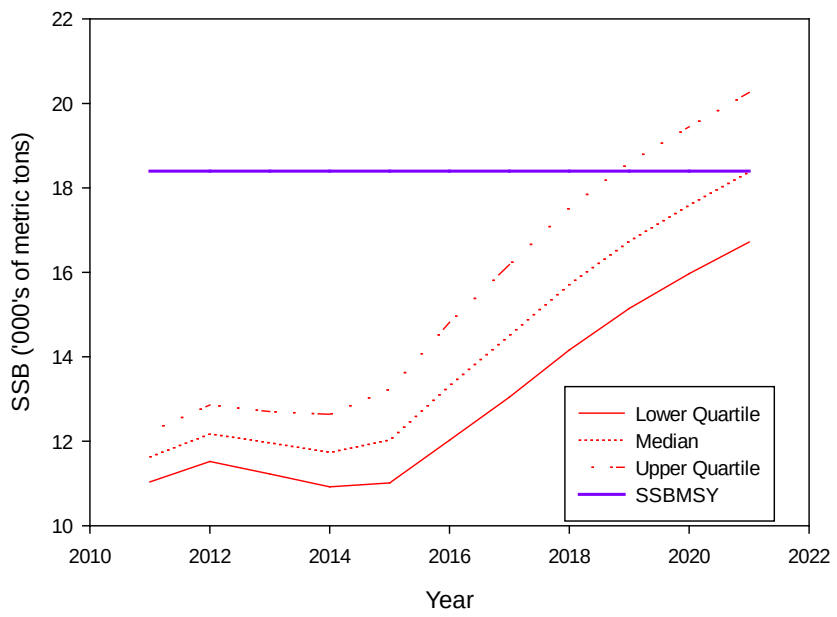
This option could also have indirect effects on other regulated groundfish stocks, since American plaice is only part of a complex fishery. During some times of the year, American plaice and witch flounder are caught on the same fishing trips. Increasing American plaice catches (as compared to Option 1/No Action) may increase catches of witch 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 slow the pace of rebuilding. This program is designed to use 75%F_{MSY} initially; however, if progress is not made, it is possible that $F_{rebuild}$ may become necessary. This option would not rebuild as quickly as Option 1/No Action.

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 1 /No Action may target American plaice 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 stocks, however, would prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 22 - Projected American Plaice stock size under Option 2, 7 year rebuilding scenario



Sub-Option B

Impacts on regulated groundfish

This option would adopt a new rebuilding strategy for American plaice and would target rebuilding by 2022 with a 50% (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 American plaice. The fishing mortality (initially greater than 75% F_{MSY}, but reduced after 2014 would be consistent with the ABC Control Rule adopted in A16) necessary to rebuild by 2022 would be greater than would be expected under Option 1/No Action. This would be expected to result in slower rebuilding of the stock. Under Option 2/Sub-Option B, the stock would rebuild by 2022 (Figure 23). The rebuilding trajectory for this option is compared to the trajectory for F=0 and No Action (Option 1) in Figure 25.The stock would rebuild four years later than the rebuilding date

expected under Option 1/No Action, one year later than the rebuilding date expected under Option 2/Sub-Option A, and two years earlier than the rebuilding date expected under Option 2/Sub-Option C.

This option could also have indirect effects on other regulated groundfish stocks, since American plaice is only part of a complex fishery. During some times of the year, American plaice and witch flounder are caught on the same fishing trips. Increasing American plaice catches (as compared to Option 1/No Action) may increase catches of witch 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 slow the pace of rebuilding. This program is designed to use 75%F_{MSY} initially; however, if progress is not made, it is possible that $F_{rebuild}$ may become necessary. This option would not rebuild as quickly as Option 1/No Action.

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 1 /No Action may target American plaice 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 stocks, however, would prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 23 - Projected American Plaice stock size under Option 2, 8 year rebuilding scenario

Sub-Option C

Impacts on regulated groundfish

This option would adopt a new rebuilding strategy for American plaice and would target rebuilding by 2024 with a 50% (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 American plaice. The fishing mortality (initially greater than 75% F_{MSY}, but reduced after 2014 would be consistent with the ABC Control Rule adopted in A16) necessary to rebuild by 2024 would be greater than would be expected under Option 1/No Action. This would be expected to result in slower rebuilding of the stock. Under Option 2/Sub-Option B, the stock would rebuild by 2024 (Figure 24). The rebuilding trajectory for this option is compared to the trajectory for F=0 and No Action (Option 1) in Figure 25.The stock would rebuild six years later than the rebuilding date expected under Option 1/No Action, three years later than the rebuilding date expected under Option 2/Sub-Option A, and two years later than the rebuilding date expected under Option 2/Sub-Option B. This option represents the maximum rebuilding period of 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 7.5.1.2.2.

This option could also have indirect effects on other regulated groundfish stocks, since American plaice is only part of a complex fishery. During some times of the year, American plaice and witch flounder are caught on the same fishing trips. Increasing American plaice catches (as compared to Option 1/No Action) may increase catches of witch 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 slow the pace of rebuilding. This program is designed to use 75%F_{MSY} initially; however, if progress is not made, it is possible that $F_{rebuild}$ may become necessary. This option would not rebuild as quickly as Option 1/No Action.

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 1 /No Action may target American plaice 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 stocks, however, would prevent overfishing from occurring in either case and so the possible impacts would not be expected to compromise mortality targets.

Figure 24 - Projected American Plaice stock size under Option 2, 10 year rebuilding scenario

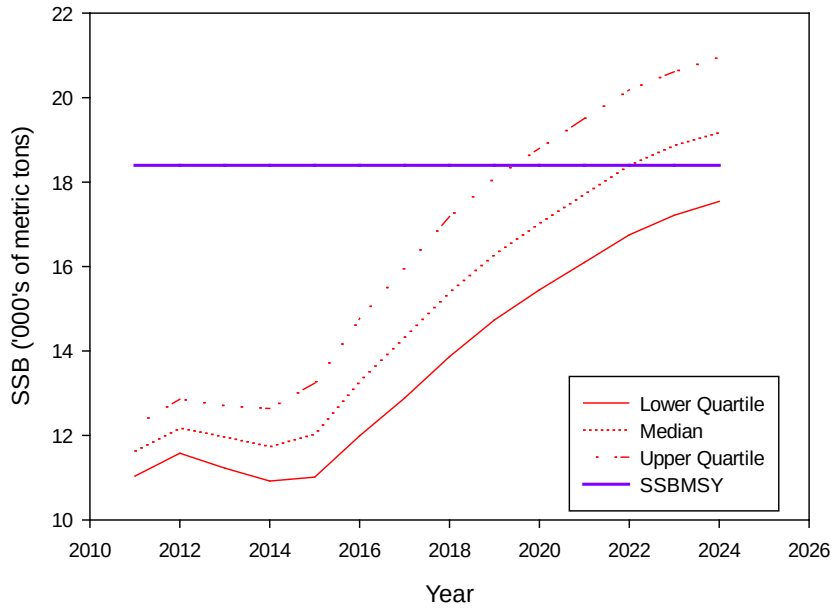
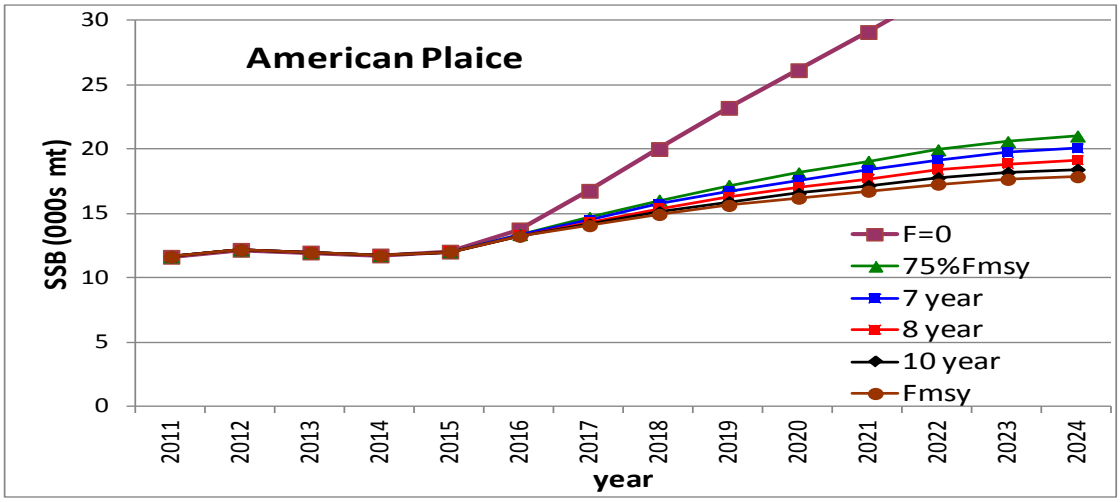


Figure 25- Projected median SSB_{MSY} for American plaice rebuilding strategies



7.1.1.2.3 Option 3: Rebuilding Plan Review Analysis for American Plaice

Impacts on regulated groundfish

Option 3 would require an analysis of the rebuilding plan using the described criteria. This is an administrative alternative and is not expected to impact American plaice or other species. Compared to the No Action alternative and Option 2, this alternative would not impact American plaice or other regulated groundfish species.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species.

7.1.1.3 Annual Catch Limits

7.1.1.3.1 Option 1: No Action

Impacts on regulated groundfish

Two groundfish stocks, white hake and GB yellowtail flounder, do not have FY 2014 specifications defined in previous actions. This option would not set specifications for these stocks in FY 2014; stocks with FY 2014 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.

For FY 2013, specifications were defined for white hake and GB yellowtail flounder stocks. However under Option 1/No Action, no Overfishing Level (OFL), Acceptable Biological Catch (ABC) or ACLs would be defined for white hake and GB yellowtail flounder 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 white hake and GB yellowtail flounder, 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.

An age-based projection model was used to estimate the short-term impacts on stock size of setting the ABCs for white hake and GB yellowtail flounder. These models 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 two stocks.

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.

White Hake
Under Option 1, white hake 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.

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 27). Option 1 would allow for greater increases in SSB than Option 2.

Figure 26 - Projected White Hake stock size under Option 1

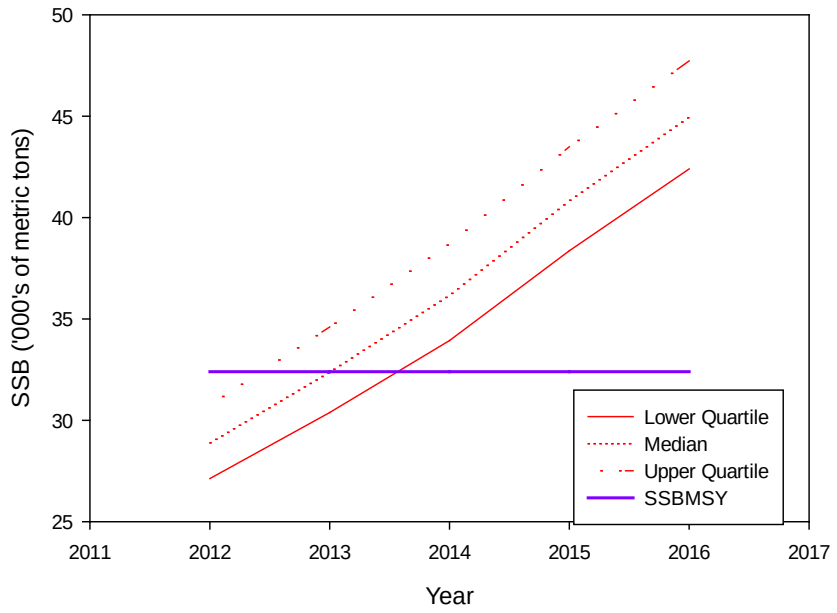


Figure 27 - Projected Georges Bank yellowtail flounder stock size under Option 1

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.

7.1.1.3.2 Option 2: Revised Annual Catch Limit Specifications

Option 2 would adopt new ABCs consistent with the best available science for GB yellowtail flounder (FY 2014) and white hake (FY 2014-2016). 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.

Both stocks had recent assessments; 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 US/CA Understanding (e.g., GB yellowtail flounder). This possibility and its effect on stock status is discussed later in this section.

Projected stock sizes are shown in Figure 28 and Figure 29. A comparison of probability of overfishing between the two options is difficult as Option 1/No Action has no OFLs defined for white hake and GB yellowtail flounder. For FY 2013, OFLs were defined for these 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.). There is some uncertainty with regard to whether the ABC would ensure that overfishing is not occurring, however, the SSC determined that maintaining an ABC of 500mt would afford the stock a better chance to show a response than in recent years.

White Hake
White hake SSB projections indicate a further increase in SSB above the SSB_{MSY} under this scenario (Figure 28).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.

GB Yellowtail Flounder
This stock is well below the SSB_{MSY}. Marginal increases in SSB occur under Option 2 catch of 400 mt (Figure 29). Slightly greater increases in SSB occur under Option 1 than Option 2.

Figure 28 - Projected White Hake stock size under Option 2

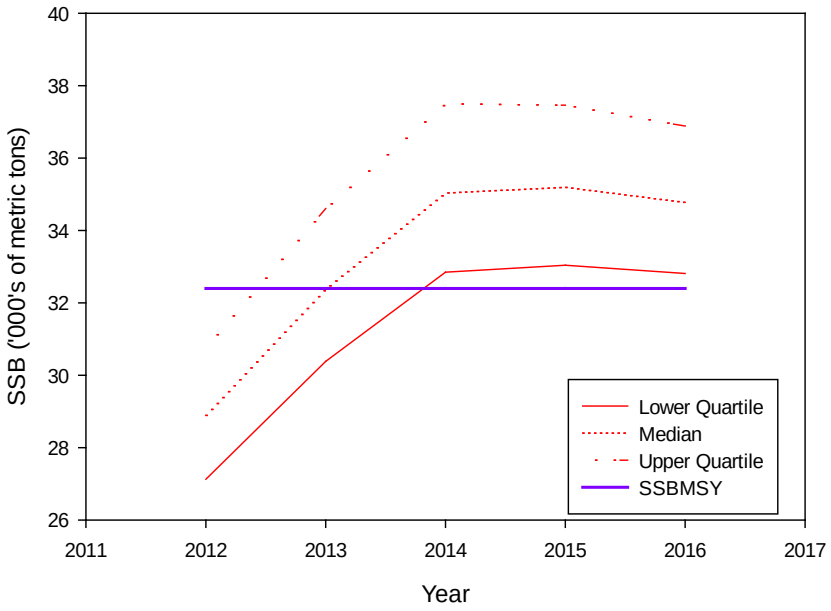
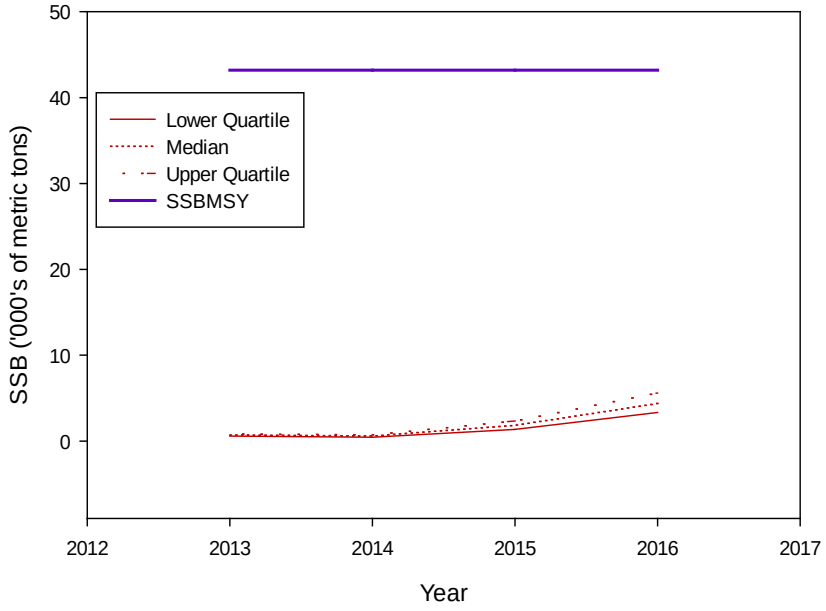


Figure 29 - Projected GB Yellowtail Flounder stock size under Option 2 (split series, rho adjusted, 400 mt)



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.

Additional species that could be affected by this option would be Atlantic sea scallops and species captured by small-mesh fisheries. The specified sub-ACLs of GB yellowtail flounder for the sea scallop fishery and small-mesh fisheries are designed to limit the incidental catch of yellowtail flounder by the scallop fishery and small-mesh fisheries. For the scallop fishery, allocations that are exceeded result in triggering AMs in subsequent years. AMs for small-mesh fisheries are being considered in this action. The sub-ACLs can affect fishing mortality and stock size of sea scallops and species captured by small-mesh fisheries through this mechanism.

Impacts of Sector Carry-Over on Biological Impacts

Framework 50 used 305(d) of MSA to clarify carryover, which remains unchanged; however, how NMFS accounts for carryover that is used in determining if accountability measures (AMs) are necessary will be handled differently beginning in FY 2014 and beyond (see Appendix V in the FW 50 Environmental Assessment for a more detailed explanation). Carryover does not apply to those stocks managed under the US/CA Understanding (i.e., Eastern Georges Bank cod, Eastern Georges Bank haddock, and Georges Bank yellowtail flounder).

Under the clarified carryover program, there are two components: A *de minimus* amount automatically provided that is not expected to cause any ACL overage and changes to catch accounting for sectors that bring forward and use more than the *de minimus* amount (up to the full 10% available).

NMFS is in the process of determining an appropriate *de minimus* amount for each stock and will provide the analysis to the Council at a later date. The *de minimus* amount is expected to be quite small so that it falls within the management uncertainty for the fishery and would not, if fully utilized, cause the sector sub-ACL to be exceeded. As such, it is expected to be consistent with National Standard 1 guidance.

Under the clarified program, sectors can continue to bring forward up to 10% of unused ACE from the previous fishing year. If this carryover is used in subsequent year (e.g., FY 2013 carryover used in FY 2014) there are two possible outcomes under the clarification:

- If the total fishery level ACL is not exceeded for the year, the carryover catch does not trigger accountability measures (AM). Essentially, sectors that use carryover ACE in this scenario benefit from underutilization of other components of the fishery and are not subject to an AM.
- If the total fishery level ACL is exceeded, the amount of carried over catch that contributed to the overage will be subject to the repayment AM specified in regulation. Under this scenario, the repayment may not equal the amount of carryover used, dependent on if other fishery components fully utilized available catch limits. Only in a situation where all fishery components used 100% of their sub-ACLs would sectors repay the full amount of carryover used. By ensuring

accountability for any stock-level overage, this carryover approach would be consistent with National Standard 1 guidance.

7.1.2 Commercial and Recreational Fishery Measures

7.1.2.1 Small-Mesh Fishery Accountability Measures

7.1.2.1.1 Option 1: No Action

Impacts on regulated groundfish

This measure would not adopt a small-mesh fishery accountability measure for GB yellowtail flounder. Catches by these fisheries (longfin squid and whiting) have ranged from 24 mt to 110 mt during the period 2004 through 2012.Should the total ACL decline in future years, this catch could be a substantial portion of overall removals, and the lack of an AM to prevent the sub-ACL from being exceeded could lead to overfishing. Currently, groundfish fishing activity would be impacted by any overage of the GB yellowtail flounder sub-ACL for this fishery. When compared to Option 2, this measure would not result in any changes in fishing effort. As a result, when compared to Option 2, this option would have an increased risk of overfishing GB yellowtail flounder.

Impacts on other species

This option would have direct biological impacts on other species, specifically squid, whiting, and Atlantic sea scallops on Georges Bank. This option would be expected to lead to changes in catches of other species, and would affect the management of those species. Additional species that could be affected by this option would be species caught in small-mesh fisheries, principally squid and whiting and Atlantic sea scallops on Georges Bank. The GB yellowtail flounder sub-ACL for small-mesh fisheries would continue to not have an AM under this option. Although a pound for pound payback would remain in place due to the Understanding, fishing would continue on whiting and squid of Georges Bank if the sub-ACL was exceeded, zero, or not specified. The sub-ACL for GB yellowtail flounder can affect fishing mortality and stock size of species captured by the small-mesh fisheries (e.g., if by avoiding high bycatch rates of GB yellowtail flounder, the small-mesh fisheries reduce their target species catches).

The specified sub-ACL of GB yellowtail flounder for the sea scallop fishery are designed to limit the incidental catch of yellowtail flounder by the scallop fishery. For the scallop fishery, allocations that are exceeded result in triggering AMs in subsequent years. The sub-ACL for GB yellowtail flounder can affect fishing mortality and stock size of sea scallops and other species captured by scallop fishery.

7.1.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder Sub-ACL

Two options (one with two sub-options) are being considered for the small-mesh fishery AM.

<u>Sub-Option A</u>:

Impacts on regulated groundfish

This sub-option would prohibit fishing with small-mesh gear if the Georges Bank yellowtail flounder sub-ACL is zero or not specified. This would reduce fishing in this area under the AM and would decrease

impacts on GB yellowtail flounder. Any unforeseen shift in fishing effort to areas outside the AM areas may increase fishing activity and impacts on other regulated groundfish species. Option 2/Sub-Option A could have positive impacts on GB yellowtail flounder compared to Option 1, making it less likely that overfishing would occur.

Impacts on other species

This measure could reduce catches of species caught on small-mesh trips, primarily squid and whiting. This is because if the AM is triggered because the sub-ACL is exceeded, it may restrict fishing activity on GB and lead to reduced catches of squid and whiting. When compared to Option 1/No Action, there is a chance this measure would lead to reduced fishing mortality on small-mesh species.

Sub-Option B1:

Impacts on regulated groundfish

This AM would only be triggered if both the total ACL and small-mesh sub-ACL of GB yellowtail flounder were exceeded. I the total ACL is not exceeded then no AM would be implemented and therefore no expected change in fishing pressure. If the AM was triggered, then the small-mesh vessels would be required to use modified gear in the GB yellowtail flounder stock area to reduce the catch of flounders in the AM areas. The gear restrictions under the AM would decrease impacts on GB yellowtail flounder. Any unforeseen shift in fishing effort to areas outside the GB yellowtail flounder stock area may increase fishing activity and impacts on other regulated groundfish species. Option 2/Sub-Option B1 could have positive impacts on GB yellowtail flounder compared to Option 1/No Action, and more positive benefits than Sub-Option A, making it less likely that overfishing would occur.

Impacts on other species

This measure could reduce catches of species caught on small-mesh trips, primarily squid and whiting. If the AM is triggered because the sub-ACL is exceeded, the required conservation gear may reduce the target catch (squid and whiting) efficiency compared to the standard gear. In addition, the AM may reduce fishing activity on GB if vessels do not own the approved selective gear, or chose not to fish with the required selective gear, which would also lead to reduced catches of squid and whiting. When compared to Option 1/No Action, there is a chance this measure would lead to reduced fishing mortality on small-mesh species. Option 2/Sub-Option B1 could have positive impacts other species compared to Option 1/No Action, and more positive benefits than Sub-Option A.

Sub-Option B2 (*Preferred Alternative*):

Impacts on regulated groundfish

The AM would be triggered if the small-mesh sub-ACL for GB yellowtail flounder was exceeded, regardless of whether the total ACL was exceeded or not. This option might be triggered sooner than the other options. If the AM was implemented then the small-mesh vessels would be required to use modified gear to reduce the catch of flounders in the AM areas. If the AM was implemented then the small-mesh vessels would be required to use modified gear to reduce the catch of flounders in the AM areas. The gear restrictions under the AM would be expected to decrease impacts on GB yellowtail flounder. Any unforeseen shift in fishing effort to areas outside the AM areas may increase fishing activity and impacts on other regulated groundfish species. Option 2/Sub-Option B2 could have positive impacts on GB yellowtail flounder compared to Option 1, but more positive benefits than Sub-Option A, making it less

likely that overfishing would occur. This option is more conservative compared to Sub-Option B1, because it would be triggered even if the total ACL was not exceeded.

Impacts on other species

This measure could reduce catches of species caught on small-mesh trips, primarily squid and whiting. If the AM is triggered because the sub-ACL is exceeded, the required conservation gear may reduce the target catch (squid and whiting) efficiency compared to the standard gear. In addition, the AM may reduce fishing activity on GB if vessels do not own the approved selective gear or choose not to fish with the required selective gear, which would also lead to reduced catches of squid and whiting. When compared to Option 1/No Action, there is a chance this measure would lead to reduced fishing mortality on small-mesh species. Option 2/Sub-Option B2 could have positive impacts other species compared to Option 1/No Action, and more positive benefits than Sub-Option A and Sub-Option B1.

7.1.2.2 Management Measures for US/CA TACs

This section considers changing fishery management measures as necessary to adjust catches of US/CA stocks. More than one option can be selected.

7.1.2.2.1 Option 1: No Action

Impacts on regulated groundfish species

This option would not alter US/CA quotas in-season; this option is not expected to impact regulated groundfish species. Compared to Options 2 and 3, the No Action alternative would impact regulated groundfish species the least, since TACs of the US/CA stocks would not be increased.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species, since TACs of the US/CA stocks would not be increased.

7.1.2.2.2 Option 2: Revised in-season adjustment for US/CA TACs

Impacts on regulated groundfish species

This option allows the Regional Administrator to adjust the US/CA quotas during the fishing year that could result in an increase or decrease in the TACs for the US/CA stocks (EGB haddock, EGB cod, and GB yellowtail flounder). An in-season adjustment could shift (or increase) fishing effort from one target species to another and from one area to another, potentially increasing impacts on the US/CA stocks and stocks caught at the same time such as other regulated groundfish species. Option 2 has similar impacts on regulated groundfish species compared to Option 3 for both sub-options. When compared to the No Action alternative, it could have increased potential impacts on groundfish species.

Impacts on other species

This option would potentially lead to changes in catches of other species caught with US/CA stocks. When compared to the No Action alternative, it could have increased potential negative impacts on other species.

7.1.2.2.3 Option 3: Distribution of US TACs in Eastern/Western Georges Bank

Sub-Option A:

Impacts on regulated groundfish

This option would allow an adjustment to the EGB haddock quota prior to the start of the fishing year; the expected adjustment would be to reduce the EGB haddock quota and increase the WGB haddock quota. This alternative could increase fishing effort in the western area and increase impacts on WGB haddock but could result in a decrease in impacts of EGB haddock in the eastern area. Likewise, other groundfish species, caught on the same trips (e.g., Georges Bank cod) could have increased fishing effort. Option 3/Sub-Option A has similar impacts on regulated groundfish species compared to Option 2/Sub-Option B and Option 2. When compared to the No Action alternative, it could have increased potential impacts on Georges Bank haddock.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species.

Sub-Option B:

Impacts on regulated groundfish

This option allows sectors or state-operated permit banks, to harvest their EGB haddock quota in the WGB stock area at any time during the fishing year. It is unknown how much EGB quota will be harvested in the WGB area or whether this sub-option would result in more EGB quota being move than Sub-Option A. This alternative could increase fishing effort in the western area and increase impacts on WGB haddock but could result in a decrease in impacts of EGB haddock in the eastern area. Likewise, other groundfish species, caught on the same trips (e.g., Georges Bank cod) could have increased fishing effort. Option 5/Sub-Option B has similar impacts on regulated groundfish species compared to Option 3/Sub-Option A and Option 2. When compared to the No Action alternative, it could have increased potential impacts on Georges Bank haddock. While unknown, impacts are not likely to be significant because the overall ABC for GB haddock remains unchanged.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species.

7.1.2.3 Georges Bank Yellowtail Flounder Management Measures

7.1.2.3.1 Option 1: No Action

Impacts on regulated groundfish

This option would not modify the management measures for GB yellowtail flounder for estimating discards. This option would continue to use the entire stock area as the discard stratification scheme used for quota monitoring purposes. This level of area stratification is consistent with that used when assessing this stock, and so presumably it would result in a closer correspondence between in-season discard estimates and the discard estimates used in assessments regardless of how observer coverage is distributed in the area. If there are different discard rates in different areas, however, this approach may lead to increased uncertainty in discard estimates. The analyses summarized in Table 60 and Table 61 show that based on FY 2010 and FY 2011 data, the discard estimates from this option would not be expected to be very different than in Option 2. As discussed, however, the variance may increase.

Impacts on other species
There are not likely to be direct impacts on fishing mortality or stock size of other species as a result of the discard strata used if this option is adopted. The selection of discard strata used to monitor GB yellowtail flounder quotas will not modify the discard strata used to estimate discards of other species. There would not likely be differences between this option and Option 2.

7.1.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail Flounder

Impacts on regulated groundfish

This measure would modify the way discards are estimated for GB yellowtail flounder. Under Option 1 No Action, each discard stratum applies to the entire GB yellowtail flounder stock area. Discards of GB yellowtail flounder are calculated based on observed and unobserved trips in SAs 522, 525, 561, and 562. This option would divide this area into two separate discard strata: one stratum would be SA 522, and SAs 525/561/562 would be the other stratum.

In a qualitative sense, if there are differences in discard rates between the two strata, and observer coverage is adequate to sample trips from both strata, then stratification should provide more precise estimates of discards. Whether a different point estimate would result from the two stratification schemes depends in part on whether observer coverage with one stratum is distributed in a way that accurately represents fishing activity. If it does not, then stratification into two areas could result in a point estimate that is different from the single stratum approach. Recent assessments of GB yellowtail flounder use only one stratum, so it is possible that if quota monitoring uses a different stratification system the catch estimates for quota monitoring could differ from those used for assessing the stock. If the differences are large, then it will make it more difficult to link quota monitoring catches to mortality targets. If the quota-monitored catch is smaller than the assessment catch mortality targets may be exceeded. If the quota-monitored catch is larger than the assessment catch available yield may be foregone. The differences between the two catch estimates should only apply to discard estimates and not to landings. Large mesh otter trawl discards of GB yellowtail flounder declined dramatically after the implementation of sectors. In 2011, they accounted for less than five percent of the total catch. Assuming these discards remain a small proportion of the total catch, differences in discard estimates between the two stratification approaches are not likely large enough to threaten mortality targets.

Data from fishing years 2010 and 2011 was used to explore how the two proposed discard strata might affect discard estimates used in monitoring sector catches. To simplify the analyses, discards were calculated using the approach used for in-season rates; none of the estimates used the assumed rate or transition rate approach that is used until five trips are observed in a stratum. Since almost all GB yellowtail flounder is caught by trawl gear, only trips using otter trawls (code 050), separator trawls (code 057), or Ruhle trawls (code 054) were used. There are several instances where there were no observed trips in a sector/gear combination and there were unobserved trips, or the opposite; these instances were not included in the analysis. The analyses summarized observed trips and discard rates by sector and gear,

and then expanded the discard rates to total discards on unobserved trips by using the total kept catch on unobserved trips. Discards on observed trips were added to get total discards in each gear and sector combination.

The results for FY 2010 are shown in Table 60 and for FY 2011 in Table 61. Generally, for both years the sector/gear discard rate in SA 525/561/562 was higher than the discard rate in SA 522, though there are a few exceptions. The discard rate in SA 525/561/562 was higher than the discard rate for all four areas in all but three instances, and in each of these three instances there were small numbers of trips. Stratification resulted in relatively small changes in the point estimate of discards. In FY 2010, the total discards estimated for these trips was five percent higher when the Option 2 approach was used, while in FY 2011 the difference was less than one percent. The effect on the variance of the discard estimates was not calculated, but it should be noted that for several sectors stratification into two areas reduces the number of observed trips to low levels which would be expected to increase the variance in those estimates. Lower observer coverage levels and an additional area stratification could result in some sector/gear/area combinations with very high or low discard rates just from chance alone. Estimates based on a finer scale of stratification will be more sensitive to errors in the expansion factor (the unobserved kept–all estimate). Many VTR records attribute all landings to one statistical area even when multiple areas were fished; this could lead to more errors in the kept-all that is used to expand discard rates to an estimate of discards if a discard stratum is small or based on one statistical area.

In summary, based on fishing activity in FY 2010 and FY 2011, changing the stratification of quota-monitoring discard estimates as proposed in this option is not likely to lead to large changes in the point estimate of discards when compared to the stratification method used in Option 1 No Action. As a result this option would be unlikely to result in biological impacts that are any different than those in Option 1 No Action. It is possible that Option 2 may result in increased variance in discard estimates as some sector/gear combinations could have few observed trips in each stratum. Based on FY 2010 and 2011, this appears likely since a number of sector/gear /area combination has fewer than five observed trips. It is also possible that if observer coverage rates decline, the variance of discard estimates could increase because more sector/gear/area combinations will have fewer trips. This option cannot be compared to Option 3 because the two measures address different issues.

Impacts on other species

This option would not have any biological impacts on other species. The proposed change to the discard strata would only be used for catches of GB yellowtail flounder and not for other species. As a result, this measure would not change the way discards of other species are calculated. The biological impacts on other species would not be any different than those expected under Option 1 No Action.

Table 60- Observed trips and expanded discards using different GB yellowtail flounder stratification schemes, FY 2010. "Other" bold-faced discard rates are higher than those in SA 522; underlined values are higher than the rates for the entire area.

2010		Observed Trips						Expanded Discards			
		GB Area		522		Other					
Sector ID	Gear	SubTrips	d:K	SubTrips	d:K	SubTrips	d:K	GB	522	Other	(522+Other)
002	050	4	0.084631	2	0.003465	2	***0.098145***	27,498	202	26,077	26,279
005	050	66	0.001679	43	0.001237	23	***0.00212***	5,993	1,877	4,354	6,231
	054	8	0.000605	2	0.000747	6	0.0006	163	39	131	170
	057	68	0.002507	25	0.00243	43	***0.00252***	10,537	1,107	9,441	10,548
007	050	55	0.003898	34	0.001783	21	***0.007747***	9,342	2,477	7,656	10,133
	054	2	0.000974	1	0	1	***0.000988***	9	0	9	9
	057	17	0.004366	7	0.000872	10	***0.006337***	1,298	65	1,397	1,463
009	050	46	0.005128	21	0.002396	25	***0.007148***	14,829	3,283	10,705	13,988
	054	3	0.000128	2	0	1	***0.000129***	1	0	1	1
	057	15	0.021771	7	0.011251	8	***0.031677***	4,469	640	4,786	5,426
012	050	35	0.002082	20	0.001795	15	***0.002374***	3,729	1,155	2,721	3,876
	057	26	0.006762	11	0.001599	15	***0.007824***	6,087	209	6,113	6,322
016	050	51	0.004653	26	0.002122	25	***0.006177***	12,727	1,947	11,190	13,137
	054	25	0.001602	11	0.000452	14	***0.002505***	811	79	893	972
	057	8	0.011684	3	0.000752	5	***0.012846***	1,157	7	1,150	1,157
017	050	95	0.010453	53	0.00295	42	***0.018264***	58,564	7,049	58,322	65,371
	054	1	0.001237			1	***0.001237***	55	0	55	55
	057	16	0.009919	7	0.000195	9	***0.01137***	1,568	4	1,609	1,613
018	050	17	0.008556	7	0.004379	10	***0.009906***	8,004	882	7,270	8,152
019	050	11	0.008052	4	0.000822	7	***0.009357***	4,866	91	4,618	4,708
020	050	3	0.00039	2	0.000391	1	0	98	66	0	66
	057	4	0.017352	1	0.023438	3	0.017299	2,047	12	2,029	2,042
								173,855	21,189	160,530	181,719

Table 61- Observed trips and expanded discards using different GB yellowtail flounder stratification schemes, FY 2011. "Other" bold-faced discard rates are higher than those in SA 522; underlined values are higher than the rates for the entire area.

		Observed Trips						Expanded Discards			
		GB Area		522		Other					
Sector	Gear	Sub Trips	d:K	Sub Trips	d:K	SubTrips	d:K	GB	522	Other	(522+Other)
005	050	100	0.000878	66	0.000918	34	0.000816	3,658	2,018	1,604	3,622
	054	2	0			2	0	0	0	0	0
	057	55	0.002542	20	0.000408	35	***0.003048***	5,827	101	6,311	6,411
007	050	45	0.003	28	0.001599	17	***0.006827***	5,946	2,223	3,978	6,201
	057	6	0.003444	2	0	4	***0.003711***	3,135	0	3,148	3,148
009	050	48	0.007793	26	0.002939	22	***0.012107***	18,034	3,634	12,867	16,501
	057	10	0.001279	5	0.00107	5	***0.001364***	140	29	111	140
012	050	40	0.002714	26	0.000415	14	***0.006013***	3,832	293	4,427	4,720
	057	12	0.00154	6	0	6	***0.001962***	355	0	308	308
								0	0	0	0
016	050	68	0.004404	34	0.000974	34	***0.008926***	12,448	1,423	12,024	13,446
								0	0	0	0
	054	10	0.000401	1	0	9	***0.000409***	81	0	81	81
017	050	160	0.006421	90	0.003126	70	***0.009634***	49,351	12,336	35,642	47,978
	057	10	0.002581	5	0	5	***0.003888***	678	0	712	712
018	050	6	0.005114	3	0.002983	3	***0.006598***	1,628	346	1,367	1,713
019	050	5	0.002488	2	0.001469	3	***0.003045***	1,086	84	1,148	1,232
020	050	5	0.000683	3	0	2	***0.002038***	248	0	138	138
								106,446	22,486	83,865	106,352

7.1.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

7.1.2.4.1 Option 1: No Action

Impacts on regulated groundfish

This option would maintain the requirement for limited access scallop vessels to land all legal-sized yellowtail flounder. The No Action alternative is not expected to change fishing activities by scallop vessels and would not impact GB and SNEMA yellowtail flounder species. In addition due to concerns about discarding of yellowtail flounder, this option would maintain accountability for catches of this stock. However if vessels choose to take advantage of this regulation and target yellowtail flounder then when compared to Option 2 yellowtail flounder catches could increase. Option 1 could have slightly more

negative impacts on GB and SNEMA yellowtail flounder than Option 2 if LA scallop vessels target yellowtail flounder.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species.

7.1.2.4.2 Option 2: Prohibition on possession of yellowtail flounder

Impacts on regulated groundfish

This option would prohibit possession of GB and SNEMA yellowtail flounder stocks by limited access scallop vessels, i.e. they would be required to discard all yellowtail flounder. This measure is expected to eliminate any potential targeting of YT flounder by scallop vessels, which could have negative impacts on groundfish species. Therefore, prohibiting possession may have positive impacts on groundfish species if it eliminates the incentive for scallop vessels to target yellowtail flounder. This measure does not affect the level of effort in the scallop fishery. Scallop vessels will likely maintain the same fishing patterns under this option, and discard any YT flounder as bycatch. As analyses show in this document, the majority of yellowtail flounder caught in this fishery is discarded. Compared to Option 1 this option has potentially more positive impacts on groundfish species if it helps to eliminate targeting of yellowtail flounder by scallop vessels.

Impacts on other species

This option would not be expected to have any direct impacts on other species. This option would not be expected to lead to any changes in catches of other species, and would not affect the management of those species.

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 the implementation of 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 Surf clam and Ocean Quahog; Atlantic Bluefish; Northeast Skates; and Atlantic Highly Migratory Species. The Preferred Alternative action makes relatively minor adjustments in the context of the fishery as a whole, and is not expected to have significant additional adverse impact on EFH relative to No Action. Furthermore, the Preferred Alternatives do not allow for access to the existing habitat closed areas on GB and in the GOM that were implemented in Amendment 13 to the Multispecies FMP and therefore they continue to minimize the adverse impacts of bottom trawling on EFH.

7.2.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

7.2.1.1 Revised Gulf of Maine Cod 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. If this option was adopted, fishing mortality would be set as close to zero as possible in 2015. This may reduce groundfish fishing activity in the GOM area compared to Option 2. Thus, No Action would be expected to reduce fishery impacts on EFH.

7.2.1.1.2 Option 2: Revised Rebuilding Strategy for Gulf of Maine Cod

Two options are being considered for a revised rebuilding strategy for GOM cod. Overall, when compared with the No Action alternative, Option 2 would result in more fishing activity targeting GOM cod because the fishing mortality would be set higher than 75% FMSY.

Sub-Option A would revise the rebuilding strategy to a target date of 2022 with a median probability of success, while Sub-Option B would revise the rebuilding strategy to a target date of 2024 with a median probability of success.

Either approach would allow for a slightly higher fishing mortality rate, which would probably lead to increased fishing effort and therefore increased impacts to EFH in the GOM when compared to the No Action alternative. However, fishing effort will be limited by ACLs for associated species, such as GOM

haddock, which has a lower ACL compared to GOM cod. Thus, it is difficult to estimate how much a change in the rebuilding plan would contribute to increased fishing effort in the GOM. Overall, the impacts of Option 2 on EFH are probably slightly negative to neutral relative to Option 1, No Action.

7.2.1.1.3 Option 3: Rebuilding Plan Review Analysis

If selected, Option 3 would be implemented in conjunction with Option 2. It would require an analysis of the rebuilding plan using the described criteria. This administrative alternative is not expected to impact EFH directly.

7.2.1.2 Revised American Plaice Rebuilding Strategy

7.2.1.2.1 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. If this option is adopted, fishing mortality would be set as close to zero as possible in 2015. This may reduce groundfish fishing activity in the American plaice stock area (GOM and GB) compared to Option 2.

7.2.1.2.2 Option 2: Revised Rebuilding Strategy for American Plaice

Three options are being considered for a revised rebuilding strategy for American plaice. Overall, when compared with the No Action alternative, Option 2 would result in more fishing activity targeting American plaice because the fishing mortality would be set higher than 75% FMSY.

Sub-Option A would revise the rebuilding strategy to a target date of 2021 with a median probability of success. Sub-Option B would revise the rebuilding strategy to a target date of 2022 with a median probability of success. Sub-Option C would revise the rebuilding strategy to a target date of 2024 with a median probability of success.

All three approaches would allow for a slightly higher fishing mortality rate, which would probably lead to increased fishing effort and therefore increased impacts to EFH in the American plaice stock area (GOM and GB) when compared to the No Action alternative. However, fishing effort will be limited by ACLs for associated species, such as witch flounder. Thus, it is difficult to estimate how much a change in the rebuilding plan would indirectly contribute to increased fishing effort in the American plaice stock area (GOM and GB). Overall, the impacts of Option 2 on EFH are probably slightly negative to neutral relative to Option 1, No Action.

7.2.1.2.3 Option 3: Rebuilding Plan Review Analysis

If selected, Option 3 would be implemented in conjunction with Option 2. It would require an analysis of the rebuilding plan using the described criteria. This administrative alternative is not expected to impact EFH directly.

7.2.1.3 Annual Catch Limits

7.2.1.3.1 Option 1: No Action

Under No Action, stocks with FY 2014 specifications from previous actions would be maintained at that level. However, GB yellowtail flounder and white hake do not have FY 2014 specifications defined in

previous actions. This option would not set specifications for these stocks in FY 2014. Without specification of an ACL, 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 in the GB and GOM regions as compared to the alternative specifications (Option 2).

7.2.1.3.2 Option 2: Revised Annual Catch Limit Specifications

Option 2 would adopt new ABCs consistent with the best available science for GB yellowtail flounder (FY 2014), GB haddock (FY 2014), GB cod (FY 2014) and white hake (FY 2014-2016) as shown in Table 4. The ABCs for other stocks were set in previous actions. The ACLs and sub-ACLs, where specified, follow directly from the ABC levels.

One way to consider these ABCs and ACLs is in comparison with status quo catch limits. The white hake ABCs are similar for FY 2014, 2015, and 2016 (4,642, 4,713, and 4,645 mt, respectively), and represent a slight increase as compared to the 2013 ABC of 4,177 mt. However, in FY2012, less than 70% of the white hake ACL was caught by the groundfish fleet (Table 33), so the ACL changes alone are not likely to result in increased fishing effort and increased impacts to EFH. Thus, the white hake specifications are expected to have neutral impacts relative to current conditions. It is difficult to predict how fishing effort may change in later years of the specifications, i.e. fishing years 2015 and 2016, because ACLs for some key stocks (GB cod, haddock, and yellowtail) have not yet been determined.

The GB yellowtail flounder, eastern GB cod, and eastern GB haddock U.S. TACs/ABCs would increase during FY 2014, which may increase fishing effort and therefore impacts to EFH on GB relative to current conditions:

GB yellowtail flounder: 215 mt in FY 2013 to 328 mt in FY 2014
E. GB cod: 96 mt in FY 2013 to 154 mt in FY 2014
E GB haddock: 3,952 mt in FY 2013 to 10,530 mt in FY 2014

While the groundfish fleet caught only 58.5% of their yellowtail ACL in 2012 (Table 33), the GB yellowtail flounder ACL is generally smaller and probably more of a constraint on effort in the fishery as compared to the white hake limit, so increased effort and impacts to EFH are a likely response to the increased ABC and ACL for GB yellowtail flounder. A smaller percentage of the GB cod ACL was caught in FY 2012, 26.9%, but this stock is also likely to constrain effort in the fishery. The GB haddock catch limits do not constrain the fishery as they are very large relative to other catch limits. It is difficult to assess where on GB effort increases may occur as stocks like GB cod and yellowtail may be taken incidentally while targeting more abundant species such as haddock and winter flounder. Fishing on structurally complex, lower energy areas along the northern edge of the bank will have a greater impact on seabed habitats as compared to fishing on lower vulnerability, high energy sand habitats on the southeastern part of the bank.

Another way to consider the impacts of these ABCs and ACLs is relative to the No Action option. Option 2 would have a negative impact on EFH compared to No Action, which sets no ABC/ACL for four

stocks: GB cod, GB haddock, GB yellowtail flounder, or white hake. The No Action option is expected to reduce fishing effort on Georges Bank significantly, such that impacts of the groundfish fishery on EFH would be reduced. Thus, Option 2 has negative impacts for EFH as compared to Option 1, No Action.

7.2.2 Commercial and Recreational Fishery Measures

7.2.2.1 Small-Mesh Fishery Accountability Measures

7.2.2.1.1 Option 1: No Action

FW48 established a sub-ACL for GB yellowtail flounder for the small mesh fishery. This option would continue current management where there is no AM for the small-mesh fishery for GB yellowtail flounder. Fishing effort would not be modified if the sub-ACL is exceeded, for example through gear restricted areas or a reduction in the sub-ACL the following year. GB yellowtail flounder is a TMGC stock; if the US exceeds its negotiated TAC there is a pound for pound payback under the U.S./Canada Resource Sharing Understanding. The small-mesh fishery is prohibited from landing GB yellowtail flounder; the pound for pound payback may not correct an overage thus fishing effort may remain at current levels under the No Action alternative and would not be expected to result in changes to impacts on EFH. The No Action alternative does not have the expected positive benefit like Option 2.

7.2.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder Sub-ACL

Two options are being considered for the small-mesh fishery AM. Overall, Option 2 would have positive impacts on EFH when compared to the No Action alternative, as discussed in each section below.

Sub-Option A:

If adopted, this sub-option prevents fishing in the GB yellowtail flounder stock area if the sub-ACL for the small-mesh fishery was zero. A zero sub-ACL would result from repayment of pound for pound overages under the US-Canada Sharing Agreement. This AM option would reduce fishing effort on Georges Bank, for example whiting fishing in the Cultivator Shoal Area and squid/mackerel/butterfish trawling along the southern flank of Georges Bank, which would be a positive impact in those areas. It is unclear if this would shift effort to other areas, which would negatively impact EFH in those areas. Compared to the No Action alternative, Sub-option A has fewer impacts on EFH as it restricts trawl gear effort on GB. It is difficult to compare Sub-Option A to Sub-Option B because Sub-Option A is a reduction in effort overall and Sub-Option B is a gear change. Both are expected to have positive impacts on EFH but would do so via different mechanisms.

Sub-Option B1:

If adopted, this sub-option would establish an AM that would require the use of approved selective trawl gear designed to reduce the catch of yellowtail flounder if the AM is triggered. The selective gear would need to use either a raised footrope or a chain sweep, as approved by NMFS. The AM is only triggered if the total ACL and small-mesh sub-ACL for GB yellowtail flounder are exceeded; this is less conservative than sub-option B2. Switching to a different type of trawl gear could reduce seabed impacts. In particular, along the footrope, the contact of a raised footrope trawl with the seabed is likely very low (estimated at 5% for the Swept Area Seabed Impact model, NEFMC 2011). Trawls used in the squid fishery are also relatively low contact along the sweep; estimated at about 50% (NEFMC 2011). Thus, if the AM is triggered, a shift from gear that uses cookie or roller sweeps to gear that uses a raised footrope or chain

sweeps is expected to reduce impacts to EFH. This assumes that gear efficiency is maintained such that overall bottom fishing time does not increase. It is difficult to compare Sub-Option A to Sub-Option B because Sub-Option A is a reduction in effort overall and Sub-Option B is a gear change. Both are expected to have positive impacts on EFH but would do so via different mechanisms.

Sub-Option B2:

If adopted, this sub-option would establish an AM that would require the use of approved selective trawl gear designed to reduce the catch of yellowtail flounder if the AM is triggered. The AM is triggered if the total ACL for GB yellowtail flounder is exceeded; this is more conservative than sub-option B1. As above, switching to a different type of trawl gear is likely to reduce seabed impacts. It is difficult to compare Sub-Option A to Sub-Option B because Sub-Option A is a reduction in effort overall and Sub-Option B is a gear change. Both are expected to have positive impacts on EFH but would do so via different mechanisms.

7.2.2.2 Management Measures for US/CA TACs

This section considers changing fishery management measures as necessary to adjust catches of US/CA stocks. More than one option can be selected. It is difficult to rank the various options in terms of their potential impacts. The US/CA stocks include GB cod, GB haddock, and GB yellowtail flounder.

7.2.2.2.1 Option 1: No Action

This option would not alter how the US/CA TACs are administered. Any impacts to EFH would be dependent on the magnitude of the TACs negotiated according to the current process. These TACs are unknown for FY beyond 2014. The impacts of the FY 2014 TACs and their associated ABCs/ACLs are discussed in a previous section. It is reasonable to assume that trades contemplated under Option 2 would have a good chance of increasing fishing effort and therefore EFH impacts in US waters, otherwise such trades would not be suggested. However, it is not certain that a mutually beneficial exchange could be arrived at in any given year. Therefore, fishing effort on Georges Bank would probably remain the same or be less under No Action US/CA TAC administration as compared to a scenario where US/CA TACs could be adjusted in season. It is difficult to estimate what the actual impacts might be without knowing the magnitude of catch shifts that might occur. If increases in the TAC were to occur, there may be more bottom contact; bottom contact would be reduced if the TAC was decreased. However, habitat in these areas has already been degraded by fishing gear.

7.2.2.2.2 Option 2: Revised in-season adjustment for US/CA TACs

This option would authorize the Regional Administrator to adjust the US/CA quotas after the initial negotiations. Additional quota would be allocated consistent with the current ABC distribution, which would include both groundfish and non-groundfish vessels. The trade would be dependent on the current needs of fisheries in each country and the resource allocation distribution, both of which cannot be predicted. Any shifts in fishing effort given the updated allocations would occur within the GB stock area. EFH impacts would vary depending on the magnitude of quota received by the various fisheries (and gear types) harvesting the quota. Because these values are unknown, the impacts to EFH are unknown.

7.2.2.2.3 Option 3: Distribution of US TACs in Eastern/Western Georges Bank

Sub-Option A:

If this sub-option was adopted, the Regional Administrator would be authorized to adjust the portion of U.S. TAC for EGB haddock that is available in the EGB stock area. GB haddock is assessed as a unit stock, and the EGB and WGB stock areas are administrative. Under the current approach, only the amount of the GB haddock ABC remaining after deducting the shared TAC for Eastern GB haddock is available to be caught outside of the Eastern U.S./Canada Area. This reduces operational flexibility for commercial groundfish vessels, and could potentially limit fishing outside of the Eastern U.S./Canada Area even if the total GB haddock ACL has not been fully caught. This measure would help increase the use of the GB haddock ACL, improve flexibility for commercial groundfish vessel, and could increase fishing effort overall. Thus, compared to the No Action alternative and Options 2, and Option 5 Sub-Option A would have negative impacts on EFH if the quota transfer leads to an increase in fishing effort overall. The increases would occur outside the Eastern U.S./Canada area.

Sub-Option B:
If this sub-option was adopted, sectors would be authorized to transfer a portion (or all) of their U.S. TAC for EGB haddock to the WGB stock area. As above, compared to the No Action alternative and Options 2, and Option 5 Sub-Option B would have negative impacts on EFH if the quota transfer leads to an increase in fishing effort overall. The increases would occur outside the Eastern U.S./Canada area.

7.2.2.3 Georges Bank Yellowtail Flounder Management Measures

7.2.2.3.1 Option 1: No Action

This option would not change management measures for GB yellowtail flounder, specifically there would be no stratification of discard estimates by any elements besides sector, gear, and mesh, and also no gear modification requirements imposed on small-mesh trawling activities (this mainly applies to the squid and whiting fisheries). This measure would not be expected to have any direct impacts on EFH. It could, however, indirectly lead to shifts in the distribution of fishing effort when compared to Option 2. Because of the expected low ABC for GB yellowtail flounder in the short term, if discard estimates are not stratified as proposed in Option 2, it is possible that fishermen may more rapidly catch their sector's allocation for this stock. This would prevent them from fishing on most of GB. While if this occurs it may reduce impacts to EFH when compared to Option 2, it is difficult to predict with certainty if this would actually occur. It is possible fishermen would modify fishing practices to reduce catches of yellowtail flounder in order to avoid exceeding their ACE and continue fishing in the area.

7.2.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail Flounder

This option would impose additional stratification criteria for the purpose of estimating in-season progress towards catching the GB yellowtail flounder quota. Specifically, Statistical Area 522 catches would be separated out from catches from Statistical Areas 561,562, and 525. Because catch rates of GB yellowtail flounder in the deeper portions of Statistical Area 522 tend to be lower than in the other statistical areas, this stratification would likely allow trawl vessels targeting other species, particularly haddock, to fish more in this area without exceeding GB yellowtail flounder allocations. Assuming that fishing effort on Georges Bank would be limited by yellowtail flounder catch limits, this stratification could lead to additional fishing activity in Area 522 and elsewhere on Georges Bank where haddock occur when compared to Option 1. This increased effort could increase seabed impacts, but catches would also be expected to more closely approach targets for stocks such as GB haddock. With the exception of the cobble-dominated habitats east and west of Georges Shoal in the eastern part of SA 522, the portion of SA 522 that is on the bank itself is generally relatively sandy and low energy, and therefore the habitat is less vulnerable as compared to habitats in SA 561. In this way, shifting effort from the western part of SA 561 into SA 522 could neutralize any negative impacts of increased fishing effort.

7.2.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

7.2.2.4.1 Option A: No Action

Under No Action, limited access scallop vessels are required to land all legal-sized yellowtail flounder caught in the GB and SNEMA stock areas. While the measure is intended in part to obtain additional data about the distribution of yellowtail flounder catches in the scallop fishery, it may be creating an incentive for some vessel operators to target yellowtail. Generally speaking, yellowtail flounder catches are a limiting factor in the distribution of scallop fishing effort, and many vessel operators try to avoid catching the species.

Regardless of whether yellowtail must be landed, the fishery is still limited to an overall sub-ACL for each yellowtail flounder stock, so this measure is probably not the main determinant of the amount and distribution of effort in the scallop fishery, and therefore on scallop fishery impacts to EFH. Based on scallop PDT analyses (see biological impacts section) compliance with this provision seems to be fairly low, i.e. most yellowtail are already discarded, at least during observed trips.

However, if yellowtail flounder are being targeted during additional tows that are not targeting scallops, then this measure could be causing additional fishing time in the scallop fishery and therefore increased impacts to EFH. This is more likely to occur on access area trips as compared to DAS trips, as scallop vessels would be expected to focus on catching more valuable scallops when they are time-limited on a DAS. If the landed yellowtail are truly incidental catch and are not being deliberately targeted, then the patterns of fishing effort and therefore impacts to EFH would not be expected to change very much if possession is prohibited. Overall, Option A likely has a small negative impact on EFH.

7.2.2.4.2 Option B: Prohibition on possession of yellowtail flounder

If this option is adopted, limited access scallop vessels would be prohibited from landing yellowtail flounder caught in the GB and SNEMA stock areas. This would reduce the incentive to target yellowtail flounder. Removing this incentive may lead to changes in fishing location and therefore the distribution of EFH impacts, or it could simply affect the rate of discards in the fishery. The prohibition would be expected to eliminate scallop fishery effort targeting yellowtail, and thus could reduce effort overall. However, if the majority of yellowtail catch is already incidental catch, then a prohibition on possession is not expected to have much influence on the patterns of fishing effort and therefore impacts to EFH in the scallop fishery. Overall, Option B likely has a small positive impact on EFH.

7.3 Impacts on Endangered and Other Protected Species

7.3.1 Updates to Status Determination Criteria, Formal Rebuilding Programs, and Annual Catch Limits

7.3.1.1 Revised Gulf of Maine Cod Rebuilding Strategy

7.3.1.1.1 Option 1: No Action

This option would result in no revision to the rebuilding strategy for Gulf of Maine cod. Fishing mortality (set at 75% F_{MSY}) would be maintained. The stock is unlikely to rebuild by 2014; this option does not alter fishing mortality and is not expected to greatly impact protected species. Compared to Options 2 and 3, this option would have low negative impacts on protected species.

7.3.1.1.2 Option 2: Revised Rebuilding Strategy for Gulf of Maine Cod

This option contains two sub-options that would allow the stock to rebuild by 2022 or 2024. The two sub-options allow for an increase in catch, which may increase interactions with protected resources when compared to the No Action alternative.

Sub-Option A: This strategy would rebuild the stock in 8 years with a 50% probability of success. The 8 year scenario is very similar to that of 75% F_{MSY}. The 8 year rebuilding plan is expected to allow a small increase in catch, which may impact protected species in areas where fishing for Gulf of Maine cod occurs. Compared to the No Action alternative and Option 3, this alternative is expected to adversely affect, but not jeopardize protected species in areas where fishing for Gulf of Maine cod occurs because of the slight increase in F allowed. The difference in F between Sub-Options A and B is small and may be difficult to detect; Sub-Option A would have similar impacts on protected resources as Sub-Option B during the length of the rebuilding plan.

Sub-Option B: This strategy would rebuild the stock in 10 years with a 50% probability of success. The resulting F for the 10 year scenario is higher than that of 75%F_{MSY} based on projections. The 10 year rebuilding plan is expected to allow an increase in catch, which may impact protected species in areas where fishing for Gulf of Maine cod occurs. Compared to the No Action alternative, this alternative is expected to adversely affect, but not jeopardize protected species in areas where fishing for Gulf of Maine cod occurs because of the slight increase in F allowed. The difference in F between Sub-Options A and B is small and may be difficult to detect; Sub-Option B would have similar impacts on protected resources as Sub-Option A during the length of the rebuilding plan.

7.3.1.1.3 Option 3: Rebuilding Plan Review Analysis

Option 3 would require an analysis of the rebuilding plan using the described criteria. This is an administrative alternative and is not expected to impact protected species.

7.3.1.2 Revised American Plaice Rebuilding Strategy

7.3.1.2.1 Option 1: No Action

This option would result in no revision to the rebuilding strategy for American plaice. Fishing mortality (set at 75% F_{MSY}) would be maintained. The stock is unlikely to rebuild by 2014, however, this option

does not alter fishing mortality and is not expected to greatly impact protected species. Compared to Options 2 and 3, this option would have low impacts on protected species.

7.3.1.2.2 Option 2: Revised Rebuilding Strategy for American Plaice

This option contains three sub-options that would allow the stock to rebuild by 2021, 2022 or 2024. The three sub-options allow for an increase in catch, which may increase interactions with protected resources when compared to the No Action alternative.

Sub-Option A: This strategy would rebuild the stock in 7 years with a 50% probability of success. The resulting F for the 7 year scenario is higher than that of 75%F_{MSY} based on projections. This is expected to allow a small increase in catch, which may impact protected species in areas where fishing for American plaice occurs. Compared to the No Action alternative and Option 3, this alternative is expected to adversely affect, but not jeopardize protected species in areas where fishing for American plaice occurs because of the slight increase in F allowed. The difference in F between Sub-Options A, B and C is small and may be difficult to detect; Sub-Option A would have similar impacts on protected resources as Sub-Options B and C during the length of the rebuilding plan.

Sub-Option B: This strategy would rebuild the stock in 8 years with a 50% probability of success. The resulting F for the 8 year scenario is higher than that of 75%F_{MSY} based on projections. This is expected to allow a small increase in catch, which may impact protected species in areas where fishing for American plaice occurs. Compared to the No Action alternative and Option 3, this alternative is expected to adversely affect, but not jeopardize protected species in areas where fishing for American plaice occurs because of the slight increase in F allowed. The difference in F between Sub-Options A, B and C is small and may be difficult to detect; Sub-Option B would have similar impacts on protected resources as Sub-Options A and C during the length of the rebuilding plan.

Sub-Option C: This strategy would rebuild the stock in 10 years with a 50% probability of success. The resulting F for the 10 year scenario is higher than that of 75%F_{MSY} based on projections. This is expected to allow a small increase in catch, which may impact protected species in areas where fishing for American plaice occurs. Compared to the No Action alternative and Option 3, this alternative is expected to adversely affect, but not jeopardize protected species in areas where fishing for American plaice occurs because of the slight increase in F allowed. The difference in F between Sub-Options A, B and C is small and may be difficult to detect; Sub-Option C would have similar impacts on protected resources as Sub-Options A and B during the length of the rebuilding plan.

7.3.1.2.3 Option 3: Rebuilding Plan Review Analysis

Option 3 would require an analysis of the rebuilding plan using the described criteria. This is an administrative alternative and is not expected to impact protected species. Compared to the No Action alternative and Option 2, this alternative would not impact protected species.

7.3.1.3 Annual Catch Limits

7.3.1.3.1 Option 1: No Action

For white hake and the US/CA 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 in areas where these species are caught. If compared to groundfish sub-ACLs set for white hake and the US/CA stocks in FW50, the No Action alternative represents a reduction in the sub-ACLs, which would

have positive impacts on protected species. Option 1 may have more positive impacts on protected species than Option 2.

7.3.1.3.2 Option 2: Revised Annual Catch Limit Specifications

This option proposes to adopt new specifications and ACLs for FY 2014 -2015 for GB cod, GB haddock, GB yellowtail flounder, and white hake. 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. Implementation of ACLs is required by the Magnuson-Stevens Act and may have protected species impacts that are difficult to define. The protected species impacts of ACL-setting in general are discussed in detail in Amendment 16.

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. For the US/Canada stocks, the U.S. TAC for GB cod, GB haddock and GB yellowtail flounder all increase. This could lead to a shift in effort to the eastern area for GB cod and haddock. 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.

Option 2 would increase the white hake ABC. 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. The No Action alternative would be expected to have a lower impact on protected species, as it would result in reduced fishing activity. Option 2 would have more negative impacts on protected species than Option 1.

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 are 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.

7.3.2 Commercial and Recreational Fishery Measures

7.3.2.1 Small-Mesh Fishery Accountability Measures

7.3.2.1.1 Option 1: No Action

If this option is adopted, an accountability measure for the small-mesh fishery would not be established. Fishing activity would not be impacted by any overage of the GB yellowtail flounder sub-ACL for this fishery, which would not alter the expected level of interactions with protected species. When compared to Option 2, this measure would not result in any changes in fishing effort and would not be expected to have any differential impacts on protected species.

7.3.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder sub-ACL

This option would establish an accountability measure that would impact fishing activity if the Georges Bank yellowtail flounder sub-ACL was exceeded by the small-mesh fishery. This option may provide an

incentive to decrease yellowtail flounder bycatch, e.g. by using modified gear, however, a reduction in yellowtail bycatch may not reduce interactions with protected resources unless the modified gear is shown to decrease interactions with protected resources or fishing effort is reduced.

Sub-Option A: This sub-option would prohibit fishing with small-mesh gear, if the sub-ACL is zero, or if there was no sub-ACL specified for the Georges Bank yellowtail flounder stock area. This would reduce fishing in this area under the AM and would decrease impacts on protected resources. Any unforeseen shift in fishing effort to areas outside the AM areas may increase fishing activity and impacts on protected species. Option 2 could have positive impacts on protected species compared to Option 1.

Sub-Option B1: This AM would only be triggered if both the total ACL and small-mesh sub-ACL of GB yellowtail flounder were exceeded. If the AM was implemented, then the small-mesh vessels would be required to use modified gear to reduce the catch of flounders in the AM areas. Any unforeseen shift in fishing effort to areas outside the AM areas may increase fishing activity and impacts on protected species. Option 2 could have positive impacts on protected species compared to Option 1.

Sub-Option B2: The AM would be triggered if only the small-mesh sub-ACL for GB yellowtail flounder was exceeded. This option might be triggered sooner than the other options. If the AM was implemented then the small-mesh vessels would be required to use modified gear to reduce the catch of flounders in the AM areas. Any unforeseen shift in fishing effort to areas outside the AM areas may increase fishing activity and impacts on protected species. Option 2 could have positive impacts on protected species compared to Option 1

7.3.2.2 Management Measures for US/CA TACs

7.3.2.2.1 Option 1: No Action

This option would not alter US/CA quotas in-season; this option is not expected to impact protected species. Compared to Options 2, 3, 4 and 5, the No Action alternative would impact protected species the least.

7.3.2.2.2 Option 2: Revised In-Season Adjustment for US/CA TACs

This option allows the Regional Administrator to adjust the US/CA quotas during the fishing year that could result in an increase or decrease in the TACs for the US/CA stocks. An in-season adjustment could shift (or increase) fishing effort from one target species to another and from one area to another, potentially increasing impacts on protected species. Option 2 has similar impacts on protected species compared to Option 3. When compared to the No Action alternative, it could have increased potential impacts on protected species.

7.3.2.2.3 Option 3: Distribution of US TACs for Eastern/Western Georges Bank Haddock

Sub-Option A: This option would allow an adjustment to the EGB haddock quota prior to the start of the fishing year; the expected adjustment would be to reduce the EGB haddock quota and increase the WGB haddock quota. This alternative could increase fishing effort in the western area and increase impacts on protected species but could result in a decrease in impacts on protected species in the eastern area. Option 3 has similar impacts on protected species compared to Option 2. When compared to the No Action alternative, it could have increased potential impacts on protected species.

Sub-Option B: This option allows sectors or state-operated permit banks, to harvest their EGB haddock quota in the WGB stock area at any time during the fishing year. It is unknown how much EGB quota

will be harvested in the WGB area or whether this sub-option would result in more EGB quota being move than sub-option A. This alternative could increase fishing effort in the western area and increase impacts on protected species but could result in a decrease in impacts on protected species in the eastern area. Option 3 has similar impacts on protected species compared to Option 2. When compared to the No Action alternative, it could have increased potential impacts on protected species.

7.3.2.3 GB Yellowtail Founder Management Measures

7.3.2.3.1 Option 1: No Action

This option would not alter existing measures for GB yellowtail flounder and is not expected to impact protected species. Compared to Options 2, this option would have negligible impacts on protected species.

7.3.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail Flounder

This option alters the stratification used for estimating discards of GB yellowtail flounder for in-season quota monitoring. If adopted this measure would allow fishing to continue in statistical area (SA) 522, an area that has been identified as having low abundance of yellowtail flounder, when the allocation is almost reached. This measure may increase interactions with protected species in this statistical area if a large amount of fishing effort shifts to the SA once the allocation is almost reached. Protected species in the remaining GB yellowtail flounder statistical areas may benefit from reduced impacts if fishing does shift from these areas. This option could have low negative impacts when compared to Option 1.

7.3.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

7.3.2.4.1 Option 1: No Action

This option would maintain the requirement for limited access scallop vessels to land all legal-sized yellowtail flounder. The No Action alternative is not expected to change current fishing activities resulting in low negative impacts on protected resources. However, interactions are not likely to increase under the No Action alternative. Option 1 would have less negative impact on protected species than Option 2.

7.3.2.4.2 Option 2: Prohibition on Possession of Yellowtail Flounder

This option would prohibit possession of GB and SNEMA yellowtail flounder stocks by limited access scallop vessels, i.e. they would be required to discard all yellowtail flounder. Effort control in the scallop fishery is based on DAS and this measure may not result in a large increase in fishing effort. Depending on the magnitude of the scallop sub-ACL for yellowtail flounder, this measure has the potential to increase effort by limited access scallop vessels if limited access vessels are not restricted by a potentially low sub-ACL. This could have increased impacts on protected species but is not thought to jeopardize protected species. Option 2 would have more negative impact on protected species than Option 1.

7.4 Economic Impacts

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 MSA 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 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 (NMFS 2007b). Where possible, cumulative effects of regulations will be identified and discussed. Other social concerns are discussed in Section 7.5. The economic impacts presented here consist of both qualitative and quantitative analyses dependent on available data, resources, and the measurability of predicted outcomes. In general, the regulations proposed in Framework 51 will impact revenue through changes to ACLs and fishery measures and may, for particular fisheries, impact operating costs through the modification of accountability measures and monitoring requirements. 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.

7.4.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

7.4.1.1 GOM Cod Rebuilding Strategy

7.4.1.1.1 Option 1: No Action

The current rebuilding strategy for Gulf of Maine (GOM) cod, adopted in Amendment 13, uses a fishing mortality target that is calculated to rebuild the stock by 2014 with a 50 percent (median) probability of success. The stock is unlikely to rebuild by that date in the absence of all fishing mortality and in 2012, the Council was notified that the current rebuilding strategy had not resulted in adequate progress towards rebuilding. As a result, section 304(e)(3) of the MSA requires that a revised rebuilding program be implemented within 2 years for GOM cod. This No Action alternative would not address the Magnuson-Stevens Act requirement. If this option is adopted, fishing mortality (set at 75% F_{MSY}) as implemented in FW 50 would be maintained in 2014. However, because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on incidental bycatch (i.e.., set as close to zero as possible) starting in 2015.

This option could result in no change in net economic impacts for 2014, but the resulting quota reductions for 2015 could cause severe disruptions to the groundfish fishery in the GOM stock area. Cod is a primary component of the multispecies catch in this region, and a quota set at or near levels consistent with "incidental bycatch" would impede the harvest of every groundfish stock. Commercial catches in the GOM would fall to trivial levels, resulting in a reduction of revenues that likely would approach 100% of those observed in FY2014. However, a zero-possession restriction could be imposed on cod in the GOM, thereby allowing fisherman to target other stocks while discarding cod. Such a restriction is

unlikely to meet MSA requirements, but would dramatically decrease the economic costs associated with this Option.

Recreational fisheries would also experience significant economic losses, though these fisheries are perhaps better able to target stocks other than cod in the GOM. Economic losses for recreational fisheries may instead approach 50-80% reductions from FY2014 levels.

7.4.1.1.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

Two options are being considered for a revised rebuilding strategy for GOM cod. Both rebuilding options assume no changes to the FY2014-2015 ABC (1,550 mt) that was previously recommended by the SSC, and adopted by FW 50.

Sub-Option A: This strategy would rebuild the stock in 8 years, with a 50 percent (median) probability of success by 2022. This strategy is developed to be more conservative compared to sub-Option B and is based on a fishing mortality rate that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ > 75% F_{MSY}).

Sub-Option B (Preferred Alternative): This strategy would rebuild the stock in 10 years, with a 50 percent (median) probability of success by 2024. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ and is not allowed to be initially limiting (i.e., $F_{rebuild}$ > 75% F_{MSY}).

In FY2014, there is no difference in economic impacts between the sub-options and relative to the No Action option. Both sub-options result in significantly greater economic benefits than the No Action option for FY2015 and beyond, because they appear to maintain fishing mortality targets at (or above) 75% F_{MSY}. Relative to Sub-Option B, Sub-Option A may be more likely to require reversion to a $F_{rebuild}$ below 75% F_{MSY} and potentially lower ACLs in FY2016 and beyond.

Subsequent framework actions will modify ACLs in accordance with the (sub-) option selected, and these actions will provide a more precise estimate of the economic impacts of ACLs on commercial and recreational fisheries.

If it were assumed, however, that improved targeting technology amongst other factors were to allow the fishing industry to capture 100% of the allocated quota for GOM cod, and if it were further assumed that the quotas as projected remain in place for the duration of the rebuilding time frame, it would be possible to compare the net present value, in 2013 dollars, of the two sub-options and the No Action option. This comparison is complicated by the presence of two competing models of the GOM cod stock, either of which may be used in quota setting. Therefore, two scenarios emerge for each sub-option, referred to here as the Base Case and M-Ramp models.

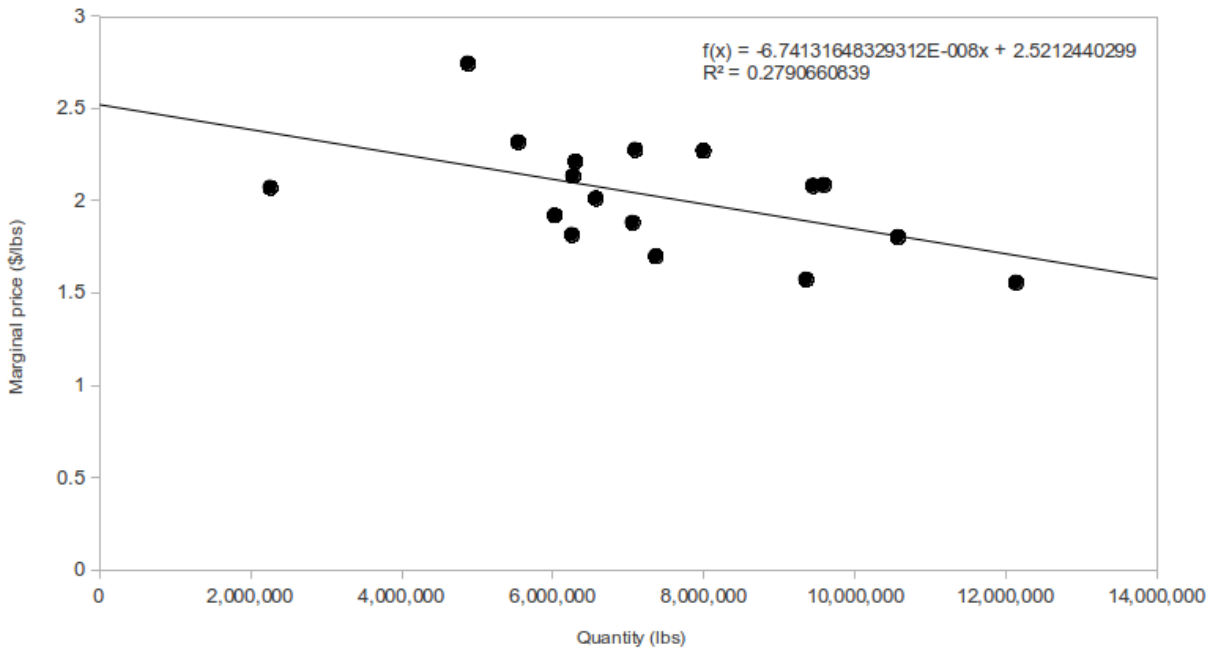
Comparison of alternative benefit streams over time requires discounting future benefits to convert all benefit streams to a present value. For this purpose, a discount rate of 3% was selected as recommended by NOAA to reflect the social rate of time preference (NOAA 2003). The Executive Branch Office 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 (NPVs) are calculated through 2024, 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 GOM cod landings. As previously stated, this analysis assumes implicitly that all allocated fish are caught, and it also assumes that a 10% discard rate is applied in all years to estimate landings.

NPVs are of GOM cod 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 GOM cod from 1996 – 2011 (Figure 30). The resulting prices were then applied to the anticipated ACLs under the various scenarios (Table 62).

Given the assumptions of full use of ACLs and perfect realization of predicted ACLs through 2024, the results indicate that under the Base Case model, a 10-year rebuilding plan (Sub-Option B) would maximize net present value relative to an 8-year rebuilding plan (Sub-Option A) (Table 62). Under the M-Ramp model, there is little discernable difference between the two sub-options. Either sub-option is preferable to the No Action option which would likely yield very little economic benefits.

Figure 30 – Price and quantity relationship for GOM cod



Notes:
Data from 1996-2011 CFDERS. Prices in dollars.

Table 62 – Net present value estimates for revenues from GOM cod landings based on two different models, three Options and three discount rates (millions of dollars)

	Discount rate	8-year	10-year	No Action
Base Case	3%	$159	$167	$7
	7%	$124	$130	$7
	10%	$104	$109	$6
M-Ramp	3%	$172	$171	$7
	7%	$135	$135	$7
	10%	$114	$115	$6

7.4.1.1.3 Option 3: Rebuilding Plan Review Analysis for GOM Cod (Preferred Alternative)

This option must be selected in conjunction with an above option under Option 2.

Sub-Option A: Option 3, Sub-Option A (no action) would maintain the current biennial review process.

This sub-Option specifies an administrative procedure for reviewing the revised GOM cod rebuilding plan in the future. It has no direct or indirect economic impacts.

Sub-Option B (Preferred Alternative): Option 3, Sub-Option B would establish a rebuilding plan review analysis for GOM cod for use during the new rebuilding period.

This sub-Option specifies an administrative procedure for reviewing the revised GOM cod rebuilding plan in the future. It has no direct or indirect economic impacts.

7.4.1.2 American Plaice Rebuilding Strategy

7.4.1.2.1 Option 1: No Action

The current rebuilding strategy for American plaice, adopted in Amendment 13, uses a fishing mortality target that is calculated to rebuild the stock by 2014 with a 50 percent probability of success. The stock is unlikely to rebuild by that date in the absence of all fishing mortality, and in 2012, the Council was notified that the current rebuilding strategy had not resulted in adequate progress towards rebuilding. As a result, section 304(e)(3) of the MSA requires that a revised rebuilding program be implemented within two years for American plaice. The No Action alternative would not address the MSA requirement. If this option is adopted, fishing mortality (set at 75% F_{MSY}) as implemented in FW 50 would be maintained in FY2014. However because the stock is not projected to be rebuilt by 2014, fishing mortality would be based on incidental bycatch (i.e., set as close to zero as possible) starting in FY2015.

This option would result in no change in net economic impacts for FY2014, but the anticipated quota reductions for FY2015 would result in severe disruptions to the groundfish fishery across all stock areas. American plaice is sometimes referred to as a “unit stock” species, meaning that it does not have multiple stocks within the management unit. As such, a low or *de minimis* allocation will result in loss of groundfish fishing opportunities coast-wide. The FY2012 value of groundfish catch was approximately $69 million in 2012 dollars. FY2014 revenues would be consistent with ACLs specified elsewhere in this document, and would be unaffected by this option, but FY2015 groundfish revenues would likely approach zero without other future changes to the management regulations, such as a zero possession restriction imposed on the fishery.

Recreational fisheries would be unaffected by this option, as there is no directed recreational fishery, and no recreational sub-allocation, for American plaice.

7.4.1.2.2 Option 2: Revised Rebuilding Strategy (Preferred Alternative)

Three options are being considered for a revised rebuilding strategy for American plaice. All three rebuilding options assume no changes to the FY2014-2015 ABCs that were previously recommended by the SSC, and adopted by FW 50.

Sub-Option A: The rebuilding strategy would be to rebuild the stock in 7 years with a 50 percent (median) probability of success by 2021. This strategy is the most conservative compared to sub-Options

B and C. This strategy is based on a fishing mortality that is above 75%F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ > 75% F_{MSY}).

Sub-Option B: The rebuilding strategy would be to rebuild the stock in 8 years with a 50 percent (median) probability of success by 2022. This strategy is based on a fishing mortality that is above 75% F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ > 75% F_{MSY}).

Sub-Option C (Preferred Alternative): The rebuilding strategy would be to rebuild the stock in 10 years with a 50 percent (median) probability of success by 2024. This strategy is based on a fishing mortality that is above 75% F_{MSY}; $F_{rebuild}$ is not allowed to be initially limiting (i.e., $F_{rebuild}$ > 75% F_{MSY}).

In FY2014, there is no difference in economic impacts between the three sub-options and the No Action option. The sub-options result in significantly greater economic benefits than the No Action option for FY2015 and beyond, because they appear to maintain fishing mortality targets at (or above) 75% of F_{MSY}. In general, longer rebuilding programs have greater economic benefits. This result is consistently observed across all discount rates greater than approximately 1%.

Subsequent framework adjustment actions will modify ACLs in accordance with the (sub-) option selected, and these actions will provide a more precise estimate the economic impacts of ACLs on commercial and recreational fisheries.

If it were assumed, however, that improved targeting technology amongst other factors were to allow the fishing industry to capture 100% of the allocated quota for American plaice, and if it were further assumed that the quotas as projected remained in place for the duration of the rebuilding time frame, it would be possible to compare the net present value, in 2013 dollars, of the three sub-options and the No Action option.

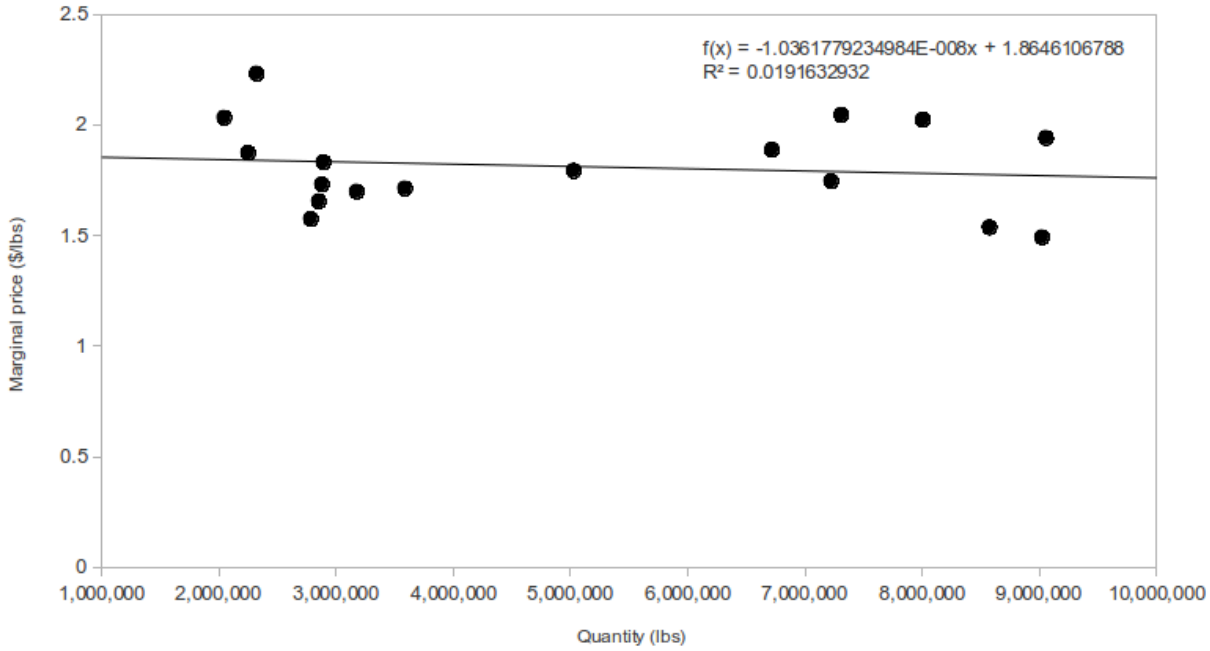
Comparison of alternative benefit streams over time requires discounting future benefits to convert all benefit streams to a present value. For this purpose, a discount rate of 3% was selected as recommended by NOAA to reflect the social rate of time preference (NOAA 2003). The Executive Branch Office 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. NPVs are calculated through 2024, 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 American plaice landings. Implicitly, again, 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 American plaice landings alone and do not take into account potential revenue losses or gains from the sale of other stocks of groundfish.

American plaice demonstrates a demand function where price is inelastic with respect to quantity (i.e., demands changes little due to price) (Figure 31). As such, a constant average price is applied to all landings and this price is applied to the anticipated ACLs under the various scenarios (Table 63).

Given the assumptions of full utilization of ACLs and perfect realization of predicted ACLs through 2024, the results indicate that there is little discernable difference between the three sub-options. The sub-options are generally preferable to the No Action option, since the No Action option yields very little economic benefits.

Figure 31 - Price and quantity relationship for American plaice



Notes:
Data from 1996-2011 CFDERS. Prices in dollars.

Table 63 - Net present value estimates for revenues from American plaice landings based on four Options and three discount rates (millions of dollars)

Discount Rate	7-year	8-year	10-year	No Action
3%	$74	$78	$80	$5
7%	$59	$61	$63	$5
10%	$50	$52	$54	$5

7.4.1.2.3 Option 3: Rebuilding Plan Review Analysis for American Plaice (Preferred Alternative)

This option must be selected in conjunction with an above option under Option 2.

Sub-Option A: Option 3, Sub-Option A (no action) would maintain the current biennial review process.

This sub-Option specifies an administrative procedure for reviewing the revised GOM cod rebuilding plan in the future. It has no direct or indirect economic impacts.

Sub-Option B (Preferred Alternative): Option 3, Sub-Option B would establish a rebuilding plan review analysis for American plaice for use during the new rebuilding period.

This sub-Option specifies an administrative procedure for reviewing the revised GOM cod rebuilding plan in the future. It has no direct or indirect economic impacts.

7.4.1.3 Annual Catch Limit Specifications

7.4.1.3.1 Option 1: No Action

By selecting Option 1, ACLs will be based on FW50 specifications for the years 2013-2014, which have missing values for many species (Table 64).Specifically, GB East cod and haddock, GB yellowtail flounder, and white hake would have no ACLs. Fishing would not be permitted for these species, nor would fishing be allowed in these species' broad stock areas. The portion of the GB East cod and haddock ACLs that would ordinarily be allocated to the eastern GB area would instead be allocated the western GB stock area, and consequently the ACLs for GB West cod and haddock are higher under the No Action option than under Option 2.

Table 64 – No Action Option Groundfish Sector sub-ACLs (lbs)

Species	Stock	Sector sub-ACL
American plaice		2,996,079
Cod	GB East	0
	GB West	3,913,201
	GOM	1,794,561
Haddock	GB East	0
	GB West	70,089,279
	GOM	480,607
Halibut		-
Ocean pout		-
Pollock		28,964,298
Redfish		23,197,012
White hake		0
Windowpane	North	-
	South	-
Winter flounder	GB	7,420,751
	GOM	1,521,849
	SNE/MA	2,134,072
Witch flounder		1,324,977
Wolffish		-
Yellowtail flounder	CC/GOM	1,029,558
	GB	0
	SNE	992,079

Economic impacts on the sector commercial groundfish fishery
As the white hake stock area encompasses the geographic range of the management unit, the adoption of the No Action option would almost certainly lead to a complete shut-down of the groundfish fishery, bringing fishery-wide commercial groundfish revenues to zero.

Economic impacts on the common pool commercial groundfish fishery
Similarly, the common pool would not have an allocation of white hake and vessels fishing in the common pool would likely be prohibited from participating in the groundfish fishery.

Economic impacts on the recreational groundfish fishery
Impacts on the recreational fishery are less certain. There is no recreational fishery in the eastern GB stock area, and no recreational sub-allocation for GB yellowtail flounder or white hake. It seems likely that the recreational fishery would not be significantly impacted by the adoption of the No Action alternative. Sub-allocations for other recreational stocks (GOM cod, haddock) are similar to those from

FY2013 and no measures are proposed in this framework action that would alter the administration of this fishery.

Economic impacts on the scallop fishery
The precise impacts of the No Action option on the scallop fishery are unclear. This option does not identify a scallop fishery sub-ACL for GB yellowtail flounder. While this would not prevent the scallop fishery from fishing in FY2014, it is not clear if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this were the case, then catches would lead to scallop fishery AMs being triggered in FY2015 and/or later years. As a result, this option would result in large reductions in scallop fishery revenues relative to Option 2. But if this is not the case, and the scallop fishery catches 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 sub-ACL specified in Option 2.

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

Quota Change Model
As in past framework adjustment actions, the Quota Change Model (QCM) is used to predict the potential impact of changes in quota on the sector-based commercial fishery. 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 use of allocated ACE, using fishery-dependent trip-level data from FY2012. The more efficiently a trip used 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 FY2012 (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 are representative, that trips are repeatable, and that price/quantity relationships realized during the data period are applicable to the forecast period (FY2014). 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 change 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, or if fisherman become more efficient at maximizing the value of their ACE. Conversely, the model will over-predict true landings and/or revenues if stock conditions decline, markets deteriorate or fishing costs increase. The model will over-predict landings if stock conditions for a highly constraining stocks 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.

Economic impacts on the sector commercial groundfish fishery

Groundfish sector sub-ACLs (mt) for FY2010-2013 and Option 2 for FY2014 ACLs are summarized in Table 65. Output from the QCM is provided in Table 66.

Under Option 2, gross groundfish revenues for FY2014 are predicted to be just over $55 million and all gross revenues on groundfish trips are predicted to be just under $71 million (Table 67). This represents approximately a 26% reduction in all gross revenues on groundfish trips relative to FY2012 and a 4% reduction relative to those predicted in FY2013 (Table 67). On a home-port state level, New Hampshire is expected to have the largest percentage decline (32%) in gross revenues from groundfish relative to FY2012. Rhode Island is expected to be the least affected by these ACLs, with a small 7% predicted increase in gross groundfish revenues relative to FY2012. For major home-ports, Gloucester, MA is expected to have the largest percentage decline (33%) in gross revenue and New Bedford, MA is expected to be the least affected, with a 5% decline in gross groundfish revenues predicted (Table 68).

The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the 30-50 foot category experiencing the largest drop in gross revenue compared to FY2012, with a predicted 35% reduction (Table 69). Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft.) predicted to see a 10% decline in gross revenues. This result is not surprising, as 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 drive fisherman to fish as efficiently as possible (Table 67). 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 FY2014. Predicted trip costs for FY2013 are substantially lower than those predicted for FY2014 despite a similar number of trips, days absent, etc. This is in part a function of the optimization component of the QCM, which selects the most profitable trips (often the lowest-cost trips) disproportionately, but may also be signaling a trend in rising trip costs.

FY2014 is predicted to see a 21% decline in net revenues relative to FY2012 and a 12% decline relative to predicted net revenues for FY2013. Crew-days, days absent and total sector trips are all predicted to decline substantially relative to FY2012, as the model predicts only the most efficient trips will occur under continued restrictive quota allocations (Table 67). This represents fewer earning opportunities for crew members, and may signal reductions in incomes for down-stream fishing businesses such as fish dealers, ice houses, gear shops, and shipyards.

Table 65 – Groundfish Sector sub-ACLs (mt) for 2010-2013 and Option 2 for 2014

Species	Stock	FY2010	FY2011	FY2012	FY2013	Option 2, FY2014
American plaice		2,748	3,108	3,223	1,420	1,359
Cod	GB East	325	423	445	92	145
	GB West	2,977	3,878	4,079	1,715	1,584
	GOM	4,327	4,825	3,619	830	814
Haddock	GB East	11,913	9,065	8,111	3,754	9,971
	GB West	28,273	21,515	19,252	22,442	18,666
	GOM	799	778	648	187	218
Halibut		-	-	-		-
Ocean pout		-	-	-		-
Pollock		16,178	13,952	12,530	12,893	13,138
Redfish		6,756	7,541	8,291	10,132	10,522
White hake		2,505	2,974	3,257	3,849	4,308
Windowpane	North	-	-	-		-
	South	-	-	-		-
Winter flounder	GB	1,823	2,007	3,367	3,528	3,364
	GOM	133	329	690	714	690
	SNE/MA			-	1,210	968
Witch flounder		827	1,236	1,426	610	601
Wolffish		-	-		-	-
Yellowtail flounder	CC/GOM	729	940	1,021	479	467
	GB	803	1,142	364	116	252
	SNE/MA	235	524	607	570	450

Table 66 – Predicted Option 2 catch (lbs) and gross revenue by stock from simulation model (*500 realizations*)

Species	Stock	Limit	Catch	Use	Ex-vessel Value
American plaice		2,996,079	2,629,857	88%	$3,903,973
Cod	GB East	319,670	146,707	46%	$162,253
	GB West	3,492,118	3,363,083	96%	$6,820,426
	GOM	1,794,561	1,769,437	99%	$4,280,519
Haddock	GB East	21,982,266	804,401	4%	$1,219,368
	GB West	41,151,437	1,747,944	4%	$2,793,642
	GOM	480,607	367,450	76%	$780,661
Halibut		0	96,646	.	$146,703
Non-Groundfish		0	21,827,479	.	$15,437,992
Ocean Pout		0	76,571	.	$0
Pollock		28,964,298	11,869,407	41%	$10,856,342
Redfish		23,197,012	7,414,715	32%	$3,727,931
White Hake		9,497,503	4,259,018	45%	$5,698,826
Windowpane	North	0	228,891	.	$1
Windowpane	South	0	232,426	.	$0
Winter flounder	GB	7,416,342	4,477,145	60%	$9,061,821
	GOM	1,521,849	258,900	17%	$539,169
	SNE/MA	2,134,072	210,003	10%	$2,490
Witch flounder		1,324,977	1,301,836	98%	$2,467,637
Wolffish		0	44,458	.	.
Yellowtail flounder	CC/GOM	1,029,558	745,874	72%	$1,029,291
	GB	554,462	368,615	66%	$574,568
	SNE/MA	992,079	991,296	100%	$1,506,325
	TOTAL		**65,232,160**		**$71,009,940**
	TOTAL GROUNDFISH	**148,848,888**	**43,404,682**	**29%**	**$58,653,156**

Table 67 – Predicted outcomes under Option 2 based on 500 model realizations ($ millions)

	Gross revenue	Gross groundfish revenue	Net revenue	Total variable cost	Trip cost	Quota cost	Sector landing fees	Crew days	Days Absent	Number trips
FY2010	$ 95.8	$ 80.5	$ 53.3	$ 45.0	$ 20.7	$ 21.8	$ 2.5	55,992	18,401	13,474
FY2011	$ 109.8	$ 88.8	$ 53.5	$ 59.3	$ 29.2	$ 27.5	$ 2.7	65,450	21,465	15,958
FY2012	$ 95.4	$ 67.7	$ 46.2	$ 49.2	$ 30.3	$ 17.0	$ 2.0	65,669	19,556	14,487
FY2013 (predicted)	*$ 74.1*	*$ 55.8*	*$ 41.8*	*$ 32.3*	*$ 16.6*	*$ 13.8*	*$ 1.7*	*47,583*	*13,472*	*6,797*
FY2014 (predicted) *MIN*	*$ 64.7*	*$ 50.5*	*$ 33.7*	*$ 32.0*	*$ 19.6*	*$ 10.9*	*$ 1.4*	*20,918*	*6,892*	*6,091*
MAX	*$ 75.9*	*$ 59.2*	*$ 38.8*	*$ 38.3*	*$ 23.6*	*$ 13.0*	*$ 1.7*	*50,595*	*14,149*	*6,949*
MEAN	*$ 70.9*	*$ 55.5*	*$ 36.7*	*$ 35.2*	*$ 21.6*	*$ 12.0*	*$ 1.6*	*46,735*	*13,162*	*6,602*
STD	*$ 1.9*	*$ 1.6*	*$ 0.9*	*$ 0.7*	*$ 1.1*	*$ 0.4*	*$ 0.0*	*2,140*	*533*	*140*
% change FY2012	-26%	-18%	-21%	-29%	-28%	-29%	-20%	-29%	-33%	-54%
% change FY2013(p)	-4%	-1%	-12%	9%	30%	-13%	-8%	-2%	-2%	-3%

Table 68 – Predicted groundfish catch and gross revenue by homeport state and port under Option 2 from simulation model

	FY2010 Ex-vessel value	FY2011 Ex-vessel value	FY2012 Ex-vessel value	FY2013 (predicted) *Catch (lbs)*	FY2013 (predicted) Ex-vessel value	FY2013 (predicted) *Catch (lbs)*	FY2014 (predicted) Ex-vessel value	% change from FY2012
Connecticut	$ 35,081	$ 46,646	$ 12,778	*14,031*	$ 16,284	*18,387*	$ 14,766	16%
Massachusetts	$ 58,006,800	$ 64,605,304	$ 47,530,895	*29,945,047*	$ 38,255,313	*28,582,837*	$ 38,143,540	-20%
Boston	$ 14,251,495	$ 17,458,607	$ 13,203,964	*8,730,169*	$ 11,142,660	*8,429,184*	$ 10,925,097	-17%
Chatham	$ 2,482,876	$ 2,582,201	$ 957,320	*557,276*	$ 857,939	*503,753*	$ 833,477	-13%
Gloucester	$ 16,224,983	$ 16,807,126	$ 12,110,282	*9,068,082*	$ 9,962,835	*7,006,414*	$ 8,067,363	-33%
New Bedford	$ 18,149,740	$ 20,387,478	$ 16,213,206	*9,552,957*	$ 13,516,564	*10,852,708*	$ 15,482,606	-5%
Maine	$ 14,470,489	$ 14,599,316	$ 13,498,376	*12,820,916*	$ 12,683,212	*10,590,255*	$ 11,413,905	-15%
Portland	$ 10,269,562	$ 9,683,130	$ 8,841,043	*9,677,859*	$ 8,823,335	*7,795,446*	$ 7,627,913	-14%
New Hampshire	$ 3,347,576	$ 4,673,318	$ 3,110,230	*1,962,643*	$ 2,317,117	*1,576,817*	$ 2,107,929	-32%
New Jersey	$ 97,897	$ 66,667	$ 208,687	*1,424*	$ 1,315	*94,599*	$ 150,478	-28%
New York	$ 909,309	$ 1,262,452	$ 665,866	*352,138*	$ 581,975	*444,907*	$ 739,782	11%
Rhode Island	$ 3,123,923	$ 3,144,732	$ 2,536,242	*1,449,554*	$ 1,838,143	*1,957,761*	$ 2,723,910	7%
Point Judith	$ 2,412,589	$ 2,284,227	$ 1,848,403	*1,198,607*	$ 1,444,257	*1,509,505*	$ 2,043,208	11%
Other Northeast	$ 511,277	$ 365,959	$ 124,222	*69,987*	$ 119,577	*107,239*	$ 174,472	40%
TOTAL	**$ 80,502,352**	**$ 88,764,394**	**$ 67,687,297**	***46,615,739***	**$ 55,812,937**	***43,372,802***	**$ 55,468,783**	**-18%**

Table 69 – Predicted groundfish catch and gross revenue by vessel length class under Option 2 from simulation model

Length class	FY2010	FY2011	FY2012	FY2013 (predicted)	FY2014 (predicted)
<30'	$ 16,485,506	$ 496,779	$ 527,746	$ 19,114	$ 447,791
30'to<50'	$ 24,689,727	$ 18,835,175	$ 13,457,745	$ 10,001,904	$ 8,671,624
50'to<75'	$ 39,225,644	$ 28,294,806	$ 22,332,585	$ 17,559,012	$ 18,105,071
75'+	$ 107,682	$ 41,142,431	$ 31,369,221	$ 28,232,906	$ 28,244,296
TOTAL	**$ 80,508,559**	**$ 88,769,191**	**$ 67,687,297**	**$ 55,812,937**	**$ 55,468,783**

Economic impacts on the common pool commercial groundfish fishery
As with sectors, Option 2 could result in declines in catch for the common pool fishery, which would have negative economic impacts for this component of the fishery.

Economic impacts on the recreational groundfish fishery
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 6.5.9.3, 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 FY2014.

Option 2 could 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. However, the exact measures that will be in place are likely to be carried over from FY2013. There is likely to be no difference in economic impacts between Option 1 and Option 2.

Economic impacts on the scallop fishery
If the scallop fishery triggers the GB yellowtail flounder AMs, Option 2 would likely reduce scallop fishery revenues. However how this reduction in revenue compares to the Option 1/No Action is unclear. The No Action does not identify a scallop fishery sub-ACL for GB yellowtail flounder. While this would not prevent the scallop fishery from fishing in FY2014, it is not clear if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this were the case, then catches would lead to scallop fishery AMs being triggered in FY2015 and/or later years. As a result, No Action/Option 1 would result in large reductions in scallop fishery revenues relative to Option 2. But if this is not the case, and the scallop fishery catches do not trigger AMs, then Option 1/No Action might allow for greater scallop fishery revenues than would be the case if AMs are triggered using the sub-ACL specified in Option 2.

7.4.2 Commercial and Recreational Fishery Measures

7.4.2.1 Small Mesh Fishery Accountability Measures

7.4.2.1.1 Option 1: No Action

This option would not establish additional accountability measures (AMs) for the small-mesh fishery for Georges Bank yellowtail flounder under the Multispecies FMP. FW 48 adopted a sub-ACL of GB yellowtail flounder beginning in FY2013. If the U.S. TAC (equal to the U.S. ABC) for GB yellowtail flounder is exceeded, the U.S./Canada Resource Sharing Understanding requires that the U.S. TAC for the following fishing year be reduced by the amount of the overage. Option 1 would not change the existing regulatory requirements for the small-mesh bottom-trawl fishery. No new economic impacts are expected.

7.4.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder Sub-ACL (Preferred Alternative)

Two options (one with two sub-options) are being considered for the small-mesh fishery AM.

Sub-Option A: If the sub-ACL is zero for the small-mesh fishery, or a sub-ACL is not specified, then vessels fishing with bottom otter trawl gear with a cod-end mesh size less than 5 inches would be prohibited from fishing in the Georges Bank yellowtail flounder stock area (Statistical Areas 522, 525, 561 and 562). Because of the timing of availability of data for this fishery, the AM would likely be implemented in the fishing year following the notification of the overage.

Sub-Option B1: The AM would be implemented if both the total ACL and the small-mesh fishery sub-ACL for GB yellowtail flounder are exceeded. The AM would require that vessels fishing with bottom otter trawl gear with a cod-end mesh size of less than 5 inches to use approved selective trawl gear that reduces the catch of GB yellowtail flounder.

Sub-Option B2 (Preferred Alternative): The AM would be implemented if the small-mesh fishery sub-ACL of GB yellowtail flounder is exceeded. The AM would require that vessels fishing with bottom otter trawl gear with a cod-end mesh size of less than 5 inches to use approved selective trawl gear that reduces the catch of GB yellowtail flounder.

Economic Impacts on the Groundfish fishery
Compared to No Action/Option1, by reducing the GB yellowtail flounder bycatch discards in the small-mesh fishery, it is less likely that overfishing will occur in these areas and catch rates of groundfish trips may increase slightly for groundfish vessels. This may result in higher net revenue for Sub-Options A, B1, and B2 relative to No Action. In addition, groundfish sub-ACLs could be increased slightly as a result of reduced discards.

Economic Impacts on the Small-mesh fisheries
Relative to the No Action/Option 1, by closing the GB yellowtail flounder stock area to small-mesh fisheries when the AM was triggered under Option A, fishing would be displaced out of that area which could also displace revenue and increase costs. Small-mesh fishing effort would likely increase in the next best place to fish, potentially lowering catch rates of target stocks and increasing associated costs.

Information in revenue and landings from the longfin squid and whiting fisheries within the GB yellowtail flounder stock area and adjacent areas can be found in Section 6.5.11.

Relative to the No Action/Option1 and Option A, the small-mesh fishermen would likely experience higher costs including the fixed cost of purchasing new gear/modifying existing gear under Sub-Options B1 and B2. Their operating costs would probably increase due to the gear restrictions (i.e., likely lower catch rates), effectively lowering their net revenue and overall profitability.

7.4.2.2 Management Measures for US/CA TACs

7.4.2.2.1 Option 1: No Action

If this option is adopted, the U.S./Canada TACs would be specified at the beginning of the fishing year, and there would be no in-season adjustments to the U.S./Canada TACs. This option would not consider the quota trading mechanism established by the TMGC and U.S./Canada Steering Committee, and would

not allow additional quota to be distributed to the U.S. at the end of the Canadian fishing year (December). Under this option, there would also be no adjustment to the amount of the U.S. TAC for eastern GB haddock that is allocated to the Eastern U.S./Canada Management Area.

This option would not change existing fishery regulations and would have no new economic impacts.

7.4.2.2.2 Option 2: Revised In-Season Adjustment for US/CA TACs (Preferred Alternative)

Option 2 would allow the Regional Administrator to make in-season adjustments to U.S./Canada TACs. Additional allocation of quota would be consistent with current ABC distribution, including both groundfish and non-groundfish vessels.

Option 2, is not expected to alter, in the short term, the aggregate amount of GB haddock caught by in the groundfish fishery. Catch is persistently less than allocation for both the eastern and western stocks of GB haddock. Option 2 is expected to have no additional economic impacts, positive or negative, relative to Option 1. Further, it is not known at this time if this option would increase or decrease quota allocated to groundfish fishermen. However, if the ability to alter quotas in season were to result in increased quota for sector and/or common pool fishermen, and if that quota were to be converted into landings, then Option 2 could be viewed as economically beneficial.

7.4.2.2.3 Option 3: Distribution of US TACs for Eastern/Western Georges Bank Haddock (Preferred Alternative)

<u>Sub-Option A:</u> If this option is adopted, the Regional Administrator, in consultation with the Council, would be allowed to adjust the portion of the U.S. TAC for Eastern GB haddock that is available in the Eastern U.S./Canada Area.

Sub-Option A is administrative in nature, and does not propose any particular quota adjustment. To the extent that they better allow the Regional Administrator to increase the flexibility of fishing operations on Georges Bank, it should be considered economically beneficial.

<u>Sub-Option B (Preferred Alternative):</u> A sector, or state-operated permit bank, may convert its Eastern GB haddock ACE to Western GB haddock ACE at any time during the fishing year, and up to two weeks into the following fishing year (unless otherwise instructed by NMFS) to cover any overage during the previous fishing year.

Sub-Option B is administrative in nature, and does not propose any particular quota adjustment. To the extent that they better allow the Regional Administrator to increase the flexibility of fishing operations on Georges Bank, it should be considered economically beneficial.

7.4.2.3 Georges Bank Yellowtail Flounder Management Measures

7.4.2.3.1 Option 1: No Action

Under Option 1, there would be no changes to the management measures for GB yellowtail flounder for estimating discards. Option 1 would neither change the current discard rates used for GB yellowtail flounder quota monitoring nor the existing regulatory requirements for the small-mesh bottom-trawl fishery. Yellowtail flounder are primarily caught in the shallower waters of GB, mainly SA 522. The No Action alternative would not develop a different discard stratum for yellowtail flounder taking this into

account, therefore fishing activity in the entire GB stock area could be negatively impacted by catches in SA 522 if an AM is triggered. Under Option 1, no new economic impacts are expected.

7.4.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail Flounder (Preferred Alternative)

This option would modify the stratification used for estimating discards of GB yellowtail flounder for in-season quota monitoring of sector catches. It would not change the stratification used in assessments, nor would it change the stratification used to monitor common pool fishing trips. Option 2 would modify the spatial stratification used to estimate discards for in-season quota monitoring. A separate discard rate would be calculated for statistical area 522 from all other GB yellowtail flounder statistical areas.

There are a number of potential economic impacts associated with this option. If the discard rate is lowered in area 522, vessels fishing in that area will be able to expend less GB yellowtail flounder quota on each trip, increasing net revenues by allowing for more fishing. This is expected to have the largest effect on trawl vessels, since they are the vessels that predominantly fish in area 522. If area 522 is removed from the discard rate calculation for other areas, the discard rate for other areas would likely be higher than in the past (Section 7.1.2.3.2). This will represent decreased net revenues to vessels fishing in those areas, because the opportunity cost of quota will likely increase. If area 522 becomes relatively more profitable to fish in than the other statistical areas, there could be a shift in spatial effort to area 522 by other trawl vessels. This could have unforeseen impacts on area-specific fishing levels, which could have negative long-term MSY consequences.

7.4.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

7.4.2.4.1 Option 1: No Action

For limited access scallop fishery vessels, there would be no trip limit for yellowtail flounder stocks (GB and SNE/MA) and limited access scallop vessels will be required to land all legal-sized yellowtail flounder that is caught, as established in FW 44 to the Northeast Multispecies FMP.

Economic Impacts on the Groundfish Fishery
This option maintains the requirement for limited access scallop vessels to land all legal sized yellowtail flounder catch for each trip. The groundfish fishery is not directly impacted as long as scallop vessels do not target yellowtail flounder as a result of this measure and increase overall mortality on yellowtail flounder. In addition, more precise accounting of yellowtail flounder catch in the limited access scallop fishery may over the long term improve the accuracy of the yellowtail flounder stock assessments with commensurate benefits accruing to vessels participating in both the sector and common pool groundfish fisheries.

Economic Impacts on the Scallop Fishery
If some yellowtail flounder vessels are targeting yellowtail flounder as a result of the current requirement to retain all legal sized yellowtail flounder, that could have potentially negative impacts on the overall scallop fishery if it increases yellowtail flounder catch and causes the ACL to be exceeded, triggering AMs for the scallop fishery. A limited number of limited access vessel that are landing yellowtail flounder will lose some income, but the majority of limited access vessels are not landing yellowtail flounder, and it is a small fraction of total revenue so impacts are very limited (see Table 48,Table 49,Table 50,Table 51, and Table 52)

7.4.2.4.2 Option 2: Prohibition on Possession of Yellowtail Flounder (Preferred Alternative)

For limited access scallop fishery vessels, there would be zero possession of yellowtail flounder stocks (GB and SNE/MA). Under this option, yellowtail flounder could not be landed or sold by the limited access scallop fishery.

Economic impacts on the Groundfish Fishery

This option requires limited access scallop vessels to discard all yellowtail flounder caught while fishing under the Atlantic sea scallop FMP. The groundfish fishery is not directly impacted. Accurate catch information is necessary for accurate stock assessments, and the groundfish fishery is impacted in the medium to long term by the accuracy and stability of three separate stock assessments: southern New England yellowtail flounder, Georges Bank yellowtail flounder, and the annual Trans-boundary Resource Sharing Agreement shared-stock yellowtail flounder assessment. This option will influence both true removals and removal estimate accuracy for the yellowtail flounder caught in the limited access scallop fishery. If true removals remain below the sub-allocation for the fishery, this option will have a positive medium and long-term effect on vessels participating in both the sector and common pool groundfish fisheries.

In a general sense, all mandatory discard programs create economic losses as potentially valuable landings are converted into discards. In this case, those losses accrue to the scallop fishery and are not shared by the groundfish fishery. The Atlantic sea scallop fishery is restricted by a sub-allocation of yellowtail flounder which is designed to limit yellowtail flounder mortality in the scallop fishery. Accurately accounting for yellowtail mortality in this fishery is dependent upon accurate discard observations and/or estimates. To the extent that sampling observations form a valid basis for population-level estimates (i.e. discard rates are consistent across both the sampled and unsampled populations) a sufficient level of sampling should enable accurate estimates of aggregate yellowtail flounder removals in this fishery, and therefore will have a positive medium and long-term economic impact on the groundfish fishery.

If, however, representativeness assumptions necessary to scale from sampling units to populations are violated, removal estimates may be inaccurate. The primary driver for inaccuracy in this case would be increased discard rates on unobserved scallop fishing trips. Additionally, this option may not provide as strong an incentive to avoid yellowtail flounder catch as Option 1/No Action. If either, or both, of these factors result in the limited access scallop fishery exceeding their sub-allocation of yellowtail flounder, and this results in delayed stock rebuilding, the groundfish fishery will face direct medium-term economic losses from foregone potential catch. If these factors lead to inaccurate removal estimates for this fishery, the accuracy and/or stability of yellowtail flounder stock assessments may degrade in the medium to long term, with commensurate negative effects on vessels participating in both the sector and common pool groundfish fisheries.

Economic Impacts on the Scallop Fishery

Relative to Alternative 1/No Action, the requirement to land all legal sized yellowtail flounder under Groundfish FW44 was expected to reduce discards of yellowtail flounder and improve estimates of scallop fishery catches of yellowtail, to the extent vessels complied with the requirement. Based on observer data from 2011-2013, it does not appear that discards have been reduced substantially because the majority of legal sized yellowtail flounder is still being discarded. In addition, if most legal sized yellowtail flounder are still being discarded, the overall estimates of scallop fishery catches have likely not improved as a result of this requirement. If compliance improves, some of these potential benefits may be more realized.

If scallop vessels are prohibited from retaining and landing yellowtail flounder there could be some economic loss for vessels that have been landings yellowtail flounders. Only a relatively small proportion

of the limited access fishery is currently landing YT, about 60-80 vessels depending on the year. The number of vessels landing yellowtail flounder does seem to have increased since the requirement to land legal sized yellowtail flounder went into effect in May 2010, but the majority of limited access vessels do not land yellowtail flounder. Total yellowtail flounder landings increased in 2011, but declined again in 2012 and 2013. Average revenue per vessel that has landed yellowtail flounder is about $2,000-6,000 dollars, or less than 5% of total revenue. Therefore, the impact of zero possession would only impact a relatively small proportion of the fishery, and impacts would be expected to be small since yellowtail flounder landings revenue is a very small percentage of total revenue for these vessels.

7.5 Social Impacts

The current interpretation of National Standard 8 (NS8) requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. Thus, continued overall access to fishery resources is a consideration, but not a guarantee that fishermen will be able to use a particular gear type, harvest a particular species of fish, fish in a particular area, or fish during a certain time of the year.

A fundamental difficulty exists in forecasting social change relative to management alternatives, since communities or other societal groups are constantly evolving in response to external factors (e.g., market conditions, technology, alternate uses of waterfront, and tourism). Certainly, management regulations influence the direction and magnitude of economic and social change, but attribution is difficult with the tools and data available. While the focus here is on the economic and social impacts of the proposed fishing regulations, external factors may also influence change, both positive and negative, in the affected communities. External factors may also lead to unanticipated consequences of a regulation, due to cumulative impacts. These factors contribute to a community's ability to adapt to new regulations.

When examining potential social impacts of management measures, it is important to consider impacts on the following: the fishing fleet (vessels grouped by fishery, primary gear type, and/or size); vessel owners and employees (captains and crew); herring dealers and processors; final users of herring; community cooperatives; fishing industry associations; cultural components of the community; and fishing families. Furthermore, there are other stakeholders who may be affected, such as those with businesses that rely on herring as forage (e.g., the whale watch industry). While some management measures may have a short-term negative impact on some communities, these should be weighed against potential long-term benefits to all communities which can be derived from a sustainable herring fishery.

The social impact factors outlined below can be used to describe the Northeast multispecies fishery, its sociocultural and community context and its participants. These factors or variables are considered relative to the management alternatives and used as a basis for comparison between alternatives. Use of these kinds of factors in social impact assessment is based on NMFS guidance (NMFS 2007a) and other texts (e.g., Burdge 1998). Longitudinal data describing these social factors region-wide and in comparable terms is limited. While this analysis does not quantify the impacts of the management alternatives relative to the social impact factors, qualitative discussion of the potential changes to the factors characterizes the likely direction and magnitude of the impacts.

The social impact factors fit into five categories:

- *Size and Demographic Characteristics* of the fishery-related workforce residing in the area; these determine demographic, income, and employment effects in relation to the workforce as a whole, by community and region.
- The *Attitudes, Beliefs, and Values* of fishermen, fishery-related workers, other stakeholders and their communities; these are central to understanding the behavior of fishermen on the fishing grounds and in their communities.
- The effects of the proposed action on *Social Structure and Organization*; that is, changes in the fishery's ability to provide necessary social support and services to families and communities, as well as effects on the community's social structure, politics, etc.
- The *Non-Economic Social Aspects* of the proposed action; these include lifestyle, health, and safety issues, and the non-consumptive and recreational uses of living marine resources and their habitats.

- 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 2007a).

7.5.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

7.5.1.1 Gulf of Maine Cod Rebuilding Strategy

7.5.1.1.1 Option 1: No Action

Option 1, the No Action alternative, would retain the target rebuilding end date of 2014. Given the current status of the stock, it is unlikely that GOM cod will be rebuilt by 2014. Thus, the fishing mortality for GOM cod would be based on incidental bycatch (i.e., reduced to as close to zero as possible) starting in FY2015 until the stock is rebuilt.

Under Option 1, many of the management options that might allow limited harvesting in FY2015 and beyond would be precluded, in favor of the 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 GOM cod stock, it could have a negative impact on the *Attitudes, Beliefs and Values* of the fishermen regarding management. To many vessel owners and operators in the Northeast groundfish fishery, the rules that limit fishing are considered inflexible and based on poorly understood science (Holland et al. 2010). Option 1 could perpetuate this negative view of management and government when it comes to the flexibility of rebuilding targets. Option 1 could also have negative impacts on the *Size and Demographic Characteristics* of the fishery as well as the *Historical Dependence on and Participation* in the fishery starting in FY2015, since GOM cod would be effectively reduced to a bycatch-only fishery, and there would no longer be participants in the directed fishery. Option 1 could particularly impact communities that rely on GOM cod.

Table 28 demonstrates that landings of GOM cod are important to primary and secondary ports throughout the Northeast US. Due to the fact that multiple groundfish species are caught in conjunction, a zero allocation of GOM cod would inhibit harvest of other groundfish species in the GOM as well. If Option 1 leads to successful rebuilding of the GOM cod stock, then there could be long-term positive impacts, unless markets, processing capability, and other infrastructure that are lost during the period of low catch are unable to recover when the stocks rebuild.

7.5.1.1.2 Option 2: Revised Rebuilding Strategy for Gulf of Maine Cod (Preferred Alternative)

Two options are being considered for a revised rebuilding strategy for GOM cod, but neither would change the FY 2014-2015 ABC (1,550 mt). For FY2014, there is no difference in social impacts between Option 1 and Option 2. Compared to the No Action alternative, Option 2 is likely to have positive social impacts. The differential impacts of Option 2, Sub-Option A and B are difficult to determine and will depend upon whether or not the rebuilding target under each scenario is successfully met. Sub-Option B may have the most positive short-term impacts due to its higher fishing mortality rate. However, Sub-Option A may have more long-term positive impacts, as it could lead to quicker rebuilding of the fishery to sustainable levels.

<u>Sub-Option A</u>: Option 2, Sub-Option A would revise the target rebuilding date for GOM cod, with a median probability of success, to 2022. Fishing mortality would be above 75% F_{MSY}.

Option 2, Sub-Option A would likely have short-term positive social impacts relative to No Action, as it would allow a higher level of fishing effort to be directed on GOM cod. This alternative could have a small positive impact on the overall *Size and Demographic Characteristics* of the fishery-related workforce, if it allows for higher harvest of GOM cod. Long-term social impacts could be positive if this alternative successfully rebuilds the GOM cod fishery. There may also be a small positive impact to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of management because Option 2, Sub-Option A would not require the most rapid stock rebuilding measures.

Sub-Option B (Preferred Alternative): Option 2, Sub-Option B would revise the target rebuilding date for GOM cod, with a median probability of success, to 2024. Fishing mortality would be above 75% F_{MSY}.

Option 2, Sub-Option B would likely have short-term positive social impacts, relative to No Action, as it would allow a higher level of fishing effort to be directed on GOM cod. This option could have a small positive impact on the overall *Size and Demographic Characteristics* of the fishery-related workforce, if it allows for higher harvest of GOM cod in the near-term. Long-term social impacts could be positive if the GOM cod fishery is rebuilt. There may also be a small positive impact to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of management because Option 2, Sub-Option B would not require the most rapid stock rebuilding measures.

7.5.1.1.3 Option 3: Rebuilding Plan Review Analysis for Gulf of Maine Cod (Preferred Alternative)

This option must be selected in conjunction with an above option under Option 2.

Sub-Option A: Option 3, Sub-Option A would maintain the current biennial review process.

Sub-Option A could have a negative impact to the *Attitudes, Beliefs and Values* of stakeholders who believe, when rebuilding has not occurred, additional investigation as to why is warranted. However, there could be positive impacts related to maintaining the status quo, as it would continue consistent review processes across fisheries.

Sub-Option B (Preferred Alternative): Option 3, Sub-Option B (under specific conditions), would establish a rebuilding plan review analysis for GOM cod for use during the new rebuilding period.

Sub-Option B could have a positive impact to the *Attitudes, Beliefs and Values* of stakeholders towards management, because it would assure that the most current information is used in decision making and it could lead to more flexible and responsive management. This benefit could be offset due to the fact that this new rebuilding plan review process would only apply to the GOM cod fishery. If this review process proves beneficial, stakeholders may feel that the process should be applied for all stocks in the fishery.

7.5.1.2 American Plaice Rebuilding Strategy

7.5.1.2.1 Option 1: No Action

Option 1, the No Action alternative, would retain the target rebuilding end date of 2014. Given the current status of the stock, it is unlikely that American plaice will be rebuilt by 2014. Thus, the fishing mortality for American plaice would be based on incidental bycatch (i.e., reduced to as close to zero as possible) starting in FY2015 until the stock is rebuilt.

Under Option, many of the management options that might allow limited harvesting in FY2015 and beyond would be precluded, in favor of the 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 American plaice stock, it could have a negative impact on the *Attitudes, Beliefs and Values* of the fishermen regarding management. To many vessel owners and operators in the Northeast groundfish fishery, the rules that limit fishing are considered inflexible and based on poorly understood science (Holland, et al. 2010). Option 1 could perpetuate this negative view of management and government when it comes to the flexibility of rebuilding targets. Option 1 would also have negative impacts on the *Size and Demographic Characteristics* of the fishery as well as the *Historical Dependence on and Participation* in the fishery starting in FY2015, as American plaice would be effectively reduced to a bycatch-only fishery. Option 1 could particularly impact communities that rely upon American plaice.

Table 28 demonstrates that landings of American plaice are important to primary and secondary ports throughout the Northeast US. Due to the fact that multiple groundfish species are caught in conjunction and the American plaice stock unit comprises the entire Gulf of Maine and Georges Bank region, a fishing mortality of zero for American plaice would impact the entire groundfish fishery. If this option leads to successful rebuilding of the American plaice stock, then there could be long-term positive impacts, unless markets, processing capability, and other infrastructure that are lost during the period of low catch are unable to recover when the stocks rebuild.

7.5.1.2.2 Option 2: Revised Rebuilding Strategy for American Plaice (Preferred Alternative)

Three options are being considered for a revised rebuilding strategy for American plaice. Compared to the No Action alternative, Option 2 is likely to have positive social impacts. For FY2014, there is no difference in social impacts between Option 1 and Option 2. The differential impacts of Option 2, Sub-Option A, B and C are difficult to determine and will depend upon whether or not the rebuilding targets are successfully met. Sub-Option C may have the most positive short-term impacts due to higher fishing effort. However, Sub-Option A may have more long-term positive impacts, as it could lead to quicker rebuilding of the fishery to sustainable levels.

<u>Sub-Option A</u>: Option 2, Sub-Option A would revise the target rebuilding date for American plaice, with a median probability of success, to 2021. Fishing mortality would be above 75% F_{MSY}.

Option 2, Sub-Option A would likely have short-term positive social impacts, as it would allow a higher level of fishing effort to be directed on American plaice. This option could have a small positive impact on the overall *Size and Demographic Characteristics* of the fishery-related workforce, if it allows for higher harvest of American plaice. Long-term social impacts could be positive if this alternative successfully rebuilds the American plaice fishery. 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, Sub-Option A would require less rapid stock rebuilding measures relative to No Action.

<u>Sub-Option B</u>: Option 2, Sub-Option B would revise the target rebuilding date for American plaice, with a median probability of success, to 2022. Fishing mortality would be above 75% F_{MSY}.

Option 2, Sub-Option B would likely have short-term positive social impacts as it would allow a higher level of fishing effort to be directed on American plaice. This alternative could have a small positive impact on the overall *Size and Demographic Characteristics* of the fishery-related workforce, if it allows for higher harvest of American plaice. Long-term social impacts could be positive if this alternative successfully rebuilds the American plaice fishery. 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, Sub-Option B would not require the most rapid stock rebuilding measures.

Sub-Option C (Preferred Alternative): Option 2, Sub-Option C would revise the target rebuilding date for American plaice with a median probability of success to 2024. Fishing mortality would be above 75% F_{MSY}.

Option 2, Sub-Option B would likely have short-term positive social impacts as it would allow a higher level of fishing effort to be directed on American plaice. This alternative could have a small positive impact on the overall *Size and Demographic Characteristics* of the fishery-related workforce, if it allows for higher harvest of American plaice. Long-term social impacts could be positive if this alternative successfully rebuilds the American plaice fishery. 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, Sub-Option C would not require the most rapid stock rebuilding measures.

7.5.1.2.3 Option 3: Rebuilding Plan Review Analysis for American Plaice (Preferred Alternative)

This option must be selected in conjunction with an above option under Option 2.

Sub-Option A: Option 3, Sub-Option A (no action) would maintain the current biennial review process.

Sub-Option A could have a negative impact to the *Attitudes, Beliefs and Values* of stakeholders, who believe, when rebuilding has not occurred, additional investigation as to why is warranted. However, there could be positive impacts related to maintaining the status quo as it would continue consistent review processes across fisheries.

Sub-Option B (Preferred Alternative): Option 3, Sub-Option B would establish a rebuilding plan review analysis for American plaice for use during the new rebuilding period.

Sub-Option B could have a positive impact to the *Attitudes, Beliefs and Values* of stakeholders, because it would reaffirm that the most current information would be used in decision making and it could lead to more flexible and responsive management. This benefit could be offset due to the fact that this new rebuilding plan review process would only apply to the American plaice fishery. If this review process proves beneficial, stakeholders may feel that the process should be applied for all stocks in the fishery.

7.5.1.3 Annual Catch Limits

7.5.1.3.1 Option 1: No Action

Option 1, the No Action alternative, would retain constant groundfish fishery ACLs from FY2013 for FY2014-2015, with the exception of white hake, which would have an ACL of zero. Fishing would not be allowed in these species' broad stock areas. There would also be no allocations for the US/Canada Resource Sharing Understanding quotas of EGB cod, EGB haddock and EGB yellowtail flounder for FY2014.

Option 1 would have a large negative impact on the *Size and Demographic Characteristics* of the fishery-related workforce and the *Historical Dependence on and Participation in* the fishery.

The zero ACL for white hake and lack of US/Canada quotas could have a large negative social impact on the individuals and communities involved with the groundfish fishery, particularly those who target white

hake, EGB cod, EGB haddock or EGB yellowtail flounder, or catch these stocks in conjunction with others.

Table 28 demonstrates that landings of white hake are important to primary and secondary ports throughout the Northeast US. The Georges Banks stocks are particularly important to the ports of Portland, Gloucester, New Bedford, and Point Judith. Because multiple groundfish species are caught in conjunction with others and the extensive range of the white hake stock unit, a zero ACL for white hake would likely result in a shutdown of the entire groundfish fishery. This would cause severe negative social impacts for the commercial fishery.

Such a severe limitation on fishing could cause a change in the *Size and Demographics* of the groundfish fishery by reducing the number of vessels and fishermen involved. This could also cause distrust in management because the zero allocation for white hake and lack of allocation for US/Canada Resource Sharing stocks would be seen as a failure on the part of management. This could have a negative impact on the formation of *Attitudes and Beliefs.*

If Option 1 changes *Historical Dependence on and Participation in* the fishery (e.g. prevents industry segments from fishing), perceived inequities could cause resentment or conflict between fishing groups, a negative social impact in the form of changes to *Social Structures and Organizations*. The impacts of Option 1 would be less negative for the recreational fishery, as there is no recreational fishery in the eastern GB stock area and no recreational sub-ACL for white hake. Selecting Option 1 could lead to perceived inequities between the commercial and recreational fishery components, if the recreational fishery can continue fishing while the commercial fishery cannot.

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

Option 2 would specify the annual specifications for FY2014 through FY2015 as in Table 4. For all stocks, except white hake, these specifications are the same as Option 1. Option 2 would also adopt specifications for the US/CA Resource Sharing Understanding quotas.

Option 2 would have generally positive social impacts relative to No Action, as all stocks would have specified catch limits. The *Size and Demographic Characteristics* of the fishery-related workforce would be unchanged or experience a slight improvement, as would and the *Historical Dependence on and Participation in* the fishery.

Table 28 demonstrates that landings of cod and haddock are important to primary and secondary ports throughout the Northeast US, particularly in Maine, New Hampshire and Massachusetts. Compared to Option 1/No Action alternative, it is likely that Option 2 could provide some positive social benefits for individuals and communities involved in the multispecies fishery. Because white hake is not overfished and overfishing is not occurring (Section 6.2.1.14), Option 2 would likely result in more positive *Attitudes and Beliefs* of stakeholders towards management than Option 1.

For some stocks, selecting Option 2 would result in lower catch limits relative to no action, continuing an overall trend in allocation reductions from previous years. Under Option 2, there are likely to be reduced fishing opportunities in FY2014 and FY2015 relative to prior years, likely resulting in increased negative social impacts for the fishery. However, because Option 1 would likely result in shutting down the fishery, Option 2 would likely have more positive social impacts relative to Option 1.

U.S./Canada TACs
The U.S./Canada TACs for EGB cod, EGB haddock, and EGB yellowtail flounder specified under Option 2 are described in Table 2. A comparison of the proposed FY2014 U.S. TACs and the FY2013 U.S.

TACs shown in Table 4 shows the percent change in U.S. allocations between the two years. For all three stocks, the 2014 U.S. allocation is a substantial increase (53-166%) from the 2013 allocations. This could result in positive social impacts. Vessel operators, families and communities that fish offshore, particularly those who are reliant on the groundfish fishing opportunities in EGB will experience the greatest beneficial impact from this alternative. The increased allocations provide an incentive for offshore vessels to fish offshore. This could improve the *Non-Economic Social Aspects* of fishing. There could be reduced gear conflicts with smaller vessels on inshore grounds, improving safety and reducing fishing-related stress.

7.5.2 Commercial and Recreational Fishery Measures

7.5.2.1 Small-Mesh Fishery Accountability Measures

7.5.2.1.1 Option 1: No Action

Option 1, the No Action alternative, would establish no additional Accountability Measures for the small-mesh fishery for Georges Bank yellowtail flounder. Under current AMs, if the US TAC is exceeded, the sub-ACL of the component of the fishery that caused the overage would be reduced the following fishing year by the same amount as the overage. Because the small-mesh fishery is currently prohibited from landing GB yellowtail flounder, there is effectively no sub-ACL to reduce.

Option 1 would have a negative social impact on the *Attitudes, Beliefs and Values,* of the participants in the multispecies fishery, because it would perpetuate discrepancies in AMs for different components of the fishery. The perception of differential treatment could create conflicts, particularly with other components of the fishery that are subject to pound-for-pound paybacks. This could have a negative impact on the *Non-Economic Social Aspects* of the fishery.

7.5.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder Sub-ACL (Preferred Alternative)

Two options (one with two sub-options) are being considered for the small-mesh fishery AM.

<u>Sub-Option A</u>: Under Option 2, Sub-Option A, when an overage occurs and the small-mesh fishery has a zero sub-ACL for GB yellowtail flounder, or a sub-ACL is not specified, an area closure would be implemented the following year that would prohibit vessels with small-mesh gear from fishing in the GB yellowtail flounder stock area (Section 4.2.1.2). The AM would be implemented in the fishing year following the notification of the overage.

Sub-Option A would have no substantial social impacts expected from creating this AM, but if this AM is triggered, it could cause a disruption in fishing practices, particularly if the fishery does not pro-actively use gear that reduces GB yellowtail flounder bycatch. As it is intended, this AM would change where the small-mesh fishery fishes, which would have an impact on the *Historic and Present Participation* in the fishery. To the small-mesh fishery, an area closure could have more negative social impacts than mandatory gear modifications. Thus, Sub-Option A may result in more negative impacts than Sub-Option B.

Option 2, Sub-Option A could have a positive impact on the *Attitudes, Beliefs and Values,* of the participants in the multispecies fishery, because it could be seen as more fair management of different components of the fishery. This may decrease conflicts, particularly with other components of the fishery

that are subject to pound-for-pound paybacks. This could have a positive impact on the *Non-Economic Social Aspects* of the fishery.

Sub-Option B1: Under Option 2, Sub-Option B1, when an overage occurs in both the total ACL and the small-mesh fishery sub-ACL for GB yellowtail flounder, selective trawl gear that reduces the catch of GB yellowtail flounder would be required for vessels using small mesh gear, when fishing in GB yellowtail flounder stock area (gear and area described in Section 4.2.1.2).

Sub-Option B1 would have no substantial social impacts expected from creating this AM, but if this AM is triggered, it could cause a disruption in fishing practices, particularly if the fishery does not pro-actively use gear that reduces GB yellowtail flounder bycatch. Gear modifications affect changes in occupational opportunities, community infrastructure, and *Attitudes, Beliefs and Values*. Gear modifications can compromise business planning for shoreside support services and impose an economic burden on a large number of vessels. The ability to adapt to the new gear regulations would depend on vessels current economic situation and ability to cover the short-term costs of the gear. The magnitude of these impacts will depend on the cost and catch efficiency of the new gear. To the small-mesh fishery, mandatory gear modifications could have more positive social impacts than an area closure. Thus, Sub-Option B may result in more positive impacts than Sub-Option A.

Option 2, Sub-Option B1 could have a positive impact on the *Attitudes, Beliefs and Values,* of the participants in the multispecies fishery, because it could be seen as more fair management of different components of the fishery. This may decrease conflicts, particularly with other components of the fishery that are subject to pound-for-pound paybacks. This could have a positive impact on the *Non-Economic Social Aspects* of the fishery.

Sub-Option B2 (Preferred Alternative): Under Option 2, Sub-Option B2, when an overage occurs in small-mesh fishery sub-ACL for GB yellowtail flounder, selective trawl gear that reduces the catch of GB yellowtail flounder would be required for vessels using small mesh gear, when fishing in the GB yellowtail flounder stock area (gear and area described in Section 4.2.1.2).

Sub-Option B2 would have similar social impacts to those discussed under Option B1. Additional negative impacts are possible, due to the fact that this AM would be implemented regardless of whether or not the total ACL of GB yellowtail flounder is exceeded. This could negatively impact *Values, Attitudes, and Beliefs* regarding flexibility of management if AMs are imposed on the small-mesh fishery when there is no overage on the total ACL, particularly because not all AMs for non-groundfish fisheries are treated this way.

7.5.2.2 Management Measures for US/CA TACs

This section considers changing fishery management measures as necessary to adjust catches of US/CA stocks. More than one option can be selected.

7.5.2.2.1 Option 1: No Action

Option 1 would specify U.S./Canada TACs at the beginning of the fishing year, and no in-season adjustments would be made.

Option 1 could have negative social impacts by reducing the flexibility of fishing vessels. This would particularly affect communities that are more reliant on the EGB stocks (Table 28). There may also be a negative social impact to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of

management, because Option 1would not utilize the resource to the full extent approved by U.S./Canada agreements.

7.5.2.2.2 Option 2: Revised In-season Adjustment for US/CA TACs (Preferred Alternative)

Option 2 would allow the Regional Administrator to make in-season adjustments to U.S./Canada TACs. Additional allocation of quota would be consistent with current ABC distribution, including both groundfish and non-groundfish vessels. This authority can only exist for trades made by or before the end of FY2014.

Because of the sunset provision in Option 2, its potential impacts relative to Option 1 may be short-term in nature. Option 2 could have positive social impacts to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of management, because Option 2 would make adjustments in as timely a manner as possible to allow vessels to utilize the resource to the full extent approved by U.S./Canada agreements. The potential additional in-season quota may also help maintain the *Historic and Present Participation* in the fishery, particularly for communities more reliant on EGB stocks (Table 28). Depending on how the revised in-season quota is distributed among fisheries (e.g. groundfish and scallops), there could be conflict between fisheries, resulting in negative impacts to the *Non-Economic Social Aspects* of fisheries.

7.5.2.2.3 Option 3: Distribution of US TACs in Eastern/Western Georges Bank (Preferred Alternative)

Sub-Option A: This option would allow the Regional Administrator, in consultation with the Council, to adjust the portion of the U.S. TAC for Eastern GB haddock that is available in the Eastern U.S./Canada Area.

Sub-Option A could have positive social impacts by increasing the flexibility of fishing operations. This would particularly affect communities that are more reliant on EGB haddock (Table 28). There may also be a positive social impact to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of management.

Sub-Option B (Preferred Alternative): This option would allow a sector or state-operated permit bank to convert its Eastern GB haddock ACE to Western GB haddock ACE to cover overages during the previous fishing year. This conversion may only be made within a sector or permit bank and must be approved by NMFS.

Sub-Option B could have positive social impacts on the *Historical Dependence on and Participation in* the fishery by increasing the flexibility of fishing operations. This would particularly affect communities that are more reliant on EGB haddock (Table 28).

There may also be a positive social impact to the *Attitudes, Beliefs and Values* of fishermen regarding the flexibility of management. Relative to Sub-Option A, Sub-Option B would have more positive impacts on the flexibility of fishing operations.

7.5.2.3 Georges Bank Yellowtail Flounder Management Measures

7.5.2.3.1 Option 1: No Action

Option 1, the No Action alternative, would maintain the status quo measures for GB yellowtail flounder, with regard to how GB yellowtail flounder discards are calculated.

Under Option 1, there would be no new social impacts, as Option 1 continues to use the current method of accounting for discards on unobserved trips.

7.5.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail Flounder (Preferred Alternative)

Option 2 would modify the stratification method used for estimating discards of GB yellowtail flounder, such that trips made in Statistical Area 522 would have a different calculated discard rate than the rest of GB.

Under Option 2, the catch and discard rates of GB yellowtail flounder could be lower in SA 522 than the rest of GB, allowing for fishing in SA 522 with a lower risk of exceeding allocations of GB yellowtail flounder. It is important to point out that, because the GB discard rate is calculated based on observed hauls in the GB statistical areas, removing hauls with low yellowtail discards made in one area will inflate the calculated discard rate in the other areas. Removing observed hauls with low yellowtail discards made in SA 522 from the hauls used to determine the GB discard stratum, will increase the yellowtail discard rate assigned to the other GB statistical areas. It is possible that the fishing opportunities gained in SA 522 could occur at a loss in opportunity in the other GB statistical areas, because of higher calculated discard rates.

Compared to the No Action alternative, Option 2 could offer some small but positive social impacts. The perception among fishermen could be that Option 2 would provide some assurance that vessels fishing in SA 522 would not be penalized by the higher discard rates found in other stock areas. This would have a small but positive social impact on the formation of *Attitudes and Beliefs* about government and management. Other potential social impacts of adopting Option 2 are difficult to predict, because they will vary based on the calculated discard rates in SA 522 and the other GB stock areas, as well as based on the distribution of fishing in those areas.

7.5.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

7.5.2.4.1 Option 1: No Action

Under Option 1, there would continue to be no trip limit for yellowtail flounder stocks for vessels in the limited access scallop fishery, and these vessels would continue to be required to land all legal-sized yellowtail flounder.

Under Option 1, the social impacts are expected to be mixed. There may be positive social impacts associated with having no regulatory discards of yellowtail flounder, thereby reducing the negative social impacts commonly associated with the forced discard of marketable fish. However, these could be offset by negative social impacts associated with the perception that limited access scallop vessels are targeting a bycatch species. Incentivizing the scallop fishery to target yellowtail flounder could result in exceeding their sub-ACL, the social consequences of which would exceed any benefits resulting from yellowtail flounder landings.

7.5.2.4.2 Option 2: Prohibition on Possession of Yellowtail Flounder (Preferred Alternative)

Under Option 2, there would be zero possession of yellowtail flounder stocks for vessels in the limited access scallop fishery. These vessels would be prohibited from landing or selling yellowtail flounder.

Under Option 2, the social impacts are expected to be mixed. 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 could 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 however, there are likely to be positive social impacts associated with the prohibition on possession of yellowtail flounder, as it will remove any incentive for targeting flounders, and therefore any perception that limited access scallop vessels are targeting a bycatch species.

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.

Valued Ecosystem Components (VEC)
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).

Temporal Scope of the VECs
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, 2014) and 2019.

Geographic Scope of the VECs
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

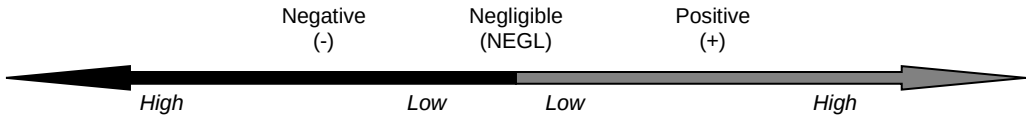
A cumulative effects assessment ideally makes effect determinations based on the culmination of the following: (1) impacts from past, present and reasonably foreseeable future actions; PLUS (2) the baseline condition for resources and human communities (note – the baseline condition consists of the present 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 71. 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 70.

Table 70- 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 71- 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 streamlined 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**	**-**
Secretarial Amendment to Establish Annual Catch Limits and Accountability Measures for the Small-Mesh Multispecies Fishery **This amendment established the mechanism for implementing ACLs and AMs.**	**Negl to L+**	**Negl**	**Negl**	**Negl**	**Negl to +**
Amendment 3 to the Spiny Dogfish FMP **This amendment established 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+**

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
Framework 24 to the Atlantic Sea Scallop FMP (Framework 49 to the Northeast Multispecies FMP) **This framework set specifications for scallop FY 2013 and 2014. It is also considered 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 modified 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**
FW50 to the Multispecies FMP **This FW adopted FY2013-2015 ACLs and specifications for the U.S./Canada Total Allowable Catches (TACs)**	**+**	**+**	**+**	**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**

Actions	Habitat	Regulated Groundfish Stocks	Non-Groundfish Species	Endangered and other Protected Resources	Human Communities
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 -**
Framework 25 to the Atlantic Sea Scallop FMP **This framework sets specifications for scallop FY 2014 and 2015. It is also considering accountability measures for windowpane flounder stocks.**	**Likely Negl**	**Likely Negl to L+**	**Likely Negl to L+**	**Likely Negl**	**Likely - to +**

Noted: ND= Not determined

Table 72 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 72 come from fishery-related activities (e.g., federal fishery management actions – many of which are identified above in Table 71). 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.

Framework Adjustment 25 (FW 25) to the Scallop FMP is considering a range of specification alternatives for FY2014 and default measures for FY2015. The Preferred Alternative in that action would include similar allocations and catches to FY2013. The projected catch of GB yellowtail flounder for the Preferred Alternative is higher than the sub-ACL allocated to the scallop fishery in 2014. Therefore, there is a potential risk that the scallop fishery may exceed their sub-ACL and cause the total ACL to be exceeded. FW 25 explains that these bycatch projections are very uncertain, and have been overestimated for the last three years. Furthermore, there are several measures that are expected to help reduce bycatch in the scallop fishery including a seasonal closure of closed area 2, a voluntary bycatch avoidance program, potential gear modifications, and elimination of the requirement to land legal sized YT (being proposed in this action). The total estimate of area swept from these specifications are lower than recent years; therefore, the cumulative impacts of this action on both the groundfish species and groundfish fishery overall are likely negligible.

There may even be potentially positive cumulative impacts on groundfish stocks from FW 25 Preferred Alternatives related to SNE/MA windowpane flounder accountability measures. A proactive gear modification is proposed that would limit the number of rows in the apron of a scallop dredge to seven. Currently vessels are required to have at least seven rows in the apron on the topside of a dredge. Shorter aprons have been found to improve escapement of flatfish. A reactive AM is also proposed that would implement a seasonal gear modified area is all waters west of 71 W, excluding scallop access areas. The gear modification includes a reduced hanging ratio for the twine top on a scallop dredge, and a requirement for an even shorter apron (5 rows). These modifications are expected to reduce windowpane bycatch by about 45%, and about 37% for yellowtail flounder. These AMs may reduce flatfish bycatch in the scallop fishery overall, which may have potentially positive cumulative impacts on the groundfish resource and groundfish fishery.

Table 72- Summary effects of past, present and reasonably foreseeable future actions on the VECs identified for Framework 51.

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

Impact Definitions:
-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 73) summarizes the added effects of the condition of the VECs (i.e., status/trends from Section 6.2.1) and the sum effect of the past, present and reasonably foreseeable future actions (from Table 72 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 1817.2 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 74.

Table 73- 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 72)	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 73 cont'd.

VEC		Status/Trends	Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 72)	Combined CEA Baseline Conditions
Non-groundfish Species (principal species listed in section 6.3)	**Monkfish**	Not overfished and overfishing is not occurring.	**Positive** – Continued management of directed stocks will also control incidental catch/bycatch.	**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.
	Dogfish	Not overfished and overfishing is not occurring.		
	Skates	Thorny skate is overfished but overfishing is not occurring. All other skate species are not overfished and overfishing is not occurring.		
Habitat		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.	**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.	**Mixed** - reduced habitat disturbance by fishing gear but impacts from non-fishing actions, such as global warming, could increase and have a negative impact.
Protected Resources	**Sea Turtles**	Leatherback, Kemp's ridley and green sea turtles are classified as endangered under the ESA and loggerhead sea turtles are classified as threatened.	**Positive** – reduced gear encounters through effort reductions and management actions taken under the ESA and MMPA have had a positive impact	**Positive** – reduced gear encounters through effort reductions and additional management actions taken under the ESA and MMPA.
	Large Cetaceans	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.		
	Small Cetaceans	Pilot whales, dolphins and harbor porpoise are all protected under the MSA, the HPTRP and the Large Whale Take Reduction Plan Amendment		
	Pinnipeds	ESA classification: Endangered, number of nesting females below sustainable level; taken by longfin trawl		

Table 73 cont'd.

VEC	Status/Trends	Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 72)	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 51 Actions

The alternatives contained in Framework 51 can be divided into two broad categories, as seen in Table 74 (summary of impacts from action – for a complete discussion of impacts please see Section 7.0 of document). First, this action adjusts the Gulf of Maine cod and American plaice rebuilding strategies and modifies OFLs/ABCs/ACLs by setting specifications for white hake and stocks managed by the U.S./Canada Resource Sharing agreement (Eastern Georges Bank cod, Eastern Georges Bank haddock, and Georges Bank yellowtail flounder). Second, the action adopts commercial fishing measures including measures to establish an accountability measure for the Georges Bank yellowtail flounder sub-ACL in small-mesh fisheries, a mechanism to transfer quota between US and Canada shared stocks, a mechanism to transfer Eastern Georges Bank haddock quota to Western Georges Bank haddock quota, a revised discard strata for Georges Bank yellowtail flounder, and zero possession of yellowtail flounder in the scallop fisheries.

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, 48, and 50 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 51 are thus consistent with the amendment. The proposed revisions to the Gulf of Maine cod and American plaice rebuilding plans are needed to continue the rebuilding of those stocks 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 fishery. Several changes are proposed to modify management measures including to establish an accountability measure for the Georges Bank yellowtail flounder sub-ACL in small-mesh fisheries and zero possession of yellowtail flounder in the scallop fisheries. AMs are established to prevent the sub-ACL of GB yellowtail flounder from being exceeded by small-mesh fisheries. Zero retention in the limited access scallop fishery would eliminate the incentive to target yellowtail flounder. The other measures would establish a mechanism to transfer quota between US and Canada shared stocks, a mechanism to transfer Eastern Georges Bank haddock quota to Western Georges Bank haddock quota, and revise the discard strata for Georges Bank yellowtail flounder, and would allow for more flexibility for the fishing industry.

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 preferred alternative changes to commercial fishery management measures would also contribute to achieving these objectives by providing additional fishing revenues that will benefit both fishermen and their communities. 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 ACLs are likely to have negative impacts on communities in the short term, but as stocks rebuild communities should benefit from larger future catches.

Table 74- 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 GULF OF MAINE COD 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 AMERICAN PLAICE 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 continued reductions in fishing revenues in the short term. Overall revenues will increase as stocks increase.

Table 74 cont'd.

Management Measure		VECs				
		Managed Resources	**Non-target Species**	**Protected Resources**	**Habitat Including EFH**	**Human Communities**
COMMERCIAL FISHERY MEASURES	**SMALL- MESH FISHERY ACCOUNTABILITY MEASURES FOR GB YELLOWTAIL FLOUNDER SUB-ACL**	**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 protected resources	**No impact** – measures are not expected to create additional impacts to habitat	**Mixed** – Overall revenues will increase as stocks rebuild, however restrictions may constrain fishing
	MANAGEMENT MEASURES FOR US/CA TACS	**No impact** – measures are not expected to create additional impacts to 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 protected resources	**No impact** – measures are not expected to create additional impacts to habitat	**Positive** – Increasing access to landings will provide additional commercial fishing revenues and recreational opportunities
	GB YELLOWTAIL FLOUNDER MANAGEMENT MEASURES	**No impact** – measures are not expected to create additional impacts to 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 protected resources	**No impact** – measures are not expected to create additional impacts to habitat	**Positive** – Removing the incentive to target yellowtail flounder reduces the likelihood of the scallop fishery AMs being triggered

	PROHIBITION ON POSSESSION OF YELLOWTAIL FLOUNDER BY THE LIMITED ACCESS SCALLOP FISHERY	**No impact** – measures are not expected to create additional impacts to 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 protected resources	**No impact** – measures are not expected to create additional impacts to habitat	**Positive** – Landings will provide additional commercial fishing revenues and recreational opportunities

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 74 provides as a summary of likely cumulative effects found in the various groups of management alternatives contained in Framework 51. The CEA baseline that, as described above in Table 73, 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 73, 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 51 are expected to continue this trend. The adoption of revised rebuilding plans for Gulf of Maine cod and American plaice and the revised ABCs/ACLs will have the largest biological impacts. The revised rebuilding strategies will continue to rebuild Gulf of Maine cod and American plaice, 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 small-mesh fishery accountability measure for the Georges Bank yellowtail flounder sub-ACL will have similar effects. The other measures – management measures for US/CA TAC, Georges Bank yellowtail flounder management measures, and prohibition on the possession of yellowtail flounder –will likely have no impact. 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. In addition, the cumulative impacts of FW 25 to the Scallop FMP on groundfish species are likely negligible and potentially positive for windowpane flounder.

Non-Target Species

As noted in Table 73, 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 51 are expected to continue this trend. The primary mechanism is through the reduced ABCs/ACLs (reduced from recent years). The modifications in management measures 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 73, 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 51 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 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 73, 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 73, 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 2014 (FW 51) 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. Modest increases in ACLs for Georges Bank yellowtail flounder and white hake will likely cause short term mixed impacts on human communities. Modifying the Gulf of Maine cod and American plaice rebuilding plans will provide some benefits to fishing communities. However, this action alone is not expected to have significant socioeconomic impacts beyond what was anticipated in Amendment 16. In addition, the cumulative impacts of FW 25 to the Scallop FMP on the groundfish fishery are likely negligible and potentially positive for the windowpane flounder fishery. 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.

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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 GOM cod and American plaice rebuilding plans and 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.

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 NE Groundfish 2012 Updates Integrated Peer Review Meeting (American plaice), subsequent benchmark assessments (SARC 55 for GOM cod and SARC 56 for white hake) and the most recent TRAC proceedings (2013). 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 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. 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, such as transfer of GB haddock from EGB, revising the discard strata for GB yellowtail flounder and restricting the possession of yellowtail flounder by the LA scallop fishery. 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 effort 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 small-mesh fisheries, 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.

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 are consistent with that Understanding.

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. Likely future conditions of the resource are described 7.1.1.3. 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 and Frameworks 44, 45, 47, 49 and 50. 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 6.1.5.

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 are 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;

The Standardized Bycatch Reporting Methodology omnibus amendment was dismissed by the U.S. Court of Appeals for the District of Columbia Circuit in 2011 (No. 10-5299 Oceana, Inc. v. Gary F. Locke). That method no longer applies to this framework. 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, 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 51 (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 GOM cod
- A revised rebuilding strategy for American plaice
- Updated TACs for stocks managed consistent with the U.S./Canada Resource Sharing Understanding
- Revised ACL specifications for white hake and GB yellowtail flounder FY 2014 – FY 2016
- Small-mesh fishery AMs for GB yellowtail flounder
- Management measures for US/CA TACs
- GB yellowtail flounder management measures
- Prohibition on the possession of yellowtail flounder by the LA scallop fishery

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 GOM cod and American plaice rebuilding plans may result in a small increase in the number of groundfish fishing trips in the stock areas 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.

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 2012 or FY 2013. These reduced effects on EFH would be expected to continue for several years, but as stocks rebuild fishing effort may increase.

Table 75- Summary of possible effects to EFH as a result of the Preferred Alternatives

	Preferred Alternative
Possible negative impacts	Revised rebuilding strategy for GOM cod
	Revised rebuilding strategy for American plaice; Management Measures for US/CA TACs
Neutral Impacts	Revised Discard Strata for GB Yellowtail Flounder
Possible Positive Impacts	Annual Catch Limits; Small-Mesh Fishery AMs; Prohibition on possession of yellowtail flounder
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 8.2.3 and 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 3.0.
- 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

8.2.2 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Order (NAO) 216-6 (revised May 20, 1999) provides nine 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 2013 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.

(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. As discussed in Section 7.3, these species are expected to have very minimal impacts from the minor changes in fishing effort that are proposed by this action.

(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 8.11.1) and the Initial Regulatory Flexibility Act review (Section 8.11.2). The proposed catch limits are expected to result in gross groundfish revenues for FY2014 are predicted to be just over $55 million and all gross revenues on groundfish trips are predicted to be just under $71 million. This represents approximately a 26% reduction in all gross revenues on groundfish trips relative to FY2012 and a 4% reduction relative to those predicted in FY2013. On a home-port state level, New Hampshire is expected to have the largest percentage decline (32%) in gross revenues from groundfish relative to FY2012. Rhode Island is expected to be the least affected by these ACLs, with a small 7% predicted increase in gross groundfish revenues relative to FY2012. For major home-ports, Gloucester, MA is expected to have the largest percentage decline (33%) in gross revenue and New Bedford, MA is expected to be the least affected, with a 5% decline in gross groundfish revenues predicted.

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).

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 51 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.

The 2012 GOM cod assessment review panel 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.

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, FW 49, and FW 50. 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. Framework 50 adjusted ABCs/ACLs for FY 2013. 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?*

Response: 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?*

Response: 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?*

Response: 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?*

Response: 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 51 to the Northeast Multispecies Fishery Management Plan, it is hereby determined that Framework Adjustment 51 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

Regional Administrator,
Greater Atlantic Regional Fisheries
Office, NOAA

4/9/14
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

The Preferred Alternatives were developed during the period June 2013 through December 2013 and was discussed at the following meetings. Opportunities for public comment were provided at each of these meetings.

Date	Meeting Type	Location
6/18-20/13	Council Meeting	Portland, ME
8/14/13	Oversight Committee Meeting	Holiday Inn, Peabody, MA
8/26/13	Groundfish PDT	Radisson, Plymouth, MA
9/16/13	Groundfish Advisory Panel Meeting	Holiday Inn, Portsmouth, NH
9/17/13	Oversight Committee Meeting	Holiday Inn, Portsmouth, NH
9/24-9/26/13	Council Meeting	Cape Codder Hotel, Hyannis, MA
10/28/13	Groundfish PDT Meeting	NMFS Office, Gloucester, MA
11/18-19/13	Oversight Committee Meeting	Newport Marriott, Newport, RI
11/20/13	Council Meeting	Newport Marriott, Newport, RI
12/9/13	Oversight Committee Meeting	Omni Hotel, Providence, RI
12/16-18/13	Council Meeting	DoubleTree by Hilton, Danvers, MA

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. The NEFMC 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.

The Council 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. The NEFMC is now seeking the concurrence of the National Marine Fisheries Service with respect to Framework Adjustment 51.

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 47, 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 54 (NEFSC 2012), the NE Groundfish 2012 Updates Integrated Peer Review Meeting (NEFSC 2012), and SAW 55 (NEFSC 2013) 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 2011, and in some cases includes information that was collected during the first eight

months of calendar year 2012. Complete data were not available for calendar year 2012. 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 51. 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 51 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; and
- 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:

1* Have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

2* Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

3* Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

4* Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

8.11.1.1 Objectives

The goals and objectives of Framework Adjustment 51 derive from 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 trans-boundary 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 FW51 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 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. Given the large supply of domestic and foreign seafood imports consumer surplus is not expected to be affected by any of the regulatory changes proposed in FW51.

8.11.1.4.1 Updates to Status Determination Criteria, Formal Rebuilding Programs and Annual Catch Limits

8.11.1.4.1.1 Revised Gulf of Maine Cod Rebuilding Strategy

A detailed description of this alternative can be found in Section 4.1.1 of this document.

8.11.1.4.1.1.1 Option 1: No Action

This option could result in no change in net economic impacts for 2014, but the resulting quota reductions for 2015 could cause severe disruptions to the groundfish fishery in the GOM stock area. Cod is a primary component of the multispecies catch in this region, and a quota set at or near levels consistent with "incidental bycatch" would impede the harvest of every groundfish stock. Commercial catches in the GOM would fall to trivial levels, resulting in a reduction of revenues that likely would approach 100% of those observed in FY2014. However, a zero-possession restriction could be imposed on cod in the GOM, thereby allowing fisherman to target other stocks while discarding cod. Such a restriction is unlikely to meet MSA requirements, but would dramatically decrease the economic costs associated with this Option.

Recreational fisheries would also experience significant economic losses, though these fisheries are perhaps better able to target stocks other than cod in the GOM. Economic losses for recreational fisheries may instead approach 50-80% reductions from FY2014 levels.

8.11.1.4.1.1.2 Option 2: Revised Rebuilding Strategy for Gulf of Maine Cod (Preferred Alternative)

A detailed net present value (NPV) analysis of estimated future landings under different target mortality rates for GOM cod 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)).

Two options are being considered for a revised rebuilding strategy for GOM cod. Both rebuilding options assume no changes to the FY2014-2015 ABC (1,550 mt) that was previously recommended by the SSC, and adopted by FW 50.

NPVs are of GOM cod 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 GOM cod from 1996 –

2011 (Figure 30). The resulting prices were then applied to the anticipated ACLs under the various scenarios (Table 63).

Given the assumptions of full use of ACLs and perfect realization of predicted ACLs through 2024, the results indicate that under the Base Case model, a 10-year rebuilding plan (Sub-Option B) would maximize net present value relative to an 8-year rebuilding plan (Sub-Option A). Under the M-Ramp model, there is little discernable difference between the two sub-options. Either sub-option is preferable to the No Action option which would likely yield very little economic benefits.

8.11.1.4.1.1.3 Option 3: Rebuilding Plan Review Analysis for Gulf of Maine Cod (Preferred Alternative)

This sub-Option specifies an administrative procedure for reviewing the revised GOM cod rebuilding plan in the future. It has no direct or indirect economic impacts.

8.11.1.4.1.2 Revised American Plaice Rebuilding Strategy

A detailed description of this alternative can be found in Section 4.1.2 of this document.

8.11.1.4.1.2.1 Option 1: No Action

This option would result in no change in net economic impacts for FY2014, but the anticipated quota reductions for FY2015 would result in severe disruptions to the groundfish fishery across all stock areas. American plaice is sometimes referred to as a “unit stock” species, meaning that it does not have multiple stocks within the management unit. As such, a low or de minimis allocation will result in loss of groundfish fishing opportunities coast-wide. The FY2012 value of groundfish catch was approximately $69 million in 2012 dollars. FY2014 revenues would be consistent with ACLs specified elsewhere in this document, and would be unaffected by this option, but FY2015 groundfish revenues would likely approach zero without other future changes to the management regulations, such as a zero possession restriction imposed on the fishery.

Recreational fisheries would be unaffected by this option, as there is no directed recreational fishery, and no recreational sub-allocation, for American plaice.

8.11.1.4.1.2.2 Option 2: Revised Rebuilding Strategy for American Plaice (Preferred Alternative)

Three options are being considered for a revised rebuilding strategy for American plaice. All three rebuilding options assume no changes to the FY2014-2015 ABCs that were previously recommended by the SSC, and adopted by FW 50.

The NPV analysis translates the potential landing streams into future revenues, discounted as appropriate, by applying an average price to potential American plaice landings. Implicitly, again, 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 American plaice landings alone and do not take into account potential revenue losses or gains from the sale of other stocks of groundfish.

American plaice demonstrates a demand function where price is inelastic with respect to quantity (i.e., demands changes little due to price). As such, a constant average price is applied to all landings and this price is applied to the anticipated ACLs under the various scenarios.

Given the assumptions of full utilization of ACLs and perfect realization of predicted ACLs through 2024, the results indicate that there is little discernable difference between the three sub-options. The sub-options are generally preferable to the No Action option, since the No Action option yields very little economic benefits.

8.11.1.4.1.2.3 Option 3: Rebuilding Plan Review Analysis for American Plaice (Preferred Alternative)

This sub-Option specifies an administrative procedure for reviewing the revised GOM cod rebuilding plan in the future. It has no direct or indirect economic impacts.

8.11.1.4.1.3 Annual Catch Limits

A detailed description of this alternative can be found in Section 4.1.2 of this document.

8.11.1.4.1.3.1 Option 1: No Action

By selecting Option 1, ACLs will be based on FW50 specifications for the years 2013-2014, which have missing values for many species. Specifically, GB East cod and haddock, GB yellowtail flounder, and white hake would have no ACLs. Fishing would not be permitted for these species, nor would fishing be allowed in these species' broad stock areas. The portion of the GB East cod and haddock ACLs that would ordinarily be allocated to the eastern GB area would instead be allocated the western GB stock area, and consequently the ACLs for GB West cod and haddock are higher under the No Action option than under Option 2.

As the white hake stock area encompasses the geographic range of the management unit, the adoption of the No Action option would almost certainly lead to a complete shut-down of the groundfish fishery, bringing fishery-wide commercial groundfish revenues to zero.

Impacts on the recreational fishery are less certain. There is no recreational fishery in the eastern GB stock area, and no recreational sub-allocation for GB yellowtail flounder or white hake. It seems likely that the recreational fishery would not be significantly impacted by the adoption of the No Action alternative. Sub-allocations for other recreational stocks (GOM cod, haddock) are similar to those from FY2013 and no measures are proposed in this framework action that would alter the administration of this fishery.

The precise impacts of the No Action option on the scallop fishery are unclear. This option does not identify a scallop fishery sub-ACL for GB yellowtail flounder. While this would not prevent the scallop fishery from fishing in FY2014, it is not clear if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this were the case, then catches would lead to scallop

fishery AMs being triggered in FY2015 and/or later years. As a result, this option would result in large reductions in scallop fishery revenues relative to Option 2. But if this is not the case, and the scallop fishery catches 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 sub-ACL specified in Option 2.

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

Under Option 2, gross groundfish revenues for FY2014 are predicted to be just over $55 million and all gross revenues on groundfish trips are predicted to be just under $71 million, as estimated under the Quota Change Model (QCM). This represents approximately a 26% reduction in all gross revenues on groundfish trips relative to FY2012 and a 4% reduction relative to those predicted in FY2013 (Table 68). On a home-port state level, New Hampshire is expected to have the largest percentage decline (32%) in gross revenues from groundfish relative to FY2012. Rhode Island is expected to be the least affected by these ACLs, with a small 7% predicted increase in gross groundfish revenues relative to FY2012. For major home-ports, Gloucester, MA is expected to have the largest percentage decline (33%) in gross revenue and New Bedford, MA is expected to be the least affected, with a 5% decline in gross groundfish revenues predicted.

The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the 30-50 foot category experiencing the largest drop in gross revenue compared to FY2012, with a predicted 35% reduction. Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft.) predicted to see a 10% decline in gross revenues. This result is not surprising, as 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 drive fisherman to fish as efficiently as possible. 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 FY2014. Predicted trip costs for FY2013 are substantially lower than those predicted for FY2014 despite a similar number of trips, days absent, etc. This is in part a function of the optimization component of the QCM, which selects the most profitable trips (often the lowest-cost trips) disproportionately, but may also be signaling a trend in rising trip costs.

FY2014 is predicted to see a 21% decline in net revenues relative to FY2012 and a 12% decline relative to predicted net revenues for FY2013. Crew-days, days absent and total sector trips are all predicted to decline substantially relative to FY2012, as the model predicts only the most efficient trips will occur under continued restrictive quota allocations (Table 68). This represents fewer earning opportunities for crew members, and may signal reductions in incomes for down-stream fishing businesses such as fish dealers, ice houses, gear shops, and shipyards.

If the scallop fishery triggers the GB yellowtail flounder AMs, Option 2 would likely reduce scallop fishery revenues. However how this reduction in revenue compares to the Option 1/No Action is unclear. The No Action does not identify a scallop fishery sub-ACL for GB yellowtail flounder. While this would not prevent the scallop fishery from fishing in FY2014, it is not clear

if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this were the case, then catches would lead to scallop fishery AMs being triggered in FY2015 and/or later years. As a result, No Action/Option 1 would result in large reductions in scallop fishery revenues relative to Option 2. But if this is not the case, and the scallop fishery catches do not trigger AMs, then Option 1/No Action might allow for greater scallop fishery revenues than would be the case if AMs are triggered using the sub-ACL specified in Option 2.

8.11.1.4.2 Commercial and Recreational Fishery Measures

8.11.1.4.2.1 Small-Mesh Fishery Accountability Measures

A detailed description of this alternative can be found in Section 4.2.1 of this document.

8.11.1.4.2.1.1 Option 1: No Action

This option would not establish additional accountability measures (AMs) for the small-mesh fishery for Georges Bank yellowtail flounder under the Multispecies FMP. FW 48 adopted a sub-ACL of GB yellowtail flounder beginning in FY2013. If the U.S. TAC (equal to the U.S. ABC) for GB yellowtail flounder is exceeded, the U.S./Canada Resource Sharing Understanding requires that the U.S. TAC for the following fishing year be reduced by the amount of the overage. Option 1 would not change the existing regulatory requirements for the small-mesh bottom-trawl fishery. No new economic impacts are expected.

8.11.1.4.2.1.2 Option 2: Accountability Measure for the Small-Mesh Fishery Georges Bank Yellowtail Flounder Sub-ACL (Preferred Alternative)

Two options (one with two sub-options) are being considered for the small-mesh fishery AM.

Compared to No Action/Option1, by reducing the GB yellowtail flounder bycatch discards in the small-mesh fishery, it is less likely that overfishing will occur in these areas and catch rates of groundfish trips may increase slightly for groundfish vessels. This may result in higher net revenue for Sub-Options A, B1, and B2 relative to No Action. In addition, groundfish sub-ACLs could be increased slightly as a result of reduced discards.

Relative to the No Action/Option 1, by closing the GB yellowtail flounder stock area to small-mesh fisheries when the AM was triggered under Option A, fishing would be displaced out of that area which could also displace revenue and increase costs. Small-mesh fishing effort would likely increase in the next best place to fish, potentially lowering catch rates of target stocks and increasing associated costs.

Information in revenue and landings from the Longfin squid and whiting fisheries within the GB yellowtail flounder stock area and adjacent areas can be found in Section 6.5.11.

Relative to the No Action/Option1 and Option A, the small-mesh fishermen would likely experience higher costs including the fixed cost of purchasing new gear/modifying existing gear

under Sub-Options B1 and B2. Their operating costs would probably increase due to the gear restrictions (lower catch rates), effectively lowering their net revenue and overall profitability.

8.11.1.4.2.2 Management Measures for US/CA TACs

A detailed description of this alternative can be found in Section 4.2.2 of this document.

8.11.1.4.2.2.1 Option 1: No Action

This option would not change existing fishery regulations and would have no new economic impacts.

8.11.1.4.2.2.2 Option 2: Revised In-Season Adjustment for US/CA TACs (Preferred Alternative)

Option 2 is not expected to alter, in the short term, the aggregate amount of GB haddock caught by in the groundfish fishery. Catch is persistently less than allocation for both the eastern and western stocks of GB haddock. Option 2 is expected to have no additional economic impacts, positive or negative, relative to Option 1. Further, it is not known at this time if this option would increase or decrease quota allocated to groundfish fishermen. However, if the ability to alter quotas in season were to result in increased quota for sector and/or common pool fishermen, and if that quota were to be converted into landings, then Option 2 could be viewed as economically beneficial.

8.11.1.4.2.2.3 Option 3: Revised In-Season Adjustment for US/CA TACs (Preferred Alternative)

Two sub-Options are presented (A and B). Both are administrative in nature, and do not propose any particular quota adjustment. To the extent that they better allow the Regional Administrator to increase the flexibility of fishing operations on Georges Bank, they should be considered economically beneficial.

8.11.1.4.2.3 Georges Bank Yellowtail Flounder Management Measures
8.11.1.4.2.3.1 Option 1: No Action

Under Option 1, there would be no changes to the management measures for GB yellowtail flounder for estimating discards. Option 1 would neither change the current discard rates used for GB yellowtail flounder quota monitoring nor the existing regulatory requirements for the small-mesh bottom-trawl fishery. This option not change the way the fishery currently operates, and will have no new economic impacts.

8.11.1.4.2.3.2 Option 2: Revised Discard Strata for GB Yellowtail flounder

There are a number of potential economic impacts associated with this option. If the discard rate is lowered in area 522, vessels fishing in that area will be able to expend less GB yellowtail flounder quota on each trip, increasing net revenues by allowing for more fishing. This is

expected to have the largest effect on trawl vessels, since they are the vessels that predominantly fish in area 522. If area 522 is removed from the discard rate calculation for other areas, the discard rate for other areas would likely be higher than in the past (Section 7.1.2.3.2). This will represent decreased net revenues to vessels fishing in those areas, because the opportunity cost of quota will likely increase. If area 522 becomes relatively more profitable to fish in than the other statistical areas, there could be a shift in spatial effort to area 522 by other trawl vessels. This could have unforeseen impacts on area-specific fishing levels, which could have negative long-term MSY consequences.

8.11.1.4.2.4 Prohibition on Possession of Yellowtail Flounder by the Limited Access Scallop Fishery

8.11.1.4.2.4.1 Option 1: No Action

This option maintains the requirement for limited access scallop vessels to land all legal sized yellowtail flounder catch for each trip. The groundfish fishery is not directly impacted as long as scallop vessels do not target yellowtail flounder as a result of this measure and increase overall mortality on yellowtail flounder. In addition, more precise accounting of yellowtail flounder catch in the limited access scallop fishery may over the long term improve the accuracy of the yellowtail flounder stock assessments with commensurate benefits accruing to vessels participating in both the sector and common pool groundfish fisheries.

If some yellowtail flounder vessels are targeting yellowtail flounder as a result of the current requirement to retain all legal sized yellowtail flounder, that could have potentially negative impacts on the overall scallop fishery if it increases yellowtail flounder catch and causes the ACL to be exceeded, triggering AMs for the scallop fishery. A limited number of limited access vessel that are landing yellowtail flounder will lose some income, but the majority of limited access vessels are not landing yellowtail flounder, and it is a small fraction of total revenue so impacts are very limited.

8.11.1.4.2.4.2 Option 2: Prohibition on Possession of Yellowtail Flounder (Preferred Alternative)

This option requires limited access scallop vessels to discard all yellowtail flounder caught while fishing under the Atlantic sea scallop FMP. The groundfish fishery is not directly impacted. Accurate catch information is necessary for accurate stock assessments, and the groundfish fishery is impacted in the medium to long term by the accuracy and stability of three separate stock assessments: southern New England yellowtail flounder, Georges Bank yellowtail flounder, and the annual Trans-boundary Resource Sharing Agreement shared-stock yellowtail flounder assessment. This option will influence both true removals and removal estimate accuracy for the yellowtail flounder caught in the limited access scallop fishery. If true removals remain below the sub-allocation for the fishery, this option will have a positive medium and long-term effect on vessels participating in both the sector and common pool groundfish fisheries.

In a general sense, all mandatory discard programs create economic losses as potentially valuable landings are converted into discards. In this case, those losses accrue to the scallop fishery and

are not shared by the groundfish fishery. The Atlantic sea scallop fishery is restricted by a sub-allocation of yellowtail flounder which is designed to limit yellowtail flounder mortality in the scallop fishery. Accurately accounting for yellowtail mortality in this fishery is dependent upon accurate discard observations and/or estimates. To the extent that sampling observations form a valid basis for population-level estimates (i.e. discard rates are consistent across both the sampled and unsampled populations) a sufficient level of sampling should enable accurate estimates of aggregate yellowtail flounder removals in this fishery, and therefore will have a positive medium and long-term economic impact on the groundfish fishery.

If, however, representativeness assumptions necessary to scale from sampling units to populations are violated, removal estimates may be inaccurate. The primary driver for inaccuracy in this case would be increased discard rates on unobserved scallop fishing trips. Additionally, this option may not provide as strong an incentive to avoid yellowtail flounder catch as Option 1/No Action. If either, or both, of these factors result in the limited access scallop fishery exceeding their sub-allocation of yellowtail flounder, and this results in delayed stock rebuilding, the groundfish fishery will face direct medium-term economic losses from foregone potential catch. If these factors lead to inaccurate removal estimates for this fishery, the accuracy and/or stability of yellowtail flounder stock assessments may degrade in the medium to long term, with commensurate negative effects on vessels participating in both the sector and common pool groundfish fisheries.

Relative to Alternative 1/No Action, the requirement to land all legal sized yellowtail flounder under Groundfish FW44 was expected to reduce discards of yellowtail flounder and improve estimates of scallop fishery catches of yellowtail, to the extent vessels complied with the requirement. Based on observer data from 2011-2013, it does not appear that discards have been reduced substantially because the majority of legal sized yellowtail flounder is still being discarded. In addition, if most legal sized yellowtail flounder are still being discarded, the overall estimates of scallop fishery catches have likely not improved as a result of this requirement. If compliance improves, some of these potential benefits may be more realized.

If scallop vessels are prohibited from retaining and landing yellowtail flounder there could be some economic loss for vessels that have been landings yellowtail flounders. Only a relatively small proportion of the limited access fishery is currently landing YT, about 60-80 vessels depending on the year. The number of vessels landing yellowtail flounder does seem to have increased since the requirement to land legal sized yellowtail flounder went into effect in May 2010, but the majority of limited access vessels do not land yellowtail flounder. Total yellowtail flounder landings increased in 2011, but declined again in 2012 and 2013. Average revenue per vessel that has landed yellowtail flounder is about $2,000-6,000 dollars, or less than 5% of total revenue. Therefore, the impact of zero possession would only impact a relatively small proportion of the fishery, and impacts would be expected to be small since yellowtail flounder landings revenue is a very small percentage of total revenue for these vessels.

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, though all vessels are predicted to see increases in operating costs as it becomes more difficult to selectively target stocks with abundant quota while avoiding quota-constrained stocks. 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 $25 million from the FY 2012 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 2014 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 job reductions and loss of 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, but the No Action Alternative is not the proposed action.

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 51 are the same as those detailed in Amendment 16 to the Northeast Multispecies Fishery FMP. In general, FW 51 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 -
  - $19.0 million in the case of commercial finfish harvesting entities (NAIC[10] 114111),
  - $5.0 million in the case of commercial shellfish harvesting entities (NAIC 114112), or
  - $7.0 million in the case of for-hire fishing entities (NAIC 487210)
- or if it has fewer than -
  - 500 employees in the case of fish processors, or
  - 100 employees in the case of fish dealers.

This proposed rule impacts commercial and recreational fish harvesting entities engaged in the Northeast multispecies limited access and open access fisheries, the small-mesh multispecies and squid fisheries, and the scallop fishery. A description of the specific permits that are likely to be impacted is included below for informational purposes, followed by a discussion of the impacted businesses (ownership entities) which can include multiple vessels and/or permit types. For the purposes of the RFA analysis, the ownership entities, not the individual vessels, are considered to be the regulated entities.

Regulated Commercial Harvesting Entities

Limited Access Northeast Multispecies harvesting permits
The limited access groundfish[11] 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 percent 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. All limited access multispecies permit holders are eligible to participate in the sector allocation program, however many permits select to remain in the common pool

[10] The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.
[11] The species managed under the Northeast multispecies FMP are commonly referred to as groundfish.

fishery as a result of low catch histories and in turn, low Potential Sector Contributions (PSC) for groundfish stocks.

As of January 14, 2014 (fishing year 2013) there were 1,088 individual limited access permits[12]. 664 of these permits were enrolled in the sector program and 424 were in the common pool. Each of these permits will be eligible to join a sector or enroll in the common pool in fishing year 2014. Alternatively each permit owner could also allow their permit to expire by failing to renew it. Of the 1,088 limited access multispecies permits issued in FY2013, 767 have landings of any species and 414 have groundfish landings.

Open Access Northeast Multispecies harvesting permits

Open access permits can be requested at any time, with the limitation that a vessel cannot have a limited access and open access permit concurrently. No qualification criteria are required for these permits. Permits categories included in this group are HB, I, J and K.

Category I permits are charter/party permits which are discussed separately under regulated recreational fish harvesting entities. Category J permits are scallop multispecies possession permits. Impacts to these vessels will be captured under the discussion of the limited access Atlantic sea scallop harvesting entities. Category K permits are non-regulated multi-species permits and are impacted by the proposed action by way of the small-mesh multispecies (whiting) fishery regulations. Permit category HB is a rod and reel handgear permit that must adhere to specified possession limits for groundfish species with special provisions for cod. The cod possession limit for HB permits is set annually to 75 pounds per trip and is automatically adjusted relative to the GOM cod limited access possession limit as specified in Amendment 13. The current possession limit is 75 pounds. As of February 18, 2014 (Fishing Year 2013) there were 891 HB permits and 78 of those vessels landed groundfish.

Limited Access Atlantic Sea 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. The proposed action would not alter the regulations for LGC permit holders. As of February 19, 2014 (Fishing Year 2013) there were 348 active LA scallop permits with at least one dollar of revenue from sea scallops.

Small Mesh Multispecies (whiting) harvesting permits

The small mesh exempted fishery allows vessels to harvest species in designated areas using mesh sizes smaller than the minimum mesh size required by Regulated Mesh Area (RMA) regulations. To participate in the small-mesh multispecies (whiting) fishery exemptions, vessels must hold either a limited access multispecies permit (categories A-F) or an open access multispecies permit (category K). Limited access multispecies permit holders can only target whiting when not fishing under a DAS and while declared out of the fishery using VMS. A description of limited access multispecies permits was provided above. As of

[12] For purposes of this analysis, groundfish limited access eligibilities held as Confirmation of Permit History (CPH) are not included because although they may generate revenue from ACE leasing, they do not generate any gross sales from fishing activity and thus would not be classified as commercial fishing entities.

February 18, 2014 (Fishing Year 2013) there were 776 open access category K multispecies permits issued, with only 34 of them landing whiting. Many of these vessels target both whiting and Loligo squid on small-mesh trips taken in the GBYTFS stock area and therefore most of them also have open access or limited access Squid, Mackerel, and Butterfish (SMB) permits. For the trips that catch whiting or squid in the GBYTF stock area, revenues from whiting and squid combined make up the majority of trip revenues as discussed in Section 6.5.11. The GBYTF stock area provided almost half of total whiting landings in CY2010-2011. Since squid landings in the GBYTF stock area comprised less than 10% of overall squid landings during the same time period and since most SMB permitted vessels fishing in the GBYTF stock area will also have a multispecies permit, SMB permits will not be handled separately in this analysis.

Regulated Recreational Fish Harvesting Entities

Party/charter permits are issued as an open access category I permit under the Northeast Multispecies FMP and are subject to recreational management measures. As of February 20, 2014 (Fishing Year 2013) there were 667 party/charter permits issued, 383 of which reported taking a party or charter trip. 120 of the active party or charter vessels caught cod or haddock in the Gulf of Maine in 2013. A more detailed description of the recreational harvesting component can be found in Section 6.5.9.3 of this document.

Ownership entities in regulated fish 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 entities are identified on June 1st of each year based on the list of all permit numbers, for the most recent complete calendar year, that have applied for any type of Northeast Federal fishing permit. The current ownership data set is based on calendar year 2012 permits and contains average gross sales associated with those permits for calendar years 2010 through 2012.

Matching the potentially impacted permits described above (Fishing Year 2013) to the calendar year 2012 ownership data, results in 2,064 distinct ownership entities. Of these, 2,042 are categorized as small and 22 are categorized as large entities per the SBA guidelines (Table 76 and Table 77).

Table 76- Description of regulated entities by business type and size

Business Type	Small	Large	Total
Charter	439	0	439
Finfish	943	0	943
Shellfish	660	22	682
Total	2,042	22	2,064

* Business type is based on the fishing activity that generated the highest gross sales for each entity. Ownership entities with zero sales were defaulted into the finfish category.

Table 77 - Description of regulated entities by gross sales

Sales	Number of entities	Number of large businesses	Average number of permits owned per entity	Maximum permits per entity	Median gross sales per entity	Mean gross sales per entity
0	319	0	1.1	30	0	0
<$50K	700	0	1.1	6	$8,342	$13,794
$50-100K	183	0	1.1	4	$70,856	$73,107
$100-500K	511	0	1.2	5	$208,124	$236,269
$500K-1mil	117	0	1.5	5	$714,764	$712,794
$1-4mil	202	0	1.6	6	$1,625,189	$1,806,804
$4mil+	32	22	7.3	28	$6,522,943	$9,414,703
Total ownership entities	*2064*					

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 regulated species associated with a specific fishery, we are able to identify those ownership groups most likely to be impacted by the proposed regulations[13]. Using this threshold, we find that 151 entities are groundfish-dependent, all of which are small and all of which are finfish commercial harvesting businesses (Table 78). Of the 151 groundfish-dependent entities, 130 have some level of participation in the sector program and 21 operate exclusively in the common pool. There are 234 regulated entities which are scallop-dependent. All of these are shellfish businesses, and 20 are considered large (Table 79). There are 35 small-mesh fishery-dependent[14] entities identified; 19 of them are finfish businesses, 16 of them are shellfish businesses and

[13] Charter/party vessels are prohibited from selling fish though some ownership entities may have recreational and commercial permits. Entities designated as charter businesses derive the largest part of their gross sales from for-hire fees from passengers.
[14] Greater than 50% of gross sales are derived from combined squid and whiting landings.

all of them are considered small. The small-mesh fishery-dependent entities described in Table 80 may overestimate the number of impacted entities since missing statistical area information in the commercial dealer database makes it difficult to track whiting and squid landings that occurred exclusively in the GBYTF stock area. Finally, a description of gross sales for party/charter fishing businesses is presented in Table 81 and includes all entities that earned one dollar or more from for-hire fees.

Table 78 - Description of groundfish-dependent entities regulated by the Proposed Action

Sales	Number of entities	Number of large businesses	Average number of permits owned per entity	Maximum permits per entity	Median gross sales per entity	Mean gross sales per entity	Median groundfish sales per entity	Mean groundfish sales per entity
<$50K	24	0	1.0	1	$5,903	$15,248	$5,056	$11,409
$50-100K	8	0	1.6	4	$79,889	$79,272	$52,968	$56,152
$100-500K	74	0	1.5	5	$222,610	$255,896	$176,416	$201,620
$500K-1mil	22	0	2.0	5	$790,229	$789,068	$588,679	$592,902
$1-4mil	22	0	2.4	6	$1,489,786	$1,684,026	$1,234,031	$1,401,008
$4mil+	1	0	7.0	7	$4,406,227	$4,406,227	$2,379,189	$2,379,189
Total ownership entities	*151*							

Table 79 - Description of scallop-dependent entities regulated by the Proposed Action

Sales	Number of entities	Number of large businesses	Average number of permits owned per entity	Maximum permits per entity	Median gross sales per entity	Mean gross sales per entity	Median scallop sales per entity	Mean scallop sales per entity
<$50K	11	0	1.1	2	$14,021	$17,936	$12,356	$16,525
$50-100K	4	0	1.0	1	$75,532	$77,791	$67,819	$68,032
$100-500K	37	0	1.3	3	$252,677	$277,280	$191,023	$245,970
$500K-1mil	18	0	1.4	3	$616,058	$630,185	$483,365	$504,651
$1-4mil	138	0	1.3	4	$1,676,832	$1,872,829	$1,641,737	$1,822,986
$4mil+	26	20	7.9	28	$6,793,051	$10,100,000	$6,557,615	$9,064,929
Total ownership entities	*234*							

Table 80 - Description of small-mesh fishery-dependent entities regulated by the Proposed Action

Sales	Number of entities	Number of large businesses	Average number of permits owned per entity	Maximum permits per entity	Median gross sales per entity	Mean gross sales per entity	Mean whiting sales per entity	Mean squid sales per entity
<$50K	2	0	1.5	2	$4,118	$4,118	$1,557	$1,739
$50-100K	3	0	1.0	1	$76,422	$77,112	$1,585	$46,883
$100-500K	10	0	1.0	1	$282,142	$264,707	$35,232	$133,098
$500K-1mil	12	0	1.0	1	$670,874	$711,327	$197,887	$265,792
$1-4mil	8	0	1.8	3	$1,335,690	$1,662,759	$551,127	$586,074
Total ownership entities	*35*							

Table 81 – Description of party/charter fishing businesses regulated by the Proposed Action

Sales	Number of entities	Number of large businesses	Average number of permits owned per entity	Maximum permits per entity	Median gross sales per entity	Mean gross sales per entity
<$50K	297	0	1.0	2	$8,433	$13,432
$50-100K	43	0	1.0	2	$67,621	$72,191
$100-500K	73	0	1.2	3	$270,677	$269,155
$500K-1mil	18	0	1.7	5	$734,645	$720,083
$1-4mil	8	0	2.4	5	$1,258,528	$1,456,632
Total ownership entities	*439*					

8.11.2.5 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 requirement and the type of professional skills necessary for the preparation of the report or records

The proposed rules in FW 51 are not expected to create any additional reporting, record-keeping or other compliance requirements.

8.11.2.6 Identification 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.

8.11.2.7 Significance of economic impacts on small entities

Substantial number criterion

In colloquial terms, substantial number refers to "more than a few." Given that the majority of the regulated entities impacted by this action are considered small, all of the proposed alternatives will have impacts on a substantial number of small entities.

Significant economic impacts

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 has the potential to place small entities at a significant competitive disadvantage relative to large entities. Impacts on profitability from the proposed action may be significant for a substantial number of small entities as described in the next section.

8.11.2.8 Description of impacts on small entities

This Initial Regulatory Flexibility Act (IRFA) analysis is intended to analyze the impacts of the alternatives described in Section 4.0 of FW 51 on small entities. These alternatives include modifications to the GOM/Cod and American Plaice rebuilding strategies, modifications to the ACLs and sub-ACLs for white hake and the trans-boundary Georges Bank stocks, changes to small-mesh fishery Accountability Measures (AMs), updates to the US/CA TAC management measures, and changes to yellowtail flounder measures (GB and other).

The provisions to change the rebuilding strategies for GOM cod and American plaice are expected to positively impact profitability of small entities regulated by this action. All of the sub-options being considered for both species are expected to result in higher Net Present Values (NPVs) for each stock than under the no action alternative, which will translate into larger profits. The 10-year rebuilding plan for GOM cod is expected to have modest gains in NPV and profitability over the 8-year rebuilding plan and for American Plaice, there is little discernible difference between the three sub-options being considered. In addition, by adopting new rebuilding strategies for GOM cod and American plaice, the proposed action will circumvent severe economic loss that could occur under highly restrictive catch limits in FY2015, especially to groundfish-dependent small entities. Charter fishing businesses would also experience significant economic loss under the No Action option for GOM cod but would be unaffected by the American Plaice action as there is no directed recreational fishery and no recreational sub-allocation for American plaice. A more detailed discussion of the expected economic impacts can be found in Section 7.4.1.1.2 and Section 7.4.1.2.2 of this document.

The proposed action to modify the ACLs and sub allocations for white hake, GB East cod and haddock, and GB yellowtail flounder has the potential to impact groundfish and scallop-dependent small entities, and is discussed in the next section. Recreational harvesting entities as well as small-mesh fishery-dependent entities do not target the stocks in question and are not expected to be directly impacted. If the measure to modify the small-mesh GB yellowtail flounder AM is adopted in conjunction with the new ACLs specified, the likelihood of triggering expensive gear modifications could increase as a result of more restrictive GB yellowtail flounder catch limits. These impacts to the small-mesh fishery will be discussed in more detail under the small-mesh GB yellowtail flounder AM alternative. Only the impacts of Option 2, the preferred alternative, will be discussed here. Impacts of the No Action option, which would result in zero allocation for the four stocks mentioned above in FY2013 and FY2014, are discussed in detail in Section 7.4.1.3.1.

Economic impacts to groundfish-dependent small entities

The results of the QCM simulation discussed in Section 7.4.1.3.2 indicate that those entities which are dependent on groundfish landings will be negatively impacted by the proposed sub-ACLs. Gross revenues for the groundfish industry are predicted to decrease in FY2014 by 26% relative to FY2012 and by 4% relative to FY2013. In terms of net revenue FY2014 is predicted to see a 21% decline relative to FY2012 and a 12% decline relative to predicted net revenues for FY2013. While the QCM analysis is based exclusively on sector trips, it is likely that the potential negative impacts to profitability resulting from more restrictive sub-ACLs for GB cod, GB haddock, and GB yellowtail flounder will be shared by all groundfish-dependent small entities.

Economic impacts to scallop-dependent small entities

If the scallop fishery triggers the GB yellowtail flounder AMs, Option 2 would likely reduce scallop fishery revenues. How this reduction in revenue compares to the Option 1/No Action is unclear. The No Action does not identify a scallop fishery sub-ACL for GB yellowtail flounder. While this would not prevent the scallop fishery from fishing in FY2014, it is not clear if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this were the case, then catches would lead to scallop fishery AMs being triggered in FY2015 and/or later years. As a result, No Action/Option 1 would result in large reductions in scallop fishery revenues relative to Option 2. But if this is not the case, and the scallop fishery catches do not trigger AMs, then Option 1/No Action might allow for

greater scallop fishery revenues than would be the case if AMs are triggered using the sub-ACL specified in Option 2.

Economic Impacts to small-mesh fisheries.

The preferred alternative to implement a GB yellowtail flounder AM for small-mesh fisheries is expected to negatively impact small-mesh fishery-dependent small entities and has the potential to create minor economic benefits for groundfish-dependent small entities. Under the preferred alternative, if the small-mesh sub-ACL for GB yellowtail flounder is exceeded, a gear-based AM will go into effect at the start of the next fishing year[15]. Details of the AM are presented in Section 4.2.1.2. Small entities would likely experience higher costs including the fixed cost of purchasing new gear and/or modifying existing gear. Their operating costs would probably increase as well due to the gear restrictions (lower catch rates), effectively lowering their net revenue and overall profitability. The impacts from the preferred sub-option are expected to be lower than under sub-option A which would close the GBYTF stock area to small-mesh fisheries if the sub-ACL is exceeded. If the chosen AM successfully reduces discards of GB yellowtail flounder and prevents overfishing, catch rates for the species could increase for groundfish-dependent small entities, resulting in small increases in profitability.

Economic impacts of other measures.

The provisions to modify the US/Canada TAC management measures are not expected to alter, in the short term, the aggregate amount of GB haddock caught by the groundfish fishery. Catch is persistently less than allocation for both the eastern and western stocks of GB haddock. Option 2 is expected to have no additional economic impacts, positive or negative, relative to the No Action alternative. Further, it is not known at this time if this option would increase or decrease quota allocated to groundfish fishermen. However, if the ability to alter quotas in season were to result in increased quota for sector and/or common pool fishermen, and if that quota were to be converted into landings, then Option 2 could be viewed as beneficial to groundfish-dependent small entities.

The alternative to modify the distribution of US TACs for Eastern/Western Georges Bank Haddock is expected to have small but positive impacts on groundfish-dependent small entities that participate in the sector program in terms of operational flexibility. Under the preferred sub-option, sector permits will be permitted to convert their Eastern GB haddock ACE to Western GB haddock ACE during the fishing year or up to 2 weeks into the following fishing year (unless otherwise instructed by NMFS) to cover any overage during the previous fishing year. Since catch for both stocks is persistently lower than sector ACE, the benefit is likely to be very small.

The proposed action to revise the discard strata for GB yellowtail flounder is only expected to impact groundfish-dependent entities that participate in the sector program. The stratification used to monitor common pool trips would not be changed. If the discard rate is lowered in area 522, vessels fishing in that area will be able to expend less GB yellowtail flounder quota on each trip, increasing net revenues by allowing for more fishing. This is expected to have the largest effect on trawl vessels, since they are the vessels that predominantly fish in area 522. If area 522 is removed from the discard rate calculation for other areas, the discard rate for other areas would likely be higher

[15] If reliable information verifying the overage is not made available prior to the start of the next fishing year, then the AM will be delayed for one additional fishing year.

than in the past (Section 7.1.2.3.2). This will represent decreased net revenues to vessels fishing in those areas, because the opportunity cost of quota will likely increase.

Finally, the alternative to prohibit the possession of yellowtail flounder by the limited access scallop fishery is expected to impact scallop-dependent small entities only. If scallop vessels are prohibited from retaining and landing yellowtail flounder there could be some economic loss for vessels that have been landing the species. Only a relatively small proportion (less than a quarter) of the active limited access fishery is currently landing yellowtail flounder and the average revenue per vessel from yellowtail flounder is less than 5% of average total revenue as discussed in Section 7.4.2.4.2. As such, the effects of the proposed action on the profitability of scallop-dependent entities are expected to be small.

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 yearclass.

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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Framework Adjustment 51

To the

Northeast Multispecies FMP

Appendix I

SSC Recommendations for Northeast Multispecies ABCs FY 2014 – FY 2016

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
Ernest F. Stockwell III, *Acting Chairman* | Thomas A. Nies, *Executive Director*

To: Tom Nies, Executive Director
From: Scientific and Statistical Committee
Date: September 3, 2013

Subject: Overfishing levels (OFLs) and acceptable biological catch (ABC) recommendations for Georges Bank yellowtail flounder.

The SSC met on August 21, 2013 to address the following term of reference (TOR):

> Provide an OFL and an ABC for each year for FY 2014-2015 that will meet management objectives and prevent overfishing.

The SSC considered the following documents in its deliberations:

1. Memo from PDT to SSC re ABCs (August 2013)
2. Transboundary Resources Assessment Committee (TRAC) Status Report (June 2013)
3. DRAFT TRAC Stock Assessment Report for 2013 (June 2013)

Developing catch advice for the Georges Bank yellowtail flounder stock has proved to be challenging in recent years due to a persistent retrospective pattern in the assessment outputs. The TRAC review panel approved a VPA model using a split survey series and a rho-adjustment to the terminal year as the best configuration among the approaches considered. The assessment report acknowledges the difficulties in fully describing dynamics of the stock using the model, but affirms a general conclusion that the status of the stock is poor. Of particular concern is that estimated recruitment in recent years is the lowest in the time series.

Catch advice provided in the TRAC report is more pessimistic than that offered in 2012, which was that catch of no more than 500mt would be needed to achieve a high probability of stock growth, and that catch of no more than 200mt would be needed to reduce fishing mortality below the reference point. This advice was amended in the 2013 report, which indicates that:

- Catch of 500mt or less would allow some possibility of stock growth from 2014 to 2015 (21% probability at 500mt).
- Catch of 400mt would achieve a high probability of a stock increase greater than 10%.
- Catch less than 200 mt would reduce fishing mortality below the reference point.

The SSC agreed with the TRAC conclusion that status of the stock is poor, but debated whether a model with such troubling diagnostics should be used as the primary means for directly developing catch advice. That the Groundfish PDT could not reach consensus on a preferred ABC or OFL is indicative of the uncertainties in this assessment. Therefore, as did the TRAC, the SSC discussed conflicting trends in the catch and surveys that could not be resolved by the

suite of models considered. These catch and survey trends suggest less concern for the status of the stock than indicated by the model.

Survey trends for the past decade or so have remained relatively stable, albeit much lower than the peak values, and fluctuate around a mean without consistent directionality. Survey trends do show a potential downturn at the very end of the time series, but a downward trend has not been maintained, the recent values are generally within the range of the ten-year average, and the values over the past decade are above the lowest values in the time series observed from the mid-1980s to the mid-1990s. The SSC also considered estimates of relative fishing mortality, calculated as catch biomass divided by survey biomass. This index shows that recent values are the lowest in the time series.

It is important to note that consideration of these data did not change the SSC's agreement with the TRAC conclusion that stock status is poor and concern is warranted. Rather, the data caused the SSC to question the magnitude of depletion and extent of concern warranted relative to that suggested by model outputs.

The status quo ABC for the stock is 500mt, first adopted for the 2013 fishing year. The SSC has adopted status quo ABCs for other stocks that either lacked an approved assessment or had high uncertainty in an approved assessment. The ABC of 500mt represents a reduction of more than 50% from the 2012 ABC of 1150mt, and 75% or more from the ABCs in place between 2008 and 2011. Therefore, the SSC felt that maintaining an ABC of 500mt would afford the stock a better chance to show a response than it has had in some time. This expectation is consistent with the assessment results, which suggest that an ABC of 500mt allows some possibility of stock growth, although the assessment report notes that this outcome is less likely if recruitment expectations are optimistic.

In light of these considerations, the SSC recommends that the FY 2014-2015 ABC for the Georges Bank yellowtail flounder stock not exceed 500mt. The SSC further strongly recommends that catch be reduced as much as practicable in light of concerns about the status of the stock, consistent with the TRAC recommendation that, "Catches well below 500 mt are likely needed to achieve the harvest strategy" (TRAC Summary Report, p. 2).

The SSC recognized the need for an ABC as the basis for development of management measures, and offers an upper limit of 500mt with a strong recommendation to reduce catch as much as practicable as the best advice the available science will allow. However, the SSC reiterates its 2012 conclusion that OFL cannot be reliably estimated, and therefore remains unknown.

In offering this catch advice, the SSC also offers a strong recommendation for a thorough re-examination of the scientific basis for assessment of the stock and methods for development of catch advice, as well as a comprehensive investigation of the factors determining contemporary yellowtail flounder distribution and dynamics. The most robust analytical tools should be sought. However, the possibility that the major constraint on yellowtail productivity and recovery is not fishing pressure but rather some other factor means that the recommended process is not a benchmark assessment, but rather a broader scientific investigation.

Management strategy evaluation (MSE) should be part of this process. In the absence of such a comprehensive consideration of alternative analytical tools and ecological processes, the SSC expects that the difficulties and uncertainties in the assessment, and resulting management challenges, will persist. A representative of the sea scallop fleet present at the meeting highlighted the potential for the industry to support needed research through the research set-aside (RSA) program in support of the SSC's recommendation, and sought guidance on the most important avenues to pursue. The SSC did not have time to develop a thorough response to this request, but highlights the opportunity to the Council and urges that a suitable response be provided as soon as possible.

Summary of recommendations

1. **Acceptable biological catch (ABC) for Georges Bank yellowtail flounder for FY 2014-2015 should not exceed 500mt, and catch should be reduced as much as practicable.**
2. **The overfishing limit (OFL) for Georges Bank yellowtail flounder remains unknown.**
3. **A more thorough scientific examination of the processes determining productivity of the Georges Bank yellowtail flounder stock and most robust analytical tools for determining its status and developing management measures is needed.**

New England Fishery Management Council
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Ernest F. Stockwell III, *Acting Chairman* | Thomas A. Nies, *Executive Director*

To: Tom Nies, Executive Director
From: Scientific and Statistical Committee
Date: September 3, 2013

Subject: Overfishing levels (OFLs) and acceptable biological catch (ABC) recommendations for white hake.

The SSC met on August 20, 2013 to address the following terms of reference (TORs):

> Review the assessment and work of the Groundfish Plan Development Team (PDT) and provide an OFL and an ABC for each year for FY 2014-2016 that will prevent overfishing and is consistent with the default control rule.

The SSC considered the following documents in its deliberations:

1. Memo from PDT to SSC re ABCs (August 2013)
2. SARC 56 Assessment Summary for white hake (August 2013)
3. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Report (use this link to download - http://nefsc.noaa.gov/publications/crd/crd1310/)
4. SAW SARC 56 Panelist Reports (http://www.nefsc.noaa.gov/saw/saw56/index.html)

A new benchmark assessment for white hake conducted earlier this year concluded that the stock is not overfished and overfishing is not occurring. The Groundfish PDT provided a range of ABC alternatives to the SSC, including one based on the default control rule, two that adopt constant catch strategies, and two based on sustainable harvest levels estimated from long-term projections. The four alternative approaches to the default control rule developed by the PDT were in response to two SSC concerns during deliberations on other groundfish stocks.

The first SSC concern is the poor performance often observed in projections when later evaluated against actual biomass trajectories estimated in later stock assessments. Often, the projections proved in hindsight to be optimistic, with the magnitude of the deviation generally increasing further from the terminal year of the assessment. This has led to riskier catch levels than intended. A constant catch strategy is one means of increasing the ABC buffer as the magnitude of uncertainty increases in later years of the projection, as was the approach adopted by the SSC earlier this year for Gulf of Maine cod.

The second SSC concern is that some stocks may have entered a low productivity regime (e.g., driven by changes in the marine ecosystem), and therefore that recruitments trends observed over the assessment time series might not be maintained going forward. Projections that assume lower recruitment scenarios can safeguard against this possibility. The SSC adopted an approach along these lines earlier this year for South New England/Mid-Atlantic winter flounder.

The SSC expressed gratitude for the PDT's consideration of these lessons learned from other stocks, and supports the PDT's initiative and forethought in offering a range of ABC alternatives in response. However, the SSC chose to adopt the PDT's first ABC alternative based on the default control rule as the basis for advice. This results in ABCs of 4,642mt for 2014, 4,713mt for 2015, and 4,645mt for 2016. Associated OFLs are 6,082mt for 2014, 6,237 for 2015, and 6,314 for 2016.

This decision was made not because the concerns discussed above have diminished, but rather because, unlike GOM cod and SNE/MA winter flounder, that status of white hake is good. Therefore, the consequences of either concern are less in the near-term. The Council should not lose sight of these issues, however, and might choose to adopt catch strategies that are more risk-averse than the default control rule for white hake should its status change. The process to develop more explicit risk policies as a means for re-evaluating ABC control rules should inform those decisions.

Summary of recommendations

1. **Acceptable biological catches (ABCs) for white hake are 4,642mt for 2014, 4,713mt for 2015, and 4,645mt for 2016.**
2. **Overfishing limits (OFLs) are 6,082mt for 2014, 6,237 for 2015, and 6,314 for 2016.**

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Ernest F. Stockwell III, *Acting Chairman* | Thomas A. Nies, *Executive Director*

To: Tom Nies, Executive Director
From: Scientific and Statistical Committee
Date: September 3, 2013

Subject: **American Plaice and Gulf of Maine Cod Rebuilding Strategies**

The SSC met on May 16, 2013 to address the following terms of reference (TORs):

> Review the 2012 assessments of American plaice and GOM cod and comment on the rebuilding strategies developed by the PDT based on the recent assessments and the rebuilding alternatives under development. The SSC is requested to advise on the technical basis for the range of alternatives that has been developed by the PDT.

The SSC considered the following documents in its deliberations:

1. Memo from PDT to SSC re ABCs (August 2013)
2. 2012 Groundfish Assessment Update Summary Report for American plaice (2012)
3. 55th SAW Assessment Summary for Gulf of Maine Cod (January 2013)
4. 55th SAW Assessment Report for Gulf of Maine Cod (June 2013)

The Groundfish PDT presented possible methods for determining rebuilding strategies for Gulf of Maine cod and American plaice, to be implemented in five years after the current ABCs that have been established by the SSC have passed. There is concern about the need to address uncertainty in the projections under rebuilding plans, but the mechanism for articulating that uncertainty is unclear.

The procedures outlined by the PDT seem reasonable. The SSC noted that it might be necessary to make clear the consequences to yield and biomass associated with the assumptions implicit in the projections (e.g. assumptions about M or recruitment). There does not seem to be a large difference in the consequences associated with different timelines (e.g., 8 years vs. 10 years), so it may be prudent to focus on 10 year time lines and explore the consequences of assumptions on the probability of recovery within what remains of the 10 year period.

Constant vs. time varying F strategies might also be considered, approaches similar to those PDTs have developed in the past with some success. Scenarios where the change in catch is bounded in order to constrain ecological and economic disruptions to the fishery might also be considered.

In analyzing rebuilding options, attention should be paid to metrics beyond solely biomass relative to B_{MSY}. For example, stock structure, especially age composition, is an important attribute. For some stocks, reconsideration of the reference points might be warranted. It might also be important to consider rebuilding in the mixed stock context. For example, the Council might not wish to speed up the rebuilding of cod, say, at the expense of limiting catch of haddock or pollock.

Finally, as the PDT has recognized, plans that focus on *F*, rather than *B*, appear to be more robust. However, legally, the 10-year rebuilding target remains an important constraint on options.

Framework Adjustment 51

To the

Northeast Multispecies FMP

Appendix II

Analytic Techniques: Rebuilding Plan Analysis

Rebuilding Plan Analysis

1) American plaice and Gulf of Maine cod rebuilding plans

Need

New rebuilding plans need to be developed for American plaice and Gulf of Maine (GOM) cod. Both stocks had original rebuilding plan end dates in 2014. However adequate progress towards rebuilding was not made, which requires new rebuilding schedules to be developed within two years (see letter to Council from Acting Regional Administrator Dan Morris dated May 30, 2012). The Magnuson-Stevens Act states that rebuilding time periods should be as short as possible, not to exceed 10 years.

Concerns about rebuilding plans

The Groundfish Plan Development Team (PDT) is concerned that, for most stocks, has not occurred according to plan due to: 1) starting in the wrong place (e.g., terminal year of the assessment), 2) the difficulty of setting catch advice that is related to achieving a target fishing mortality rate, and 3) recruitment that was less optimistic than what is seen in the projections.

The PDT noted that management based on rebuilding plans and F-rebuild for groundfish has not typically worked well in the past. Groundfish stocks have not rebuilt as predicted from past projections. For most stocks, updates to data and assessment models have revealed that stock size was smaller than believed when rebuilding began, that fishing mortality was higher than expected, and/or that realized recruitment was lower than predicted. For two stocks (redfish and GB haddock), rebuilding has occurred much quicker than planned, mainly because of better than expected recruitment. Redfish had a 50 year plan due to life history constraints, but the stock rebuilt in less than 10 years. One groundfish stock (Southern New England/Mid-Atlantic (SNE/MA) yellowtail flounder) is rebuilt not because the stock biomass has increased but because biomass reference points changed in response to perceived changes in stock productivity (i.e., lower recruitment and biomass).

As rebuilding plan end dates get closer, inadequate progress toward a set biomass target can also require disproportionate cuts in catch to achieve the calculated F-rebuilding mortality rate. ABCs based on F-rebuild can dramatically change from one assessment to the next if recruitment is not realized as the rebuilding end date approaches. The enhanced PDT projection simulation work showed that long-term projections are unreliable and tend to be optimistic. ABCs based on F-rebuild are also unreliable, since F-rebuild in the near term is dependent on recruitment from longer term projections.

The PDT also discussed whether comparing short-term rebuilding, versus long-term rebuilding and comparing the outputs relative to revenues, yields and stock rebuilding would be a better approach. Another approach could be to develop biomass, trawl index, or recruitment threshold that, when exceeded, catches could be increased (e.g., to 75% F_{MSY}). Such approaches would require further discussion and development.

Revised American plaice and GOM cod rebuilding plans

Recent assessments and assumptions- American plaice was last assessed during the 2012 groundfish updates, with a terminal year of 2010 for the assessment. An estimated catch was used for the 2011 and 2012 bridge years in the projection. The SSC set 2013-2015 ABCs for American plaice using 75%F_{MSY} projections. GOM cod was assessed at SARC 55 in December 2012. Two accepted models (base and m-ramp) were used for setting constant catch ABCs for 2013-2015 by the SSC in January 2013.

The PDT proposes to develop two rebuilding plan options (see below) for each stock that meets two requirements:

1) Assume no changes in the SSC's ABC decisions.
2) F-rebuild is not allowed to be initially limiting (75%F_{MSY} < F-rebuild).

Rebuilding plan options-

1) Developed to be more conservative using a time period less than 10 years, with 75%F_{MSY} still estimated to be below but closer to the F-rebuild estimate.
2) Developed based on the maximum 10-year plan.

The PDT also based all rebuilding plans on a 50% probability of success to help avoid confusion between rebuilding timelines, probability of rebuilding, and the interaction with the ABC uncertainty buffer (75%F_{MSY} or the newer constant harvest buffers). For example, reducing the rebuilding timeline has the same effect as increasing the probability of rebuilding by a certain date. Rebuilding schedules less than the maximum 10-year or rebuilding plans with a higher probability than 50% will make it more likely that F-rebuild will be used for ABC determination in the future.

Rationale- The PDT felt that one way to rebuild stocks is with uncertainty buffers on the fishing mortality rate. Basing ABCs on F-rebuild is not desirable, since it can quickly lead to dramatic reductions in the ABCs based on less accurate longer term projections as the rebuilding end date gets closer. In addition, as F-rebuild approaches zero then it is less likely to get adopted for ABC determination (e.g., SNE/MA winter flounder). ABCs based on F-rebuild are less desirable since considerable uncertainty surrounds the F-rebuild estimate due to the estimate's dependence on future recruitment, which is difficult to predict.

Results- Rebuilding schedule development was based on the latest projection for each stock that was used for estimating the ABCs and ACLs. These projections were treated more as theoretical projections since the PDT did not change bridge year catch assumptions. The PDT also assumed the ACL catch for the three years that are already in place. However, the original bridge year catch assumptions are similar to the updated PDT catch from DIMS (See Appendix B).

The proposed rebuilding plan options that meet the PDT requirements (see above) are shown in Figures 1-3. American plaice has the 7, 8, and 10-year plan options at 50% probability of success (Figure 1; Tables 1-3). GOM cod has 8 and 10-year plan options at 50% probability of success (base case Figure 2, Tables 4-6; m-ramp Figure 3, Tables 7-9).

American plaice

Option 1- rebuild in 7 or 8 years- American plaice could rebuild in seven years with a fishing mortality that is still above 75%F_{MSY}. A rebuild schedule of 8 years was also calculated with similar results.

Option 2 - rebuild in 10 years- F-rebuild was estimated to be below F_{MSY} with the maximum 10 year rebuilding plan.

GOM cod

There is little difference in the rebuilding time needed under the accepted base case or m-ramp model (M=0.2 in projections) for GOM cod. However, the catches estimated in the out years and the SSB_{MSY} are different between the models. The m-ramp projection assumes a change in M back to 0.2. The SARC 55 Panel concluded that if m is currently 0.4, then it seemed more reasonable to assume that in the short-term m would remain at 0.4, rather than reduce to 0.2. However, a change back to 0.2 is required to rebuild the stock. It is not known when M will change back to 0.2 in the future for the m-

ramp formulation, so interpretation and development of rebuilding plans using the m-ramp model is more difficult.

Option 1-rebuild in 8 years- GOM cod requires at least eight years for F-rebuild to remain above 75%F_{MSY}.

Option 2- rebuild in 10 years- F-rebuild was estimated to be below F_{MSY} with the maximum 10 year rebuilding plan.

Conclusions- The PDT discussed all the developed options for American plaice and GOM cod. The PDT discussed under what circumstances that a rebuilding time line could be extended beyond the requirement to minimize time (i.e., species generation time, recruitment, extenuating fishery considerations). Some PDT members were concerned that even under a shorter time frame (i.e., 7 versus 10 years) fishing mortality rates might not be achieved. Recent catch estimates for American plaice and Gulf of Maine cod are in Tables 10 and 11.

The PDT also discussed concerns that under both stock projections, catches would be increasing appreciably, even in the near term. The PDT viewed this as unrealistic and an inaccurate portrayal of potential future catch streams.

year	F=0	75%Fmsy	7 year	8 year	10 year	Fmsy
2011	0.143	0.143	0.143	0.143	0.143	0.143
2012	0.164	0.164	0.164	0.164	0.164	0.164
2013	0.128	0.128	0.128	0.128	0.128	0.128
2014	0.127	0.127	0.127	0.127	0.127	0.127
2015	0.127	0.127	0.127	0.127	0.127	0.127
2016	0.000	0.135	0.147	0.160	0.171	0.180
2017	0.000	0.135	0.147	0.160	0.171	0.180
2018	0.000	0.135	0.147	0.160	0.171	0.180
2019	0.000	0.135	0.147	0.160	0.171	0.180
2020	0.000	0.135	0.147	0.160	0.171	0.180
2021	0.000	0.135	0.147	0.160	0.171	0.180
2022	0.000	0.135	0.147	0.160	0.171	0.180
2023	0.000	0.135	0.147	0.160	0.171	0.180
2024	0.000	0.135	0.147	0.160	0.171	0.180

Table 1: Fishing mortality from 2012 groundfish update American plaice AGEPRO projections. Original bridge year catch (2011-2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 7, 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	7 year	8 year	10 year	Fmsy
2011	1,624	1,624	1,624	1,624	1,624	1,624
2012	1,922	1,922	1,922	1,922	1,922	1,922
2013	1,482	1,482	1,482	1,482	1,482	1,482
2014	1,442	1,442	1,442	1,442	1,442	1,442
2015	1,470	1,470	1,470	1,470	1,470	1,470
2016	0	1,742	1,887	2,043	2,174	2,280
2017	0	1,927	2,069	2,219	2,342	2,440
2018	0	2,108	2,247	2,391	2,506	2,597
2019	0	2,259	2,393	2,529	2,636	2,719
2020	0	2,382	2,510	2,638	2,738	2,815
2021	0	2,493	2,617	2,738	2,831	2,902
2022	0	2,604	2,723	2,839	2,927	2,993
2023	0	2,683	2,799	2,909	2,990	3,053
2024	0	2,738	2,847	2,954	3,029	3,088

Table 2: Catch from 2012 groundfish update American plaice AGEPRO projections. Original bridge year catch (2011-2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 7, 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	7 year	8 year	10 year	Fmsy
2011	11,631	11,631	11,631	11,631	11,631	11,631
2012	12,171	12,171	12,171	12,171	12,171	12,171
2013	11,961	11,961	11,961	11,961	11,961	11,961
2014	11,733	11,733	11,733	11,733	11,733	11,733
2015	12,031	12,031	12,031	12,031	12,031	12,031
2016	13,759	13,356	13,321	13,285	13,254	13,227
2017	16,760	14,681	14,511	14,327	14,174	14,052
2018	20,009	16,033	15,723	15,400	15,133	14,920
2019	23,207	17,178	16,746	16,288	15,914	15,624
2020	26,134	18,150	17,601	17,029	16,562	16,186
2021	29,102	19,047	18,386	17,717	17,163	16,729
2022	32,165	19,944	19,179	18,404	17,775	17,276
2023	34,778	20,578	19,737	18,872	18,192	17,649
2024	36,862	21,016	20,098	19,175	18,430	17,858

Table 3: Spawning stock biomass from 2012 groundfish update American plaice AGEPRO projections. Original bridge year catch (2011-2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 7, 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	8 year	10 year	Fmsy
2012	0.459	0.459	0.459	0.459	0.459
2013	0.161	0.161	0.161	0.161	0.161
2014	0.135	0.135	0.135	0.135	0.135
2015	0.098	0.098	0.098	0.098	0.098
2016	0.000	0.135	0.139	0.165	0.180
2017	0.000	0.135	0.139	0.165	0.180
2018	0.000	0.135	0.139	0.165	0.180
2019	0.000	0.135	0.139	0.165	0.180
2020	0.000	0.135	0.139	0.165	0.180
2021	0.000	0.135	0.139	0.165	0.180
2022	0.000	0.135	0.139	0.165	0.180
2023	0.000	0.135	0.139	0.165	0.180
2024	0.000	0.135	0.139	0.165	0.180

Table 4: Fishing mortality from SARC 55 gulf of Maine cod base run AGEPRO projections. Original bridge year catch (2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	8 year	10 year	Fmsy
2012	3,767	3,767	3,767	3,767	3,767
2013	1,470	1,470	1,470	1,470	1,470
2014	1,470	1,470	1,470	1,470	1,470
2015	1,470	1,470	1,470	1,470	1,470
2016	0	2,911	2,993	3,517	3,814
2017	0	3,818	3,915	4,522	4,854
2018	0	4,594	4,700	5,350	5,702
2019	0	5,283	5,394	6,064	6,417
2020	0	6,037	6,151	6,829	7,179
2021	0	6,733	6,851	7,534	7,872
2022	0	7,263	7,378	8,046	8,375
2023	0	7,631	7,749	8,404	8,706
2024	0	7,908	8,016	8,641	8,928

Table 5: Catch from SARC 55 gulf of Maine cod base run AGEPRO projections. Original bridge year catch (2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	8 year	10 year	Fmsy
2012	8,995	8,995	8,995	8,995	8,995
2013	9,355	9,355	9,355	9,355	9,355
2014	11,949	11,949	11,949	11,949	11,949
2015	16,795	16,795	16,795	16,795	16,795
2016	24,175	23,567	23,550	23,435	23,372
2017	33,584	30,077	29,983	29,363	29,016
2018	42,760	35,449	35,273	34,074	33,398
2019	51,697	40,043	39,756	38,001	37,003
2020	63,228	45,603	45,192	42,662	41,287
2021	76,173	51,292	50,773	47,332	45,543
2022	87,114	55,489	54,800	50,697	48,536
2023	96,531	58,494	57,710	53,025	50,574
2024	104,039	60,772	59,909	54,727	52,017

Table 6: Spawning stock biomass from SARC 55 gulf of Maine cod base run AGEPRO projections. Original bridge year catch (2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	8 year	10 year	Fmsy
2012	0.517	0.517	0.517	0.517	0.517
2013	0.177	0.177	0.177	0.177	0.177
2014	0.130	0.130	0.130	0.130	0.130
2015	0.076	0.076	0.076	0.076	0.076
2016	0.000	0.135	0.143	0.166	0.180
2017	0.000	0.135	0.143	0.166	0.180
2018	0.000	0.135	0.143	0.166	0.180
2019	0.000	0.135	0.143	0.166	0.180
2020	0.000	0.135	0.143	0.166	0.180
2021	0.000	0.135	0.143	0.166	0.180
2022	0.000	0.135	0.143	0.166	0.180
2023	0.000	0.135	0.143	0.166	0.180
2024	0.000	0.135	0.143	0.166	0.180

Table 7: Fishing mortality from SARC 55 gulf of Maine m-ramp run (m=0.2) AGEPRO projections. Original bridge year catch (2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	8 year	10 year	Fmsy
2012	3,767	3,767	3,767	3,767	3,767
2013	1,470	1,470	1,470	1,470	1,470
2014	1,470	1,470	1,470	1,470	1,470
2015	1,470	1,470	1,470	1,470	1,470
2016	0	4,110	4,341	4,996	5,390
2017	0	5,507	5,785	6,560	7,010
2018	0	6,747	7,055	7,895	8,372
2019	0	7,846	8,172	9,043	9,532
2020	0	9,099	9,440	10,337	10,818
2021	0	10,100	10,443	11,330	11,791
2022	0	10,804	11,148	12,006	12,452
2023	0	11,316	11,644	12,466	12,879
2024	0	11,649	11,969	12,762	13,155

Table 8: Catch from SARC 55 gulf of Maine cod m-ramp run (m=0.2) AGEPRO projections. Original bridge year catch (2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

year	F=0	75%Fmsy	8 year	10 year	Fmsy
2012	8,196	8,196	8,196	8,196	8,196
2013	9,094	9,094	9,094	9,094	9,094
2014	13,649	13,649	13,649	13,649	13,649
2015	22,156	22,156	22,156	22,156	22,156
2016	33,951	33,136	33,089	32,950	32,862
2017	47,825	42,975	42,713	41,963	41,522
2018	61,633	51,296	50,774	49,286	48,419
2019	75,841	58,971	58,150	55,829	54,483
2020	95,799	68,889	67,648	64,239	62,248
2021	114,755	76,902	75,240	70,707	68,130
2022	130,536	82,387	80,376	75,016	72,010
2023	143,324	86,602	84,290	78,162	74,689
2024	154,005	89,281	86,809	80,067	76,358

Table 9: Spawning stock biomass from SARC 55 gulf of Maine cod m-ramp run (m=0.2) AGEPRO projections. Original bridge year catch (2012) and ACLs (2013-2015) catch were assumed in all projections. Rebuilding projections that rebuild the stock in 8 and 10 years that meet the PDT requirements are shown. Projections at F=0, 75%Fmsy, and Fmsy are also shown for comparison.

Table 10: Estimated calendar year 2011, 2012, and 2013 Northeast multispecies American plaice catch (mt)

Estimated CY 2011, 2012 and 2013 NE Multispecies American Plaice Catch (mt)

	ACLs and sub-ACLs; (with accountability measures (AMs))							sub-components: No AMs	
Stock	**Total Groundfish**	Commercial Groundfish*	Landings	Discard	Recreational	Herring Fishery	Scallop Fishery	State Water	Other
	A to G	A+B+C	A	B	C	D	E	F	G
Plaice									
2011	1,615.1	1,574.8	1,383.4	191.5				16.4	23.8
Jan - Jun 2011	733.7	705.8	601.1	104.7				10.4	17.5
Jul - Dec 2011	881.4	869.0	782.3	86.7				6.1	6.3
2012	1,838.2	1,709.3	1,467.5	241.7				28.0	100.9
Jan - Jun 2012	882.5	844.1	713.0	131.1				10.0	28.4
Jul - Dec 2012	955.6	865.1	754.5	110.6				18.0	72.5
2013	1,574.2	1,472.5						32.7	69.0
Jan - Jun 2013	773.5	702.8	597.4	105.4				17.2	53.5
Jul - Dec 2013 (est)	800.7	769.7						15.5	15.5

Values in live weight
*Includes estimate of missing dealer reports
Source: NMFS Northeast Regional Office
August 5, 2013: Data Dates: May 28 2013, July 31, 2013

These data are the best available to NOAA's National Marine Fisheries Service (NMFS). Data sources for this report include: (1) Vessels via VMS; (2) Vessels via vessel logbook reports; (3) Dealers via Dealer Electronic reporting. Differences with previous reports are due to corrections made to the database.

Sector/Common Pool:
Jan 2011 -Jun CY13 commercial data from Data Matching and Imputation System
Jul-Dec CY13 value = (Jul-Dec CY12 value)*(May-Jun CY13 value / May-Jun CY12 value)

State Water, Other Subcomponent - CY sum of monthly average FY10 and FY11 actual catch plus monthly average of FY12 and FY13 catch limit

Table 11: Estimated calendar year 2011, 2012, and 2013 Northeast multispecies Gulf of Maine cod catch (mt)

Estimated CY 2012 and 2013 NE Multispecies GOM Cod Catch (mt)

	ACLs and sub-ACLs; (with accountability measures (AMs))							sub-components: No AMs	
Stock	**Total Groundfish**	Groundfish*	Landings	Discard	Recreational	Herring Fishery	Scallop Fishery	State Water	Other
	A to G	A+B+C	A	B	C	D	E	F	G
GOM Cod									
2012	3,636.7	3,345.0	2,669.5	143.5	531.9			240.8	50.9
Jan - Jun 2012	1,860.4	1,726.2	1,317.3	79.0	329.9			114.3	19.9
Jul - Dec 2012	1,776.3	1,618.8	1,352.2	64.6	202.0			126.5	31.0
2013	2,237.6	2,030.0			1,062.3			153.0	54.7
Jan - Jun 2013	1,505.7	1,375.0	514.3	41.4	819.3			101.5	29.2
Jul - Dec 2013 (est)	732.0	655.0			243.0			51.5	25.5

Values in live weight
*Includes estimate of missing dealer reports
Source: NMFS Northeast Regional Office
August 8, 2013: Data Dates: May 28 2013, July 31, 2013

These data are the best available to NOAA's National Marine Fisheries Service (NMFS). Data sources for this report include: (1) Vessels via VMS; (2) Vessels via vessel logbook reports; (3) Dealers via Dealer Electronic reporting. Differences with previous reports are due to corrections made to the database

Sector/Common Pool:	Jan 2012 -Jun 2013 commercial data from Data Matching and Imputation System Jul-Dec CY13 value = (Jul-Dec CY12 value)*(May-Jun CY13 value / May-Jun CY12 value)
Recreational	- CY12: wave 6, 2011 - wave 5, 2012 landings only - CY13: sum of monthly average FY11 actual catch plus monthly average of FY12 and FY13 catch limit
State Water and Other Subcomponent	- CY sum of monthly average FY11 actual catch plus monthly average of FY12 and FY13 catch limit

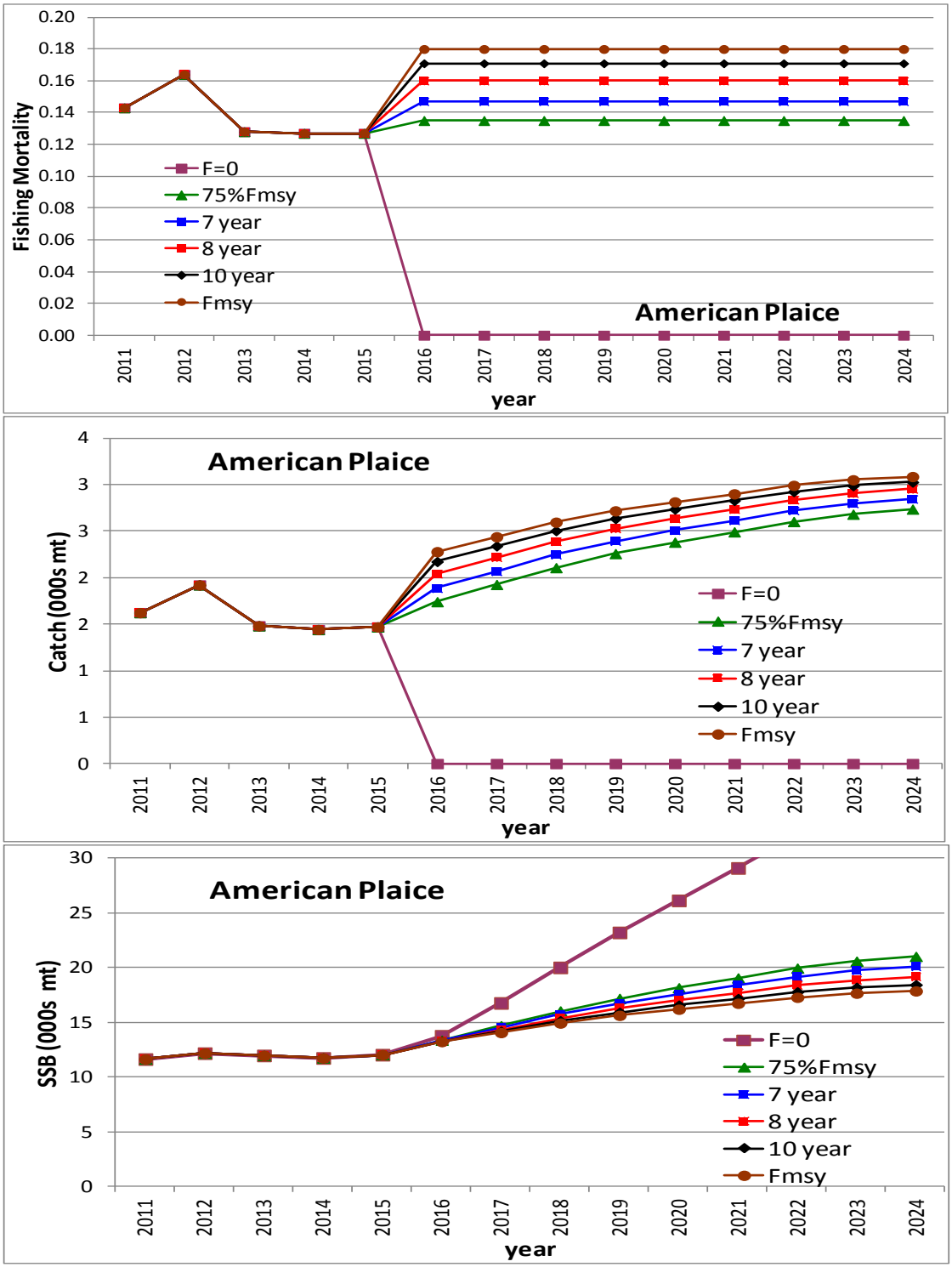

Figure 1: American plaice fishing mortality, catch, and SSB trends for F=0, 75%F_{MSY}, and F_{MSY} projections. Proposed rebuilding plans that meet the PDT requirements are shown in the 7 year, 8 year, and 10 year projections. Bridge year catch and ACL assumptions were made from 2011-2015.

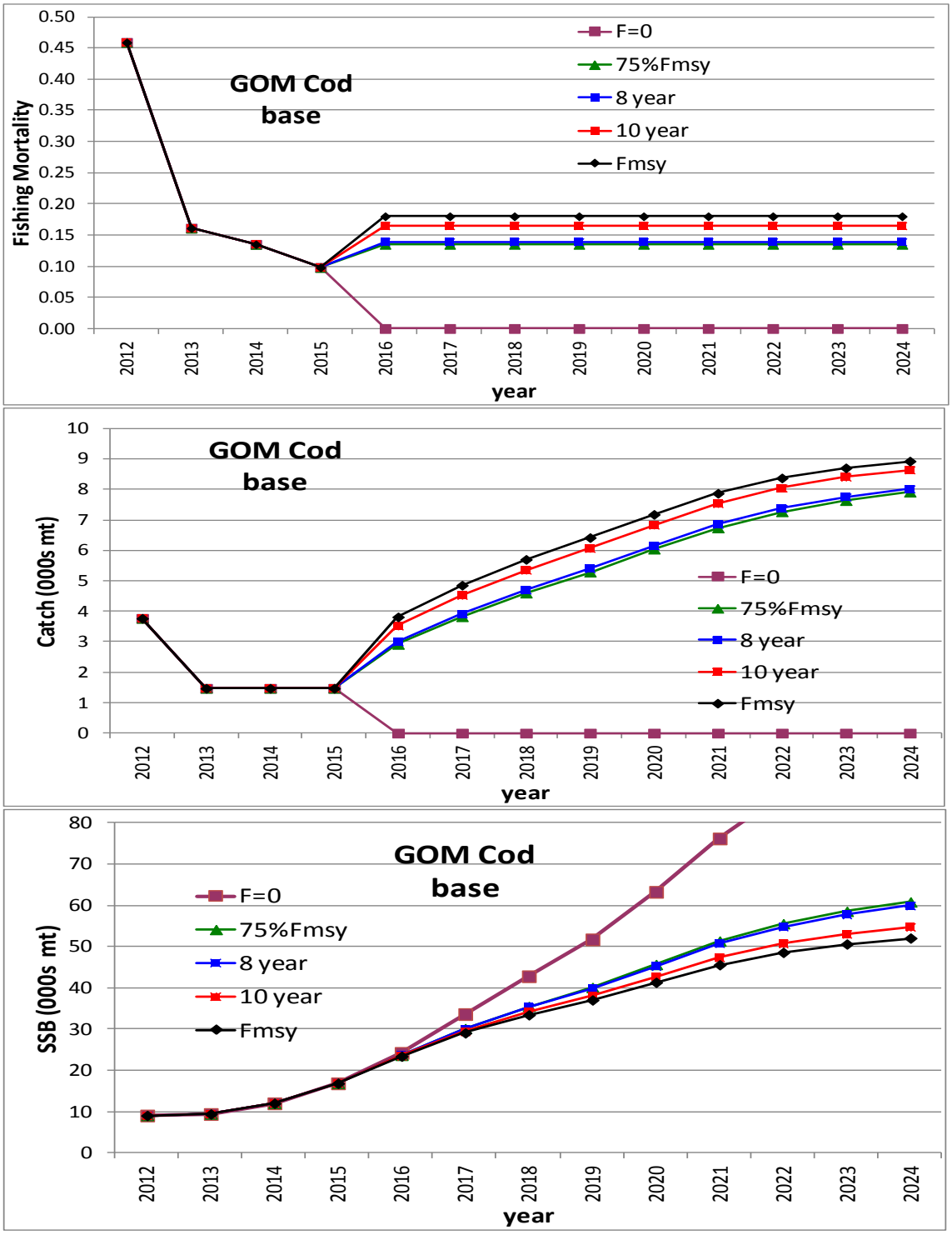

Figure 2: Gulf of Maine cod base model fishing mortality, catch, and SSB trends for F=0, 75%F_{MSY}, and F_{MSY} projections. Proposed rebuilding plans that meet the PDT requirements are shown in the 8 and 10 year projections. Bridge year catch and ACL assumptions were made from 2012-2015.

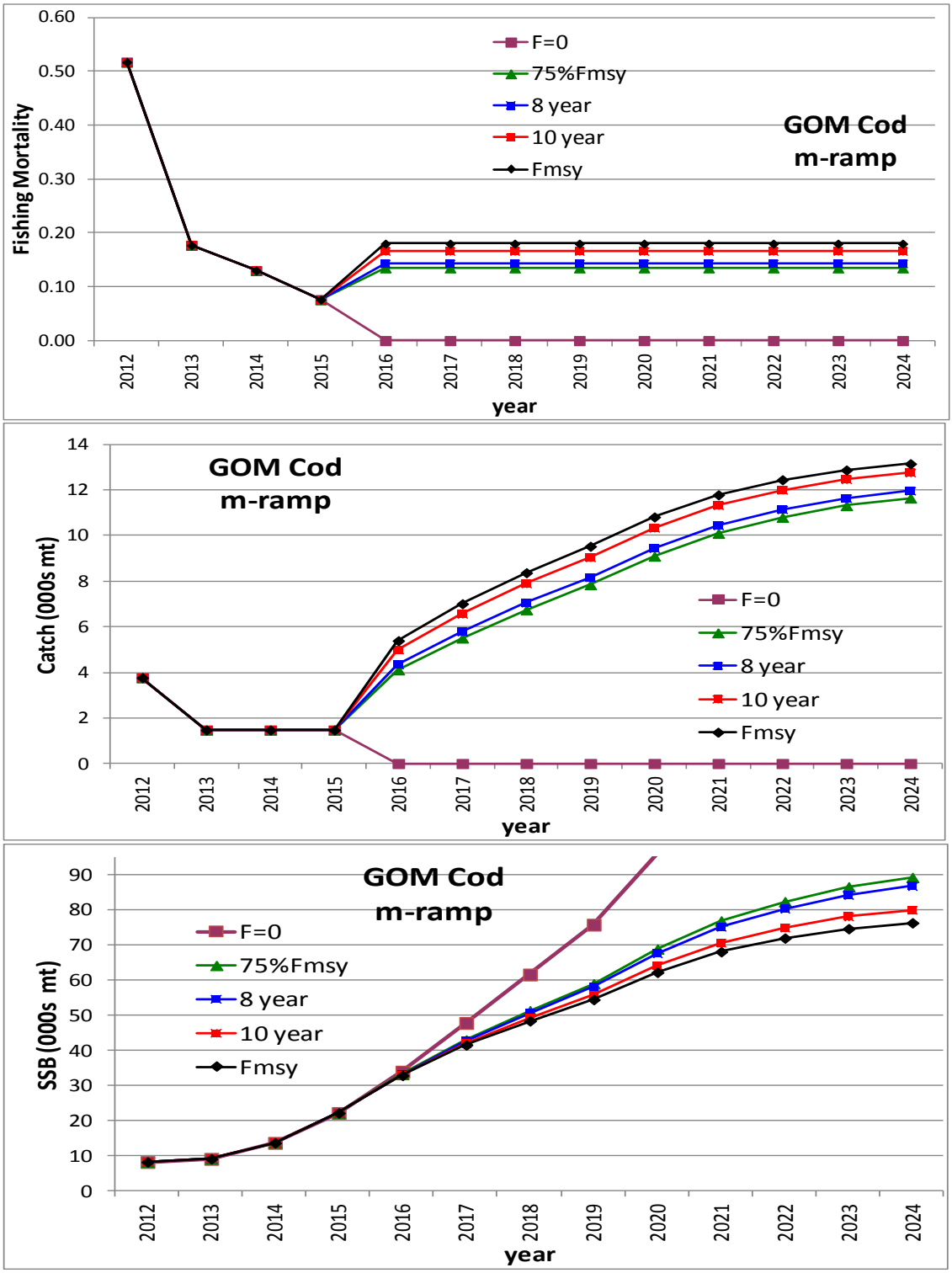

Figure 3: Gulf of Maine cod m-ramp model fishing mortality, catch, and SSB trends for F=0, 75%F_{MSY}, and F_{MSY} projections. Proposed rebuilding plans that meet the PDT requirements are shown in the 8 and 10 year projections. Bridge year catch and ACL assumptions were made from 2012-2015.

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to the

Northeast Multispecies FMP

Appendix III

Calculation of Northeast Multispecies Annual Catch Limits, FY 2014 – FY 2016

This appendix documents the calculation of Northeast Multispecies Overfishing Levels (OFLs), Acceptable Biological Catches (ABCs), and Annual Catch Limits (ACLs) for FY 2014 - FY 2016. 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 white hake for FY 2014-FY 2016 and Georges Bank yellowtail flounder for FY 2014. In addition, TACs for Eastern Georges Bank haddock and Eastern George Bank cod are specified.

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 2014) in order to keep a clear record of the distribution. Amendment 16 authorized changes to be made in a framework action, although no changes are being proposed in this action.

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:

White hake	(SARC 56)
GB yellowtail flounder	(TRAC 2013)

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 2014, an additional assumption must be made in the projections for the years between the terminal year and 2014. 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 $F_{rebuild}$ 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. For white hake, the ABC in FY 2014 is based on the projection output at the target fishing mortality, and then this ABC is used for FY 2015 and FY 2016 as well. This means that effectively the target fishing mortality is lower for FY 2015 and FY 2016. Specific deviations from the projection output are identified below. Projection output used for setting ABCs is in Appendix IV.

a. White Hake: The ABC for FY 2014 - 2016 is based the 2014 catch at 75% of F_{MSY}.

c. GB yellowtail flounder: The PDT did not make a specific recommendation for ABC or OFL for GB yellowtail flounder, expect to repeat the TRAC's finding that catches should be below 500 mt. The SSC recommended that the ABC for GB yellowtail flounder for FY 2014 should not exceed 500mt, and that catch should be reduced as much as practicable. The OFL for Georges Bank yellowtail flounder remains unknown. After reviewing the SSC recommendation, the Council set the ABC for FY 2014 at 400 mt.

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: 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.

Tab 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 2011 – FY 2012 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. White Hake: No changes from previous years.

b. GB yellowtail flounder: There is no state waters component because the stock area does not include state waters. No changes from previous years.

c. GB cod: 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 2014. Future values will be adopted based on future TMGC advice.

d. 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 2014. Future values will be adopted based on future TMGC advice.

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. For reference, a summary of recent adjustments are shown in Table 5. However, no adjustments to the management uncertainty buffers are being proposed in this Action.

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 7 and Table 8 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 – 2012 and 2013 catch assumption used in age-based projections for stocks with recent age-based analytic assessments.

Stock	2012 Catch	2013 Catch
GB Yellowtail	N/A	N/A
White Hake	2,900	2,594

Table 2 – Mortality targets used to calculate ABCs, FY 2014 – 2016 for white hake and FY 2014 for GB yellowtail flounder.

Species	Stock	Basis for Target Fishing Mortality	Targeted Fishing Mortality or Exploitation	F_{msy}
Yellowtail Flounder	**GB**	See text	N/A	N/A
White Hake	**GB/GOM**	75% F_{MSY}	0.15	0.2

Tab 3 – 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	OFL	ABC	Canadian Share/Allowance	U.S. ABC	Percent of ABC							
						State Waters	Other sub-	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	MWT or Small-
GB Cod	2014	3,570	2,506	546	1,960	0.01	0.04		0.95	0.95		0.9827342094	
	2015	4,191	2,506		2,506	0.01	0.04		0.95	0.95		0.9827342094	
	2016					0.01	0.04		0.95	0.95		0.9827342094	
GOM Cod	2014	1,917	1,550		1,550	0.10	0.05		na	0.663	0.337	0.9779780045	
	2015	2,639	1,550		1,550	0.10	0.05		na	0.663	0.337	0.9779780045	
	2016					0.10	0.05		na	0.663	0.337	0.9779780045	
GB Haddock	2014	46,268	35,699	16,470	19,229	0.01	0.04		0.940	0.94		0.9967654507	0.01
	2015	56,293	43,606		43,606	0.01	0.04		0.940	0.94		0.9967654507	0.01
	2016					0.01	0.04		0.940	0.94		0.9967654507	0.01
GOM Haddock	2014	440	341		341	0.02	0.03		0.94	0.725	0.275	0.9914926367	0.01
	2015	561	435		435	0.02	0.03		0.94	0.725	0.275	0.9914926367	0.01
	2016					0.02	0.03		0.94	0.725	0.275	0.9914926367	0.01
GB Yellowtail Flounder	2014	unknown	400	72	328		0.02	0.160	0.800	0.80		0.9880140673	0.02
	2015						0.02	0.160	0.800	0.80		0.9880140673	0.02
	2016						0.02	0.160	0.800	0.80		0.9880140673	0.02
SNE/MA Yellowtail Flour	2014	1,042	700		700	0.01	0.04	0.102	0.848	0.85		0.8323330148	
	2015	1,056	700		700	0.01	0.04	0.099	0.851	0.85		0.8323330148	
	2016					0.01	0.04		0.950	0.95		0.8323330148	
CC/GOM Yellowtail Flour	2014	936	548		548	0.06	0.02		0.92	0.92		0.9720201784	
	2015	1,194	548		548	0.06	0.02		0.92	0.92		0.9720201784	
	2016					0.06	0.02		0.92	0.92		0.9720201784	
American Plaice	2014	1,981	1,515		1,515	0.02	0.02		0.96	0.96		0.9824653524	
	2015	2,021	1,544		1,544	0.02	0.02		0.96	0.96		0.9824653524	
	2016					0.02	0.02		0.96	0.96		0.9824653524	
Witch Flounder	2014	1,512	783		783	0.03	0.15		0.82	0.82		0.9825249396	
	2015	1,846	783		783	0.03	0.15		0.82	0.82		0.9825249396	
	2016					0.03	0.15		0.82	0.82		0.9825249396	

Stock	Year	OFL	ABC	Canadian Share/Allowance	U.S. ABC	Percent of ABC							
						State Waters	Other sub-	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	MWT or Small-
GB Winter Flounder	2014	4,626	3,598		3,598		0.03		0.97	0.97		0.9937146348	
	2015						0.03		0.97	0.97		0.9937146348	
	2016						0.03		0.97	0.97		0.9937146348	
GOM Winter Flounder	2014	1,458	1,078		1,078	0.25	0.05		0.70	0.70		0.9630488571	
	2015					0.25	0.05		0.70	0.70		0.9630488571	
	2016					0.25	0.05		0.70	0.70		0.9630488571	
SNE/MA Winter Flounder	2014	3,372	1,676		1,676	0.14	0.10		0.76	0.76		0.8876590880	
	2015	4,439	1,676		1,676	0.14	0.10		0.76	0.76		0.8876590880	
	2016					0.14	0.10		0.76	0.76		0.8876590880	
Redfish	2014	16,130	11,465		11,465	0.01	0.02		0.97	0.97		0.9960386508	
	2015	16,845	11,974		11,974	0.01	0.02		0.97	0.97		0.9960386508	
	2016					0.01	0.02		0.97	0.97		0.9960386508	
White Hake	2014	6,082	4,642		4,642	0.01	0.02		0.97	0.97		0.9928907096	
	2015	6,237	4,713		4,713	0.01	0.02		0.97	0.97		0.9928907096	
	2016	6,314	4,645		4,645	0.01	0.02		0.97	0.97		0.9928907096	
Pollock	2014	20,554	16,000		16,000	0.06	0.07		0.87	0.87		0.9929805872	
	2015					0.06	0.07		0.87	0.87		0.9929805872	
	2016								1.00	1.00		0.9929805872	
N. Windowpane Flounder	2014	202	151		151	0.01	0.29		0.70	0.70			
	2015	202	151		151	0.01	0.29		0.70	0.70			
	2016					0.01	0.29		0.70	0.70			
S.Windowpane Flounder	2014	730	548		548	0.10	0.34	0.36	0.20	0.20			
	2015	730	548		548	0.10	0.34	0.36	0.20	0.20			
	2016					0.10	0.34	0.36	0.20	0.20			
Ocean Pout	2014	313	235		235	0.01	0.09		0.90	0.90			
	2015	313	235		235	0.01	0.09		0.90	0.90			
	2016					0.01	0.09		0.90	0.90			
Atlantic Halibut	2014	180	109		109	0.40	0.05		0.55	0.55			
	2015	198	119		119	0.40	0.05		0.55	0.55			
	2016					0.40	0.05		0.55	0.55			
Atlantic Wolffish	2014	94	70		70	0.01	0.04		0.95	0.95			
	2015	94	70		70	0.01	0.04		0.95	0.95			
	2016					0.01	0.04		0.95	0.95			

Table 4 – Distribution of ABC to fishery components
Northeast Multispecies OFLs, ABCs, ACLs and other ACL sub-components for FY 2014 – FY 2015 (metric tons, live weight). Values are rounded to the nearest metric ton. Sector shares based on 2013 PSCs. Only stocks that are underlined are proposed to be adjusted. Other stocks are provided for informational purposes. Grayed out values will be adjusted as a result of future recommendations of the TMGC.
(1) Includes commercial ABC in state waters and other sub-components

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components (4)	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non-Sector Ground-fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
GB Cod	2014	3,570	1,960	20	78	0	1,769		0	1,738	31	0	1,867
	2015	4,191	2,506	25	100	0	2,262		0	2,223	39	0	2,387
	2016												
GOM Cod	2014	1,917	1,550	103	51	0		830	486	812	18	0	1,470
	2015	2,639	1,550	103	51	0		830	486	812	18	0	1,470
	2016												
GB Haddock	2014	46,268	19,229	192	769	0	17,171		0	17,116	56	179	18,312
	2015	56,293	43,606	436	1,744	0	38,940		0	38,814	126	406	41,526
	2016												
GOM Haddock	2014	440	341	5	7	0		220	87	218	2	3	323
	2015	561	435	6	9	0		280	111	278	2	4	412
	2016												
GB Yellowtail Flounder	2014	unknown	328		6.6	50.9	254.5		0	251.5	3.1	6.1	318.1
	2015												
	2016												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non_ Sector Ground-fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
SNE/MA Yellowtail Flounder	2014	1,042	700	7	28	66	564		0	469	95	0	665
	2015	1,056	700	7	28	64	566		0	471	95	0	665
	2016												
CC/GOM Yellowtail Flounder	2014	936	548	33	11	0	479		0	466	13	0	523
	2015	1,194	548	33	11	0	479		0	466	13	0	523
	2016												
American Plaice	2014	1,981	1,515	30	30	0	1,382		0	1,357	24	0	1,442
	2015	2,021	1,544	31	31	0	1,408		0	1,383	25	0	1,470
	2016												
Witch Flounder	2014	1,512	783	23	117	0	610		0	599	11	0	751
	2015	1,846	783	23	117	0	610		0	599	11	0	751
	2016												
GB Winter Flounder	2014	4,626	3,598	0	108	0	3,385		0	3,364	21	0	3,493
	2015												
	2016												
GOM Winter Flounder	2014	1,458	1,078	272	54	0	714.7		0	688.3	26.4	0	1,040
	2015												
	2016												
SNE/MA Winter Flounder	2014	3,372	1,676	235	168	0	1,210		0	1,074	136	0	1,612
	2015	4,439	1,676	235	168	0	1,210		0	1,074	136	0	1,612
	2016												
Redfish	2014	16,130	11,465	115	229	0	10,565		0	10,523	42	0	10,909
	2015	16,845	11,974	120	239	0	11,034		0	10,990	44	0	11,393
	2016												

Stock	Year	OFL	U.S. ABC	State Waters Sub-component	Other Sub-Components	Scallops	Ground-fish Sub-ACL	Comm Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Prelim-inary Sectors Sub-ACL	Prelim-inary Non_Sector Ground fish Sub-ACL	Small Mesh/ MWT Sub-ACL	Total ACL
White Hake	2014	6,082	4,642	46	93	0	4,278	-	0	4,247	30	0	4,417
	2015	6,237	4,713	47	94	0	4,343		0	4,312	31	0	4,484
	2016	6,314	4,645	46	93	0	4,280		0	4,250	30	0	4,420
Pollock	2014	20,554	16,000	960	1,120	0	13,224		0	13,131	93	0	15,304
	2015												
	2016												
N. Window-pane Flounder	2014	202	151	2	44	0	98		0	0	98	0	144
	2015	202	151	2	44	0	98		0	0	98	0	144
	2016												
S. Window-pane Flounder	2014	730	548	55	186	183	102		0	0	102	0	527
	2015	730	548	55	186	183	102		0	0	102	0	527
	2016												
Ocean Pout	2014	313	235	2	21	0	197		0	0	197	0	220
	2015	313	235	2	21	0	197		0	0	197	0	220
	2016												
Atlantic Halibut	2014	180	109	44	5	0	57		0	0	57	0	106
	2015	198	119	48	6	0	62		0	0	62	0	116
	2016												
Atlantic Wolffish	2014	94	70	1	3	0	62		0	0	62	0	65
	2015	94	70	1	3	0	62		0	0	62	0	65
	2016												

Table 5 – ACL adjustments

Stock	Year	State Waters	Other Sub-Components	Scallops	Groundfish	Comm/Non_ Sector Groundfish	Rec Groundfish	Sector PSC	MWT
GB Cod	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
GOM Cod	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
	2016	1	1	1	0.95	0.95	0.93	0.95	1
GB Haddock	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
	2016	1	1	1	0.95	0.95	0.95	0.95	0.93
GOM Haddock	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
	2016	1	1	1	0.95	0.95	0.93	0.95	0.93
GB Yellowtail Flounder	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
	2016	1	1	0.97	0.97	0.97	0.95	0.97	0.93
SNE/MA Yellowtail Flounder	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
	2016	1	1	0.93	0.95	0.95	0.95	0.95	1
CC/GOM Yellowtail Flounder	2014	1	1	1	0.95	0.95	0.95	0.95	1
	2015	1	1	0.97	0.95	0.95	0.95	0.95	1
	2016	1	1	0.97	0.95	0.95	0.95	0.95	1
Plaice	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
Witch Flounder	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
	2016	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	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
	2016	1	1	1	0.97	0.97	0.97	0.97	1
GOM Winter Flounder	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
SNE/MA Winter Flounder	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
Redfish	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
White Hake	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
Pollock	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
N. Windowpane Flounder	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
	2016	1	1	1	0.93	0.93	0.95	0.93	1
S. Windowpane Flounder	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
	2016	1	1	0.93	0.93	0.93	0.95	0.93	1
Ocean Pout	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
	2016	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	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
	2016	1	1	1	0.95	0.95	0.95	0.95	1
Atlantic Wolffish	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
	2016	1	1	1	0.93	0.93	0.95	0.95	1

Table 6 - 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	**0.03**	0.03
GB Yellowtail Flounder	0.00	0.00	0.00	0.05	**0.04**	**0.02**
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	**0.02**	0.02
Plaice	0.01	0.01	***0.02***	0.04	0.04	**0.02**
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	**0.03**
GOM Winter Flounder	0.25	0.25	0.25	0.05	0.05	0.05
SNE/MA Winter Flounder	0.08	***0.28***	0.14	0.05	***0.20***	0.10
Redfish	0.01	0.01	0.01	0.04	0.04	**0.02**
White Hake	0.01	***0.02***	**0.01**	0.04	***0.03***	**0.02**
Pollock	0.06	**0.05**	***0.06***	0.06	***0.09***	**0.07**
Northern Windowpane	0.01	0.01	0.01	0.29	**0.19**	***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	**0.40**	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 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 51

To the

Northeast Multispecies FMP

Appendix IV

ABC Projection Output

GOM cod rebuild in 8 years base model

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 22 Jul 2013 14:48

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\REBUILD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_FMSY1470_CONSTANT_12CAT3767_THEN8YEAR.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	1470
2014	Landings	1470
2015	Landings	1470
2016	F-Mult	0.1390
2017	F-Mult	0.1390
2018	F-Mult	0.1390
2019	F-Mult	0.1390
2020	F-Mult	0.1390
2021	F-Mult	0.1390
2022	F-Mult	0.1390
2023	F-Mult	0.1390
2024	F-Mult	0.1390
2025	F-Mult	0.1390
2026	F-Mult	0.1390
2027	F-Mult	0.1390
2028	F-Mult	0.1390
2029	F-Mult	0.1390
2030	F-Mult	0.1390

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	9.1991	2.2879
2013	9.6480	2.7989
2014	12.2739	3.3445
2015	17.2239	4.3152
2016	24.2777	6.1521
2017	30.9844	7.7022
2018	36.4432	8.6993
2019	41.0249	9.4031
2020	46.5034	10.0111
2021	52.1395	11.1843
2022	56.1209	11.6500
2023	58.9579	11.8806
2024	60.9938	12.0346
2025	62.4579	12.0540
2026	63.5621	12.0904
2027	64.3580	12.1483
2028	64.9156	12.2382
2029	65.3385	12.2976
2030	65.6298	12.3434

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	4.0939	5.4892	6.1803	7.6922	9.3551	11.2834	13.2972	14.6085	17.2061
2014	5.6742	7.3142	8.2201	9.9385	11.9494	14.2030	16.6306	18.3527	21.2871

2015	8.7431	10.8678	12.0589	14.1991	16.7950	19.8633	22.9812	24.9867	28.9419
2016	12.9987	15.6086	17.1487	20.0234	23.5500	27.7174	32.3090	35.5021	42.6640
2017	17.2890	20.2510	22.1903	25.5592	29.9829	35.1541	41.1676	45.3931	53.9325
2018	21.0308	24.3464	26.4205	30.2025	35.2727	41.2609	48.3558	52.5123	61.8400
2019	24.3045	27.9083	30.0577	34.2745	39.7563	46.5198	53.6538	58.4374	68.0871
2020	28.6386	32.4385	34.7852	39.3459	45.1919	52.4564	59.9328	64.8606	75.3200
2021	31.7461	36.2267	38.9757	44.1587	50.7730	58.8375	67.1149	72.6232	83.7272
2022	34.4294	39.1784	42.2418	47.7698	54.8003	63.1665	71.5737	77.1992	88.7143
2023	36.6518	41.5746	44.6767	50.4914	57.7101	66.1338	74.6641	80.3908	92.1335
2024	37.9531	43.2922	46.5905	52.4671	59.9085	68.2247	77.0136	82.6587	94.8282
2025	39.4038	44.6379	47.8534	53.8568	61.3587	69.6789	78.5069	83.9816	95.6171
2026	40.4168	45.6801	48.9800	54.9834	62.5288	71.0202	79.7629	85.2789	96.1233
2027	41.2061	46.5531	49.6548	55.6402	63.1609	71.8662	80.7944	86.3033	96.9543
2028	41.6838	46.9429	50.2344	56.1014	63.6612	72.3427	81.3401	86.9195	97.9094
2029	42.4304	47.2259	50.4593	56.4419	64.1709	72.8866	81.9242	87.4851	98.9524
2030	42.4453	47.5134	50.8172	56.6691	64.3661	73.2502	82.2811	87.7635	98.7426

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	13.4228	3.2496
2014	17.8732	4.1259
2015	24.5581	5.8120
2016	33.0830	8.0717
2017	40.5697	9.6577
2018	46.5215	10.6257
2019	51.5040	11.2731
2020	57.4677	11.8326
2021	63.5981	13.0137
2022	67.9431	13.4957
2023	71.0566	13.7545
2024	73.2907	13.9292
2025	74.8976	13.9481
2026	76.1099	13.9885
2027	76.9657	14.0744
2028	77.5515	14.1795
2029	78.0120	14.2239
2030	78.3356	14.2612

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	9.7193	11.7556	12.9126	14.9832	17.4809	20.4088	23.3523	25.3186	28.9525
2015	13.7488	16.2307	17.7914	20.5507	23.8978	27.8458	32.1798	35.1157	41.6345
2016	18.4367	21.8048	23.7447	27.4644	32.0721	37.5248	43.7353	48.0976	57.2831
2017	23.3240	27.0417	29.4276	33.6873	39.3132	45.8699	53.4478	58.5972	68.5782
2018	27.6155	31.6091	34.1993	38.9274	45.0092	52.7399	60.8079	66.0579	77.1474
2019	31.2609	35.6158	38.3641	43.4230	50.0404	58.2187	66.5344	72.1116	84.3096
2020	35.8767	40.6059	43.5169	49.0386	56.0459	64.5384	73.2343	79.1948	90.8322
2021	39.4141	44.8754	48.1069	54.2797	62.1227	71.3860	80.9754	87.4597	99.4583
2022	42.4011	48.1922	51.8350	58.3352	66.6082	76.1316	85.8673	92.1185	105.1436
2023	44.7968	50.8014	54.5619	61.3404	69.7209	79.4626	89.2989	95.6166	109.4327
2024	46.4211	52.6208	56.4148	63.3705	72.0925	81.6891	91.8993	98.0748	112.2506
2025	48.0673	54.0945	57.9582	64.9454	73.5890	83.4497	93.3259	100.0918	112.9112
2026	48.8582	55.4526	59.1824	66.1657	74.8844	84.8221	95.0154	101.1734	113.1451
2027	49.8388	56.2978	59.9870	66.9112	75.6410	85.6538	95.8834	102.1566	114.1772
2028	50.7384	56.5107	60.3991	67.4070	76.1409	86.2494	96.6146	102.9635	115.9210
2029	51.2515	56.9599	60.7760	67.7033	76.6775	86.8319	97.0096	103.5740	116.8360
2030	51.0273	57.3685	61.1467	67.9830	77.0024	87.2709	97.5009	103.7980	116.1428

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	14.3147	3.3501
2013	16.7918	3.8990
2014	23.0582	5.3199
2015	31.6784	7.8038
2016	40.4743	10.0672
2017	47.7693	11.4314
2018	53.7006	12.2896
2019	58.7773	12.8674
2020	64.1984	13.2966
2021	69.3869	14.0270
2022	73.0713	14.3553
2023	75.7350	14.5555
2024	77.6621	14.6938
2025	79.0617	14.7297
2026	80.1001	14.7878
2027	80.8319	14.8924
2028	81.3196	14.9849
2029	81.7026	14.9965
2030	81.9749	15.0197

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	8.9265	10.9718	12.0857	14.0387	16.4543	19.1872	21.9486	23.8273	27.1726
2014	12.8715	15.4133	16.8228	19.3706	22.4347	26.1032	30.0884	32.7071	38.3022
2015	17.7640	21.0188	22.7678	26.2052	30.6233	35.9214	41.8697	46.1162	55.7653
2016	23.0102	26.5946	29.0093	33.3094	39.1336	45.8817	53.8070	59.3794	70.0229
2017	27.8332	31.9181	34.6043	39.5963	46.2287	54.2555	63.3858	69.0184	81.1392
2018	31.9283	36.4334	39.3500	44.9177	52.0564	60.8910	70.1944	76.2261	89.3290
2019	35.5926	40.6253	43.6507	49.5554	57.2007	66.4092	76.0642	82.2228	95.6722
2020	39.8090	45.0408	48.4507	54.7539	62.6065	72.2488	82.0357	88.8382	101.5196
2021	43.1130	48.8956	52.6284	59.3515	67.8574	77.9145	88.0508	94.8846	108.1695
2022	45.6558	52.0152	55.8553	62.8707	71.6845	81.9094	92.0175	98.7128	112.4881
2023	47.7595	54.1914	58.2279	65.3755	74.3390	84.3666	95.1369	101.6937	116.1811
2024	49.5074	55.9653	59.8156	67.1423	76.3352	86.6164	97.3689	104.0711	117.3763
2025	50.6438	57.2374	61.2634	68.5979	77.7658	88.1875	98.8233	105.4553	118.6280
2026	51.3810	58.4685	62.1863	69.5357	78.6894	89.2722	100.0705	106.4790	119.7543
2027	52.5007	58.9332	62.8723	70.1726	79.3128	89.8665	100.9259	107.5340	120.8773
2028	53.3903	59.2612	63.2366	70.5050	79.7882	90.5529	101.5309	108.4660	121.8035
2029	53.1253	59.5917	63.5203	70.8399	80.3218	91.0777	101.9206	108.4275	122.2614
2030	53.3745	60.0106	63.9226	71.0962	80.6420	91.2604	102.0282	108.8565	121.7962

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	3.0915	0.8004
2017	4.0551	1.0556
2018	4.8772	1.2209
2019	5.5871	1.3514
2020	6.3396	1.4513
2021	7.0609	1.5822
2022	7.5717	1.6314
2023	7.9319	1.6550

2024	8.1917	1.6707
2025	8.3809	1.6749
2026	8.5233	1.6832
2027	8.6256	1.6914
2028	8.7026	1.7014
2029	8.7577	1.7116
2030	8.7931	1.7181

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	1.5998	1.9654	2.1681	2.5387	2.9927	3.5410	4.1361	4.5697	5.5075
2017	2.2120	2.6216	2.8554	3.3128	3.9147	4.6186	5.4248	6.0317	7.2708
2018	2.7656	3.2014	3.4797	4.0026	4.7003	5.5367	6.5264	7.1650	8.4737
2019	3.2492	3.7273	4.0248	4.6188	5.3944	6.3603	7.4218	8.1071	9.4782
2020	3.7862	4.3078	4.6510	5.3008	6.1510	7.2014	8.2983	9.0011	10.6184
2021	4.2158	4.8176	5.2134	5.9305	6.8514	7.9979	9.1740	9.9989	11.5886
2022	4.5725	5.2193	5.6339	6.4118	7.3776	8.5568	9.7352	10.5532	12.1033
2023	4.8485	5.5346	5.9643	6.7454	7.7487	8.9357	10.1160	10.9105	12.5429
2024	5.0437	5.7605	6.2009	7.0010	8.0162	9.1969	10.3967	11.1918	12.8416
2025	5.2157	5.9288	6.3518	7.1799	8.2313	9.3811	10.6206	11.3765	12.9769
2026	5.3346	6.0252	6.4935	7.3210	8.3618	9.5549	10.7791	11.5768	13.1490
2027	5.4618	6.1471	6.5848	7.4094	8.4556	9.6546	10.9072	11.6579	13.1681
2028	5.5123	6.2309	6.6781	7.4788	8.5203	9.7291	11.0011	11.7656	13.3340
2029	5.5795	6.2498	6.7042	7.5200	8.5880	9.7861	11.0692	11.8598	13.4331
2030	5.6017	6.2937	6.7216	7.5470	8.6100	9.8529	11.1150	11.8701	13.4732

Landings x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	3.0915	0.8004
2017	4.0551	1.0556
2018	4.8772	1.2209
2019	5.5871	1.3514
2020	6.3396	1.4513
2021	7.0609	1.5822
2022	7.5717	1.6314
2023	7.9319	1.6550
2024	8.1917	1.6707
2025	8.3809	1.6749
2026	8.5233	1.6832
2027	8.6256	1.6914
2028	8.7026	1.7014
2029	8.7577	1.7116
2030	8.7931	1.7181

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	1.5998	1.9654	2.1681	2.5387	2.9927	3.5410	4.1361	4.5697	5.5075

2017	2.2120	2.6216	2.8554	3.3128	3.9147	4.6186	5.4248	6.0317	7.2708
2018	2.7656	3.2014	3.4797	4.0026	4.7003	5.5367	6.5264	7.1650	8.4737
2019	3.2492	3.7273	4.0248	4.6188	5.3944	6.3603	7.4218	8.1071	9.4782
2020	3.7862	4.3078	4.6510	5.3008	6.1510	7.2014	8.2983	9.0011	10.6184
2021	4.2158	4.8176	5.2134	5.9305	6.8514	7.9979	9.1740	9.9989	11.5886
2022	4.5725	5.2193	5.6339	6.4118	7.3776	8.5568	9.7352	10.5532	12.1033
2023	4.8485	5.5346	5.9643	6.7454	7.7487	8.9357	10.1160	10.9105	12.5429
2024	5.0437	5.7605	6.2009	7.0010	8.0162	9.1969	10.3967	11.1918	12.8416
2025	5.2157	5.9288	6.3518	7.1799	8.2313	9.3811	10.6206	11.3765	12.9769
2026	5.3346	6.0252	6.4935	7.3210	8.3618	9.5549	10.7791	11.5768	13.1490
2027	5.4618	6.1471	6.5848	7.4094	8.4556	9.6546	10.9072	11.6579	13.1681
2028	5.5123	6.2309	6.6781	7.4788	8.5203	9.7291	11.0011	11.7656	13.3340
2029	5.5795	6.2498	6.7042	7.5200	8.5880	9.7861	11.0692	11.8598	13.4331
2030	5.6017	6.2937	6.7216	7.5470	8.6100	9.8529	11.1150	11.8701	13.4732

Total Fishing Mortality

Year	Average	StdDev
2012	0.4853	0.1465
2013	0.1744	0.0640
2014	0.1446	0.0525
2015	0.1025	0.0297
2016	0.1390	0.0000
2017	0.1390	0.0000
2018	0.1390	0.0000
2019	0.1390	0.0000
2020	0.1390	0.0000
2021	0.1390	0.0000
2022	0.1390	0.0000
2023	0.1390	0.0000
2024	0.1390	0.0000
2025	0.1390	0.0000
2026	0.1390	0.0000
2027	0.1390	0.0000
2028	0.1390	0.0000
2029	0.1390	0.0000
2030	0.1390	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	0.0838	0.1003	0.1109	0.1315	0.1605	0.2007	0.2583	0.2956	0.4251
2014	0.0702	0.0831	0.0923	0.1099	0.1346	0.1654	0.2115	0.2410	0.3362
2015	0.0552	0.0643	0.0704	0.0820	0.0975	0.1172	0.1399	0.1580	0.2049
2016	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2017	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2018	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2019	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2020	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2021	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2022	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2023	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2024	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2025	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2026	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2027	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2028	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2029	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390
2030	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390	0.1390

Probability Spawning Stock Biomass Exceeds Threshold 54.743 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000100
2017	0.008500
2018	0.035600
2019	0.087000
2020	0.192100
2021	0.362900
2022	0.501700
2023	0.607600
2024	0.674100
2025	0.722200
2026	0.756900
2027	0.776800
2028	0.792700
2029	0.798800
2030	0.803500

Probability Threshold Exceeded at Least Once = 0.9180

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	0.015300
2017	0.083700
2018	0.200800
2019	0.341100
2020	0.545300
2021	0.736700
2022	0.843000
2023	0.897300
2024	0.925900
2025	0.943200
2026	0.957800
2027	0.964600
2028	0.968900
2029	0.970600
2030	0.974000

Probability Threshold Exceeded at Least Once = 0.9940

Probability Mean Biomass Exceeds Threshold 54.743 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.011500
2016	0.089300
2017	0.238800

2018	0.408900
2019	0.581000
2020	0.750400
2021	0.862600
2022	0.916600
2023	0.944700
2024	0.961100
2025	0.970300
2026	0.976800
2027	0.980400
2028	0.983600
2029	0.984600
2030	0.985300

Probability Threshold Exceeded at Least Once = 0.9979

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	1.000000
2013	0.350300
2014	0.191100
2015	0.021600
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

GOM cod rebuild in 8 years M-ramp model

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE_M_SPLIT_M2_M2

Date & Time of Run: 22 Jul 2013 15:26

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\REBUILD\GOMCOD_SAW55_3BLOCK_BASE_M_SPLIT_SHORT_M2_M2_12CAT3767_THEN8YEAR.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 39
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	1470
2014	Landings	1470
2015	Landings	1470
2016	F-Mult	0.1430
2017	F-Mult	0.1430
2018	F-Mult	0.1430
2019	F-Mult	0.1430
2020	F-Mult	0.1430
2021	F-Mult	0.1430
2022	F-Mult	0.1430
2023	F-Mult	0.1430
2024	F-Mult	0.1430
2025	F-Mult	0.1430
2026	F-Mult	0.1430
2027	F-Mult	0.1430
2028	F-Mult	0.1430
2029	F-Mult	0.1430
2030	F-Mult	0.1430
2031	F-Mult	0.1430
2032	F-Mult	0.1430
2033	F-Mult	0.1430
2034	F-Mult	0.1430
2035	F-Mult	0.1430
2036	F-Mult	0.1430
2037	F-Mult	0.1430
2038	F-Mult	0.1430
2039	F-Mult	0.1430
2040	F-Mult	0.1430
2041	F-Mult	0.1430
2042	F-Mult	0.1430
2043	F-Mult	0.1430

2044	F-Mult	0.1430
2045	F-Mult	0.1430
2046	F-Mult	0.1430
2047	F-Mult	0.1430
2048	F-Mult	0.1430
2049	F-Mult	0.1430
2050	F-Mult	0.1430

Recruits 1000 Fish

Year Class	Average	StdDev
2012	10058.1028	4439.1032
2013	9940.3706	4451.2362
2014	10024.7462	4508.9494
2015	10025.6013	4459.7690
2016	9991.5194	4481.5210
2017	10077.8413	4484.5670
2018	10047.7273	4503.3431
2019	9988.7153	4503.3791
2020	10010.8671	4432.4609
2021	10045.0329	4478.2887
2022	9890.5273	4374.0231
2023	9892.2672	4408.6661
2024	10071.0822	4541.7368
2025	10016.8327	4474.6771
2026	10043.3856	4470.1960
2027	9987.6612	4439.2783
2028	9971.5524	4431.6694
2029	10002.3623	4514.2320
2030	9936.6360	4417.4206
2031	10006.2981	4456.4337
2032	10040.9340	4551.7106
2033	9973.6762	4439.1311
2034	10024.6770	4468.0711
2035	9908.1500	4406.2212
2036	9993.2555	4483.1040
2037	9999.2057	4431.6129
2038	10006.8649	4441.0846
2039	9944.4177	4388.3565
2040	10018.3914	4443.6823
2041	10061.3157	4517.8095
2042	10008.5719	4445.6926
2043	10002.3279	4520.6819
2044	9991.5898	4460.7130
2045	10063.4908	4443.4921
2046	9961.2532	4423.8337
2047	9911.9273	4478.2196
2048	10041.6312	4445.9568
2049	10022.4676	4439.8044
2050	9979.8614	4458.1431

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3020.9780	4503.6300	4829.5200	6275.1260	9479.5970	12328.7900	14871.0700	16299.9000	26161.4600
2013	3029.9060	4442.8980	4811.6180	6036.9770	9360.8365	12265.3200	14736.5000	16251.0900	26559.0000
2014	3007.6790	4461.8370	4827.2380	6055.1110	9450.9240	12517.0100	14939.9800	16291.7100	26565.9400
2015	3071.0210	4504.7800	4833.4730	6191.6660	9428.5100	12340.7400	14802.3500	16232.5800	26395.1400
2016	3011.3470	4461.8720	4822.0090	6041.2330	9432.3230	12312.9300	14720.3100	16312.5500	26770.0500
2017	3011.7560	4490.5130	4831.4580	6166.4120	9484.2570	12679.0200	14949.2500	16319.7100	26668.9000
2018	3130.4210	4476.8170	4822.4390	6159.7290	9401.3055	12448.1400	14907.9300	16260.0300	26992.4900
2019	3005.3570	4471.6130	4826.1740	6099.8320	9379.0890	12291.2600	14746.6600	16264.1700	27226.0000

2020	3058.5760	4461.3210	4822.2410	6181.8390	9445.3790	12319.6800	14812.2400	16275.3600	26142.8100
2021	2947.0880	4448.7280	4821.0780	6205.6100	9423.7690	12653.2100	14891.9600	16309.4700	26515.4200
2022	2934.9920	4455.4630	4822.7950	5970.6940	9316.8265	11957.8900	14743.5900	16210.4000	25747.8500
2023	2965.9310	4421.8340	4809.2580	5987.8450	9314.4845	12025.4000	14663.9100	16209.6800	26195.9000
2024	3153.9860	4531.3640	4830.9370	6201.5510	9418.8595	12158.1600	14885.7500	16261.4400	27165.9300
2025	3079.5130	4502.1800	4827.5620	6124.1990	9379.4085	12372.6000	14922.0100	16295.4300	26723.8700
2026	2968.4180	4458.6270	4829.7840	6178.5120	9428.4215	12475.1800	14902.3800	16329.2000	26425.2200
2027	3055.2640	4492.1920	4830.9120	6083.5340	9393.0485	12342.3600	14803.2800	16311.2200	26331.2200
2028	3030.9150	4504.4140	4837.9410	6114.5760	9381.8485	12042.2800	14850.2500	16253.8200	26798.7700
2029	3061.2670	4500.0350	4823.3300	6036.3810	9369.2665	12316.4400	14886.9500	16313.2600	26714.7200
2030	2970.6530	4451.4740	4813.9170	5977.6940	9389.6670	12313.4500	14865.4700	16237.6400	26306.8900
2031	2992.8850	4446.6490	4823.0200	6127.5130	9438.7760	12209.2300	14899.5800	16283.2300	26594.9400
2032	3008.5070	4458.0880	4818.0040	6148.4640	9367.8915	12487.9800	15036.9300	16378.9800	26738.0200
2033	3059.0760	4482.4310	4823.0910	6069.8810	9388.2900	12209.9200	14737.5600	16268.1700	26462.5900
2034	3010.9020	4451.1080	4829.2420	6105.4570	9437.4725	12422.4700	15015.4500	16349.1700	25956.8200
2035	2975.8300	4446.0980	4818.9390	6063.0810	9296.1935	12067.9600	14637.4300	16277.3000	26383.3700
2036	2960.0990	4402.0950	4815.1480	6074.9700	9431.0390	12294.7500	14863.9100	16267.0700	26731.4200
2037	3069.2460	4464.7250	4817.6030	6110.4590	9427.7230	12358.4200	14822.1800	16288.0700	26252.1300
2038	3000.1050	4460.6700	4825.2650	6163.0130	9432.9280	12410.0600	14892.7400	16229.7700	26109.6900
2039	3003.8760	4469.4130	4825.4850	6143.2760	9402.4215	11998.4200	14627.2800	16128.0200	26561.8000
2040	3019.7470	4445.1400	4819.7600	6224.3790	9429.0435	12268.4300	14698.8200	16262.9900	26301.3300
2041	3005.7710	4474.3530	4825.4260	6173.6990	9406.4645	12519.4400	14986.2500	16344.1300	27088.7700
2042	3066.6870	4494.5820	4836.6150	6152.5690	9327.9995	12280.2800	14885.9700	16324.0200	26044.1200
2043	2971.4440	4459.9760	4823.8500	6090.8010	9406.0175	12270.8400	14774.9000	16289.9900	27271.1300
2044	3028.0240	4487.0150	4829.0030	6115.5260	9386.4090	12389.5300	14793.5900	16301.4700	26653.9000
2045	2976.3410	4500.3460	4826.2160	6233.1870	9443.9725	12587.3400	14930.9200	16244.1800	26266.2300
2046	3124.6270	4499.7390	4832.7620	6129.9440	9342.9530	12058.6600	14706.9700	16306.1200	26487.0600
2047	3077.1980	4429.3370	4802.9320	5874.5780	9345.0220	12071.9000	14647.0700	16244.5800	26643.0700
2048	2996.8680	4523.5630	4831.3220	6206.8060	9460.8485	12440.1600	14801.2200	16274.4800	26297.6200
2049	3049.1950	4489.0730	4832.1420	6163.1290	9428.9315	12344.5500	14744.4900	16250.4600	26315.7700
2050	2968.9680	4461.3600	4824.5270	6110.2510	9370.2365	12322.2400	14811.1200	16289.2500	26421.5600

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	8.3745	2.0471
2013	9.3931	2.5736
2014	14.0190	3.1893
2015	22.5242	4.2542
2016	33.5430	6.1474
2017	43.2545	7.7400
2018	51.4336	8.7184
2019	58.7550	9.3923
2020	68.2184	10.0384
2021	75.8448	11.2442
2022	81.1393	11.8434
2023	84.9110	12.1897
2024	87.5706	12.2859
2025	89.4111	12.3434
2026	90.6961	12.3636
2027	91.5868	12.3629
2028	92.2477	12.3778
2029	92.7614	12.3241
2030	93.1169	12.2746
2031	93.2798	12.2397
2032	93.4069	12.2038
2033	93.5689	12.2517
2034	93.6518	12.2578
2035	93.7347	12.2563
2036	93.7779	12.2513
2037	93.7960	12.2275
2038	93.7935	12.2369

2039	93.7522	12.2375
2040	93.7692	12.3058
2041	93.8069	12.3451
2042	93.7953	12.2528
2043	93.8056	12.2053
2044	93.7973	12.1525
2045	93.8639	12.2487
2046	93.9070	12.2994
2047	93.9254	12.2932
2048	93.9260	12.2956
2049	93.9596	12.2999
2050	93.9575	12.3521

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.3829	5.3626	5.8672	6.9163	8.1955	9.6963	11.1620	11.9135	13.8862
2013	4.5507	5.6196	6.3099	7.5625	9.0940	11.0455	12.9541	13.9595	16.6594
2014	7.9863	9.3324	10.1967	11.7034	13.6494	16.0378	18.3205	19.6740	22.7246
2015	14.1837	16.0958	17.3453	19.5548	22.1556	25.1214	28.1965	30.1889	34.1116
2016	21.4128	24.1977	26.1583	29.2977	33.0887	37.1370	41.5890	44.5922	50.5547
2017	27.6507	31.6751	33.9605	37.8547	42.7126	47.8977	53.1484	57.3026	64.8358
2018	33.7552	38.4288	40.9184	45.3985	50.7739	56.6964	62.7341	66.9822	75.2666
2019	39.2631	44.4178	47.3855	52.2553	58.1503	64.4811	71.0480	75.5679	83.5097
2020	47.8029	52.7660	55.9065	61.3338	67.6478	74.3136	81.4083	86.1414	94.9258
2021	52.7980	58.3740	62.0297	68.1175	75.2395	82.7492	90.5340	95.6919	105.6394
2022	56.8122	62.8291	66.4618	72.9063	80.3757	88.4549	96.5496	102.0704	112.1181
2023	59.7407	66.1238	69.8940	76.4145	84.2900	92.5179	100.9220	106.4320	116.6235
2024	61.9166	68.8895	72.5183	79.1116	86.8093	95.2373	103.7979	109.0632	119.9027
2025	63.8313	70.3403	74.2897	80.8333	88.7331	97.1838	105.5142	110.8488	121.4809
2026	64.9801	71.6187	75.4310	82.1142	89.8482	98.6120	107.0898	112.0427	122.1242
2027	65.8679	72.4982	76.3172	83.0981	90.7276	99.4295	107.9503	113.0058	123.0129
2028	66.5951	73.0626	76.9799	83.6964	91.5952	100.0257	108.2764	113.7791	124.4131
2029	67.0618	73.7570	77.6182	84.2834	92.0918	100.5000	108.7003	113.9150	124.7897
2030	67.1524	74.1141	77.9677	84.6415	92.4127	100.8602	108.9727	114.3829	125.4283
2031	67.5885	74.3107	78.1401	84.9104	92.7301	100.8495	109.2897	114.3645	125.1838
2032	67.7621	74.7195	78.4402	84.9868	92.6882	101.1017	109.0897	114.5377	125.3481
2033	68.0669	74.7747	78.4584	85.0689	92.8568	101.1908	109.5880	114.8458	126.3922
2034	67.7929	74.8796	78.6880	85.1240	92.9457	101.4397	109.4849	114.9693	126.3275
2035	67.2676	74.7629	78.7512	85.2741	93.0359	101.5151	109.4120	114.8506	125.9057
2036	67.6058	74.9238	78.6943	85.4870	93.0930	101.4367	109.6048	114.9480	125.9411
2037	67.5797	74.9028	78.8378	85.3652	93.0790	101.5385	109.7696	115.1506	125.5282
2038	67.5021	75.1033	78.7624	85.2748	92.9729	101.6311	109.8859	115.2434	125.0723
2039	67.9650	74.9110	78.6291	85.2994	92.9790	101.5659	109.9452	115.1773	125.4080
2040	68.4192	74.9470	78.5659	85.2240	93.0806	101.5509	109.6555	115.2975	125.9952
2041	68.7026	74.5873	78.5716	85.1428	93.1063	101.6669	109.9608	115.3088	126.4585
2042	68.7261	74.6789	78.5031	85.1669	93.1691	101.5419	109.8053	114.9837	126.0943
2043	68.6711	74.9502	78.6968	85.2514	93.1877	101.4073	109.6152	114.7231	125.4908
2044	68.4962	74.9103	78.7663	85.3748	93.2558	101.3977	109.6053	115.0894	125.1205
2045	68.1433	75.0351	78.5776	85.3238	93.1920	101.6238	109.6574	115.2462	125.2398
2046	68.3608	74.8675	78.7520	85.3366	93.2620	101.7061	109.7537	115.3970	125.5965
2047	68.4586	75.2441	78.9161	85.3493	93.0760	101.6843	109.9069	115.3518	127.0003
2048	68.7751	75.1768	78.9842	85.4190	93.0120	101.5898	109.8590	115.4323	126.9146
2049	68.9348	75.2695	78.9369	85.4666	93.1058	101.7215	110.1210	115.3239	126.6923
2050	68.6185	75.2324	78.9159	85.3009	93.2035	101.6484	110.2252	115.4742	126.4898

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.5504	2.5212
2013	14.9485	3.1035
2014	22.5391	4.0638

2015	33.2986	5.8110
2016	46.3201	8.0989
2017	57.0482	9.6892
2018	65.9733	10.6323
2019	73.9640	11.3096
2020	84.2826	11.9688
2021	92.5794	13.1977
2022	98.3392	13.8251
2023	102.4388	14.1644
2024	105.3003	14.2439
2025	107.2815	14.2848
2026	108.7074	14.3089
2027	109.7147	14.3128
2028	110.4484	14.3134
2029	110.9989	14.2407
2030	111.3694	14.1825
2031	111.5354	14.1536
2032	111.6655	14.1358
2033	111.8496	14.1981
2034	111.9565	14.1999
2035	112.0515	14.1920
2036	112.0888	14.1742
2037	112.0896	14.1563
2038	112.0808	14.1719
2039	112.0488	14.1716
2040	112.0731	14.2204
2041	112.1103	14.2513
2042	112.1074	14.1588
2043	112.1402	14.1301
2044	112.1374	14.1144
2045	112.2006	14.2386
2046	112.2441	14.2658
2047	112.2681	14.2409
2048	112.2525	14.2401
2049	112.2661	14.2435
2050	112.2722	14.2910

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.8705	8.8913	9.5365	10.7571	12.2647	14.1628	15.9815	16.9840	19.8072
2013	9.0118	10.3617	11.2181	12.7063	14.6211	16.9162	19.1351	20.4228	23.5111
2014	14.5414	16.3840	17.5764	19.6955	22.2034	25.0577	27.9477	29.8188	33.5185
2015	21.8288	24.4307	26.2787	29.3130	32.8354	36.7201	41.0350	43.6942	49.1231
2016	30.0565	34.1193	36.5421	40.6787	45.7605	51.1660	56.7293	60.9569	68.8161
2017	37.5012	42.4901	45.3350	50.2782	56.3644	62.9206	69.4637	74.4176	83.6984
2018	44.1677	49.7773	53.0451	58.6013	65.2643	72.3551	79.8231	84.9356	94.1132
2019	50.8556	56.6631	60.2023	66.0892	73.2238	80.8474	88.7737	94.0883	103.7519
2020	59.8673	65.7813	69.5680	75.9929	83.5018	91.6647	99.9170	105.4091	115.6344
2021	65.4467	72.1151	76.3417	83.4491	91.8399	100.7350	109.6904	115.7566	127.0520
2022	69.5509	76.9888	81.1793	88.8297	97.4779	106.9994	116.2922	122.8339	134.3342
2023	72.9076	80.6011	85.0979	92.7378	101.5750	111.3263	121.1956	127.4685	139.7799
2024	75.6496	83.4101	87.6984	95.5032	104.4875	114.2286	123.9709	130.1450	142.4538
2025	77.2627	85.1870	89.5782	97.3601	106.4413	116.2174	126.0870	131.9142	144.2407
2026	78.6182	86.5053	90.9733	98.8571	107.7242	117.8262	127.7600	133.5675	144.7592
2027	79.8725	87.4618	91.9164	99.8790	108.8824	118.8227	128.4361	134.5541	146.4089
2028	80.6408	88.1116	92.8344	100.5044	109.6881	119.5353	128.9546	135.2070	147.9992
2029	80.8118	88.9352	93.5533	101.1233	110.2049	120.0524	129.4151	135.7633	148.0152
2030	81.1885	89.4150	93.8177	101.7388	110.5319	120.2306	129.8888	136.0289	148.7979
2031	81.7571	89.5344	94.1120	101.8099	110.8453	120.4247	129.8869	135.8631	148.7850
2032	81.9854	89.8350	94.2761	101.8547	110.8533	120.6885	129.9190	136.1137	148.6484
2033	82.1013	90.0712	94.3183	102.0010	111.0052	120.7647	130.4253	136.2565	149.4027

2034	81.4446	90.1469	94.4338	102.2051	111.1142	120.9797	130.3002	136.7178	148.5885
2035	81.3338	89.8927	94.7453	102.4321	111.2881	121.1185	130.2651	136.6749	149.1452
2036	81.8842	90.1006	94.7359	102.4585	111.2991	121.1454	130.3407	136.4670	149.1910
2037	81.8355	90.3926	94.8368	102.3394	111.2091	121.1215	130.5320	137.0770	148.5751
2038	82.0679	90.6265	94.6957	102.2792	111.2033	121.1949	130.6967	136.8604	148.8122
2039	82.5302	90.2621	94.5119	102.2522	111.2634	121.1705	130.4563	136.8569	148.4256
2040	82.9210	90.1536	94.3073	102.1291	111.3343	121.0841	130.6479	136.5547	149.2495
2041	83.0978	89.8718	94.3665	102.2145	111.3799	121.1060	130.7938	136.6099	149.2876
2042	82.8172	90.0427	94.4618	102.2020	111.5791	121.1381	130.3896	136.1474	148.6445
2043	82.6210	90.2300	94.5556	102.3065	111.4605	121.0480	130.2375	136.4316	148.1436
2044	82.5486	90.3170	94.6946	102.1935	111.4217	121.0350	130.5159	136.6786	148.0171
2045	82.2675	90.3979	94.4583	102.2238	111.4123	121.1658	130.5193	137.2839	148.7819
2046	82.4145	90.3662	94.7799	102.2369	111.5222	121.2606	130.8446	137.0752	149.0112
2047	82.9086	90.5092	94.8969	102.3863	111.2489	121.3127	130.8653	136.7762	150.6260
2048	82.9899	90.5186	94.7794	102.4293	111.3221	121.0836	130.8691	136.9316	150.6939
2049	83.0877	90.4905	94.8207	102.2226	111.2517	121.0260	131.0376	137.0499	150.1175
2050	82.6011	90.3611	94.8459	102.3051	111.4207	121.1673	131.1953	137.1473	149.6703

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	14.7715	3.1646
2013	20.2952	3.8333
2014	31.0621	5.3492
2015	44.6153	7.8704
2016	57.4985	10.1232
2017	67.9800	11.4613
2018	76.9418	12.2906
2019	84.8426	12.9457
2020	93.7580	13.5443
2021	100.7544	14.3693
2022	105.6189	14.8157
2023	109.0599	15.0288
2024	111.4401	15.0469
2025	113.0825	15.0522
2026	114.2800	15.0611
2027	115.1766	15.0627
2028	115.8281	15.0378
2029	116.2789	14.9706
2030	116.5743	14.9067
2031	116.7106	14.8969
2032	116.8212	14.9074
2033	116.9733	14.9594
2034	117.0708	14.9625
2035	117.1629	14.9600
2036	117.1811	14.9474
2037	117.1623	14.9273
2038	117.1445	14.9512
2039	117.1299	14.9559
2040	117.1565	14.9583
2041	117.1833	14.9384
2042	117.1902	14.8585
2043	117.2403	14.8808
2044	117.2692	14.9282
2045	117.3175	15.0446
2046	117.3502	15.0560
2047	117.3722	15.0321
2048	117.3495	15.0241
2049	117.3351	15.0094
2050	117.3242	15.0239

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	8.6123	10.1053	10.9720	12.5220	14.4023	16.8029	19.1009	20.3910	23.6077
2013	12.8262	14.5660	15.6990	17.5634	19.9692	22.7019	25.3441	27.1420	30.6958
2014	20.4195	22.8920	24.6093	27.3944	30.5974	34.2672	38.1943	40.6826	45.6720
2015	29.1131	32.7120	35.1769	39.1020	44.0718	49.1413	54.7871	58.7313	66.8636
2016	37.2572	42.3563	45.3059	50.4374	56.8221	63.6064	70.3095	75.8438	85.6321
2017	44.5572	50.6543	54.1538	60.0435	67.1310	74.8679	82.9572	88.3666	98.9344
2018	51.7430	58.0291	61.9775	68.3953	76.1301	84.3597	93.2068	99.0631	109.8843
2019	58.5187	64.8798	68.9986	75.9119	84.0372	92.7106	101.7992	107.7812	119.2007
2020	66.1877	72.8774	77.0501	84.3270	92.9445	102.1438	111.5628	117.6191	129.1057
2021	70.9982	78.4128	82.9862	90.8442	99.8855	109.8044	119.3295	126.0751	138.1309
2022	74.6401	82.8141	87.4474	95.4247	104.7383	114.9254	125.3032	131.7584	144.8917
2023	77.6101	85.9916	90.6437	98.6441	108.2003	118.2586	128.9403	135.3103	148.3424
2024	80.3663	88.2295	92.8162	101.1156	110.5108	120.8158	130.9587	137.6123	150.3349
2025	81.4466	89.8404	94.3363	102.7325	112.1009	122.5299	132.9726	139.1248	151.9670
2026	82.5959	90.9328	95.4715	103.8883	113.3737	123.7748	134.4080	140.8334	152.7394
2027	84.0757	91.7250	96.4463	104.6708	114.3638	124.6639	134.7788	141.4448	154.4549
2028	83.9464	92.6801	97.2073	105.5015	115.0158	125.2984	135.3063	141.8105	155.2619
2029	84.6210	93.0216	97.7349	106.0449	115.3553	125.7177	135.6411	142.2424	156.1295
2030	85.5031	93.4501	98.1514	106.4217	115.6909	125.7725	136.1486	142.0291	155.0834
2031	85.5298	93.5435	98.4173	106.3914	115.8512	125.9667	135.9912	142.4451	155.9253
2032	85.8419	93.8311	98.4334	106.5183	115.8761	126.3132	136.2011	142.4917	156.1548
2033	85.0657	94.0144	98.6325	106.6857	116.0061	126.4352	136.3454	142.9199	156.3357
2034	84.9912	93.8902	98.8234	106.8148	116.2538	126.6078	136.4647	143.0126	156.8593
2035	85.0169	93.7738	98.8701	107.0258	116.4068	126.6694	136.6801	142.9626	156.3259
2036	85.0454	93.9289	98.8061	106.9341	116.2524	126.7971	136.5735	143.2901	155.7385
2037	85.5968	94.4318	98.8299	106.8368	116.1963	126.7959	136.6379	143.1480	155.6773
2038	85.9544	94.2494	98.6532	106.7904	116.2541	126.7282	136.7913	143.0426	156.1769
2039	86.0315	93.9072	98.6470	106.7267	116.3249	126.6190	136.6671	143.1333	155.5996
2040	86.2394	94.0288	98.6046	106.6329	116.3006	126.6411	136.7484	142.9279	156.0638
2041	86.2887	93.9990	98.5083	106.8095	116.4297	126.7313	136.5639	142.9593	156.1966
2042	86.1562	94.0697	98.6859	106.7957	116.4542	126.6326	136.3532	142.5578	155.5872
2043	85.6379	94.2460	98.7455	106.8901	116.4855	126.5426	136.4069	142.7581	155.4703
2044	85.4390	94.4047	98.7940	106.8123	116.4327	126.7480	136.5887	143.3497	155.5096
2045	85.9968	94.4115	98.8357	106.7511	116.4698	126.7604	136.9125	143.4095	155.9266
2046	86.0003	94.5046	99.0424	106.8645	116.3501	126.7986	136.9496	143.7477	157.2853
2047	86.6235	94.6478	99.0458	106.9077	116.4766	126.7855	136.9074	143.3339	157.9119
2048	86.5207	94.5216	99.0848	106.8826	116.3845	126.7326	137.1094	143.3248	157.5093
2049	86.6014	94.3683	99.1018	106.8886	116.3529	126.6641	137.1385	143.5088	156.9886
2050	86.1318	94.2201	99.0192	106.8036	116.2790	126.8077	137.1083	143.3446	156.1626

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	4.4099	0.8250
2017	5.8688	1.0923
2018	7.1440	1.2639
2019	8.2709	1.3871
2020	9.5414	1.4872
2021	10.5452	1.6317
2022	11.2466	1.7005
2023	11.7430	1.7465
2024	12.0937	1.7620
2025	12.3405	1.7680
2026	12.5067	1.7697
2027	12.6162	1.7659
2028	12.7029	1.7673

2029	12.7713	1.7626
2030	12.8202	1.7569
2031	12.8455	1.7514
2032	12.8631	1.7462
2033	12.8836	1.7491
2034	12.8914	1.7517
2035	12.9001	1.7505
2036	12.9080	1.7533
2037	12.9112	1.7525
2038	12.9132	1.7508
2039	12.9066	1.7518
2040	12.9063	1.7612
2041	12.9111	1.7670
2042	12.9106	1.7522
2043	12.9097	1.7431
2044	12.9085	1.7362
2045	12.9197	1.7442
2046	12.9267	1.7556
2047	12.9292	1.7591
2048	12.9294	1.7618
2049	12.9364	1.7608
2050	12.9361	1.7665

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	2.7795	3.1510	3.4117	3.8471	4.3411	4.8950	5.5013	5.8877	6.6623
2017	3.7153	4.2296	4.5681	5.1097	5.7852	6.4931	7.2636	7.8480	9.0174
2018	4.6084	5.2690	5.6134	6.2590	7.0545	7.8980	8.7530	9.4057	10.6766
2019	5.4103	6.1592	6.6038	7.3135	8.1724	9.1062	10.0894	10.7585	12.0147
2020	6.5213	7.2613	7.7260	8.5105	9.4399	10.4595	11.4926	12.2158	13.5570
2021	7.2381	8.0208	8.5473	9.4302	10.4426	11.5418	12.6791	13.4473	14.8538
2022	7.7684	8.6231	9.1433	10.0533	11.1477	12.3036	13.4613	14.2330	15.7197
2023	8.1582	9.0496	9.5870	10.5327	11.6442	12.8377	14.0151	14.8239	16.2677
2024	8.4444	9.3936	9.9421	10.8785	11.9692	13.1966	14.4219	15.1808	16.7354
2025	8.6930	9.6137	10.1796	11.1126	12.2415	13.4435	14.6499	15.4086	16.9671
2026	8.8624	9.7789	10.3229	11.2886	12.3858	13.6299	14.8564	15.6014	17.0475
2027	8.9288	9.9019	10.4325	11.4020	12.4907	13.7145	14.9732	15.6752	17.1570
2028	9.0551	9.9593	10.5199	11.4799	12.6006	13.8165	15.0349	15.8082	17.3342
2029	9.1314	10.0747	10.5984	11.5466	12.6653	13.8800	15.0642	15.8133	17.4492
2030	9.1009	10.1233	10.6580	11.6148	12.7067	13.9318	15.1110	15.8809	17.4519
2031	9.1776	10.1382	10.6768	11.6524	12.7580	13.9290	15.1209	15.8454	17.4167
2032	9.2368	10.1839	10.7315	11.6577	12.7533	13.9548	15.1141	15.9060	17.4816
2033	9.2680	10.2048	10.7386	11.6857	12.7742	13.9858	15.1675	15.9287	17.6311
2034	9.2924	10.2130	10.7555	11.6745	12.7816	14.0050	15.1549	15.9489	17.5677
2035	9.2297	10.2087	10.7799	11.6975	12.7915	14.0002	15.1119	15.9682	17.5831
2036	9.1849	10.2079	10.7580	11.7185	12.8096	13.9887	15.1669	15.9273	17.6156
2037	9.1940	10.2000	10.7825	11.7185	12.7983	14.0159	15.2191	15.9465	17.4781
2038	9.2230	10.2255	10.7761	11.7045	12.7913	14.0198	15.2122	15.9980	17.4530
2039	9.2481	10.2302	10.7519	11.6949	12.7852	14.0229	15.2184	15.9819	17.3910
2040	9.2488	10.2082	10.7425	11.6800	12.8032	14.0169	15.1912	16.0105	17.5425
2041	9.3127	10.1772	10.7415	11.6695	12.8052	14.0370	15.2345	15.9934	17.5334
2042	9.3515	10.1917	10.7354	11.6728	12.8187	14.0376	15.1995	15.9348	17.5044
2043	9.3172	10.2274	10.7494	11.6814	12.7995	14.0046	15.1514	15.9048	17.4703
2044	9.3172	10.2075	10.7612	11.7085	12.8319	13.9871	15.1542	15.9188	17.4499
2045	9.2589	10.2525	10.7445	11.7109	12.8305	14.0140	15.1697	15.9709	17.4065
2046	9.2353	10.2244	10.7872	11.7037	12.8263	14.0401	15.2255	15.9925	17.4723
2047	9.3157	10.2619	10.7819	11.6935	12.8054	14.0317	15.2380	15.9903	17.5927

2048	9.3515	10.2449	10.7898	11.6961	12.8020	14.0111	15.2220	16.0326	17.7240
2049	9.3188	10.2706	10.7996	11.7216	12.8077	14.0427	15.2338	16.0278	17.6533
2050	9.3343	10.2757	10.7721	11.7080	12.8254	14.0302	15.2697	16.0201	17.6445

Landings x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	4.4099	0.8250
2017	5.8688	1.0923
2018	7.1440	1.2639
2019	8.2709	1.3871
2020	9.5414	1.4872
2021	10.5452	1.6317
2022	11.2466	1.7005
2023	11.7430	1.7465
2024	12.0937	1.7620
2025	12.3405	1.7680
2026	12.5067	1.7697
2027	12.6162	1.7659
2028	12.7029	1.7673
2029	12.7713	1.7626
2030	12.8202	1.7569
2031	12.8455	1.7514
2032	12.8631	1.7462
2033	12.8836	1.7491
2034	12.8914	1.7517
2035	12.9001	1.7505
2036	12.9080	1.7533
2037	12.9112	1.7525
2038	12.9132	1.7508
2039	12.9066	1.7518
2040	12.9063	1.7612
2041	12.9111	1.7670
2042	12.9106	1.7522
2043	12.9097	1.7431
2044	12.9085	1.7362
2045	12.9197	1.7442
2046	12.9267	1.7556
2047	12.9292	1.7591
2048	12.9294	1.7618
2049	12.9364	1.7608
2050	12.9361	1.7665

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	2.7795	3.1510	3.4117	3.8471	4.3411	4.8950	5.5013	5.8877	6.6623
2017	3.7153	4.2296	4.5681	5.1097	5.7852	6.4931	7.2636	7.8480	9.0174
2018	4.6084	5.2690	5.6134	6.2590	7.0545	7.8980	8.7530	9.4057	10.6766
2019	5.4103	6.1592	6.6038	7.3135	8.1724	9.1062	10.0894	10.7585	12.0147
2020	6.5213	7.2613	7.7260	8.5105	9.4399	10.4595	11.4926	12.2158	13.5570
2021	7.2381	8.0208	8.5473	9.4302	10.4426	11.5418	12.6791	13.4473	14.8538
2022	7.7684	8.6231	9.1433	10.0533	11.1477	12.3036	13.4613	14.2330	15.7197
2023	8.1582	9.0496	9.5870	10.5327	11.6442	12.8377	14.0151	14.8239	16.2677

2024	8.4444	9.3936	9.9421	10.8785	11.9692	13.1966	14.4219	15.1808	16.7354
2025	8.6930	9.6137	10.1796	11.1126	12.2415	13.4435	14.6499	15.4086	16.9671
2026	8.8624	9.7789	10.3229	11.2886	12.3858	13.6299	14.8564	15.6014	17.0475
2027	8.9288	9.9019	10.4325	11.4020	12.4907	13.7145	14.9732	15.6752	17.1570
2028	9.0551	9.9593	10.5199	11.4799	12.6006	13.8165	15.0349	15.8082	17.3342
2029	9.1314	10.0747	10.5984	11.5466	12.6653	13.8800	15.0642	15.8133	17.4492
2030	9.1009	10.1233	10.6580	11.6148	12.7067	13.9318	15.1110	15.8809	17.4519
2031	9.1776	10.1382	10.6768	11.6524	12.7580	13.9290	15.1209	15.8454	17.4167
2032	9.2368	10.1839	10.7315	11.6577	12.7533	13.9548	15.1141	15.9060	17.4816
2033	9.2680	10.2048	10.7386	11.6857	12.7742	13.9858	15.1675	15.9287	17.6311
2034	9.2924	10.2130	10.7555	11.6745	12.7816	14.0050	15.1549	15.9489	17.5677
2035	9.2297	10.2087	10.7799	11.6975	12.7915	14.0002	15.1119	15.9682	17.5831
2036	9.1849	10.2079	10.7580	11.7185	12.8096	13.9887	15.1669	15.9273	17.6156
2037	9.1940	10.2000	10.7825	11.7185	12.7983	14.0159	15.2191	15.9465	17.4781
2038	9.2230	10.2255	10.7761	11.7045	12.7913	14.0198	15.2122	15.9980	17.4530
2039	9.2481	10.2302	10.7519	11.6949	12.7852	14.0229	15.2184	15.9819	17.3910
2040	9.2488	10.2082	10.7425	11.6800	12.8032	14.0169	15.1912	16.0105	17.5425
2041	9.3127	10.1772	10.7415	11.6695	12.8052	14.0370	15.2345	15.9934	17.5334
2042	9.3515	10.1917	10.7354	11.6728	12.8187	14.0376	15.1995	15.9348	17.5044
2043	9.3172	10.2274	10.7494	11.6814	12.7995	14.0046	15.1514	15.9048	17.4703
2044	9.3172	10.2075	10.7612	11.7085	12.8319	13.9871	15.1542	15.9188	17.4499
2045	9.2589	10.2525	10.7445	11.7109	12.8305	14.0140	15.1697	15.9709	17.4065
2046	9.2353	10.2244	10.7872	11.7037	12.8263	14.0401	15.2255	15.9925	17.4723
2047	9.3157	10.2619	10.7819	11.6935	12.8054	14.0317	15.2380	15.9903	17.5927
2048	9.3515	10.2449	10.7898	11.6961	12.8020	14.0111	15.2220	16.0326	17.7240
2049	9.3188	10.2706	10.7996	11.7216	12.8077	14.0427	15.2338	16.0278	17.6533
2050	9.3343	10.2757	10.7721	11.7080	12.8254	14.0302	15.2697	16.0201	17.6445

Total Fishing Mortality

Year	Average	StdDev
2012	0.5490	0.1661
2013	0.1892	0.0670
2014	0.1360	0.0409
2015	0.0779	0.0162
2016	0.1430	0.0000
2017	0.1430	0.0000
2018	0.1430	0.0000
2019	0.1430	0.0000
2020	0.1430	0.0000
2021	0.1430	0.0000
2022	0.1430	0.0000
2023	0.1430	0.0000
2024	0.1430	0.0000
2025	0.1430	0.0000
2026	0.1430	0.0000
2027	0.1430	0.0000
2028	0.1430	0.0000
2029	0.1430	0.0000
2030	0.1430	0.0000
2031	0.1430	0.0000
2032	0.1430	0.0000
2033	0.1430	0.0000
2034	0.1430	0.0000
2035	0.1430	0.0000
2036	0.1430	0.0000
2037	0.1430	0.0000
2038	0.1430	0.0000
2039	0.1430	0.0000
2040	0.1430	0.0000
2041	0.1430	0.0000
2042	0.1430	0.0000

2043	0.1430	0.0000
2044	0.1430	0.0000
2045	0.1430	0.0000
2046	0.1430	0.0000
2047	0.1430	0.0000
2048	0.1430	0.0000
2049	0.1430	0.0000
2050	0.1430	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.2884	0.3409	0.3688	0.4328	0.5172	0.6326	0.7681	0.8549	1.0759
2013	0.0909	0.1098	0.1198	0.1419	0.1765	0.2180	0.2742	0.3103	0.4052
2014	0.0703	0.0836	0.0904	0.1061	0.1300	0.1576	0.1882	0.2126	0.2639
2015	0.0477	0.0547	0.0587	0.0661	0.0763	0.0878	0.0992	0.1076	0.1236
2016	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2017	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2018	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2019	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2020	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2021	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2022	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2023	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2024	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2025	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2026	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2027	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2028	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2029	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2030	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2031	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2032	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2033	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2034	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2035	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2036	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2037	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2038	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2039	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2040	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2041	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2042	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2043	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2044	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2045	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2046	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2047	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2048	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2049	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430
2050	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430	0.1430

Probability Spawning 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	0.000100

2018	0.003200
2019	0.021600
2020	0.117500
2021	0.320800
2022	0.507600
2023	0.634600
2024	0.718600
2025	0.767300
2026	0.803000
2027	0.826900
2028	0.837200
2029	0.848600
2030	0.859100
2031	0.861800
2032	0.865400
2033	0.868300
2034	0.871900
2035	0.874300
2036	0.874300
2037	0.876600
2038	0.874100
2039	0.869800
2040	0.868300
2041	0.870000
2042	0.870400
2043	0.872800
2044	0.872500
2045	0.870400
2046	0.873100
2047	0.875600
2048	0.877900
2049	0.875400
2050	0.874900

Probability Threshold Exceeded at Least Once = 0.9995

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	0.000300
2017	0.019800
2018	0.094700
2019	0.268100
2020	0.617800
2021	0.827700
2022	0.914800
2023	0.953400
2024	0.973600
2025	0.981400
2026	0.985700
2027	0.989100
2028	0.990900
2029	0.991100
2030	0.992000
2031	0.993500
2032	0.993900
2033	0.994000

2034	0.992300
2035	0.992200
2036	0.993500
2037	0.993000
2038	0.994000
2039	0.994100
2040	0.994800
2041	0.995000
2042	0.994800
2043	0.994900
2044	0.994200
2045	0.994000
2046	0.994100
2047	0.994100
2048	0.994700
2049	0.994700
2050	0.994400

Probability Threshold Exceeded at Least Once = 1.0000

Probability Mean Biomass Exceeds Threshold 80.200 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000200
2016	0.027400
2017	0.136600
2018	0.369000
2019	0.623600
2020	0.848000
2021	0.933500
2022	0.968700
2023	0.983300
2024	0.990600
2025	0.992700
2026	0.994800
2027	0.995800
2028	0.996200
2029	0.996400
2030	0.996600
2031	0.997400
2032	0.997300
2033	0.996900
2034	0.995700
2035	0.996500
2036	0.996800
2037	0.997900
2038	0.997100
2039	0.997000
2040	0.997400
2041	0.997900
2042	0.997700
2043	0.998200
2044	0.997700
2045	0.997600
2046	0.997700
2047	0.997300
2048	0.997300
2049	0.997500

2050 0.997300

Probability Threshold Exceeded at Least Once = 1.0000

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	1.000000
2013	0.469100
2014	0.135600
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
2031	0.000000
2032	0.000000
2033	0.000000
2034	0.000000
2035	0.000000
2036	0.000000
2037	0.000000
2038	0.000000
2039	0.000000
2040	0.000000
2041	0.000000
2042	0.000000
2043	0.000000
2044	0.000000
2045	0.000000
2046	0.000000
2047	0.000000
2048	0.000000
2049	0.000000
2050	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

GOM cod rebuild in 10 years base model

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE

Date & Time of Run: 22 Jul 2013 14:58

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\REBUILD\GOMCOD_SAW55_3BLOCK_BASE_SHORT_FMSY1470_CONSTANT_12CAT3767_THEN10YEAR.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	1470
2014	Landings	1470
2015	Landings	1470
2016	F-Mult	0.1650
2017	F-Mult	0.1650
2018	F-Mult	0.1650
2019	F-Mult	0.1650
2020	F-Mult	0.1650
2021	F-Mult	0.1650
2022	F-Mult	0.1650
2023	F-Mult	0.1650
2024	F-Mult	0.1650
2025	F-Mult	0.1650
2026	F-Mult	0.1650
2027	F-Mult	0.1650
2028	F-Mult	0.1650
2029	F-Mult	0.1650
2030	F-Mult	0.1650

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	9.1991	2.2879
2013	9.6480	2.7989
2014	12.2739	3.3445
2015	17.2239	4.3152
2016	24.1611	6.1234
2017	30.3513	7.5566
2018	35.2160	8.4355
2019	39.1781	9.0315
2020	43.8840	9.5218
2021	48.6418	10.4581
2022	51.8951	10.7975
2023	54.1509	10.9596
2024	55.7332	11.0753
2025	56.8485	11.0882
2026	57.6786	11.1218
2027	58.2654	11.1750
2028	58.6646	11.2565
2029	58.9605	11.3082
2030	59.1549	11.3416

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	4.0939	5.4892	6.1803	7.6922	9.3551	11.2834	13.2972	14.6085	17.2061

2014	5.6742	7.3142	8.2201	9.9385	11.9494	14.2030	16.6306	18.3527	21.2871
2015	8.7431	10.8678	12.0589	14.1991	16.7950	19.8633	22.9812	24.9867	28.9419
2016	12.9476	15.5331	17.0617	19.9219	23.4347	27.5924	32.1568	35.3347	42.4889
2017	16.9449	19.8118	21.7355	25.0383	29.3625	34.4534	40.3615	44.4987	52.8417
2018	20.3125	23.4839	25.5025	29.1757	34.0741	39.8837	46.7038	50.8398	59.9981
2019	23.1337	26.5952	28.6755	32.6914	38.0012	44.4455	51.3526	55.8359	65.3295
2020	26.8096	30.4990	32.7238	37.0538	42.6619	49.4966	56.7221	61.3180	71.2455
2021	29.5840	33.7826	36.3153	41.1572	47.3323	54.8921	62.6837	68.0166	77.9366
2022	31.8126	36.1692	39.0526	44.1306	50.6967	58.3894	66.2345	71.2782	81.7790
2023	33.5223	38.0681	41.0744	46.3043	53.0253	60.8364	68.6105	73.9380	84.6274
2024	34.6291	39.4656	42.4233	47.8419	54.7269	62.3618	70.4910	75.7039	86.8173
2025	35.6632	40.4679	43.4149	48.9023	55.8185	63.5188	71.6932	76.6538	87.4548
2026	36.4034	41.2715	44.2708	49.6994	56.6390	64.4489	72.6583	77.6942	87.6562
2027	37.0258	41.9363	44.7854	50.2536	57.1552	65.1777	73.3949	78.3593	87.9097
2028	37.4333	42.1876	45.2669	50.5517	57.4781	65.4161	73.8438	78.8788	89.3439
2029	38.0021	42.3295	45.3159	50.7904	57.8328	65.8129	74.1306	79.3197	89.9510
2030	37.8690	42.6164	45.4918	50.9524	57.9818	66.1794	74.4494	79.4329	89.5390

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.8419	2.7428
2013	13.4228	3.2496
2014	17.8732	4.1259
2015	24.5581	5.8120
2016	33.0830	8.0717
2017	40.0336	9.5472
2018	45.3677	10.4018
2019	49.7033	10.9442
2020	54.8592	11.3872
2021	60.0673	12.3297
2022	63.6429	12.6837
2023	66.1397	12.8734
2024	67.8910	13.0095
2025	69.1259	13.0220
2026	70.0456	13.0591
2027	70.6779	13.1407
2028	71.0942	13.2359
2029	71.4187	13.2708
2030	71.6382	13.2960

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	9.7193	11.7556	12.9126	14.9832	17.4809	20.4088	23.3523	25.3186	28.9525
2015	13.7488	16.2307	17.7914	20.5507	23.8978	27.8458	32.1798	35.1157	41.6345
2016	18.4367	21.8048	23.7447	27.4644	32.0721	37.5248	43.7353	48.0976	57.2831
2017	23.0568	26.6800	29.0006	33.2033	38.7829	45.2898	52.7839	57.9153	67.8559
2018	26.8129	30.7619	33.3096	37.9269	43.9142	51.4167	59.4219	64.4895	75.1601
2019	30.1438	34.3219	36.9461	41.8828	48.3130	56.1866	64.2740	69.7632	81.7484
2020	34.1839	38.5707	41.4455	46.7126	53.4937	61.6802	69.9683	75.8275	86.8437
2021	37.2102	42.3058	45.4088	51.2822	58.6854	67.4563	76.5533	82.6611	94.2991
2022	39.6674	45.0840	48.4622	54.6092	62.3954	71.4396	80.4139	86.4458	98.6368
2023	41.4945	47.1471	50.7313	57.0656	64.9033	73.9928	83.3430	89.1056	102.1126
2024	42.9227	48.6654	52.1623	58.6093	66.7398	75.6401	85.3620	91.1408	103.9619
2025	44.0361	49.7725	53.3025	59.8230	67.9168	77.0710	86.5108	92.4686	104.4788
2026	44.7587	50.7987	54.2402	60.7173	68.9138	78.1651	87.8423	93.2883	105.0862
2027	45.5786	51.3587	54.8726	61.2663	69.3667	78.8385	88.3962	94.4751	105.6728
2028	46.0595	51.6466	55.0820	61.6354	69.7508	79.1276	88.9398	94.9601	107.0368
2029	46.4338	51.8822	55.3702	61.8289	70.1587	79.5958	89.2314	95.1316	107.8770

2030	46.2630	52.1956	55.6367	62.0011	70.4565	79.9525	89.4468	95.3216	106.9426

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	14.3147	3.3501
2013	16.7918	3.8990
2014	23.0582	5.3199
2015	31.6784	7.8038
2016	40.2020	10.0083
2017	46.8908	11.2557
2018	52.1612	12.0023
2019	56.5549	12.4709
2020	61.1873	12.7902
2021	65.5362	13.3492
2022	68.5312	13.5873
2023	70.6476	13.7406
2024	72.1479	13.8536
2025	73.2188	13.8852
2026	73.9999	13.9391
2027	74.5349	14.0386
2028	74.8727	14.1198
2029	75.1368	14.1205
2030	75.3189	14.1354

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	8.9265	10.9718	12.0857	14.0387	16.4543	19.1872	21.9486	23.8273	27.1726
2014	12.8715	15.4133	16.8228	19.3706	22.4347	26.1032	30.0884	32.7071	38.3022
2015	17.7640	21.0188	22.7678	26.2052	30.6233	35.9214	41.8697	46.1162	55.7653
2016	22.8619	26.4161	28.8077	33.0759	38.8485	45.5745	53.4588	59.0160	69.5655
2017	27.2788	31.2972	33.9461	38.8363	45.3816	53.2479	62.2641	67.8742	79.6812
2018	30.8956	35.3896	38.2081	43.6034	50.5584	59.1330	68.2081	74.0315	87.2111
2019	34.1341	38.9404	41.9458	47.6091	55.0225	63.9074	73.2570	79.3869	92.3067
2020	37.8002	42.7922	46.0217	52.1127	59.6246	68.8145	78.2848	84.9973	97.1687
2021	40.3813	46.1019	49.5931	56.0007	64.0694	73.7090	83.3418	89.8389	102.3195
2022	42.5717	48.6023	52.2130	58.8750	67.2266	76.8469	86.4735	92.7787	106.3796
2023	44.4291	50.3351	54.1073	60.8761	69.3683	78.8260	88.9663	95.1501	108.7258
2024	45.7805	51.6306	55.4046	62.2549	70.9214	80.5279	90.7257	97.1212	109.6873
2025	46.6156	52.8234	56.3469	63.3843	71.9601	81.6992	92.0435	98.1323	110.5883
2026	47.2244	53.5742	57.1942	64.0554	72.6353	82.5338	92.8543	98.8926	111.4772
2027	48.0819	53.9848	57.6511	64.5083	73.0911	83.0223	93.6127	100.0637	112.2813
2028	48.6256	54.2019	57.7927	64.6738	73.4224	83.5114	93.9422	100.3191	113.3692
2029	48.3794	54.3973	58.0864	64.8041	73.7645	83.9823	94.0616	100.2733	113.5581
2030	48.4784	54.7120	58.3371	65.0253	73.9177	84.0343	94.2634	100.6210	113.1713

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	3.6336	0.9410
2017	4.6848	1.2218
2018	5.5537	1.3954
2019	6.2841	1.5286
2020	7.0472	1.6254
2021	7.7649	1.7476
2022	8.2575	1.7881

2023	8.5948	1.8067
2024	8.8329	1.8203
2025	9.0033	1.8243
2026	9.1299	1.8336
2027	9.2189	1.8423
2028	9.2855	1.8530
2029	9.3313	1.8639
2030	9.3584	1.8697

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	1.8800	2.3107	2.5483	2.9837	3.5171	4.1620	4.8616	5.3740	6.4775
2017	2.5562	3.0299	3.2988	3.8240	4.5223	5.3344	6.2717	6.9796	8.4071
2018	3.1556	3.6394	3.9532	4.5547	5.3502	6.3049	7.4433	8.1667	9.6707
2019	3.6429	4.1815	4.5168	5.1924	6.0635	7.1569	8.3649	9.1290	10.7101
2020	4.1933	4.7782	5.1612	5.8813	6.8293	8.0001	9.2491	10.0376	11.8287
2021	4.6298	5.2926	5.7239	6.5166	7.5339	8.7957	10.0871	11.0062	12.8005
2022	4.9842	5.6771	6.1299	6.9797	8.0457	9.3423	10.6441	11.5227	13.2325
2023	5.2352	5.9689	6.4500	7.3004	8.4035	9.6998	10.9870	11.8576	13.5708
2024	5.4002	6.1819	6.6572	7.5302	8.6406	9.9191	11.2465	12.1268	13.9320
2025	5.5579	6.3369	6.8010	7.6921	8.8425	10.1006	11.4456	12.2809	14.0340
2026	5.6584	6.4368	6.9262	7.8278	8.9529	10.2505	11.6062	12.4326	14.1336
2027	5.8153	6.5336	7.0052	7.9036	9.0219	10.3324	11.7007	12.5306	14.2114
2028	5.8279	6.6002	7.0973	7.9537	9.0842	10.3827	11.7903	12.6123	14.3107
2029	5.8821	6.6150	7.0936	7.9862	9.1410	10.4546	11.8605	12.7049	14.4664
2030	5.9193	6.6564	7.1100	7.9971	9.1487	10.5046	11.8858	12.7307	14.4555

Landings x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	3.6336	0.9410
2017	4.6848	1.2218
2018	5.5537	1.3954
2019	6.2841	1.5286
2020	7.0472	1.6254
2021	7.7649	1.7476
2022	8.2575	1.7881
2023	8.5948	1.8067
2024	8.8329	1.8203
2025	9.0033	1.8243
2026	9.1299	1.8336
2027	9.2189	1.8423
2028	9.2855	1.8530
2029	9.3313	1.8639
2030	9.3584	1.8697

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700

2016	1.8800	2.3107	2.5483	2.9837	3.5171	4.1620	4.8616	5.3740	6.4775
2017	2.5562	3.0299	3.2988	3.8240	4.5223	5.3344	6.2717	6.9796	8.4071
2018	3.1556	3.6394	3.9532	4.5547	5.3502	6.3049	7.4433	8.1667	9.6707
2019	3.6429	4.1815	4.5168	5.1924	6.0635	7.1569	8.3649	9.1290	10.7101
2020	4.1933	4.7782	5.1612	5.8813	6.8293	8.0001	9.2491	10.0376	11.8287
2021	4.6298	5.2926	5.7239	6.5166	7.5339	8.7957	10.0871	11.0062	12.8005
2022	4.9842	5.6771	6.1299	6.9797	8.0457	9.3423	10.6441	11.5227	13.2325
2023	5.2352	5.9689	6.4500	7.3004	8.4035	9.6998	10.9870	11.8576	13.5708
2024	5.4002	6.1819	6.6572	7.5302	8.6406	9.9191	11.2465	12.1268	13.9320
2025	5.5579	6.3369	6.8010	7.6921	8.8425	10.1006	11.4456	12.2809	14.0340
2026	5.6584	6.4368	6.9262	7.8278	8.9529	10.2505	11.6062	12.4326	14.1336
2027	5.8153	6.5336	7.0052	7.9036	9.0219	10.3324	11.7007	12.5306	14.2114
2028	5.8279	6.6002	7.0973	7.9537	9.0842	10.3827	11.7903	12.6123	14.3107
2029	5.8821	6.6150	7.0936	7.9862	9.1410	10.4546	11.8605	12.7049	14.4664
2030	5.9193	6.6564	7.1100	7.9971	9.1487	10.5046	11.8858	12.7307	14.4555

Total Fishing Mortality

Year	Average	StdDev
2012	0.4853	0.1465
2013	0.1744	0.0640
2014	0.1446	0.0525
2015	0.1025	0.0297
2016	0.1650	0.0000
2017	0.1650	0.0000
2018	0.1650	0.0000
2019	0.1650	0.0000
2020	0.1650	0.0000
2021	0.1650	0.0000
2022	0.1650	0.0000
2023	0.1650	0.0000
2024	0.1650	0.0000
2025	0.1650	0.0000
2026	0.1650	0.0000
2027	0.1650	0.0000
2028	0.1650	0.0000
2029	0.1650	0.0000
2030	0.1650	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	0.0838	0.1003	0.1109	0.1315	0.1605	0.2007	0.2583	0.2956	0.4251
2014	0.0702	0.0831	0.0923	0.1099	0.1346	0.1654	0.2115	0.2410	0.3362
2015	0.0552	0.0643	0.0704	0.0820	0.0975	0.1172	0.1399	0.1580	0.2049
2016	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2017	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2018	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2019	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2020	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2021	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2022	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2023	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2024	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2025	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2026	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2027	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2028	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2029	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650
2030	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650	0.1650

Probability Spawning Stock Biomass Exceeds Threshold 54.743 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000000
2016	0.000100
2017	0.006700
2018	0.026000
2019	0.058800
2020	0.128800
2021	0.253800
2022	0.356600
2023	0.435800
2024	0.499100
2025	0.540800
2026	0.571200
2027	0.594000
2028	0.600900
2029	0.612600
2030	0.620400

Probability Threshold Exceeded at Least Once = 0.8037

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	0.015300
2017	0.076800
2018	0.174300
2019	0.287500
2020	0.456200
2021	0.633300
2022	0.745500
2023	0.810500
2024	0.848200
2025	0.874300
2026	0.891200
2027	0.902700
2028	0.906500
2029	0.910800
2030	0.914400

Probability Threshold Exceeded at Least Once = 0.9753

Probability Mean Biomass Exceeds Threshold 54.743 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.011500
2016	0.086100
2017	0.217200

2018	0.362600
2019	0.511200
2020	0.663700
2021	0.785400
2022	0.852200
2023	0.887600
2024	0.911700
2025	0.925500
2026	0.936300
2027	0.939600
2028	0.943500
2029	0.946000
2030	0.949700

Probability Threshold Exceeded at Least Once = 0.9913

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	1.000000
2013	0.350300
2014	0.191100
2015	0.021600
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

GOM cod rebuild in 10 years M-ramp model

AGEPRO VERSION 4.2

SAW55_3BLOCK_BASE_M_SPLIT_M2_M2

Date & Time of Run: 22 Jul 2013 15:39

Input File Name:
D:\NIT\GROUNDFISH_SARC55_COD\GOMCOD\REBUILD\GOMCOD_SAW55_3BLOCK_BASE_M_SPLIT_SHORT_M2_M2_12CAT3767_THEN10YEAR.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 39
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	1470
2014	Landings	1470
2015	Landings	1470
2016	F-Mult	0.1660
2017	F-Mult	0.1660
2018	F-Mult	0.1660
2019	F-Mult	0.1660
2020	F-Mult	0.1660
2021	F-Mult	0.1660
2022	F-Mult	0.1660
2023	F-Mult	0.1660
2024	F-Mult	0.1660
2025	F-Mult	0.1660
2026	F-Mult	0.1660
2027	F-Mult	0.1660
2028	F-Mult	0.1660
2029	F-Mult	0.1660
2030	F-Mult	0.1660
2031	F-Mult	0.1660
2032	F-Mult	0.1660
2033	F-Mult	0.1660
2034	F-Mult	0.1660
2035	F-Mult	0.1660
2036	F-Mult	0.1660
2037	F-Mult	0.1660
2038	F-Mult	0.1660
2039	F-Mult	0.1660
2040	F-Mult	0.1660
2041	F-Mult	0.1660
2042	F-Mult	0.1660

2043	F-Mult	0.1660
2044	F-Mult	0.1660
2045	F-Mult	0.1660
2046	F-Mult	0.1660
2047	F-Mult	0.1660
2048	F-Mult	0.1660
2049	F-Mult	0.1660
2050	F-Mult	0.1660

Recruits 1000 Fish

Year Class	Average	StdDev
2012	10058.1028	4439.1032
2013	9940.3706	4451.2362
2014	10024.7462	4508.9494
2015	10025.6013	4459.7690
2016	9991.5194	4481.5210
2017	10077.8413	4484.5670
2018	10047.7273	4503.3431
2019	9988.7153	4503.3791
2020	10010.8671	4432.4609
2021	10045.0329	4478.2887
2022	9890.5273	4374.0231
2023	9892.2672	4408.6661
2024	10071.0822	4541.7368
2025	10016.8327	4474.6771
2026	10043.3856	4470.1960
2027	9987.6612	4439.2783
2028	9971.5524	4431.6694
2029	10002.3623	4514.2320
2030	9936.6360	4417.4206
2031	10006.2981	4456.4337
2032	10040.9340	4551.7106
2033	9973.6762	4439.1311
2034	10024.6770	4468.0711
2035	9908.1500	4406.2212
2036	9993.2555	4483.1040
2037	9999.2057	4431.6129
2038	10006.8649	4441.0846
2039	9944.4177	4388.3565
2040	10018.3914	4443.6823
2041	10061.3157	4517.8095
2042	10008.5719	4445.6926
2043	10002.3279	4520.6819
2044	9991.5898	4460.7130
2045	10063.4908	4443.4921
2046	9961.2532	4423.8337
2047	9911.9273	4478.2196
2048	10041.6312	4445.9568
2049	10022.4676	4439.8044
2050	9979.8614	4458.1431

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	3020.9780	4503.6300	4829.5200	6275.1260	9479.5970	12328.7900	14871.0700	16299.9000	26161.4600
2013	3029.9060	4442.8980	4811.6180	6036.9770	9360.8365	12265.3200	14736.5000	16251.0900	26559.0000
2014	3007.6790	4461.8370	4827.2380	6055.1110	9450.9240	12517.0100	14939.9800	16291.7100	26565.9400
2015	3071.0210	4504.7800	4833.4730	6191.6660	9428.5100	12340.7400	14802.3500	16232.5800	26395.1400
2016	3011.3470	4461.8720	4822.0090	6041.2330	9432.3230	12312.9300	14720.3100	16312.5500	26770.0500
2017	3011.7560	4490.5130	4831.4580	6166.4120	9484.2570	12679.0200	14949.2500	16319.7100	26668.9000
2018	3130.4210	4476.8170	4822.4390	6159.7290	9401.3055	12448.1400	14907.9300	16260.0300	26992.4900

2019	3005.3570	4471.6130	4826.1740	6099.8320	9379.0890	12291.2600	14746.6600	16264.1700	27226.0000
2020	3058.5760	4461.3210	4822.2410	6181.8390	9445.3790	12319.6800	14812.2400	16275.3600	26142.8100
2021	2947.0880	4448.7280	4821.0780	6205.6100	9423.7690	12653.2100	14891.9600	16309.4700	26515.4200
2022	2934.9920	4455.4630	4822.7950	5970.6940	9316.8265	11957.8900	14743.5900	16210.4000	25747.8500
2023	2965.9310	4421.8340	4809.2580	5987.8450	9314.4845	12025.4000	14663.9100	16209.6800	26195.9000
2024	3153.9860	4531.3640	4830.9370	6201.5510	9418.8595	12158.1600	14885.7500	16261.4400	27165.9300
2025	3079.5130	4502.1800	4827.5620	6124.1990	9379.4085	12372.6000	14922.0100	16295.4300	26723.8700
2026	2968.4180	4458.6270	4829.7840	6178.5120	9428.4215	12475.1800	14902.3800	16329.2000	26425.2200
2027	3055.2640	4492.1920	4830.9120	6083.5340	9393.0485	12342.3600	14803.2800	16311.2200	26331.2200
2028	3030.9150	4504.4140	4837.9410	6114.5760	9381.8485	12042.2800	14850.2500	16253.8200	26798.7700
2029	3061.2670	4500.0350	4823.3300	6036.3810	9369.2665	12316.4400	14886.9500	16313.2600	26714.7200
2030	2970.6530	4451.4740	4813.9170	5977.6940	9389.6670	12313.4500	14865.4700	16237.6400	26306.8900
2031	2992.8850	4446.6490	4823.0200	6127.5130	9438.7760	12209.2300	14899.5800	16283.2300	26594.9400
2032	3008.5070	4458.0880	4818.0040	6148.4640	9367.8915	12487.9800	15036.9300	16378.9800	26738.0200
2033	3059.0760	4482.4310	4823.0910	6069.8810	9388.2900	12209.9200	14737.5600	16268.1700	26462.5900
2034	3010.9020	4451.1080	4829.2420	6105.4570	9437.4725	12422.4700	15015.4500	16349.1700	25956.8200
2035	2975.8300	4446.0980	4818.9390	6063.0810	9296.1935	12067.9600	14637.4300	16277.3000	26383.3700
2036	2960.0990	4402.0950	4815.1480	6074.9700	9431.0390	12294.7500	14863.9100	16267.0700	26731.4200
2037	3069.2460	4464.7250	4817.6030	6110.4590	9427.7230	12358.4200	14822.1800	16288.0700	26252.1300
2038	3000.1050	4460.6700	4825.2650	6163.0130	9432.9280	12410.0600	14892.7400	16229.7700	26109.6900
2039	3003.8760	4469.4130	4825.4850	6143.2760	9402.4215	11998.4200	14627.2800	16128.0200	26561.8000
2040	3019.7470	4445.1400	4819.7600	6224.3790	9429.0435	12268.4300	14698.8200	16262.9900	26301.3300
2041	3005.7710	4474.3530	4825.4260	6173.6990	9406.4645	12519.4400	14986.2500	16344.1300	27088.7700
2042	3066.6870	4494.5820	4836.6150	6152.5690	9327.9995	12280.2800	14885.9700	16324.0200	26044.1200
2043	2971.4440	4459.9760	4823.8500	6090.8010	9406.0175	12270.8400	14774.9000	16289.9900	27271.1300
2044	3028.0240	4487.0150	4829.0030	6115.5260	9386.4090	12389.5300	14793.5900	16301.4700	26653.9000
2045	2976.3410	4500.3460	4826.2160	6233.1870	9443.9725	12587.3400	14930.9200	16244.1800	26266.2300
2046	3124.6270	4499.7390	4832.7620	6129.9440	9342.9530	12058.6600	14706.9700	16306.1200	26487.0600
2047	3077.1980	4429.3370	4802.9320	5874.5780	9345.0220	12071.9000	14647.0700	16244.5800	26643.0700
2048	2996.8680	4523.5630	4831.3220	6206.8060	9460.8485	12440.1600	14801.2200	16274.4800	26297.6200
2049	3049.1950	4489.0730	4832.1420	6163.1290	9428.9315	12344.5500	14744.4900	16250.4600	26315.7700
2050	2968.9680	4461.3600	4824.5270	6110.2510	9370.2365	12322.2400	14811.1200	16289.2500	26421.5600

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	8.3745	2.0471
2013	9.3931	2.5736
2014	14.0190	3.1893
2015	22.5242	4.2542
2016	33.4043	6.1222
2017	42.4922	7.6110
2018	49.9263	8.4838
2019	56.4271	9.0609
2020	64.7661	9.6058
2021	71.2955	10.6138
2022	75.6938	11.0998
2023	78.7504	11.3776
2024	80.8526	11.4389
2025	82.2645	11.4705
2026	83.2183	11.4721
2027	83.8622	11.4645
2028	84.3416	11.4741
2029	84.7174	11.4259
2030	84.9689	11.3812
2031	85.0613	11.3514
2032	85.1339	11.3192
2033	85.2466	11.3639
2034	85.2960	11.3707
2035	85.3543	11.3699
2036	85.3825	11.3699
2037	85.3899	11.3501

2038	85.3783	11.3580
2039	85.3333	11.3600
2040	85.3444	11.4222
2041	85.3770	11.4503
2042	85.3649	11.3592
2043	85.3733	11.3133
2044	85.3690	11.2676
2045	85.4333	11.3634
2046	85.4729	11.4162
2047	85.4881	11.4127
2048	85.4885	11.4138
2049	85.5173	11.4141
2050	85.5095	11.4570

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	4.3829	5.3626	5.8672	6.9163	8.1955	9.6963	11.1620	11.9135	13.8862
2013	4.5507	5.6196	6.3099	7.5625	9.0940	11.0455	12.9541	13.9595	16.6594
2014	7.9863	9.3324	10.1967	11.7034	13.6494	16.0378	18.3205	19.6740	22.7246
2015	14.1837	16.0958	17.3453	19.5548	22.1556	25.1214	28.1965	30.1889	34.1116
2016	21.3288	24.0950	26.0525	29.1780	32.9499	36.9860	41.4080	44.4035	50.3561
2017	27.1682	31.1047	33.3573	37.1859	41.9633	47.0480	52.2051	56.3096	63.7364
2018	32.7277	37.2326	39.7055	44.0661	49.2863	55.0588	60.9397	64.9804	73.2825
2019	37.6117	42.5690	45.4587	50.1532	55.8286	61.9384	68.3253	72.6563	80.3982
2020	45.1951	49.9604	52.9708	58.2068	64.2392	70.5795	77.4041	81.8666	90.1493
2021	49.4927	54.8108	58.2707	64.0245	70.7072	77.8142	85.2044	90.1023	99.2766
2022	52.6544	58.5244	61.9859	67.9467	75.0163	82.5667	90.1583	95.2924	104.9700
2023	55.2698	61.3106	64.7803	70.8480	78.1623	85.7811	93.7216	98.8272	108.4334
2024	56.8329	63.3541	66.8202	72.9784	80.0670	88.0101	95.9271	100.8086	111.1275
2025	58.6002	64.6230	68.1952	74.3173	81.6105	89.4266	97.2346	102.2858	112.2408
2026	59.2575	65.5148	69.0765	75.2941	82.4360	90.5304	98.3439	103.0837	112.4448
2027	60.0325	66.0997	69.6443	76.0055	83.0668	91.1031	99.0451	103.9278	113.1908
2028	60.6282	66.6131	70.1289	76.3527	83.7160	91.6189	99.2607	104.3049	114.2587
2029	60.7857	67.0719	70.7720	76.8338	84.0728	91.8736	99.5498	104.3354	114.9042
2030	60.6986	67.3684	70.9589	77.1731	84.3259	92.1529	99.7052	104.7836	114.8064
2031	61.3250	67.4990	71.1499	77.3059	84.4904	92.0587	99.7694	104.5342	114.6495
2032	61.4686	67.8349	71.2165	77.3146	84.4566	92.2500	99.7399	104.7243	114.9937
2033	61.7766	67.9279	71.2784	77.4219	84.5619	92.3326	100.0844	104.9363	115.7036
2034	61.3676	67.9537	71.3923	77.4561	84.6651	92.5077	99.9566	105.1270	115.4664
2035	61.0261	67.7865	71.5032	77.5461	84.7196	92.5548	99.9612	105.1093	115.3054
2036	61.0741	67.8499	71.4270	77.7026	84.7660	92.5393	100.0819	105.0089	115.1643
2037	61.1776	67.8751	71.5323	77.5817	84.7325	92.6419	100.2037	105.2716	114.7252
2038	61.2014	68.1303	71.4589	77.5222	84.6202	92.6066	100.4198	105.2833	114.8431
2039	61.4018	67.8338	71.3258	77.4986	84.6144	92.5415	100.3023	105.1898	114.8470
2040	62.0670	67.8322	71.2076	77.3673	84.7095	92.5504	100.1030	105.3169	115.3877
2041	62.1893	67.5819	71.2908	77.3326	84.6849	92.6460	100.3990	105.2598	115.8118
2042	61.9904	67.7659	71.2102	77.4143	84.8136	92.5237	100.1613	104.9104	115.3902
2043	62.0548	67.9200	71.3234	77.4839	84.7686	92.4155	99.9208	104.8246	114.5494
2044	61.9909	67.8970	71.4572	77.6113	84.8245	92.3672	99.9862	105.0812	114.6228
2045	61.5235	67.9838	71.2680	77.5213	84.8028	92.5803	100.0539	105.3464	114.8276
2046	61.7864	67.9003	71.4891	77.4906	84.9102	92.7336	100.2827	105.5840	115.1608
2047	61.9631	68.0836	71.6096	77.5128	84.6820	92.6186	100.3581	105.4795	116.1134
2048	62.1685	68.1029	71.6542	77.5557	84.6100	92.6153	100.1710	105.4480	116.2011
2049	62.3042	68.2450	71.5277	77.5929	84.7471	92.5793	100.5258	105.4363	116.0192
2050	61.8369	68.1258	71.5109	77.5007	84.8146	92.5978	100.6309	105.5175	115.8353

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	12.5504	2.5212
2013	14.9485	3.1035

2014	22.5391	4.0638
2015	33.2986	5.8110
2016	46.3201	8.0989
2017	56.4040	9.5914
2018	64.5578	10.4338
2019	71.6940	11.0174
2020	80.8395	11.5762
2021	87.9820	12.6066
2022	92.7929	13.1188
2023	96.1326	13.3869
2024	98.4000	13.4292
2025	99.9235	13.4428
2026	100.9948	13.4493
2027	101.7369	13.4466
2028	102.2755	13.4415
2029	102.6780	13.3759
2030	102.9368	13.3233
2031	103.0268	13.2988
2032	103.0981	13.2843
2033	103.2292	13.3423
2034	103.2999	13.3452
2035	103.3684	13.3394
2036	103.3894	13.3286
2037	103.3786	13.3149
2038	103.3601	13.3283
2039	103.3238	13.3286
2040	103.3417	13.3697
2041	103.3734	13.3884
2042	103.3699	13.2967
2043	103.4006	13.2699
2044	103.4019	13.2620
2045	103.4629	13.3843
2046	103.5031	13.4141
2047	103.5237	13.3931
2048	103.5078	13.3917
2049	103.5164	13.3892
2050	103.5164	13.4250

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	7.8705	8.8913	9.5365	10.7571	12.2647	14.1628	15.9815	16.9840	19.8072
2013	9.0118	10.3617	11.2181	12.7063	14.6211	16.9162	19.1351	20.4228	23.5111
2014	14.5414	16.3840	17.5764	19.6955	22.2034	25.0577	27.9477	29.8188	33.5185
2015	21.8288	24.4307	26.2787	29.3130	32.8354	36.7201	41.0350	43.6942	49.1231
2016	30.0565	34.1193	36.5421	40.6787	45.7605	51.1660	56.7293	60.9569	68.8161
2017	37.0235	42.0024	44.7999	49.7182	55.7221	62.1866	68.6566	73.5742	82.7888
2018	43.1612	48.6447	51.8571	57.3470	63.8543	70.8702	78.2197	83.1190	92.3731
2019	49.1557	54.8496	58.3476	64.0335	70.9969	78.3978	86.1731	91.3316	100.6668
2020	57.1971	62.9720	66.6187	72.8264	80.0619	87.9639	95.9947	101.2522	111.2799
2021	62.0104	68.3882	72.4674	79.2541	87.2296	95.7891	104.3766	110.1381	120.6251
2022	65.5584	72.5146	76.5361	83.7174	91.9966	101.0143	109.8363	115.9535	126.9657
2023	68.1293	75.4845	79.6812	86.9034	95.3037	104.4631	113.8501	119.7696	131.5735
2024	70.5010	77.7521	81.7376	89.1577	97.6406	106.7753	115.9695	121.7981	133.7545
2025	71.7889	79.2773	83.3220	90.6187	99.1141	108.3353	117.5113	123.1018	134.8777
2026	72.6577	80.1396	84.2297	91.7435	100.0693	109.5974	119.0191	124.3932	135.1149
2027	73.8276	80.9089	85.0058	92.5102	100.9096	110.2692	119.3413	125.2145	136.4746
2028	74.2704	81.4075	85.6741	92.8625	101.5291	110.7935	119.7092	125.4790	137.3090
2029	74.3202	82.0914	86.2654	93.4049	101.8644	111.2038	119.8799	126.0219	137.7389
2030	75.0767	82.4204	86.4901	93.8850	102.2166	111.1641	120.3660	126.0405	138.0945
2031	75.1853	82.3571	86.7526	93.9253	102.3210	111.3218	120.2371	125.9435	138.3930
2032	75.4671	82.6042	86.7330	93.9404	102.3424	111.6185	120.2629	125.8784	138.0313

2033	75.2619	82.7454	86.8219	93.9498	102.4219	111.6323	120.6463	126.3230	138.5402
2034	74.7977	82.7790	86.8495	94.1294	102.5264	111.7530	120.4890	126.4058	138.2198
2035	74.6666	82.6208	87.0631	94.3436	102.6190	111.8186	120.4704	126.4454	138.7194
2036	74.8979	82.7227	87.0561	94.3629	102.5716	111.8639	120.5405	126.4963	137.9700
2037	75.2086	82.9699	87.0400	94.2386	102.5079	111.8666	120.7362	126.8197	137.5493
2038	75.3498	83.0404	86.9244	94.1515	102.4881	111.8493	120.8990	126.4046	138.1450
2039	75.7476	82.9187	86.8277	94.1389	102.5741	111.8847	120.7330	126.5951	137.8427
2040	75.9905	82.7409	86.6782	93.9734	102.5961	111.7709	120.7889	126.5082	138.5067
2041	76.0744	82.5141	86.7253	94.0515	102.6740	111.8729	120.7647	126.5123	138.4534
2042	75.8133	82.6821	86.8419	94.1564	102.7905	111.8234	120.6073	125.9859	137.9574
2043	75.7162	82.7760	86.9240	94.2032	102.7968	111.7490	120.4582	126.1768	137.3948
2044	75.5782	82.9358	86.9837	94.0473	102.6995	111.6814	120.7326	126.4987	137.3743
2045	75.5601	82.9441	86.8259	94.1105	102.7415	111.8762	120.6641	126.8614	137.8434
2046	75.4853	82.9642	87.0898	94.0650	102.8228	111.9710	120.9849	126.6927	139.0898
2047	76.0825	83.1639	87.2454	94.2366	102.6358	111.9493	121.0296	126.5904	139.8426
2048	76.2821	83.1219	87.2079	94.2135	102.5540	111.8794	121.0217	126.7660	139.7145
2049	75.8852	83.1641	87.1560	94.0519	102.6136	111.8481	121.2856	126.7635	139.3574
2050	75.4978	82.9229	87.2271	94.1302	102.6464	111.8661	121.3238	126.9335	138.7976

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	14.7715	3.1646
2013	20.2952	3.8333
2014	31.0621	5.3492
2015	44.6153	7.8704
2016	57.1643	10.0708
2017	66.8964	11.3050
2018	75.0131	12.0362
2019	82.0103	12.5978
2020	89.8118	13.1019
2021	95.7616	13.7820
2022	99.7776	14.1429
2023	102.5451	14.3013
2024	104.4017	14.2897
2025	105.6423	14.2746
2026	106.5314	14.2725
2027	107.1987	14.2714
2028	107.6805	14.2448
2029	108.0028	14.1849
2030	108.2017	14.1267
2031	108.2709	14.1189
2032	108.3298	14.1319
2033	108.4367	14.1798
2034	108.5038	14.1836
2035	108.5736	14.1857
2036	108.5776	14.1791
2037	108.5487	14.1621
2038	108.5225	14.1832
2039	108.5043	14.1856
2040	108.5258	14.1800
2041	108.5483	14.1507
2042	108.5548	14.0731
2043	108.6034	14.0988
2044	108.6351	14.1530
2045	108.6806	14.2661
2046	108.7099	14.2775
2047	108.7288	14.2569
2048	108.7050	14.2473
2049	108.6860	14.2257
2050	108.6707	14.2295

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	8.6123	10.1053	10.9720	12.5220	14.4023	16.8029	19.1009	20.3910	23.6077
2013	12.8262	14.5660	15.6990	17.5634	19.9692	22.7019	25.3441	27.1420	30.6958
2014	20.4195	22.8920	24.6093	27.3944	30.5974	34.2672	38.1943	40.6826	45.6720
2015	29.1131	32.7120	35.1769	39.1020	44.0718	49.1413	54.7871	58.7313	66.8636
2016	37.0286	42.1173	45.0363	50.1536	56.4937	63.2573	69.9041	75.4163	85.1287
2017	43.8246	49.7941	53.2468	59.0691	66.0682	73.6689	81.6414	86.9733	97.5309
2018	50.3294	56.5378	60.4206	66.6709	74.2148	82.2468	90.9985	96.6450	107.2147
2019	56.4140	62.6275	66.5588	73.3060	81.2107	89.5936	98.5388	104.3607	115.3353
2020	63.1219	69.6643	73.6447	80.6900	88.9523	97.9211	107.0151	112.8919	124.0244
2021	67.1924	74.3479	78.7804	86.2372	94.9380	104.4731	113.5836	120.0244	131.8636
2022	70.2011	78.0083	82.5016	90.0708	98.8819	108.6463	118.5788	124.7065	137.0288
2023	72.6887	80.5769	85.1096	92.6871	101.7301	111.2470	121.5763	127.5506	140.0602
2024	75.0335	82.3308	86.6953	94.5875	103.4169	113.4027	123.0216	129.3281	141.7171
2025	75.8922	83.6809	87.8922	95.7825	104.6776	114.5843	124.6297	130.4238	142.7258
2026	76.5186	84.4099	88.6483	96.6741	105.6911	115.4957	125.5727	131.5122	143.6875
2027	77.9351	85.0264	89.5837	97.2295	106.4510	116.1268	125.8860	132.0010	144.2514
2028	77.4820	85.8152	90.1341	97.8812	106.8571	116.5753	126.1831	132.4792	144.9884
2029	78.1817	86.0708	90.4000	98.3087	107.0917	116.9057	126.3011	132.7331	145.6130
2030	78.5319	86.3663	90.7522	98.5467	107.3482	116.8333	126.6013	132.4915	144.8184
2031	78.8131	86.4568	90.8812	98.4857	107.4596	117.1244	126.5535	132.6072	145.9467
2032	78.8330	86.6096	90.8743	98.6002	107.5291	117.3853	126.6088	132.6390	145.5366
2033	78.4447	86.6115	91.0871	98.6179	107.5484	117.3931	126.8232	133.1989	145.9488
2034	78.2098	86.6469	91.2638	98.6961	107.6996	117.4380	126.9332	132.9813	146.1141
2035	78.3875	86.4646	91.1750	98.9217	107.7881	117.5000	127.0132	133.1788	145.9501
2036	78.3013	86.6934	91.2486	98.8480	107.6300	117.6963	126.9253	133.4709	145.2202
2037	78.7791	87.0713	91.1138	98.7792	107.5870	117.6232	127.0655	133.0771	145.4153
2038	79.3118	86.8591	91.0945	98.7453	107.6078	117.6121	127.1017	133.1944	145.8939
2039	79.2970	86.5376	90.9198	98.5664	107.7310	117.4581	126.9893	133.1352	145.6428
2040	79.6156	86.6365	90.9702	98.5534	107.6642	117.5156	127.0805	133.0630	145.4140
2041	79.5561	86.6081	90.8863	98.7626	107.8582	117.5605	127.0244	132.9161	145.4794
2042	79.3310	86.6827	91.1024	98.7266	107.8414	117.4969	126.6640	132.7151	145.1727
2043	78.7596	86.8542	90.9960	98.7679	107.9025	117.4046	126.8393	132.8347	144.8609
2044	78.6210	87.0273	91.1668	98.7227	107.9073	117.7300	127.0091	133.3138	144.7932
2045	79.1246	87.0246	91.1731	98.6143	107.8673	117.5725	127.2327	133.5191	145.6904
2046	79.2608	86.9939	91.4008	98.7106	107.8067	117.5798	127.2995	133.7863	146.6152
2047	79.7448	87.1966	91.4002	98.7758	107.8471	117.4911	127.2560	133.5673	147.1330
2048	79.7952	86.9807	91.2949	98.8335	107.7644	117.5570	127.4515	133.5239	146.7953
2049	79.5584	86.8833	91.4289	98.7905	107.7484	117.5038	127.4725	133.5964	146.0827
2050	79.1055	86.8239	91.2760	98.8094	107.6870	117.6615	127.3633	133.4876	145.4561

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	5.0755	0.9496
2017	6.6538	1.2400
2018	7.9964	1.4188
2019	9.1550	1.5424
2020	10.4450	1.6400
2021	11.4366	1.7799
2022	12.1100	1.8434
2023	12.5743	1.8869
2024	12.8945	1.8997
2025	13.1142	1.9030
2026	13.2559	1.9021
2027	13.3449	1.8966

2028	13.4175	1.8981
2029	13.4757	1.8934
2030	13.5164	1.8873
2031	13.5346	1.8819
2032	13.5464	1.8762
2033	13.5628	1.8795
2034	13.5667	1.8826
2035	13.5731	1.8812
2036	13.5800	1.8849
2037	13.5820	1.8844
2038	13.5830	1.8826
2039	13.5746	1.8837
2040	13.5735	1.8937
2041	13.5783	1.8990
2042	13.5777	1.8820
2043	13.5763	1.8718
2044	13.5755	1.8648
2045	13.5880	1.8744
2046	13.5956	1.8879
2047	13.5980	1.8918
2048	13.5980	1.8945
2049	13.6054	1.8927
2050	13.6043	1.8982

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	3.1977	3.6264	3.9247	4.4284	4.9962	5.6332	6.3343	6.7768	7.6720
2017	4.2083	4.7962	5.1778	5.7929	6.5595	7.3599	8.2342	8.9021	10.2448
2018	5.1549	5.9016	6.2703	7.0089	7.8954	8.8455	9.7978	10.5366	11.9754
2019	5.9771	6.8202	7.2963	8.0948	9.0432	10.0820	11.1808	11.9136	13.3197
2020	7.1128	7.9319	8.4371	9.3160	10.3365	11.4557	12.5949	13.3829	14.8720
2021	7.8315	8.6817	9.2624	10.2237	11.3297	12.5139	13.7633	14.6040	16.1025
2022	8.3531	9.2702	9.8378	10.8118	12.0058	13.2571	14.5159	15.3429	16.9427
2023	8.6908	9.6765	10.2528	11.2668	12.4659	13.7550	15.0376	15.8971	17.4776
2024	8.9405	9.9800	10.5682	11.5848	12.7623	14.0857	15.3961	16.2211	17.9716
2025	9.1912	10.1949	10.7916	11.7959	13.0047	14.2862	15.5902	16.4416	18.1412
2026	9.3221	10.3469	10.9013	11.9359	13.1219	14.4721	15.7702	16.5638	18.1400
2027	9.3948	10.4409	11.0076	12.0437	13.1969	14.5187	15.8621	16.6577	18.2485
2028	9.5070	10.4800	11.0752	12.1021	13.2986	14.6099	15.9147	16.7359	18.3754
2029	9.5334	10.5942	11.1469	12.1596	13.3650	14.6586	15.9366	16.7437	18.5114
2030	9.5155	10.6313	11.1926	12.2226	13.3985	14.7090	15.9772	16.8146	18.4843
2031	9.5888	10.6304	11.2079	12.2513	13.4383	14.6867	15.9623	16.7839	18.5078
2032	9.6445	10.6815	11.2587	12.2487	13.4275	14.7165	15.9568	16.8298	18.5331
2033	9.6896	10.6858	11.2588	12.2800	13.4344	14.7425	16.0115	16.8552	18.6608
2034	9.6788	10.6847	11.2699	12.2528	13.4456	14.7527	15.9992	16.8640	18.5747
2035	9.6223	10.6894	11.2824	12.2846	13.4608	14.7537	15.9611	16.8859	18.6119
2036	9.5445	10.6855	11.2752	12.2993	13.4737	14.7478	16.0207	16.8404	18.6033
2037	9.6042	10.6759	11.3005	12.2848	13.4581	14.7761	16.0560	16.8723	18.4695
2038	9.6152	10.6996	11.2862	12.2785	13.4518	14.7644	16.0655	16.8841	18.4392
2039	9.6811	10.7059	11.2496	12.2770	13.4382	14.7693	16.0570	16.8658	18.4463
2040	9.6778	10.6794	11.2401	12.2570	13.4661	14.7613	16.0216	16.8911	18.6109
2041	9.7053	10.6402	11.2421	12.2484	13.4667	14.7749	16.0552	16.8870	18.5588
2042	9.7488	10.6586	11.2439	12.2538	13.4723	14.7836	16.0332	16.8687	18.5156
2043	9.7265	10.7060	11.2584	12.2670	13.4585	14.7389	16.0012	16.7995	18.4746
2044	9.7205	10.6714	11.2566	12.2840	13.4870	14.7429	15.9908	16.8023	18.4577
2045	9.6456	10.7390	11.2546	12.2821	13.4831	14.7612	16.0084	16.8579	18.4392
2046	9.6385	10.6975	11.2912	12.2807	13.4876	14.7868	16.0587	16.8974	18.5138

2047	9.7320	10.7284	11.2991	12.2711	13.4621	14.7822	16.0826	16.9152	18.6507
2048	9.7479	10.7064	11.3010	12.2757	13.4606	14.7587	16.0444	16.9261	18.7019
2049	9.7430	10.7537	11.3132	12.3005	13.4696	14.7786	16.0754	16.9412	18.7077
2050	9.7029	10.7554	11.2769	12.2871	13.4823	14.7722	16.1087	16.9153	18.7244

Landings x 1000 MT

Year	Average	StdDev
2012	3.7670	0.0000
2013	1.4700	0.0000
2014	1.4700	0.0000
2015	1.4700	0.0000
2016	5.0755	0.9496
2017	6.6538	1.2400
2018	7.9964	1.4188
2019	9.1550	1.5424
2020	10.4450	1.6400
2021	11.4366	1.7799
2022	12.1100	1.8434
2023	12.5743	1.8869
2024	12.8945	1.8997
2025	13.1142	1.9030
2026	13.2559	1.9021
2027	13.3449	1.8966
2028	13.4175	1.8981
2029	13.4757	1.8934
2030	13.5164	1.8873
2031	13.5346	1.8819
2032	13.5464	1.8762
2033	13.5628	1.8795
2034	13.5667	1.8826
2035	13.5731	1.8812
2036	13.5800	1.8849
2037	13.5820	1.8844
2038	13.5830	1.8826
2039	13.5746	1.8837
2040	13.5735	1.8937
2041	13.5783	1.8990
2042	13.5777	1.8820
2043	13.5763	1.8718
2044	13.5755	1.8648
2045	13.5880	1.8744
2046	13.5956	1.8879
2047	13.5980	1.8918
2048	13.5980	1.8945
2049	13.6054	1.8927
2050	13.6043	1.8982

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	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2014	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	3.1977	3.6264	3.9247	4.4284	4.9962	5.6332	6.3343	6.7768	7.6720
2017	4.2083	4.7962	5.1778	5.7929	6.5595	7.3599	8.2342	8.9021	10.2448
2018	5.1549	5.9016	6.2703	7.0089	7.8954	8.8455	9.7978	10.5366	11.9754
2019	5.9771	6.8202	7.2963	8.0948	9.0432	10.0820	11.1808	11.9136	13.3197
2020	7.1128	7.9319	8.4371	9.3160	10.3365	11.4557	12.5949	13.3829	14.8720
2021	7.8315	8.6817	9.2624	10.2237	11.3297	12.5139	13.7633	14.6040	16.1025
2022	8.3531	9.2702	9.8378	10.8118	12.0058	13.2571	14.5159	15.3429	16.9427

2023	8.6908	9.6765	10.2528	11.2668	12.4659	13.7550	15.0376	15.8971	17.4776
2024	8.9405	9.9800	10.5682	11.5848	12.7623	14.0857	15.3961	16.2211	17.9716
2025	9.1912	10.1949	10.7916	11.7959	13.0047	14.2862	15.5902	16.4416	18.1412
2026	9.3221	10.3469	10.9013	11.9359	13.1219	14.4721	15.7702	16.5638	18.1400
2027	9.3948	10.4409	11.0076	12.0437	13.1969	14.5187	15.8621	16.6577	18.2485
2028	9.5070	10.4800	11.0752	12.1021	13.2986	14.6099	15.9147	16.7359	18.3754
2029	9.5334	10.5942	11.1469	12.1596	13.3650	14.6586	15.9366	16.7437	18.5114
2030	9.5155	10.6313	11.1926	12.2226	13.3985	14.7090	15.9772	16.8146	18.4843
2031	9.5888	10.6304	11.2079	12.2513	13.4383	14.6867	15.9623	16.7839	18.5078
2032	9.6445	10.6815	11.2587	12.2487	13.4275	14.7165	15.9568	16.8298	18.5331
2033	9.6896	10.6858	11.2588	12.2800	13.4344	14.7425	16.0115	16.8552	18.6608
2034	9.6788	10.6847	11.2699	12.2528	13.4456	14.7527	15.9992	16.8640	18.5747
2035	9.6223	10.6894	11.2824	12.2846	13.4608	14.7537	15.9611	16.8859	18.6119
2036	9.5445	10.6855	11.2752	12.2993	13.4737	14.7478	16.0207	16.8404	18.6033
2037	9.6042	10.6759	11.3005	12.2848	13.4581	14.7761	16.0560	16.8723	18.4695
2038	9.6152	10.6996	11.2862	12.2785	13.4518	14.7644	16.0655	16.8841	18.4392
2039	9.6811	10.7059	11.2496	12.2770	13.4382	14.7693	16.0570	16.8658	18.4463
2040	9.6778	10.6794	11.2401	12.2570	13.4661	14.7613	16.0216	16.8911	18.6109
2041	9.7053	10.6402	11.2421	12.2484	13.4667	14.7749	16.0552	16.8870	18.5588
2042	9.7488	10.6586	11.2439	12.2538	13.4723	14.7836	16.0332	16.8687	18.5156
2043	9.7265	10.7060	11.2584	12.2670	13.4585	14.7389	16.0012	16.7995	18.4746
2044	9.7205	10.6714	11.2566	12.2840	13.4870	14.7429	15.9908	16.8023	18.4577
2045	9.6456	10.7390	11.2546	12.2821	13.4831	14.7612	16.0084	16.8579	18.4392
2046	9.6385	10.6975	11.2912	12.2807	13.4876	14.7868	16.0587	16.8974	18.5138
2047	9.7320	10.7284	11.2991	12.2711	13.4621	14.7822	16.0826	16.9152	18.6507
2048	9.7479	10.7064	11.3010	12.2757	13.4606	14.7587	16.0444	16.9261	18.7019
2049	9.7430	10.7537	11.3132	12.3005	13.4696	14.7786	16.0754	16.9412	18.7077
2050	9.7029	10.7554	11.2769	12.2871	13.4823	14.7722	16.1087	16.9153	18.7244

Total Fishing Mortality

Year	Average	StdDev
2012	0.5490	0.1661
2013	0.1892	0.0670
2014	0.1360	0.0409
2015	0.0779	0.0162
2016	0.1660	0.0000
2017	0.1660	0.0000
2018	0.1660	0.0000
2019	0.1660	0.0000
2020	0.1660	0.0000
2021	0.1660	0.0000
2022	0.1660	0.0000
2023	0.1660	0.0000
2024	0.1660	0.0000
2025	0.1660	0.0000
2026	0.1660	0.0000
2027	0.1660	0.0000
2028	0.1660	0.0000
2029	0.1660	0.0000
2030	0.1660	0.0000
2031	0.1660	0.0000
2032	0.1660	0.0000
2033	0.1660	0.0000
2034	0.1660	0.0000
2035	0.1660	0.0000
2036	0.1660	0.0000
2037	0.1660	0.0000
2038	0.1660	0.0000
2039	0.1660	0.0000
2040	0.1660	0.0000
2041	0.1660	0.0000

2042	0.1660	0.0000
2043	0.1660	0.0000
2044	0.1660	0.0000
2045	0.1660	0.0000
2046	0.1660	0.0000
2047	0.1660	0.0000
2048	0.1660	0.0000
2049	0.1660	0.0000
2050	0.1660	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.2884	0.3409	0.3688	0.4328	0.5172	0.6326	0.7681	0.8549	1.0759
2013	0.0909	0.1098	0.1198	0.1419	0.1765	0.2180	0.2742	0.3103	0.4052
2014	0.0703	0.0836	0.0904	0.1061	0.1300	0.1576	0.1882	0.2126	0.2639
2015	0.0477	0.0547	0.0587	0.0661	0.0763	0.0878	0.0992	0.1076	0.1236
2016	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2017	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2018	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2019	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2020	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2021	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2022	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2023	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2024	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2025	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2026	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2027	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2028	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2029	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2030	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2031	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2032	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2033	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2034	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2035	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2036	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2037	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2038	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2039	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2040	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2041	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2042	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2043	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2044	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2045	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2046	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2047	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2048	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2049	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660
2050	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660	0.1660

Probability Spawning 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	0.001400
2019	0.010600
2020	0.064500
2021	0.191500
2022	0.321500
2023	0.421900
2024	0.494500
2025	0.550200
2026	0.582500
2027	0.605100
2028	0.624400
2029	0.637600
2030	0.647900
2031	0.653100
2032	0.654700
2033	0.657100
2034	0.656400
2035	0.662400
2036	0.663100
2037	0.659200
2038	0.656600
2039	0.659000
2040	0.659400
2041	0.660900
2042	0.661200
2043	0.663000
2044	0.664300
2045	0.667300
2046	0.666500
2047	0.658700
2048	0.658600
2049	0.662200
2050	0.663000

Probability Threshold Exceeded at Least Once = 0.9903

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	0.000300
2017	0.016600
2018	0.076200
2019	0.202700
2020	0.494500
2021	0.723100
2022	0.835900
2023	0.891400
2024	0.922400
2025	0.939400
2026	0.949500
2027	0.956200
2028	0.960400
2029	0.964500
2030	0.965700
2031	0.967400
2032	0.968600

2033	0.969700
2034	0.970300
2035	0.967500
2036	0.968300
2037	0.970100
2038	0.970400
2039	0.970800
2040	0.971200
2041	0.970500
2042	0.970500
2043	0.969700
2044	0.970100
2045	0.971200
2046	0.971700
2047	0.973000
2048	0.972200
2049	0.973500
2050	0.972000

Probability Threshold Exceeded at Least Once = 1.0000

Probability Mean Biomass Exceeds Threshold 80.200 (1000 MT)

Year	Probability
2012	0.000000
2013	0.000000
2014	0.000000
2015	0.000200
2016	0.025500
2017	0.118400
2018	0.306700
2019	0.532500
2020	0.763700
2021	0.878400
2022	0.927800
2023	0.954100
2024	0.967300
2025	0.974100
2026	0.979200
2027	0.982700
2028	0.982500
2029	0.984200
2030	0.985900
2031	0.985400
2032	0.986200
2033	0.985400
2034	0.984500
2035	0.984300
2036	0.985200
2037	0.986400
2038	0.987500
2039	0.987900
2040	0.988100
2041	0.987700
2042	0.987800
2043	0.986500
2044	0.986300
2045	0.987700
2046	0.987400
2047	0.988700
2048	0.988800

2049	0.988100
2050	0.986100

Probability Threshold Exceeded at Least Once = 1.0000

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2012	1.000000
2013	0.469100
2014	0.135600
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
2031	0.000000
2032	0.000000
2033	0.000000
2034	0.000000
2035	0.000000
2036	0.000000
2037	0.000000
2038	0.000000
2039	0.000000
2040	0.000000
2041	0.000000
2042	0.000000
2043	0.000000
2044	0.000000
2045	0.000000
2046	0.000000
2047	0.000000
2048	0.000000
2049	0.000000
2050	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

American Plaice rebuild in 7 years

AGEPRO VERSION 4.2
Am. plaice F40% ty10, 2010 catch

Date & Time of Run: 11 Jul 2013 16:11

Input File Name:
D:\NIT\GARM_2012_UPDATE_PROJ\AMERICAN_PLAICE\PROJECTION\APLAICE_1624IN2011_1922IN2012_ACL2013-2014_REBUILD7YR.INP

First Age Class: 1
Number of Age Classes: 11
Number of Years in Projection: 14
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\AMERICAN_PLAICE\PROJECTION\TY10_AP_GMGB_BOOT.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Removals	1624
2012	Removals	1922
2013	Removals	1482
2014	Removals	1442
2015	Removals	1470
2016	F-Mult	0.1470
2017	F-Mult	0.1470
2018	F-Mult	0.1470
2019	F-Mult	0.1470
2020	F-Mult	0.1470
2021	F-Mult	0.1470
2022	F-Mult	0.1470
2023	F-Mult	0.1470
2024	F-Mult	0.1470

Recruits 1000000 Fish

Year Class	Average	StdDev
2011	27.5804	10.8767
2012	27.6310	11.0973
2013	27.4431	10.9843
2014	27.3880	10.7926
2015	27.3106	10.7605
2016	27.4290	10.7505
2017	27.5610	10.7743
2018	27.4900	10.6981
2019	27.5303	10.7778
2020	27.5134	10.9471
2021	27.4250	10.8000
2022	27.5023	10.8815

2023	27.5984	10.9248
2024	27.6289	10.8273

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	12.0373	15.4181	16.4740	20.2214	24.7204	31.7951	45.1528	49.0004	60.1498
2012	11.9470	15.1522	16.2997	20.1057	24.7165	32.6191	45.5383	49.2811	60.3436
2013	11.7847	15.1756	16.3470	19.9569	24.5893	31.6788	45.3253	48.9837	60.1528
2014	11.8762	15.2895	16.4014	20.2246	24.6477	30.5470	45.1372	49.0530	60.0072
2015	11.9359	15.2545	16.3654	20.0641	24.5441	31.1317	45.0456	48.8163	58.9922
2016	12.0003	15.3265	16.3597	20.1507	24.6842	31.4965	44.8967	48.8952	59.2160
2017	11.9269	15.3573	16.4141	20.4309	24.6857	31.9748	44.8922	48.8248	59.6778
2018	11.8442	15.3215	16.4003	20.1804	24.7081	32.0648	44.9461	48.7360	58.4950
2019	12.0944	15.3092	16.3955	20.2285	24.7762	31.9159	44.8875	48.7862	59.8793
2020	11.9809	15.2414	16.3804	20.0006	24.6380	31.8815	45.1496	49.1333	59.5852
2021	11.9817	15.3874	16.4454	20.0532	24.6582	31.4100	44.9637	48.8397	60.2191
2022	11.9262	15.3656	16.3582	20.1422	24.7058	32.0444	45.1564	48.9638	59.6464
2023	11.8641	15.2812	16.3584	20.1011	24.7326	32.8330	45.1867	49.1045	59.4785
2024	12.0398	15.2868	16.4304	20.2627	24.7649	32.6709	45.1567	48.9652	59.3497

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	11.6583	0.9036
2012	12.2149	1.0570
2013	11.9970	1.1868
2014	11.8262	1.3783
2015	12.2600	1.8898
2016	13.6294	2.3788
2017	14.8203	2.5123
2018	16.0288	2.5981
2019	17.0460	2.6294
2020	17.8527	2.6103
2021	18.6164	2.6243
2022	19.3749	2.5910
2023	19.9091	2.5662
2024	20.2843	2.5554

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	9.8140	10.5695	10.9220	11.5198	12.1707	12.8573	13.5522	14.1144	14.8830
2013	9.3633	10.1121	10.5251	11.2247	11.9607	12.7011	13.5140	14.1276	14.9213
2014	8.9210	9.7472	10.1485	10.9189	11.7328	12.6342	13.6609	14.1444	15.4157
2015	8.8594	9.7301	10.2073	11.0124	12.0309	13.2383	14.4961	15.3875	18.0696
2016	9.6197	10.5295	11.0555	12.0240	13.3214	14.8139	16.4398	17.6362	21.1446
2017	10.5502	11.4459	11.9969	13.0438	14.5111	16.1882	17.8825	19.2059	22.4120
2018	11.4468	12.4250	13.0024	14.1610	15.7234	17.5427	19.3439	20.5856	23.5514
2019	12.2910	13.2913	13.9238	15.1472	16.7456	18.6119	20.4809	21.7150	24.3188
2020	12.9899	14.0306	14.7245	15.9725	17.6005	19.4516	21.3337	22.4932	25.0801
2021	13.6131	14.7292	15.4140	16.7174	18.3863	20.2625	22.0813	23.2156	25.9064
2022	14.3605	15.4714	16.1825	17.4816	19.1790	21.0450	22.8299	23.9477	26.1150
2023	14.9710	16.0589	16.7194	18.0221	19.7365	21.5574	23.3621	24.4122	26.4104
2024	15.2811	16.4420	17.0980	18.4115	20.0982	21.9519	23.7241	24.7501	26.9125

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	15.2006	1.1215
2012	15.5251	1.2829

2013	14.9574	1.4495
2014	15.2043	1.9067
2015	16.5155	2.5819
2016	18.6452	3.1374
2017	20.1405	3.2378
2018	21.5144	3.2882
2019	22.6301	3.2908
2020	23.5130	3.2576
2021	24.3528	3.2628
2022	25.1829	3.2291
2023	25.7660	3.2099
2024	26.1743	3.2045

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	12.6868	13.5211	13.9474	14.6885	15.4930	16.2938	17.2198	17.8059	18.7022
2013	11.8191	12.7390	13.1744	14.0049	14.8842	15.8153	16.8933	17.4388	18.5987
2014	11.6208	12.5715	13.0696	13.9285	15.0074	16.2522	17.5246	18.3909	20.9104
2015	12.1350	13.1446	13.7342	14.8133	16.1794	17.7858	19.5336	20.8228	24.8140
2016	13.3500	14.4425	15.1722	16.4721	18.2623	20.3153	22.4501	24.1074	28.2075
2017	14.4982	15.6863	16.4104	17.8272	19.7617	21.9796	24.2471	25.8248	29.8359
2018	15.6043	16.8267	17.6411	19.1529	21.1449	23.4776	25.8000	27.3075	30.6977
2019	16.5452	17.8636	18.6766	20.2733	22.2958	24.6103	27.0085	28.4640	31.6261
2020	17.3522	18.7041	19.5473	21.1626	23.2173	25.5350	27.8486	29.2585	32.4751
2021	18.0771	19.4630	20.3567	21.9701	24.0960	26.4115	28.6558	30.1103	33.0488
2022	18.9468	20.3203	21.2067	22.8177	24.9564	27.2821	29.5237	30.8610	33.3694
2023	19.5297	20.9503	21.7940	23.4045	25.5343	27.8521	30.0871	31.3682	34.1407
2024	19.8973	21.3055	22.1767	23.8252	25.9355	28.2670	30.4826	31.7540	34.3437

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	15.6329	1.2360
2012	15.3669	1.3833
2013	14.9452	1.6604
2014	15.8592	2.4128
2015	17.8520	2.9787
2016	19.8644	3.2855
2017	21.2474	3.3522
2018	22.5288	3.3683
2019	23.5800	3.3495
2020	24.3753	3.3066
2021	25.0872	3.2992
2022	25.7877	3.2733
2023	26.2810	3.2669
2024	26.6247	3.2698

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	12.3260	13.1641	13.6630	14.4595	15.3109	16.1745	17.1764	17.8594	18.8242
2013	11.5936	12.5532	12.9973	13.8262	14.8165	15.9047	17.0552	17.7910	19.7819
2014	11.7825	12.7735	13.3131	14.2858	15.5314	17.0139	18.6092	19.8660	23.8528
2015	12.8760	13.9379	14.6154	15.8193	17.4578	19.3953	21.4498	23.0089	27.0046
2016	14.2562	15.4072	16.1255	17.5190	19.4632	21.6921	23.9829	25.6270	29.6775
2017	15.3054	16.5468	17.3099	18.8418	20.8816	23.2273	25.6059	27.1584	30.6556
2018	16.3253	17.6946	18.5146	20.1026	22.1742	24.5493	26.9675	28.4957	31.7281
2019	17.3221	18.6532	19.5410	21.1731	23.2496	25.6320	28.0202	29.4780	32.7671
2020	17.9961	19.4743	20.3061	21.9699	24.1273	26.4750	28.7495	30.2177	33.2391

2021	18.7251	20.1327	21.0227	22.6628	24.8369	27.2105	29.5438	30.9696	33.6424
2022	19.5069	20.8883	21.7205	23.3732	25.5734	27.9031	30.1673	31.5326	34.1197
2023	19.9483	21.3566	22.2145	23.8847	26.0420	28.4221	30.6788	31.9661	34.6953
2024	20.2174	21.6569	22.5811	24.2230	26.3964	28.7624	30.9982	32.3403	35.0190

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	1.6240	0.0000
2012	1.9220	0.0000
2013	1.4820	0.0000
2014	1.4420	0.0000
2015	1.4700	0.0000
2016	1.9327	0.3435
2017	2.1144	0.3604
2018	2.2896	0.3714
2019	2.4356	0.3751
2020	2.5465	0.3705
2021	2.6472	0.3720
2022	2.7498	0.3675
2023	2.8224	0.3642
2024	2.8732	0.3627

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	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820
2014	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	1.3628	1.4912	1.5635	1.7030	1.8871	2.1025	2.3300	2.5119	3.0309
2017	1.5034	1.6321	1.7092	1.8591	2.0687	2.3112	2.5549	2.7430	3.1891
2018	1.6316	1.7718	1.8544	2.0240	2.2472	2.5050	2.7668	2.9434	3.3572
2019	1.7536	1.8996	1.9886	2.1646	2.3933	2.6593	2.9305	3.1017	3.4598
2020	1.8559	2.0028	2.1018	2.2799	2.5102	2.7745	3.0435	3.2039	3.5612
2021	1.9383	2.0976	2.1930	2.3787	2.6170	2.8805	3.1395	3.3012	3.6648
2022	2.0381	2.1982	2.2959	2.4806	2.7232	2.9847	3.2427	3.3987	3.7102
2023	2.1230	2.2765	2.3703	2.5539	2.7992	3.0564	3.3095	3.4600	3.7502
2024	2.1659	2.3257	2.4215	2.6073	2.8474	3.1129	3.3607	3.5049	3.8094

Landings x 1000 MT

Year	Average	StdDev
2011	1.3141	0.0117
2012	1.5976	0.0155
2013	1.2643	0.0130
2014	1.2380	0.0260
2015	1.2376	0.0314
2016	1.5859	0.2728
2017	1.7175	0.2915
2018	1.8674	0.3063
2019	1.9959	0.3111
2020	2.0935	0.3098
2021	2.1909	0.3140
2022	2.2924	0.3100
2023	2.3640	0.3066
2024	2.4143	0.3046

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	1.5872	1.5986	1.6084	1.6166	1.6216	1.6338
2013	1.2279	1.2431	1.2482	1.2563	1.2650	1.2735	1.2798	1.2835	1.2909
2014	1.1433	1.1927	1.2076	1.2269	1.2429	1.2553	1.2638	1.2682	1.2762
2015	1.1499	1.1808	1.1949	1.2179	1.2418	1.2608	1.2744	1.2820	1.2946
2016	1.1145	1.2271	1.2910	1.4057	1.5496	1.7223	1.9050	2.0439	2.4634
2017	1.2231	1.3287	1.3936	1.5152	1.6813	1.8726	2.0728	2.2266	2.5979
2018	1.3360	1.4477	1.5158	1.6494	1.8306	2.0400	2.2537	2.4034	2.7738
2019	1.4379	1.5567	1.6295	1.7734	1.9605	2.1810	2.3988	2.5415	2.8641
2020	1.5237	1.6442	1.7227	1.8713	2.0606	2.2814	2.5036	2.6421	2.9415
2021	1.6010	1.7289	1.8119	1.9651	2.1610	2.3833	2.6067	2.7449	3.0608
2022	1.6919	1.8267	1.9125	2.0671	2.2696	2.4919	2.7031	2.8415	3.1168
2023	1.7720	1.9006	1.9828	2.1388	2.3436	2.5626	2.7739	2.9020	3.1513
2024	1.8197	1.9567	2.0360	2.1897	2.3924	2.6104	2.8253	2.9466	3.2005

Discards x 1000 MT

Year	Average	StdDev
2011	0.3099	0.0117
2012	0.3244	0.0155
2013	0.2177	0.0130
2014	0.2040	0.0260
2015	0.2324	0.0314
2016	0.3468	0.0818
2017	0.3969	0.0809
2018	0.4222	0.0792
2019	0.4397	0.0781
2020	0.4530	0.0765
2021	0.4563	0.0760
2022	0.4575	0.0756
2023	0.4584	0.0754
2024	0.4589	0.0755

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	0.2880	0.3004	0.3054	0.3136	0.3234	0.3348	0.3445	0.3506	0.3619
2013	0.1911	0.1985	0.2022	0.2085	0.2170	0.2257	0.2338	0.2388	0.2541
2014	0.1658	0.1738	0.1782	0.1867	0.1991	0.2151	0.2344	0.2492	0.2983
2015	0.1752	0.1880	0.1956	0.2092	0.2282	0.2521	0.2751	0.2891	0.3199
2016	0.2190	0.2437	0.2587	0.2879	0.3333	0.3907	0.4507	0.4937	0.6031
2017	0.2585	0.2868	0.3024	0.3358	0.3870	0.4466	0.5048	0.5431	0.6260
2018	0.2839	0.3103	0.3277	0.3613	0.4134	0.4725	0.5294	0.5651	0.6352
2019	0.2991	0.3290	0.3473	0.3813	0.4313	0.4882	0.5458	0.5827	0.6509
2020	0.3128	0.3444	0.3618	0.3956	0.4450	0.5014	0.5567	0.5923	0.6593
2021	0.3189	0.3477	0.3648	0.3983	0.4487	0.5048	0.5598	0.5932	0.6581
2022	0.3212	0.3498	0.3668	0.3989	0.4501	0.5059	0.5597	0.5926	0.6595
2023	0.3229	0.3498	0.3675	0.4017	0.4503	0.5070	0.5618	0.5960	0.6620
2024	0.3219	0.3496	0.3668	0.4025	0.4525	0.5069	0.5620	0.5945	0.6557

Total Fishing Mortality

Year	Average	StdDev
2011	0.1432	0.0115
2012	0.1648	0.0148
2013	0.1290	0.0132
2014	0.1279	0.0154
2015	0.1269	0.0184
2016	0.1470	0.0000
2017	0.1470	0.0000
2018	0.1470	0.0000

2019	0.1470	0.0000
2020	0.1470	0.0000
2021	0.1470	0.0000
2022	0.1470	0.0000
2023	0.1470	0.0000
2024	0.1470	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	0.1016	0.1078	0.1129	0.1204	0.1281	0.1369	0.1461	0.1522	0.1646
2014	0.0949	0.1046	0.1087	0.1176	0.1272	0.1372	0.1477	0.1542	0.1687
2015	0.0830	0.0982	0.1046	0.1147	0.1265	0.1385	0.1497	0.1574	0.1730
2016	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2017	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2018	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2019	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2020	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2021	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2022	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2023	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470
2024	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470	0.1470

Probability Spawning Stock Biomass Exceeds Threshold 18.398 (1000 MT)

Year	Probability
2011	0.000000
2012	0.000000
2013	0.000000
2014	0.001000
2015	0.009400
2016	0.034800
2017	0.076000
2018	0.165900
2019	0.275400
2020	0.379400
2021	0.498400
2022	0.617500
2023	0.697300
2024	0.752000

Probability Threshold Exceeded at Least Once = 0.7871

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2011	0.003000
2012	0.143000
2013	0.001000
2014	0.002100
2015	0.005000
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

Probability Threshold Exceeded at Least Once = 0.1430

American Plaice rebuild in 8 years

AGEPRO VERSION 4.2
Am. plaice F40% ty10, 2010 catch

Date & Time of Run: 22 Jul 2013 15:55

Input File Name:
D:\NIT\GARM_2012_UPDATE_PROJ\AMERICAN_PLAICE\PROJECTION\APLAICE_1624IN2011_1922IN2012_ACL2013-2014_REBUILD8YR.INP

First Age Class: 1
Number of Age Classes: 11
Number of Years in Projection: 14
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\AMERICAN_PLAICE\PROJECTION\TY10_AP_GMGB_BOOT.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Removals	1624
2012	Removals	1922
2013	Removals	1482
2014	Removals	1442
2015	Removals	1470
2016	F-Mult	0.1600
2017	F-Mult	0.1600
2018	F-Mult	0.1600
2019	F-Mult	0.1600
2020	F-Mult	0.1600
2021	F-Mult	0.1600
2022	F-Mult	0.1600
2023	F-Mult	0.1600
2024	F-Mult	0.1600

Recruits 1000000 Fish

Year Class	Average	StdDev
2011	27.5804	10.8767
2012	27.6310	11.0973
2013	27.4431	10.9843
2014	27.3880	10.7926
2015	27.3106	10.7605
2016	27.4290	10.7505
2017	27.5610	10.7743
2018	27.4900	10.6981
2019	27.5303	10.7778
2020	27.5134	10.9471
2021	27.4250	10.8000

2022	27.5023	10.8815
2023	27.5984	10.9248
2024	27.6289	10.8273

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	12.0373	15.4181	16.4740	20.2214	24.7204	31.7951	45.1528	49.0004	60.1498
2012	11.9470	15.1522	16.2997	20.1057	24.7165	32.6191	45.5383	49.2811	60.3436
2013	11.7847	15.1756	16.3470	19.9569	24.5893	31.6788	45.3253	48.9837	60.1528
2014	11.8762	15.2895	16.4014	20.2246	24.6477	30.5470	45.1372	49.0530	60.0072
2015	11.9359	15.2545	16.3654	20.0641	24.5441	31.1317	45.0456	48.8163	58.9922
2016	12.0003	15.3265	16.3597	20.1507	24.6842	31.4965	44.8967	48.8952	59.2160
2017	11.9269	15.3573	16.4141	20.4309	24.6857	31.9748	44.8922	48.8248	59.6778
2018	11.8442	15.3215	16.4003	20.1804	24.7081	32.0648	44.9461	48.7360	58.4950
2019	12.0944	15.3092	16.3955	20.2285	24.7762	31.9159	44.8875	48.7862	59.8793
2020	11.9809	15.2414	16.3804	20.0006	24.6380	31.8815	45.1496	49.1333	59.5852
2021	11.9817	15.3874	16.4454	20.0532	24.6582	31.4100	44.9637	48.8397	60.2191
2022	11.9262	15.3656	16.3582	20.1422	24.7058	32.0444	45.1564	48.9638	59.6464
2023	11.8641	15.2812	16.3584	20.1011	24.7326	32.8330	45.1867	49.1045	59.4785
2024	12.0398	15.2868	16.4304	20.2627	24.7649	32.6709	45.1567	48.9652	59.3497

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	11.6583	0.9036
2012	12.2149	1.0570
2013	11.9970	1.1868
2014	11.8262	1.3783
2015	12.2600	1.8898
2016	13.5906	2.3718
2017	14.6343	2.4797
2018	15.6976	2.5433
2019	16.5798	2.5568
2020	17.2684	2.5261
2021	17.9249	2.5293
2022	18.5820	2.4922
2023	19.0360	2.4660
2024	19.3497	2.4548

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	9.8140	10.5695	10.9220	11.5198	12.1707	12.8573	13.5522	14.1144	14.8830
2013	9.3633	10.1121	10.5251	11.2247	11.9607	12.7011	13.5140	14.1276	14.9213
2014	8.9210	9.7472	10.1485	10.9189	11.7328	12.6342	13.6609	14.1444	15.4157
2015	8.8594	9.7301	10.2073	11.0124	12.0309	13.2383	14.4961	15.3875	18.0696
2016	9.5931	10.4995	11.0235	11.9903	13.2850	14.7716	16.3940	17.5871	21.0823
2017	10.4157	11.3011	11.8493	12.8849	14.3269	15.9838	17.6599	18.9527	22.1265
2018	11.2157	12.1696	12.7277	13.8655	15.3999	17.1832	18.9472	20.1589	23.0308
2019	11.9530	12.9292	13.5449	14.7327	16.2884	18.1046	19.9366	21.1083	23.6659
2020	12.5753	13.5703	14.2364	15.4511	17.0293	18.8041	20.6371	21.7444	24.2835
2021	13.1026	14.1916	14.8408	16.0979	17.7168	19.5091	21.2772	22.3642	24.9156
2022	13.7721	14.8400	15.5114	16.7538	18.4036	20.1887	21.9181	22.9652	25.0694
2023	14.3109	15.3399	15.9740	17.2161	18.8719	20.6178	22.3534	23.3605	25.2578
2024	14.5491	15.6649	16.2807	17.5430	19.1752	20.9603	22.6569	23.6205	25.7439

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2011	15.2006	1.1215

2012	15.5251	1.2829
2013	14.9574	1.4495
2014	15.2043	1.9067
2015	16.5155	2.5819
2016	18.6452	3.1374
2017	19.9709	3.2098
2018	21.1822	3.2371
2019	22.1504	3.2219
2020	22.9060	3.1776
2021	23.6310	3.1728
2022	24.3527	3.1356
2023	24.8499	3.1149
2024	25.1922	3.1092

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	12.6868	13.5211	13.9474	14.6885	15.4930	16.2938	17.2198	17.8059	18.7022
2013	11.8191	12.7390	13.1744	14.0049	14.8842	15.8153	16.8933	17.4388	18.5987
2014	11.6208	12.5715	13.0696	13.9285	15.0074	16.2522	17.5246	18.3909	20.9104
2015	12.1350	13.1446	13.7342	14.8133	16.1794	17.7858	19.5336	20.8228	24.8140
2016	13.3500	14.4425	15.1722	16.4721	18.2623	20.3153	22.4501	24.1074	28.2075
2017	14.3725	15.5557	16.2692	17.6751	19.5937	21.7959	24.0452	25.5988	29.5707
2018	15.3372	16.5631	17.3697	18.8551	20.8105	23.1093	25.4100	26.8943	30.2272
2019	16.2138	17.4686	18.2779	19.8440	21.8266	24.0967	26.4388	27.8718	30.9775
2020	16.8850	18.2064	19.0268	20.6109	22.6235	24.8883	27.1312	28.5251	31.6108
2021	17.4903	18.8760	19.7403	21.3167	23.3832	25.6450	27.8227	29.2391	32.1125
2022	18.3201	19.6291	20.4750	22.0502	24.1318	26.3800	28.5887	29.8750	32.3706
2023	18.8162	20.1851	21.0018	22.5540	24.6318	26.8891	29.0389	30.2848	32.9579
2024	19.1333	20.4731	21.3300	22.9171	24.9648	27.2203	29.3573	30.5947	33.1259

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	15.6329	1.2360
2012	15.3669	1.3833
2013	14.9452	1.6604
2014	15.8592	2.4128
2015	17.8520	2.9787
2016	19.7786	3.2708
2017	20.9975	3.3126
2018	22.1242	3.3090
2019	23.0373	3.2762
2020	23.7170	3.2259
2021	24.3272	3.2116
2022	24.9320	3.1835
2023	25.3500	3.1761
2024	25.6362	3.1791

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	12.3260	13.1641	13.6630	14.4595	15.3109	16.1745	17.1764	17.8594	18.8242
2013	11.5936	12.5532	12.9973	13.8262	14.8165	15.9047	17.0552	17.7910	19.7819
2014	11.7825	12.7735	13.3131	14.2858	15.5314	17.0139	18.6092	19.8660	23.8528
2015	12.8760	13.9379	14.6154	15.8193	17.4578	19.3953	21.4498	23.0089	27.0046
2016	14.1933	15.3406	16.0562	17.4441	19.3795	21.6013	23.8774	25.5187	29.5313
2017	15.1219	16.3463	17.0992	18.6183	20.6304	22.9605	25.3049	26.8360	30.2993
2018	16.0232	17.3761	18.1722	19.7343	21.7713	24.1193	26.4883	27.9858	31.1443
2019	16.9043	18.2226	19.0930	20.6725	22.7156	25.0463	27.3761	28.8176	32.0668

2020	17.4862	18.9388	19.7515	21.3591	23.4781	25.7616	27.9912	29.4102	32.3780
2021	18.1392	19.5123	20.3873	21.9641	24.0883	26.3886	28.6600	30.0023	32.6084
2022	18.8407	20.1652	20.9862	22.5831	24.7259	26.9995	29.1877	30.4974	33.0397
2023	19.1825	20.5702	21.4022	23.0223	25.1290	27.4348	29.6390	30.8779	33.5564
2024	19.4515	20.8300	21.7079	23.3055	25.4238	27.7053	29.9010	31.2116	33.7932

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	1.6240	0.0000
2012	1.9220	0.0000
2013	1.4820	0.0000
2014	1.4420	0.0000
2015	1.4700	0.0000
2016	2.0925	0.3718
2017	2.2673	0.3862
2018	2.4353	0.3948
2019	2.5734	0.3961
2020	2.6761	0.3896
2021	2.7697	0.3897
2022	2.8662	0.3842
2023	2.9332	0.3805
2024	2.9793	0.3788

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	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820
2014	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	1.4755	1.6146	1.6928	1.8442	2.0432	2.2759	2.5227	2.7189	3.2807
2017	1.6121	1.7498	1.8324	1.9937	2.2189	2.4782	2.7407	2.9434	3.4185
2018	1.7346	1.8853	1.9724	2.1529	2.3905	2.6659	2.9432	3.1282	3.5658
2019	1.8501	2.0063	2.1028	2.2876	2.5292	2.8106	3.0966	3.2760	3.6533
2020	1.9486	2.1041	2.2092	2.3941	2.6380	2.9161	3.1967	3.3667	3.7441
2021	2.0245	2.1949	2.2940	2.4879	2.7377	3.0152	3.2870	3.4551	3.8300
2022	2.1247	2.2897	2.3928	2.5862	2.8392	3.1133	3.3839	3.5444	3.8646
2023	2.2044	2.3628	2.4613	2.6523	2.9091	3.1791	3.4434	3.5986	3.8988
2024	2.2407	2.4079	2.5095	2.7009	2.9535	3.2286	3.4887	3.6369	3.9605

Landings x 1000 MT

Year	Average	StdDev
2011	1.3141	0.0117
2012	1.5976	0.0155
2013	1.2643	0.0130
2014	1.2380	0.0260
2015	1.2376	0.0314
2016	1.7165	0.2953
2017	1.8398	0.3121
2018	1.9827	0.3249
2019	2.1035	0.3277
2020	2.1932	0.3245
2021	2.2838	0.3272
2022	2.3793	0.3223
2023	2.4454	0.3182
2024	2.4911	0.3161

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	1.5872	1.5986	1.6084	1.6166	1.6216	1.6338
2013	1.2279	1.2431	1.2482	1.2563	1.2650	1.2735	1.2798	1.2835	1.2909
2014	1.1433	1.1927	1.2076	1.2269	1.2429	1.2553	1.2638	1.2682	1.2762
2015	1.1499	1.1808	1.1949	1.2179	1.2418	1.2608	1.2744	1.2820	1.2946
2016	1.2064	1.3282	1.3973	1.5217	1.6772	1.8642	2.0620	2.2121	2.6660
2017	1.3101	1.4234	1.4929	1.6233	1.8008	2.0063	2.2204	2.3857	2.7815
2018	1.4186	1.5376	1.6093	1.7511	1.9439	2.1665	2.3937	2.5513	2.9442
2019	1.5146	1.6401	1.7176	1.8679	2.0669	2.2984	2.5262	2.6794	3.0183
2020	1.5951	1.7222	1.8035	1.9607	2.1594	2.3899	2.6251	2.7698	3.0853
2021	1.6681	1.8023	1.8882	2.0476	2.2533	2.4841	2.7189	2.8597	3.1898
2022	1.7562	1.8965	1.9837	2.1454	2.3560	2.5874	2.8037	2.9497	3.2308
2023	1.8311	1.9645	2.0500	2.2117	2.4243	2.6518	2.8717	3.0011	3.2679
2024	1.8778	2.0153	2.0988	2.2579	2.4686	2.6951	2.9163	3.0413	3.3051

Discards x 1000 MT

Year	Average	StdDev
2011	0.3099	0.0117
2012	0.3244	0.0155
2013	0.2177	0.0130
2014	0.2040	0.0260
2015	0.2324	0.0314
2016	0.3760	0.0886
2017	0.4275	0.0871
2018	0.4527	0.0850
2019	0.4698	0.0836
2020	0.4828	0.0818
2021	0.4859	0.0813
2022	0.4869	0.0808
2023	0.4877	0.0807
2024	0.4882	0.0808

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	0.2880	0.3004	0.3054	0.3136	0.3234	0.3348	0.3445	0.3506	0.3619
2013	0.1911	0.1985	0.2022	0.2085	0.2170	0.2257	0.2338	0.2388	0.2541
2014	0.1658	0.1738	0.1782	0.1867	0.1991	0.2151	0.2344	0.2492	0.2983
2015	0.1752	0.1880	0.1956	0.2092	0.2282	0.2521	0.2751	0.2891	0.3199
2016	0.2374	0.2643	0.2804	0.3122	0.3613	0.4234	0.4886	0.5353	0.6536
2017	0.2783	0.3086	0.3258	0.3616	0.4168	0.4811	0.5436	0.5848	0.6735
2018	0.3044	0.3325	0.3514	0.3872	0.4432	0.5066	0.5679	0.6061	0.6811
2019	0.3195	0.3515	0.3709	0.4074	0.4609	0.5216	0.5836	0.6227	0.6964
2020	0.3330	0.3671	0.3854	0.4214	0.4743	0.5346	0.5940	0.6319	0.7043
2021	0.3393	0.3698	0.3882	0.4239	0.4777	0.5379	0.5963	0.6327	0.7023
2022	0.3410	0.3716	0.3899	0.4242	0.4788	0.5386	0.5967	0.6319	0.7031
2023	0.3430	0.3719	0.3907	0.4271	0.4793	0.5398	0.5982	0.6352	0.7053
2024	0.3421	0.3715	0.3896	0.4279	0.4812	0.5396	0.5990	0.6329	0.6985

Total Fishing Mortality

Year	Average	StdDev
2011	0.1432	0.0115
2012	0.1648	0.0148
2013	0.1290	0.0132
2014	0.1279	0.0154
2015	0.1269	0.0184
2016	0.1600	0.0000
2017	0.1600	0.0000

2018	0.1600	0.0000
2019	0.1600	0.0000
2020	0.1600	0.0000
2021	0.1600	0.0000
2022	0.1600	0.0000
2023	0.1600	0.0000
2024	0.1600	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	0.1016	0.1078	0.1129	0.1204	0.1281	0.1369	0.1461	0.1522	0.1646
2014	0.0949	0.1046	0.1087	0.1176	0.1272	0.1372	0.1477	0.1542	0.1687
2015	0.0830	0.0982	0.1046	0.1147	0.1265	0.1385	0.1497	0.1574	0.1730
2016	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2017	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2018	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2019	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2020	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2021	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2022	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2023	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2024	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600

Probability Spawning Stock Biomass Exceeds Threshold 18.398 (1000 MT)

Year	Probability
2011	0.000000
2012	0.000000
2013	0.000000
2014	0.001000
2015	0.009400
2016	0.033700
2017	0.067800
2018	0.135900
2019	0.219800
2020	0.299500
2021	0.393400
2022	0.501000
2023	0.575300
2024	0.618900

Probability Threshold Exceeded at Least Once = 0.6786

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2011	0.003000
2012	0.143000
2013	0.001000
2014	0.002100
2015	0.005000
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

Probability Threshold Exceeded at Least Once = 0.1430

American Plaice rebuild in 10 years

AGEPRO VERSION 4.2
Am. plaice F40% ty10, 2010 catch

Date & Time of Run: 22 Jul 2013 15:55

Input File Name:
D:\NIT\GARM_2012_UPDATE_PROJ\AMERICAN_PLAICE\PROJECTION\APLAICE_1624IN2011_1922IN2012_ACL2013-2014_REBUILD8YR.INP

First Age Class: 1
Number of Age Classes: 11
Number of Years in Projection: 14
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\AMERICAN_PLAICE\PROJECTION\TY10_AP_GMGB_BOOT.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2011	Removals	1624
2012	Removals	1922
2013	Removals	1482
2014	Removals	1442
2015	Removals	1470
2016	F-Mult	0.1600
2017	F-Mult	0.1600
2018	F-Mult	0.1600
2019	F-Mult	0.1600
2020	F-Mult	0.1600
2021	F-Mult	0.1600
2022	F-Mult	0.1600
2023	F-Mult	0.1600
2024	F-Mult	0.1600

Recruits 1000000 Fish

Year Class	Average	StdDev
2011	27.5804	10.8767
2012	27.6310	11.0973
2013	27.4431	10.9843
2014	27.3880	10.7926
2015	27.3106	10.7605
2016	27.4290	10.7505
2017	27.5610	10.7743
2018	27.4900	10.6981
2019	27.5303	10.7778
2020	27.5134	10.9471

2021	27.4250	10.8000
2022	27.5023	10.8815
2023	27.5984	10.9248
2024	27.6289	10.8273

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2011	12.0373	15.4181	16.4740	20.2214	24.7204	31.7951	45.1528	49.0004	60.1498
2012	11.9470	15.1522	16.2997	20.1057	24.7165	32.6191	45.5383	49.2811	60.3436
2013	11.7847	15.1756	16.3470	19.9569	24.5893	31.6788	45.3253	48.9837	60.1528
2014	11.8762	15.2895	16.4014	20.2246	24.6477	30.5470	45.1372	49.0530	60.0072
2015	11.9359	15.2545	16.3654	20.0641	24.5441	31.1317	45.0456	48.8163	58.9922
2016	12.0003	15.3265	16.3597	20.1507	24.6842	31.4965	44.8967	48.8952	59.2160
2017	11.9269	15.3573	16.4141	20.4309	24.6857	31.9748	44.8922	48.8248	59.6778
2018	11.8442	15.3215	16.4003	20.1804	24.7081	32.0648	44.9461	48.7360	58.4950
2019	12.0944	15.3092	16.3955	20.2285	24.7762	31.9159	44.8875	48.7862	59.8793
2020	11.9809	15.2414	16.3804	20.0006	24.6380	31.8815	45.1496	49.1333	59.5852
2021	11.9817	15.3874	16.4454	20.0532	24.6582	31.4100	44.9637	48.8397	60.2191
2022	11.9262	15.3656	16.3582	20.1422	24.7058	32.0444	45.1564	48.9638	59.6464
2023	11.8641	15.2812	16.3584	20.1011	24.7326	32.8330	45.1867	49.1045	59.4785
2024	12.0398	15.2868	16.4304	20.2627	24.7649	32.6709	45.1567	48.9652	59.3497

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2011	11.6583	0.9036
2012	12.2149	1.0570
2013	11.9970	1.1868
2014	11.8262	1.3783
2015	12.2600	1.8898
2016	13.5906	2.3718
2017	14.6343	2.4797
2018	15.6976	2.5433
2019	16.5798	2.5568
2020	17.2684	2.5261
2021	17.9249	2.5293
2022	18.5820	2.4922
2023	19.0360	2.4660
2024	19.3497	2.4548

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	9.8140	10.5695	10.9220	11.5198	12.1707	12.8573	13.5522	14.1144	14.8830
2013	9.3633	10.1121	10.5251	11.2247	11.9607	12.7011	13.5140	14.1276	14.9213
2014	8.9210	9.7472	10.1485	10.9189	11.7328	12.6342	13.6609	14.1444	15.4157
2015	8.8594	9.7301	10.2073	11.0124	12.0309	13.2383	14.4961	15.3875	18.0696
2016	9.5931	10.4995	11.0235	11.9903	13.2850	14.7716	16.3940	17.5871	21.0823
2017	10.4157	11.3011	11.8493	12.8849	14.3269	15.9838	17.6599	18.9527	22.1265
2018	11.2157	12.1696	12.7277	13.8655	15.3999	17.1832	18.9472	20.1589	23.0308
2019	11.9530	12.9292	13.5449	14.7327	16.2884	18.1046	19.9366	21.1083	23.6659
2020	12.5753	13.5703	14.2364	15.4511	17.0293	18.8041	20.6371	21.7444	24.2835
2021	13.1026	14.1916	14.8408	16.0979	17.7168	19.5091	21.2772	22.3642	24.9156
2022	13.7721	14.8400	15.5114	16.7538	18.4036	20.1887	21.9181	22.9652	25.0694
2023	14.3109	15.3399	15.9740	17.2161	18.8719	20.6178	22.3534	23.3605	25.2578
2024	14.5491	15.6649	16.2807	17.5430	19.1752	20.9603	22.6569	23.6205	25.7439

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev

2011	15.2006	1.1215
2012	15.5251	1.2829
2013	14.9574	1.4495
2014	15.2043	1.9067
2015	16.5155	2.5819
2016	18.6452	3.1374
2017	19.9709	3.2098
2018	21.1822	3.2371
2019	22.1504	3.2219
2020	22.9060	3.1776
2021	23.6310	3.1728
2022	24.3527	3.1356
2023	24.8499	3.1149
2024	25.1922	3.1092

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	12.6868	13.5211	13.9474	14.6885	15.4930	16.2938	17.2198	17.8059	18.7022
2013	11.8191	12.7390	13.1744	14.0049	14.8842	15.8153	16.8933	17.4388	18.5987
2014	11.6208	12.5715	13.0696	13.9285	15.0074	16.2522	17.5246	18.3909	20.9104
2015	12.1350	13.1446	13.7342	14.8133	16.1794	17.7858	19.5336	20.8228	24.8140
2016	13.3500	14.4425	15.1722	16.4721	18.2623	20.3153	22.4501	24.1074	28.2075
2017	14.3725	15.5557	16.2692	17.6751	19.5937	21.7959	24.0452	25.5988	29.5707
2018	15.3372	16.5631	17.3697	18.8551	20.8105	23.1093	25.4100	26.8943	30.2272
2019	16.2138	17.4686	18.2779	19.8440	21.8266	24.0967	26.4388	27.8718	30.9775
2020	16.8850	18.2064	19.0268	20.6109	22.6235	24.8883	27.1312	28.5251	31.6108
2021	17.4903	18.8760	19.7403	21.3167	23.3832	25.6450	27.8227	29.2391	32.1125
2022	18.3201	19.6291	20.4750	22.0502	24.1318	26.3800	28.5887	29.8750	32.3706
2023	18.8162	20.1851	21.0018	22.5540	24.6318	26.8891	29.0389	30.2848	32.9579
2024	19.1333	20.4731	21.3300	22.9171	24.9648	27.2203	29.3573	30.5947	33.1259

Mean Biomass x 1000 MT

Year	Average	StdDev
2011	15.6329	1.2360
2012	15.3669	1.3833
2013	14.9452	1.6604
2014	15.8592	2.4128
2015	17.8520	2.9787
2016	19.7786	3.2708
2017	20.9975	3.3126
2018	22.1242	3.3090
2019	23.0373	3.2762
2020	23.7170	3.2259
2021	24.3272	3.2116
2022	24.9320	3.1835
2023	25.3500	3.1761
2024	25.6362	3.1791

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	12.3260	13.1641	13.6630	14.4595	15.3109	16.1745	17.1764	17.8594	18.8242
2013	11.5936	12.5532	12.9973	13.8262	14.8165	15.9047	17.0552	17.7910	19.7819
2014	11.7825	12.7735	13.3131	14.2858	15.5314	17.0139	18.6092	19.8660	23.8528
2015	12.8760	13.9379	14.6154	15.8193	17.4578	19.3953	21.4498	23.0089	27.0046
2016	14.1933	15.3406	16.0562	17.4441	19.3795	21.6013	23.8774	25.5187	29.5313
2017	15.1219	16.3463	17.0992	18.6183	20.6304	22.9605	25.3049	26.8360	30.2993
2018	16.0232	17.3761	18.1722	19.7343	21.7713	24.1193	26.4883	27.9858	31.1443

2019	16.9043	18.2226	19.0930	20.6725	22.7156	25.0463	27.3761	28.8176	32.0668
2020	17.4862	18.9388	19.7515	21.3591	23.4781	25.7616	27.9912	29.4102	32.3780
2021	18.1392	19.5123	20.3873	21.9641	24.0883	26.3886	28.6600	30.0023	32.6084
2022	18.8407	20.1652	20.9862	22.5831	24.7259	26.9995	29.1877	30.4974	33.0397
2023	19.1825	20.5702	21.4022	23.0223	25.1290	27.4348	29.6390	30.8779	33.5564
2024	19.4515	20.8300	21.7079	23.3055	25.4238	27.7053	29.9010	31.2116	33.7932

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2011	1.6240	0.0000
2012	1.9220	0.0000
2013	1.4820	0.0000
2014	1.4420	0.0000
2015	1.4700	0.0000
2016	2.0925	0.3718
2017	2.2673	0.3862
2018	2.4353	0.3948
2019	2.5734	0.3961
2020	2.6761	0.3896
2021	2.7697	0.3897
2022	2.8662	0.3842
2023	2.9332	0.3805
2024	2.9793	0.3788

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	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820	1.4820
2014	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420	1.4420
2015	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700	1.4700
2016	1.4755	1.6146	1.6928	1.8442	2.0432	2.2759	2.5227	2.7189	3.2807
2017	1.6121	1.7498	1.8324	1.9937	2.2189	2.4782	2.7407	2.9434	3.4185
2018	1.7346	1.8853	1.9724	2.1529	2.3905	2.6659	2.9432	3.1282	3.5658
2019	1.8501	2.0063	2.1028	2.2876	2.5292	2.8106	3.0966	3.2760	3.6533
2020	1.9486	2.1041	2.2092	2.3941	2.6380	2.9161	3.1967	3.3667	3.7441
2021	2.0245	2.1949	2.2940	2.4879	2.7377	3.0152	3.2870	3.4551	3.8300
2022	2.1247	2.2897	2.3928	2.5862	2.8392	3.1133	3.3839	3.5444	3.8646
2023	2.2044	2.3628	2.4613	2.6523	2.9091	3.1791	3.4434	3.5986	3.8988
2024	2.2407	2.4079	2.5095	2.7009	2.9535	3.2286	3.4887	3.6369	3.9605

Landings x 1000 MT

Year	Average	StdDev
2011	1.3141	0.0117
2012	1.5976	0.0155
2013	1.2643	0.0130
2014	1.2380	0.0260
2015	1.2376	0.0314
2016	1.7165	0.2953
2017	1.8398	0.3121
2018	1.9827	0.3249
2019	2.1035	0.3277
2020	2.1932	0.3245
2021	2.2838	0.3272
2022	2.3793	0.3223
2023	2.4454	0.3182
2024	2.4911	0.3161

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	1.5872	1.5986	1.6084	1.6166	1.6216	1.6338
2013	1.2279	1.2431	1.2482	1.2563	1.2650	1.2735	1.2798	1.2835	1.2909
2014	1.1433	1.1927	1.2076	1.2269	1.2429	1.2553	1.2638	1.2682	1.2762
2015	1.1499	1.1808	1.1949	1.2179	1.2418	1.2608	1.2744	1.2820	1.2946
2016	1.2064	1.3282	1.3973	1.5217	1.6772	1.8642	2.0620	2.2121	2.6660
2017	1.3101	1.4234	1.4929	1.6233	1.8008	2.0063	2.2204	2.3857	2.7815
2018	1.4186	1.5376	1.6093	1.7511	1.9439	2.1665	2.3937	2.5513	2.9442
2019	1.5146	1.6401	1.7176	1.8679	2.0669	2.2984	2.5262	2.6794	3.0183
2020	1.5951	1.7222	1.8035	1.9607	2.1594	2.3899	2.6251	2.7698	3.0853
2021	1.6681	1.8023	1.8882	2.0476	2.2533	2.4841	2.7189	2.8597	3.1898
2022	1.7562	1.8965	1.9837	2.1454	2.3560	2.5874	2.8037	2.9497	3.2308
2023	1.8311	1.9645	2.0500	2.2117	2.4243	2.6518	2.8717	3.0011	3.2679
2024	1.8778	2.0153	2.0988	2.2579	2.4686	2.6951	2.9163	3.0413	3.3051

Discards x 1000 MT

Year	Average	StdDev
2011	0.3099	0.0117
2012	0.3244	0.0155
2013	0.2177	0.0130
2014	0.2040	0.0260
2015	0.2324	0.0314
2016	0.3760	0.0886
2017	0.4275	0.0871
2018	0.4527	0.0850
2019	0.4698	0.0836
2020	0.4828	0.0818
2021	0.4859	0.0813
2022	0.4869	0.0808
2023	0.4877	0.0807
2024	0.4882	0.0808

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	0.2880	0.3004	0.3054	0.3136	0.3234	0.3348	0.3445	0.3506	0.3619
2013	0.1911	0.1985	0.2022	0.2085	0.2170	0.2257	0.2338	0.2388	0.2541
2014	0.1658	0.1738	0.1782	0.1867	0.1991	0.2151	0.2344	0.2492	0.2983
2015	0.1752	0.1880	0.1956	0.2092	0.2282	0.2521	0.2751	0.2891	0.3199
2016	0.2374	0.2643	0.2804	0.3122	0.3613	0.4234	0.4886	0.5353	0.6536
2017	0.2783	0.3086	0.3258	0.3616	0.4168	0.4811	0.5436	0.5848	0.6735
2018	0.3044	0.3325	0.3514	0.3872	0.4432	0.5066	0.5679	0.6061	0.6811
2019	0.3195	0.3515	0.3709	0.4074	0.4609	0.5216	0.5836	0.6227	0.6964
2020	0.3330	0.3671	0.3854	0.4214	0.4743	0.5346	0.5940	0.6319	0.7043
2021	0.3393	0.3698	0.3882	0.4239	0.4777	0.5379	0.5963	0.6327	0.7023
2022	0.3410	0.3716	0.3899	0.4242	0.4788	0.5386	0.5967	0.6319	0.7031
2023	0.3430	0.3719	0.3907	0.4271	0.4793	0.5398	0.5982	0.6352	0.7053
2024	0.3421	0.3715	0.3896	0.4279	0.4812	0.5396	0.5990	0.6329	0.6985

Total Fishing Mortality

Year	Average	StdDev
2011	0.1432	0.0115
2012	0.1648	0.0148
2013	0.1290	0.0132
2014	0.1279	0.0154
2015	0.1269	0.0184
2016	0.1600	0.0000

2017	0.1600	0.0000
2018	0.1600	0.0000
2019	0.1600	0.0000
2020	0.1600	0.0000
2021	0.1600	0.0000
2022	0.1600	0.0000
2023	0.1600	0.0000
2024	0.1600	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	0.1016	0.1078	0.1129	0.1204	0.1281	0.1369	0.1461	0.1522	0.1646
2014	0.0949	0.1046	0.1087	0.1176	0.1272	0.1372	0.1477	0.1542	0.1687
2015	0.0830	0.0982	0.1046	0.1147	0.1265	0.1385	0.1497	0.1574	0.1730
2016	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2017	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2018	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2019	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2020	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2021	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2022	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2023	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
2024	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600

Probability Spawning Stock Biomass Exceeds Threshold 18.398 (1000 MT)

Year	Probability
2011	0.000000
2012	0.000000
2013	0.000000
2014	0.001000
2015	0.009400
2016	0.033700
2017	0.067800
2018	0.135900
2019	0.219800
2020	0.299500
2021	0.393400
2022	0.501000
2023	0.575300
2024	0.618900

Probability Threshold Exceeded at Least Once = 0.6786

Probability Total Fishing Mortality Exceeds Threshold 0.1800

Year	Probability
2011	0.003000
2012	0.143000
2013	0.001000
2014	0.002100
2015	0.005000
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

Probability Threshold Exceeded at Least Once = 0.1430

White Hake ABC projection 75%Fmsy

AGEPRO VERSION 4.2
White Hake Model 59 F0 100 year projection

Date & Time of Run: 01 Nov 2013 09:58

Input File Name:
D:\NIT\GROUNDFISH_WHITEHAKE_SARC56\SHORTTERM_CAT2594IN13_75%F4015YEARRECT_WHITEHAKE_SARC56.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 14
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name: D:\NIT\GROUNDFISH_WHITEHAKE_SARC56\MODEL60_MCMC.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	2900
2013	Landings	2594
2014	F-Mult	0.1500
2015	F-Mult	0.1500
2016	F-Mult	0.1500
2017	F-Mult	0.1500
2018	F-Mult	0.1500
2019	F-Mult	0.1500
2020	F-Mult	0.1500
2021	F-Mult	0.1500
2022	F-Mult	0.1500
2023	F-Mult	0.1500
2024	F-Mult	0.1500
2025	F-Mult	0.1500

Recruits 1 Fish

Year Class	Average	StdDev
2012	3787893.8058	1186631.2163
2013	3805814.9285	1192991.0069
2014	3797703.6709	1170285.0153
2015	3802000.7735	1185064.3552
2016	3799839.7805	1178746.5047
2017	3791628.2377	1192348.6974
2018	3823207.4569	1176105.9595
2019	3810897.1516	1181352.3236
2020	3799055.4887	1175499.1219
2021	3795253.7855	1180807.9226

2022	3822822.0632	1178724.7173
2023	3787838.6454	1173578.3051
2024	3809405.4113	1191042.4572
2025	3827600.0116	1175746.9766

Recruits Distribution

Year	Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2300277.0000	2320315.0000	2374169.0000	2571407.0000	3798839.0000	4769125.0000	5407796.0000	5833602.0000	6148636.0000	
2013	2300658.0000	2320345.0000	2378358.0000	2580289.0000	3820880.5000	4808119.0000	5455374.0000	5865797.0000	6156950.0000	
2014	2301326.0000	2322108.0000	2389608.0000	2585876.0000	3817929.0000	4761418.0000	5372448.0000	5817274.0000	6151584.0000	
2015	2301430.0000	2318979.0000	2377087.0000	2587011.0000	3830045.0000	4786284.0000	5444617.0000	5858037.0000	6144294.0000	
2016	2300790.0000	2321716.0000	2381203.0000	2584217.0000	3834665.0000	4788937.0000	5383948.0000	5824553.0000	6160335.0000	
2017	2301198.0000	2321144.0000	2378285.0000	2571946.0000	3790387.0000	4797554.0000	5458484.0000	5845324.0000	6148944.0000	
2018	2300657.0000	2321460.0000	2393443.0000	2612785.0000	3861373.5000	4778805.0000	5432919.0000	5844585.0000	6158004.0000	
2019	2301594.0000	2320814.0000	2384095.0000	2585777.0000	3849415.0000	4788542.0000	5425726.0000	5857726.0000	6159046.0000	
2020	2301149.0000	2321579.0000	2378007.0000	2584948.0000	3842127.0000	4760965.0000	5402771.0000	5816639.0000	6136292.0000	
2021	2301052.0000	2320523.0000	2377780.0000	2582746.0000	3815502.0000	4771913.0000	5405744.0000	5826453.0000	6149743.0000	
2022	2300805.0000	2321827.0000	2392251.0000	2605468.0000	3857567.5000	4806355.0000	5422800.0000	5820340.0000	6151807.0000	
2023	2300678.0000	2319804.0000	2383780.0000	2578373.0000	3805927.5000	4743434.0000	5390987.0000	5792081.0000	6135063.0000	
2024	2300296.0000	2319335.0000	2379247.0000	2577232.0000	3846422.0000	4791697.0000	5458964.0000	5881732.0000	6160133.0000	
2025	2300615.0000	2321842.0000	2390895.0000	2612731.0000	3860324.5000	4805657.0000	5415179.0000	5844270.0000	6142579.0000	

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	28.9281	2.6304
2013	32.5129	3.1517
2014	35.2439	3.5361
2015	35.3731	3.3573
2016	34.9400	3.0794
2017	34.1091	2.8758
2018	33.1141	2.7781
2019	31.7376	2.7274
2020	30.8771	2.6014
2021	29.9181	2.6316
2022	29.2489	2.6480
2023	28.7779	2.6483
2024	28.4430	2.6472
2025	28.2051	2.6426

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	22.8682	24.6591	25.6348	27.1247	28.8856	30.7569	32.2572	33.1658	35.3827
2013	25.5622	27.4918	28.6479	30.3837	32.3815	34.6046	36.4348	37.6223	40.7261
2014	27.4196	29.6929	31.0011	32.8511	35.0382	37.5004	39.6862	41.1808	44.5609
2015	28.1271	30.3181	31.3681	33.0427	35.1925	37.4614	39.5867	41.0874	44.6600
2016	28.3382	30.2902	31.2257	32.8130	34.7754	36.8842	38.8918	40.1653	43.1212
2017	27.9812	29.6873	30.5691	32.0961	33.9885	35.9267	37.7931	38.9722	41.5317
2018	27.1714	28.7828	29.6206	31.1781	33.0414	34.8902	36.7213	37.8461	40.0502
2019	25.7710	27.4193	28.2889	29.8502	31.6719	33.5329	35.3035	36.3430	38.3910
2020	25.1838	26.6901	27.5689	29.0816	30.8245	32.6265	34.2598	35.2969	37.0683
2021	24.1693	25.6888	26.5166	28.1191	29.8564	31.6983	33.3464	34.3235	36.1692
2022	23.4260	24.9688	25.8219	27.4134	29.1972	31.0284	32.7208	33.7019	35.4422
2023	22.9629	24.4809	25.4109	26.9263	28.7239	30.5953	32.2817	33.2453	34.9178
2024	22.7012	24.1547	25.0383	26.5934	28.3970	30.2714	31.9506	32.8409	34.5836
2025	22.3076	23.9411	24.7870	26.3649	28.1615	30.0209	31.6538	32.5624	34.3471

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	32.8571	2.8703

2013	36.2431	3.3583
2014	39.4937	3.8100
2015	39.5431	3.6085
2016	39.0582	3.3412
2017	38.2438	3.1191
2018	37.2195	3.0174
2019	35.7339	2.9681
2020	34.8243	2.8243
2021	33.7788	2.8546
2022	33.0453	2.8707
2023	32.5300	2.8716
2024	32.1649	2.8721
2025	31.9058	2.8672

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	26.3768	28.1784	29.3131	30.9137	32.8109	34.8427	36.4370	37.4691	39.8692
2013	28.8709	30.9085	32.1167	33.9985	36.1065	38.4565	40.4789	41.7241	45.0221
2014	31.1456	33.5861	34.9078	36.9005	39.2922	41.9514	44.2670	45.7415	49.5986
2015	31.7164	34.0531	35.2281	37.0385	39.3395	41.8221	44.0979	45.6323	49.3747
2016	31.8195	34.0353	35.0159	36.7377	38.8998	41.1551	43.3943	44.7062	47.8170
2017	31.4939	33.4381	34.3681	36.0783	38.1440	40.2199	42.2392	43.5399	46.2523
2018	30.6889	32.5073	33.4039	35.1280	37.1430	39.1430	41.1101	42.3486	44.7522
2019	29.2590	31.0338	31.9968	33.6896	35.6567	37.6701	39.6572	40.7824	42.9711
2020	28.6507	30.3095	31.2163	32.8947	34.7670	36.7269	38.5139	39.6206	41.5373
2021	27.5110	29.1768	30.1180	31.8246	33.7021	35.6988	37.5099	38.5865	40.5897
2022	26.6925	28.4014	29.3483	31.0355	32.9936	34.9715	36.8180	37.8580	39.8412
2023	26.2170	27.8948	28.8621	30.5440	32.4889	34.4932	36.3372	37.3399	39.1687
2024	25.8830	27.5131	28.4705	30.1586	32.0979	34.1301	35.9442	36.9101	38.8588
2025	25.4945	27.2761	28.2047	29.9159	31.8588	33.8679	35.6572	36.6183	38.6977

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	35.2219	3.1764
2013	38.2984	3.6699
2014	40.0031	3.7821
2015	39.5244	3.4980
2016	38.6900	3.2334
2017	37.6661	3.0792
2018	36.5941	3.0104
2019	35.3021	2.9720
2020	34.4647	2.8895
2021	33.5869	2.9129
2022	32.9703	2.9237
2023	32.5357	2.9200
2024	32.2237	2.9191
2025	32.0071	2.9168

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	28.1940	30.0994	31.3306	33.0974	35.0775	37.3459	39.1831	40.3355	43.4504
2013	30.3394	32.5799	33.8584	35.8520	38.1224	40.6344	42.8803	44.3638	48.0539
2014	31.8229	34.2136	35.4852	37.3829	39.8054	42.3979	44.7487	46.3812	50.2510
2015	32.0020	34.2754	35.3218	37.0849	39.3273	41.7228	43.9738	45.4834	48.9745
2016	31.7240	33.7319	34.7253	36.4393	38.5489	40.7515	42.8497	44.1108	46.9596
2017	31.0456	32.8914	33.7991	35.5299	37.5620	39.6356	41.6494	42.9294	45.4224
2018	29.9754	31.8050	32.7655	34.5053	36.5247	38.5719	40.5335	41.6619	43.9976
2019	28.8254	30.5042	31.5349	33.2446	35.2478	37.2949	39.1579	40.3688	42.4437
2020	28.1978	29.8341	30.7378	32.4797	34.3717	36.3951	38.2269	39.3343	41.3703

2021	27.1698	28.9029	29.8295	31.5924	33.5209	35.5642	37.3992	38.4885	40.4734
2022	26.5189	28.2435	29.2152	30.9369	32.9128	34.9945	36.8156	37.8604	39.7914
2023	26.1765	27.8252	28.7900	30.4985	32.4675	34.5167	36.3979	37.3809	39.3252
2024	25.6572	27.5133	28.4738	30.1886	32.1531	34.2248	36.0403	37.0428	39.0145
2025	25.4615	27.3061	28.2342	29.9918	31.9713	33.9900	35.7811	36.9065	38.9472

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	2.9000	0.0000
2013	2.5940	0.0000
2014	4.6645	0.4658
2015	4.7406	0.4562
2016	4.6681	0.4316
2017	4.5886	0.3833
2018	4.4287	0.3720
2019	4.2348	0.3641
2020	4.1088	0.3473
2021	3.9761	0.3515
2022	3.8832	0.3532
2023	3.8176	0.3540
2024	3.7724	0.3547
2025	3.7397	0.3534

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000
2013	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940
2014	3.6402	3.9219	4.1016	4.3488	4.6424	4.9621	5.2523	5.4213	5.9025
2015	3.7400	4.0357	4.1998	4.4296	4.7143	5.0255	5.3172	5.5176	5.9744
2016	3.7452	4.0217	4.1514	4.3653	4.6435	4.9331	5.2149	5.4019	5.8516
2017	3.7670	4.0061	4.1227	4.3211	4.5687	4.8255	5.0814	5.2386	5.5979
2018	3.6369	3.8521	3.9616	4.1706	4.4158	4.6685	4.9065	5.0597	5.3614
2019	3.4431	3.6645	3.7726	3.9829	4.2253	4.4709	4.7109	4.8501	5.1371
2020	3.3441	3.5461	3.6658	3.8662	4.1022	4.3399	4.5641	4.6975	4.9379
2021	3.2160	3.4076	3.5266	3.7334	3.9677	4.2152	4.4357	4.5734	4.8111
2022	3.1138	3.3148	3.4256	3.6396	3.8737	4.1223	4.3477	4.4770	4.7136
2023	3.0413	3.2440	3.3651	3.5666	3.8091	4.0553	4.2839	4.4130	4.6429
2024	3.0048	3.1972	3.3175	3.5213	3.7647	4.0183	4.2414	4.3660	4.5915
2025	2.9643	3.1726	3.2833	3.4923	3.7347	3.9826	4.2055	4.3227	4.5626

Landings x 1000 MT

Year	Average	StdDev
2012	2.9000	0.0000
2013	2.5940	0.0000
2014	4.6645	0.4658
2015	4.7406	0.4562
2016	4.6681	0.4316
2017	4.5886	0.3833
2018	4.4287	0.3720
2019	4.2348	0.3641
2020	4.1088	0.3473
2021	3.9761	0.3515
2022	3.8832	0.3532
2023	3.8176	0.3540
2024	3.7724	0.3547
2025	3.7397	0.3534

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000
2013	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940
2014	3.6402	3.9219	4.1016	4.3488	4.6424	4.9621	5.2523	5.4213	5.9025
2015	3.7400	4.0357	4.1998	4.4296	4.7143	5.0255	5.3172	5.5176	5.9744
2016	3.7452	4.0217	4.1514	4.3653	4.6435	4.9331	5.2149	5.4019	5.8516
2017	3.7670	4.0061	4.1227	4.3211	4.5687	4.8255	5.0814	5.2386	5.5979
2018	3.6369	3.8521	3.9616	4.1706	4.4158	4.6685	4.9065	5.0597	5.3614
2019	3.4431	3.6645	3.7726	3.9829	4.2253	4.4709	4.7109	4.8501	5.1371
2020	3.3441	3.5461	3.6658	3.8662	4.1022	4.3399	4.5641	4.6975	4.9379
2021	3.2160	3.4076	3.5266	3.7334	3.9677	4.2152	4.4357	4.5734	4.8111
2022	3.1138	3.3148	3.4256	3.6396	3.8737	4.1223	4.3477	4.4770	4.7136
2023	3.0413	3.2440	3.3651	3.5666	3.8091	4.0553	4.2839	4.4130	4.6429
2024	3.0048	3.1972	3.3175	3.5213	3.7647	4.0183	4.2414	4.3660	4.5915
2025	2.9643	3.1726	3.2833	3.4923	3.7347	3.9826	4.2055	4.3227	4.5626

Total Fishing Mortality

Year	Average	StdDev
2012	0.1167	0.0112
2013	0.0916	0.0092
2014	0.1500	0.0000
2015	0.1500	0.0000
2016	0.1500	0.0000
2017	0.1500	0.0000
2018	0.1500	0.0000
2019	0.1500	0.0000
2020	0.1500	0.0000
2021	0.1500	0.0000
2022	0.1500	0.0000
2023	0.1500	0.0000
2024	0.1500	0.0000
2025	0.1500	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.0941	0.1003	0.1034	0.1084	0.1156	0.1237	0.1313	0.1367	0.1471
2013	0.0725	0.0784	0.0807	0.0849	0.0909	0.0971	0.1032	0.1077	0.1159
2014	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2015	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2016	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2017	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2018	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2019	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2020	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2021	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2022	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2023	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2024	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
2025	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500

Probability Spawning Stock Biomass Exceeds Threshold 16.000 (1000 MT)

Year	Probability
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

Probability Threshold Exceeded at Least Once = 1.0000

White Hake F = 0

AGEPRO VERSION 4.2

White Hake Model 59 F0 100 year projection

Date & Time of Run: 01 Nov 2013 09:54

Input File Name:
D:\NIT\GROUNDFISH_WHITEHAKE_SARC56\SHORTTERM_CAT2594IN13_F0_WHITEHAKE_SARC56.INP

First Age Class: 1
Number of Age Classes: 9
Number of Years in Projection: 14
Number of Fleets: 1
Number of Recruitment Models: 1
Number of Bootstraps: 1000
Number of Simulations: 10

Bootstrap File Name: D:\NIT\GROUNDFISH_WHITEHAKE_SARC56\MODEL60_MCMC.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2012	Landings	2900
2013	Landings	2594
2014	F-Mult	0.0000
2015	F-Mult	0.0000
2016	F-Mult	0.0000
2017	F-Mult	0.0000
2018	F-Mult	0.0000
2019	F-Mult	0.0000
2020	F-Mult	0.0000
2021	F-Mult	0.0000
2022	F-Mult	0.0000
2023	F-Mult	0.0000
2024	F-Mult	0.0000
2025	F-Mult	0.0000

Recruits 1 Fish

Year Class	Average	StdDev
2012	3787893.8058	1186631.2163
2013	3805814.9285	1192991.0069
2014	3797703.6709	1170285.0153
2015	3802000.7735	1185064.3552
2016	3799839.7805	1178746.5047
2017	3791628.2377	1192348.6974
2018	3823207.4569	1176105.9595

2019	3810897.1516	1181352.3236
2020	3799055.4887	1175499.1219
2021	3795253.7855	1180807.9226
2022	3822822.0632	1178724.7173
2023	3787838.6454	1173578.3051
2024	3809405.4113	1191042.4572
2025	3827600.0116	1175746.9766

Recruits Distribution

Year	Class 1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2300277.0000	2320315.0000	2374169.0000	2571407.0000	3798839.0000	4769125.0000	5407796.0000	5833602.0000	6148636.0000
2013	2300658.0000	2320345.0000	2378358.0000	2580289.0000	3820880.5000	4808119.0000	5455374.0000	5865797.0000	6156950.0000
2014	2301326.0000	2322108.0000	2389608.0000	2585876.0000	3817929.0000	4761418.0000	5372448.0000	5817274.0000	6151584.0000
2015	2301430.0000	2318979.0000	2377087.0000	2587011.0000	3830045.0000	4786284.0000	5444617.0000	5858037.0000	6144294.0000
2016	2300790.0000	2321716.0000	2381203.0000	2584217.0000	3834665.0000	4788937.0000	5383948.0000	5824553.0000	6160335.0000
2017	2301198.0000	2321144.0000	2378285.0000	2571946.0000	3790387.0000	4797554.0000	5458484.0000	5845324.0000	6148944.0000
2018	2300657.0000	2321460.0000	2393443.0000	2612785.0000	3861373.5000	4778805.0000	5432919.0000	5844585.0000	6158004.0000
2019	2301594.0000	2320814.0000	2384095.0000	2585777.0000	3849415.0000	4788542.0000	5425726.0000	5857726.0000	6159046.0000
2020	2301149.0000	2321579.0000	2378007.0000	2584948.0000	3842127.0000	4760965.0000	5402771.0000	5816639.0000	6136292.0000
2021	2301052.0000	2320523.0000	2377780.0000	2582746.0000	3815502.0000	4771913.0000	5405744.0000	5826453.0000	6149743.0000
2022	2300805.0000	2321827.0000	2392251.0000	2605468.0000	3857567.5000	4806355.0000	5422800.0000	5820340.0000	6151807.0000
2023	2300678.0000	2319804.0000	2383780.0000	2578373.0000	3805927.5000	4743434.0000	5390987.0000	5792081.0000	6135063.0000
2024	2300296.0000	2319335.0000	2379247.0000	2577232.0000	3846422.0000	4791697.0000	5458964.0000	5881732.0000	6160133.0000
2025	2300615.0000	2321842.0000	2390895.0000	2612731.0000	3860324.5000	4805657.0000	5415179.0000	5844270.0000	6142579.0000

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2012	28.9281	2.6304
2013	32.5129	3.1517
2014	36.3947	3.6519
2015	41.0617	3.9152
2016	45.2074	4.0381
2017	48.7110	4.1526
2018	51.5271	4.2862
2019	52.9089	4.4157
2020	54.4227	4.2522
2021	55.0082	4.3751
2022	55.5278	4.4621
2023	55.9519	4.5107
2024	56.2976	4.5444
2025	56.5790	4.5590

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	22.8682	24.6591	25.6348	27.1247	28.8856	30.7569	32.2572	33.1658	35.3827
2013	25.5622	27.4918	28.6479	30.3837	32.3815	34.6046	36.4348	37.6223	40.7261
2014	28.3155	30.6623	32.0159	33.9350	36.1801	38.7288	40.9847	42.5031	46.0293
2015	32.6173	35.1385	36.4154	38.3644	40.8489	43.5028	45.9565	47.7248	51.7407
2016	36.5078	39.0791	40.3545	42.4040	44.9777	47.7382	50.3578	52.0598	56.0609
2017	39.7600	42.3714	43.6378	45.8476	48.5113	51.3015	54.0478	55.7459	59.5733
2018	42.2865	44.9152	46.2179	48.5423	51.3596	54.2082	57.0739	58.8414	62.4082
2019	43.3486	46.0556	47.3879	49.8701	52.7353	55.7021	58.5935	60.4709	63.9494
2020	45.0784	47.6629	49.0972	51.5025	54.2832	57.2106	59.9423	61.6317	64.9068
2021	45.5434	47.9527	49.4329	51.9770	54.9226	57.8615	60.7361	62.3788	65.7366
2022	45.7728	48.3829	49.8120	52.4429	55.4140	58.5027	61.3641	63.0509	66.3267
2023	45.9172	48.6260	50.2051	52.8477	55.8382	58.9783	61.9004	63.5316	66.6662
2024	46.2121	48.9619	50.5471	53.1322	56.2190	59.3506	62.2791	63.9481	67.1374
2025	46.4873	49.2039	50.7815	53.4160	56.5318	59.6977	62.5188	64.1189	67.3090

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2012	32.8571	2.8703
2013	36.2431	3.3583
2014	39.4937	3.8100
2015	44.2327	4.0621
2016	48.5187	4.2117
2017	52.2521	4.3338
2018	55.2723	4.4806
2019	56.7323	4.6273
2020	58.3658	4.4451
2021	58.9808	4.5734
2022	59.5242	4.6623
2023	59.9688	4.7127
2024	60.3321	4.7503
2025	60.6285	4.7656

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	26.3768	28.1784	29.3131	30.9137	32.8109	34.8427	36.4370	37.4691	39.8692
2013	28.8709	30.9085	32.1167	33.9985	36.1065	38.4565	40.4789	41.7241	45.0221
2014	31.1456	33.5861	34.9078	36.9005	39.2922	41.9514	44.2670	45.7415	49.5986
2015	35.3973	38.0346	39.3921	41.4121	44.0066	46.7959	49.3658	51.0597	55.2471
2016	39.3329	42.1644	43.4319	45.6071	48.3010	51.1786	53.9056	55.6272	59.6334
2017	42.8894	45.6102	46.9525	49.2589	52.0690	54.9285	57.8539	59.5928	63.5166
2018	45.6004	48.3536	49.7257	52.1454	55.0878	58.0958	61.0704	62.9209	66.6495
2019	46.8120	49.5183	50.9865	53.5540	56.5431	59.6728	62.7215	64.6668	68.3150
2020	48.5726	51.3638	52.8009	55.3112	58.2252	61.2913	64.1785	65.9046	69.3046
2021	49.0867	51.6319	53.1688	55.8191	58.8864	61.9797	65.0155	66.6334	70.0531
2022	49.3268	52.0556	53.5646	56.3171	59.3884	62.6493	65.6308	67.3601	70.8222
2023	49.4805	52.3778	53.9861	56.7195	59.8592	63.1506	66.1716	67.9065	71.1742
2024	49.7250	52.7052	54.3304	57.0458	60.2622	63.5494	66.5575	68.3085	71.6316
2025	50.0230	52.9131	54.5325	57.3231	60.5608	63.8556	66.8002	68.5615	71.8858

Mean Biomass x 1000 MT

Year	Average	StdDev
2012	35.2219	3.1764
2013	38.2984	3.6699
2014	42.3041	4.0080
2015	46.4964	4.1546
2016	50.1944	4.2481
2017	53.3561	4.3596
2018	55.8764	4.4866
2019	57.1872	4.5923
2020	58.5569	4.4805
2021	59.1244	4.5900
2022	59.6192	4.6642
2023	60.0227	4.7014
2024	60.3486	4.7309
2025	60.6193	4.7447

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	28.1940	30.0994	31.3306	33.0974	35.0775	37.3459	39.1831	40.3355	43.4504
2013	30.3394	32.5799	33.8584	35.8520	38.1224	40.6344	42.8803	44.3638	48.0539
2014	33.6103	36.1545	37.5214	39.5350	42.0847	44.8469	47.3245	49.0731	53.1213
2015	37.5002	40.2501	41.5073	43.6003	46.2625	49.1200	51.7947	53.5584	57.7861
2016	41.0192	43.7627	45.0293	47.2502	50.0045	52.8573	55.6926	57.3953	61.2073
2017	43.9215	46.6520	47.9537	50.3417	53.1975	56.0756	58.9582	60.7651	64.6172

2018	46.1618	48.9407	50.2539	52.7744	55.7102	58.7629	61.6748	63.5145	67.1878
2019	47.2052	49.9309	51.4717	54.0290	57.0131	60.1803	63.1227	64.9713	68.5243
2020	48.7098	51.4092	52.8862	55.5011	58.4432	61.4724	64.4179	66.1304	69.5330
2021	49.0886	51.7655	53.2813	55.9851	59.0167	62.1511	65.1531	66.7945	70.2630
2022	49.2917	52.0968	53.6726	56.3965	59.5008	62.7395	65.7537	67.4492	70.7662
2023	49.5509	52.4404	54.0358	56.7643	59.8966	63.1804	66.1508	67.9311	71.1812
2024	49.8289	52.6881	54.3263	57.0563	60.2835	63.5363	66.5478	68.2384	71.5495
2025	49.9457	53.0245	54.5426	57.3092	60.5663	63.8695	66.7516	68.4038	71.8343

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2012	2.9000	0.0000
2013	2.5940	0.0000
2014	0.0000	0.0000
2015	0.0000	0.0000
2016	0.0000	0.0000
2017	0.0000	0.0000
2018	0.0000	0.0000
2019	0.0000	0.0000
2020	0.0000	0.0000
2021	0.0000	0.0000
2022	0.0000	0.0000
2023	0.0000	0.0000
2024	0.0000	0.0000
2025	0.0000	0.0000

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000
2013	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940
2014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2023	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Landings x 1000 MT

Year	Average	StdDev
2012	2.9000	0.0000
2013	2.5940	0.0000
2014	0.0000	0.0000
2015	0.0000	0.0000
2016	0.0000	0.0000
2017	0.0000	0.0000
2018	0.0000	0.0000
2019	0.0000	0.0000
2020	0.0000	0.0000
2021	0.0000	0.0000
2022	0.0000	0.0000
2023	0.0000	0.0000
2024	0.0000	0.0000
2025	0.0000	0.0000

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000	2.9000
2013	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940	2.5940
2014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2023	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total Fishing Mortality

Year	Average	StdDev
2012	0.1167	0.0112
2013	0.0916	0.0092
2014	0.0000	0.0000
2015	0.0000	0.0000
2016	0.0000	0.0000
2017	0.0000	0.0000
2018	0.0000	0.0000
2019	0.0000	0.0000
2020	0.0000	0.0000
2021	0.0000	0.0000
2022	0.0000	0.0000
2023	0.0000	0.0000
2024	0.0000	0.0000
2025	0.0000	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2012	0.0941	0.1003	0.1034	0.1084	0.1156	0.1237	0.1313	0.1367	0.1471
2013	0.0725	0.0784	0.0807	0.0849	0.0909	0.0971	0.1032	0.1077	0.1159
2014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2023	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Probability Spawning Stock Biomass Exceeds Threshold 16.000 (1000 MT)

Year	Probability
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

Probability Threshold Exceeded at Least Once = 1.0000

Georges Bank Yellowtail split speries rho adjusted with 400 mt in 2014

AGEPRO VERSION 4.2

Split Series SSB rho adjusted Fref

Date & Time of Run: 05 Dec 2013 15:40

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GEORGES_BANK_YELLOWTAIL_FLOUNDER\2013_TRAC\GBYT_SSBRHOADJ_400IN2014.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\2013_TRAC\SPLITSERIES_BOOT.BSN

Number of Feasible Solutions: 9940 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2013	Landings	500
2014	Landings	400
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
2021	F-Mult	0.2500

Recruits 1 Fish

Year Class	Average	StdDev
2013	11221566.4504	5804602.8006
2014	11147084.2509	5798238.2615
2015	11288144.0841	5865776.3830
2016	16504034.0924	13607054.2242
2017	22665251.5322	16504170.4330
2018	25275803.8816	17238380.0577
2019	25668251.1591	17316601.6747
2020	25554077.0382	17136177.5478

2021 25809831.8777 17230314.4631

Recruits Distribution

Year Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	2264358.0000	2277356.0000	2807622.0000	6125243.0000	10754115.0000	14530980.0000	20048960.0000	22577150.0000	22783550.0000
2014	2263753.0000	2276576.0000	2810805.0000	6071236.0000	10664865.0000	14491110.0000	19980980.0000	22567480.0000	22785890.0000
2015	2264111.0000	2277907.0000	2827667.0000	6100231.0000	10789680.0000	15162360.0000	20258090.0000	22560300.0000	22782100.0000
2016	2265582.0000	2552300.0000	5173967.0000	8649155.0000	13130860.0000	21482220.0000	24809100.0000	53724170.0000	67249110.0000
2017	2274025.0000	5969833.0000	6831151.0000	10676200.0000	20170765.0000	24580500.0000	53802740.0000	61641010.0000	68975010.0000
2018	5453189.0000	6748246.0000	7890900.0000	11910390.0000	22312770.0000	24946360.0000	55897520.0000	63570690.0000	69227840.0000
2019	6612137.0000	6788481.0000	8118832.0000	12569130.0000	22352075.0000	25089180.0000	56577700.0000	63824920.0000	69276110.0000
2020	6617530.0000	6808952.0000	8168996.0000	12869300.0000	22359360.0000	25018980.0000	56192230.0000	63811030.0000	69280890.0000
2021	6621291.0000	6805155.0000	8142713.0000	13029930.0000	22389045.0000	25135810.0000	56076760.0000	63560060.0000	69268150.0000

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2013	0.7063	0.1818
2014	0.5988	0.2110
2015	1.8794	0.6949
2016	4.4842	1.5676
2017	6.7087	1.9773
2018	9.0436	2.9254
2019	12.3307	4.7592
2020	16.0648	6.0693
2021	19.4195	6.7543

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.3080	0.4328	0.4753	0.5813	0.6954	0.8151	0.9502	1.0172	1.1833
2014	0.1980	0.2845	0.3416	0.4481	0.5876	0.7232	0.8807	0.9668	1.1842
2015	0.6162	0.8172	0.9726	1.3533	1.8342	2.3387	2.9047	3.1220	3.4175
2016	1.4361	2.0517	2.4280	3.3326	4.3822	5.5824	6.6561	7.2318	8.1183
2017	2.6351	3.5439	4.1751	5.2854	6.6396	8.0344	9.3669	10.0794	11.3358
2018	3.7149	4.8788	5.6601	6.9587	8.6704	10.6622	13.0274	14.6201	17.3864
2019	4.7099	6.1931	7.1175	9.0245	11.4489	14.5702	18.4618	22.4533	27.2841
2020	5.6933	7.8821	9.2242	11.7959	14.9301	19.4662	24.9311	27.4477	33.2402
2021	7.2895	10.0619	11.6416	14.4872	18.2321	23.9123	28.5266	31.9551	37.7871

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2013	0.8609	0.1579
2014	0.5805	0.1958
2015	0.6466	0.2130
2016	3.3131	1.4512
2017	5.7219	1.9542
2018	7.6309	2.2111
2019	10.5032	4.2948
2020	14.2333	5.9267
2021	17.8548	6.8113

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5386	0.6331	0.6743	0.7477	0.8454	0.9597	1.0691	1.1488	1.2668
2014	0.1915	0.2908	0.3412	0.4426	0.5687	0.7005	0.8378	0.9204	1.1187
2015	0.2424	0.3352	0.3909	0.4950	0.6335	0.7720	0.9314	1.0213	1.2462
2016	0.9058	1.1029	1.3197	2.1283	3.1947	4.2006	5.5099	6.0327	6.3402
2017	1.6971	2.5835	3.2235	4.2719	5.6688	7.0376	8.3679	9.0595	10.4468
2018	2.9638	4.0572	4.8114	6.0704	7.5461	9.1159	10.5584	11.4322	12.9332
2019	4.0189	5.3619	6.1790	7.7097	9.6340	12.1923	15.2765	20.7793	24.9688
2020	4.9581	6.6357	7.7947	10.0398	12.9047	17.0658	23.4151	25.5167	31.9568
2021	6.0768	8.5311	10.0828	12.9003	16.3832	22.6649	26.9993	30.2195	36.5571

Mean Biomass x 1000 MT

Year	Average	StdDev
2013	1.0526	0.2213
2014	2.4455	0.8875
2015	4.9456	1.6536
2016	7.5915	2.1827
2017	10.5376	3.4985
2018	14.4003	5.2988
2019	18.8396	6.8055
2020	22.9279	7.6985
2021	26.2466	8.1125

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5927	0.7210	0.7836	0.9011	1.0452	1.1857	1.3483	1.4349	1.6480
2014	0.8505	1.0878	1.2805	1.7725	2.3919	3.0302	3.7689	4.0463	4.3910
2015	1.6464	2.3550	2.7939	3.7445	4.8597	6.1095	7.2008	7.8387	8.8214
2016	3.0510	4.1014	4.8084	6.0235	7.5194	9.0678	10.4916	11.3497	12.7205
2017	4.4058	5.7209	6.5967	8.0753	9.9997	12.3670	15.2438	17.5468	20.8311
2018	5.5931	7.3422	8.3758	10.6245	13.4659	17.1760	21.7272	24.8976	30.2116
2019	6.8877	9.4326	11.0204	14.0439	17.7160	22.8848	28.4980	31.3876	37.8769
2020	8.7988	12.1162	13.9660	17.3182	21.7782	27.9797	33.4256	37.2809	43.5219
2021	10.9090	14.8307	16.6945	20.1607	25.3548	31.4004	37.3480	41.1530	47.8704

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2013	0.5000	0.0000
2014	0.3990	0.0176
2015	0.1970	0.0628
2016	0.5707	0.1966
2017	1.1092	0.3539
2018	1.5710	0.4647
2019	2.1068	0.7107
2020	2.7952	1.0564
2021	3.5314	1.2821

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
2014	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
2015	0.0728	0.0999	0.1185	0.1521	0.1927	0.2383	0.2811	0.3064	0.3539
2016	0.2092	0.2676	0.3128	0.4230	0.5583	0.7025	0.8573	0.9245	1.0057
2017	0.4040	0.5495	0.6508	0.8504	1.0896	1.3616	1.5884	1.7257	1.9322
2018	0.6466	0.8521	0.9922	1.2344	1.5394	1.8824	2.1991	2.3917	2.7014

2019	0.8410	1.1175	1.2985	1.6165	2.0141	2.4677	3.0193	3.5220	4.2441
2020	1.0350	1.3967	1.6364	2.0754	2.5930	3.3282	4.2778	4.9195	6.0337
2021	1.2654	1.7893	2.0869	2.6157	3.2899	4.3310	5.3267	5.9180	7.0873

Landings x 1000 MT

Year	Average	StdDev
2013	0.5000	0.0000
2014	0.3990	0.0176
2015	0.1970	0.0628
2016	0.5707	0.1966
2017	1.1092	0.3539
2018	1.5710	0.4647
2019	2.1068	0.7107
2020	2.7952	1.0564
2021	3.5314	1.2821

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
2014	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
2015	0.0728	0.0999	0.1185	0.1521	0.1927	0.2383	0.2811	0.3064	0.3539
2016	0.2092	0.2676	0.3128	0.4230	0.5583	0.7025	0.8573	0.9245	1.0057
2017	0.4040	0.5495	0.6508	0.8504	1.0896	1.3616	1.5884	1.7257	1.9322
2018	0.6466	0.8521	0.9922	1.2344	1.5394	1.8824	2.1991	2.3917	2.7014
2019	0.8410	1.1175	1.2985	1.6165	2.0141	2.4677	3.0193	3.5220	4.2441
2020	1.0350	1.3967	1.6364	2.0754	2.5930	3.3282	4.2778	4.9195	6.0337
2021	1.2654	1.7893	2.0869	2.6157	3.2899	4.3310	5.3267	5.9180	7.0873

Total Fishing Mortality

Year	Average	StdDev
2013	0.9942	0.3318
2014	1.2420	0.6663
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
2021	0.2500	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5314	0.6215	0.6795	0.7867	0.9369	1.1145	1.3500	1.5114	2.1325
2014	0.4667	0.5858	0.6498	0.8270	1.0543	1.4528	2.0322	2.5058	4.0203
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
2021	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
2013	0.000000
2014	0.000000

2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000100
2021	0.000900

Probability Threshold Exceeded at Least Once = 0.0009

Probability Total Fishing Mortality Exceeds Threshold 0.2500

Year	Probability
2013	1.000000
2014	0.998200
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

Georges Bank Yellowtail Flounder Split Series Rho Adjusted F=0 in 2014

AGEPRO VERSION 4.2

Split Series SSB rho adjusted Fref

Date & Time of Run: 07 Nov 2013 15:40

Input File Name:
C:\NIT\GARM_2012_UPDATE_PROJ\GEORGES_BANK_YELLOWTAIL_FLOUNDER\2013_TRAC\GBYT_SSBRHOADJ_F0.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\2013_TRAC\SPLITSERIES_BOOT.BSN

Number of Feasible Solutions: 10000 of 10000 Realizations

Input Harvest Scenario

Year	Type	Value
2013	Landings	500
2014	F-Mult	0.0000
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
2021	F-Mult	0.2500

Recruits 1 Fish

Year Class	Average	StdDev2013
2013	11221566.4504	5804602.8006
2014	11147084.2509	5798238.2615
2015	11288144.0841	5865776.3830
2016	17412634.5902	14286320.4027
2017	23095717.1035	16663312.3584
2018	25376902.2276	17252459.6167
2019	25688842.6927	17313127.2356
2020	25562148.0806	17140994.5180

2021 25815782.7193 17235320.7701

Recruits Distribution

Year	Class	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	2264358.0000	2277356.0000	2807622.0000	6125243.0000	10754115.0000	14530980.0000	20048960.0000	22577150.0000	22783550.0000	
2014	2263753.0000	2276576.0000	2810805.0000	6071236.0000	10664865.0000	14491110.0000	19980980.0000	22567480.0000	22785890.0000	
2015	2264111.0000	2277907.0000	2827667.0000	6100231.0000	10789680.0000	15162360.0000	20258090.0000	22560300.0000	22782100.0000	
2016	2266263.0000	2637850.0000	5491290.0000	8890836.0000	13385090.0000	22320290.0000	25381550.0000	55282600.0000	67751170.0000	
2017	2276422.0000	6583149.0000	7039908.0000	10712580.0000	20838110.0000	24623970.0000	53986040.0000	62173330.0000	69029060.0000	
2018	5530694.0000	6756366.0000	7924269.0000	12149230.0000	22326655.0000	24978220.0000	56082750.0000	63617700.0000	69227840.0000	
2019	6615375.0000	6791762.0000	8134947.0000	12599090.0000	22354550.0000	25090800.0000	56577700.0000	63824920.0000	69276110.0000	
2020	6617530.0000	6808952.0000	8168996.0000	12874830.0000	22359890.0000	25020700.0000	56204230.0000	63811030.0000	69280890.0000	
2021	6621291.0000	6805155.0000	8142713.0000	13032550.0000	22389045.0000	25142340.0000	56077860.0000	63581340.0000	69268690.0000	

Spawning Stock Biomass x 1000 MT

Year	Average	StdDev
2013	0.7063	0.1818
2014	0.7817	0.2090
2015	2.2245	0.6943
2016	4.7590	1.5746
2017	6.9053	1.9819
2018	9.2815	2.9835
2019	12.6901	4.8810
2020	16.4278	6.1370
2021	19.7197	6.7820

Spawning Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.3080	0.4328	0.4753	0.5813	0.6954	0.8151	0.9502	1.0172	1.1833
2014	0.3643	0.4706	0.5281	0.6348	0.7705	0.9013	1.0594	1.1444	1.3563
2015	0.9623	1.1619	1.3165	1.6996	2.1788	2.6835	3.2510	3.4650	3.7621
2016	1.7058	2.3134	2.6924	3.6001	4.6542	5.8659	6.9421	7.5180	8.4002
2017	2.8247	3.7310	4.3698	5.4802	6.8359	8.2419	9.5618	10.2829	11.5800
2018	3.8457	5.0147	5.7972	7.1421	8.9240	10.9587	13.3608	14.9599	17.5892
2019	4.8058	6.3368	7.3224	9.2741	11.8338	14.9585	19.3140	22.9742	27.5206
2020	5.8042	8.0770	9.4448	12.0906	15.2627	20.0672	25.2662	27.6894	33.5219
2021	7.4243	10.2897	11.8460	14.7566	18.5348	24.2318	28.9296	32.3772	37.9077

JAN-1 Stock Biomass x 1000 MT

Year	Average	StdDev
2013	0.8609	0.1579
2014	0.5805	0.1958
2015	1.0161	0.2220
2016	3.6255	1.4584
2017	5.9511	1.9595
2018	7.7904	2.2141
2019	10.8355	4.4490
2020	14.6151	6.0176
2021	18.1814	6.8476

JAN-1 Stock Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5386	0.6331	0.6743	0.7477	0.8454	0.9597	1.0691	1.1488	1.2668
2014	0.1915	0.2908	0.3412	0.4426	0.5687	0.7005	0.8378	0.9204	1.1187
2015	0.5745	0.6845	0.7451	0.8611	1.0054	1.1497	1.3108	1.4007	1.6270
2016	1.2141	1.4049	1.6183	2.4288	3.5029	4.5129	5.8383	6.3661	6.6565
2017	1.9129	2.8040	3.4460	4.4924	5.8958	7.2649	8.5972	9.2948	10.6703
2018	3.1232	4.2064	4.9688	6.2267	7.7070	9.2792	10.7205	11.5975	13.0893
2019	4.1148	5.4840	6.3043	7.8837	9.9338	12.5992	16.0605	21.4546	25.1069
2020	5.0711	6.8216	7.9771	10.3192	13.2642	17.8069	23.8257	25.8352	32.5049
2021	6.1960	8.8033	10.3770	13.1601	16.7410	23.0720	27.2999	30.8738	36.9329

Mean Biomass x 1000 MT

Year	Average	StdDev
2013	1.0526	0.2213
2014	2.6625	0.8848
2015	5.3000	1.6589
2016	7.8597	2.1881
2017	10.8621	3.5775
2018	14.8144	5.4062
2019	19.2690	6.8839
2020	23.3010	7.7376
2021	26.5430	8.1280

Mean Biomass Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5927	0.7210	0.7836	0.9011	1.0452	1.1857	1.3483	1.4349	1.6480
2014	1.0812	1.3089	1.4993	1.9900	2.6064	3.2455	3.9808	4.2610	4.5987
2015	1.9879	2.6975	3.1402	4.0942	5.2124	6.4732	7.5625	8.1999	9.1933
2016	3.3144	4.3575	5.0650	6.2822	7.7864	9.3385	10.7690	11.6242	13.0220
2017	4.5795	5.9052	6.7867	8.3081	10.3322	12.7866	15.7876	18.0006	21.0865
2018	5.7413	7.5160	8.6460	10.9658	13.9060	17.6712	22.3279	25.4795	30.5994
2019	7.0202	9.6802	11.3182	14.3645	18.1223	23.4453	28.9337	31.9571	38.2742
2020	9.0013	12.4336	14.2271	17.6569	22.1906	28.3768	33.7965	37.5973	43.7530
2021	11.1708	15.0270	16.9314	20.3896	25.6393	31.6871	37.6598	41.3854	48.0389

Combined Catch Biomass x 1000 MT

Year	Average	StdDev
2013	0.5000	0.0000
2014	0.0000	0.0000
2015	0.2713	0.0642
2016	0.6340	0.1969
2017	1.1573	0.3555
2018	1.6109	0.4681
2019	2.1610	0.7264
2020	2.8697	1.0791
2021	3.6012	1.2933

Combined Catch Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
2014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2015	0.1393	0.1720	0.1909	0.2259	0.2677	0.3128	0.3572	0.3824	0.4309
2016	0.2728	0.3307	0.3750	0.4866	0.6217	0.7662	0.9220	0.9876	1.0699
2017	0.4484	0.5954	0.6963	0.8964	1.1397	1.4116	1.6385	1.7744	1.9894
2018	0.6787	0.8837	1.0245	1.2689	1.5819	1.9293	2.2405	2.4296	2.7365

2019	0.8617	1.1430	1.3287	1.6574	2.0696	2.5325	3.1275	3.6273	4.2822
2020	1.0565	1.4313	1.6822	2.1286	2.6670	3.4216	4.4174	5.0199	6.0965
2021	1.3172	1.8344	2.1290	2.6716	3.3619	4.4316	5.3958	6.0038	7.1366

Landings x 1000 MT

Year	Average	StdDev
2013	0.5000	0.0000
2014	0.0000	0.0000
2015	0.2713	0.0642
2016	0.6340	0.1969
2017	1.1573	0.3555
2018	1.6109	0.4681
2019	2.1610	0.7264
2020	2.8697	1.0791
2021	3.6012	1.2933

Landings Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
2014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2015	0.1393	0.1720	0.1909	0.2259	0.2677	0.3128	0.3572	0.3824	0.4309
2016	0.2728	0.3307	0.3750	0.4866	0.6217	0.7662	0.9220	0.9876	1.0699
2017	0.4484	0.5954	0.6963	0.8964	1.1397	1.4116	1.6385	1.7744	1.9894
2018	0.6787	0.8837	1.0245	1.2689	1.5819	1.9293	2.2405	2.4296	2.7365
2019	0.8617	1.1430	1.3287	1.6574	2.0696	2.5325	3.1275	3.6273	4.2822
2020	1.0565	1.4313	1.6822	2.1286	2.6670	3.4216	4.4174	5.0199	6.0965
2021	1.3172	1.8344	2.1290	2.6716	3.3619	4.4316	5.3958	6.0038	7.1366

Total Fishing Mortality

Year	Average	StdDev
2013	0.9942	0.3318
2014	0.0000	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
2021	0.2500	0.0000

Total Fishing Mortality Distribution

Year	1%	5%	10%	25%	50%	75%	90%	95%	99%
2013	0.5314	0.6215	0.6795	0.7867	0.9369	1.1145	1.3500	1.5114	2.1325
2014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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
2021	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
2013	0.000000
2014	0.000000

2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000100
2021	0.001400

Probability Threshold Exceeded at Least Once = 0.0014

Probability Total Fishing Mortality Exceeds Threshold 0.2500

Year	Probability
2013	1.000000
2014	0.000000
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000

Probability Threshold Exceeded at Least Once = 1.0000

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

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

Framework Adjustment 51

To the

Northeast Multispecies FMP

Appendix V

Background Information: Small-Mesh Fishery AM for Georges Bank yellowtail flounder

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
Ernest F. Stockwell, *Acting Chairman* | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: **September 3, 2013**

TO: Whiting and squid advisors

FROM: Andrew Applegate

SUBJECT: **Background information about Georges Bank yellowtail flounder accountability measures**

In NE Multispecies Framework Adjustment 48 (submitted and approved in 2013), the Council adopted a sub-ACL (annual catch limit) allocation of Georges Bank yellowtail flounder of two percent and required itself to develop an accountability measure that would be triggered if the small-mesh fishery catch exceeds the sub-ACL in 2013 and future years. The development of an accountability measure is being taken up in Framework Adjustment 51, which the Council will approve at the November meeting.

This Advisory Panel meeting is an opportunity for the industry to develop recommendations on how an accountability measure should be applied, if one is needed in 2013 and 2014. Early indications however are that the 2013 yellowtail flounder catches will be below the sub-ACL, partly because lower amounts of fishing occurred in the Cultivator Shoals Area and partly because it will be difficult to estimate yellowtail flounder catches before the end of the fishing year. Subsequently, the whiting (and possibly squid) fishery may revised the accountability measure specifications in a future specifications package or framework adjustment, planned for development in 2014.

To help the APs develop recommendation, I compiled the information below and calculated comparative statistics for observed trips using small mesh, targeting either red hake, silver hake, or loligo squid, or a combination of any of these. These data were restricted to observed tows inside of the Georges Bank yellowtail flounder stock area (see Map 2), statistical areas 522, 525, 561, and 562. The Cultivator Shoals Area is entirely within SA 522. The mixed whiting and squid trips occur on the southern edge of Georges Bank in SA 525 and 562.

The following information is included below:

1. The final alternative that allocates a Georges Bank yellowtail flounder sub-ACL for the small-mesh fisheries, including historic catch estimates for 2004-2011.

2. Background explanation of small-mesh fishery Georges Bank yellowtail flounder allocation and monitoring (catch estimation).

3. Georges Bank yellowtail flounder ACLs
    a. Sub-allocations of regulated multispecies by fishery
    b. Maximum 2014 Georges Bank yellowtail flounder allocation.

4. Georges Bank yellowtail flounder catch estimates for the small mesh fishery during 2012 (final) and 2013 (in-season). This information will be provided by the AP meeting.

5. Summary of observed yellowtail flounder catch to kept all (yellowtail flounder per pound landed of all species) ratios during 2010-2013 by statistical area, year, month, and gear type.

6. Catch distribution maps
    a. Maps showing the 2009 and 2011 distribution and yellowtail flounder catch rates per pound landed of observed tows for trips using a raised footrope trawl.
    b. Maps showing the 2009-2013 geographical distribution of yellowtail flounder catch rates (per pound landed). Size of circles represent the yellowtail flounder catch rate, while colors represent months (dark green = Jan; yellows = late spring and summer; oranges = fall; red = Dec).
    c. Same as b) but with the spring, fall, and winter survey kg/tow distribution for recent years.

7. Statistical test of significance that yellowtail flounder catch per pound landed of all species is less than standard trawls. Due to low sample size of observed hauls using the raised footrope trawl, the differences are not significant despite a 75% or more apparent reduction.

8. 2013 quota monitoring reports for loligo, northern and southern red hake, and northern and southern silver hake.

Item 1:

NE Multispecies Framework Adjustment 48 measure to allocate Georges Bank yellowtail flounder Sub-ACLs and require accountability measures in the small-mesh fisheries.

4.1.4.2 Option 2: Small-Mesh Fisheries Sub-ACL for GB Yellowtail Flounder (*Preferred Alternative*)

If this option is adopted, there would be a specific sub-ACL for GB yellowtail flounder for small-mesh bottom trawl fisheries. Catches of this stock by vessels using this gear would be no longer counted as part of the "other sub-components" category. AMs would expected to be developed by the relevant FMPs within one year of the implementation of this sub-ACL. The sub-ACL would be based on the median small-mesh fisheries catches of GB yellowtail flounder from 2004 through 2011, or two percent (these fisheries are not permitted to land yellowtail flounder, so the percentage is based on discard estimates shown below).

For the purposes of this sub-ACL, small-mesh bottom trawl fisheries are defined as those vessels that use a bottom otter trawl with a cod-end mesh size of less than 5 inches. Typical target species for vessels using this gear on GB are whiting and squid.

The sub-ACL would be based on a percentage of the U.S. ABC for this stock. This percentage would be applied to the ABC to get a sub-ABC, and then the sub-ABC would be adjusted to account for management uncertainty in order to get the sub-ACL. The percentage will be based on recent catch history, shown below in Table 7. Because of limited observer coverage prior to 2004, the period 2004-2011 will be used as the basis for the catch history.

Table 7 – Recent small-mesh fisheries catches of GB yellowtail flounder (TRAC 2012)

Year	U.S. Landings	U.S. Discards	U.S. Catch	Small-Mesh Discards	Small-Mesh Discards as Percent of U.S. Catch
2004	5837	460	6297	55	0.01
2005	3161	414	3575	52	0.01
2006	1196	384	1580	26	0.02
2007	1058	493	1551	110	0.07
2008	937	409	1346	26	0.02
2009	959	759	1718	24	0.01
2010	654	289	943	30	0.03
2011	904	192	1096	33	0.03
				mean	0.03
				median	0.02
				90th ptile	0.04

Rationale: While small-mesh fishery catches of GB yellowtail flounder have generally been less than 100 mt in recent years, with declining ABCs for this stock they are an increasing percentage of the total U.S. catch. Adoption of a sub-ACL will enable control of those catches through the use of an AM. AMs will be developed by the relevant FMP.

Item 2:

Small-Mesh Fisheries ACL allocation and monitoring
Georges Bank (GB) Yellowtail Flounder

Background

- Catches of GB yellowtail flounder by the small-mesh fisheries have generally been less than 100 mt in recent years (Table 1).
    - A codend mesh size of less than 5 in is defined as small-mesh.
- The GB yellowtail flounder quota has been declining quite dramatically in recent years (Table 2), and as a result, small-mesh discards of the stock are becoming an increasing proportion of the total U.S. catch.
- If the U.S. exceeds its quota for GB yellowtail flounder, the Sharing Agreement with Canada requires that the amount of the overage is deducted from the U.S. quota the following year.
- Due to concerns for the declining quota, and increasing significance of small-mesh discards of GB yellowtail flounder, Framework 48 to the Northeast Multispecies Fishery Management Plan adopted a GB yellowtail flounder sub-annual catch limit (sub-ACL) for the small-mesh fisheries.
    - This measure was intended to control the catch of GB yellowtail flounder by the small-mesh fisheries through an accountability measure that would be triggered if the small-mesh fisheries' allocation is exceeded.
        - Framework 48 specified that AMs would be developed by the respective Fishery Management Plans (FMPs) within 1 year of the implementation of this sub-ACL, or by May 1, 2014.
    - The small-mesh fisheries' allocation is 2 percent of the U.S. GB yellowtail flounder Acceptable Biological Catch (ABC).
        - This allocation is based on the small-mesh median catch of GB yellowtail flounder (as a percent of total U.S. catch) from 2004-2011.
        - The small-mesh fisheries sub-ACL is calculated as the small-mesh portion of the ABC (2 percent) reduced to account for management uncertainty.
            - Because small-mesh fisheries catch of GB yellowtail are discards only, the management uncertainty buffer is 7 percent.

Table 1. GB Yellowtail Flounder Catch by Small-Mesh Otter Trawl (mt) (TRAC 2013)

Calendar Year	**U.S. Landings**	**U.S. Discards**	**U.S. Catch**	**Small-Mesh Discards**	**Small-Mesh Discards as Percent of U.S. Catch**
2004	5,837	460	6,297	55	0.01
2005	3,161	414	3,575	52	0.01
2006	1,196	384	1,580	26	0.02
2007	1,058	493	1,551	110	0.07
2008	937	409	1,346	26	0.02
2009	959	759	1,718	24	0.01
2010	654	289	943	30	0.03
2011	904	192	1,096	33	0.03
2012	443	188	631	24	0.04
				Mean	0.03
				Median	0.02
				90th ptile	0.05

Table 2. GB Yellowtail Flounder Quota (mt)

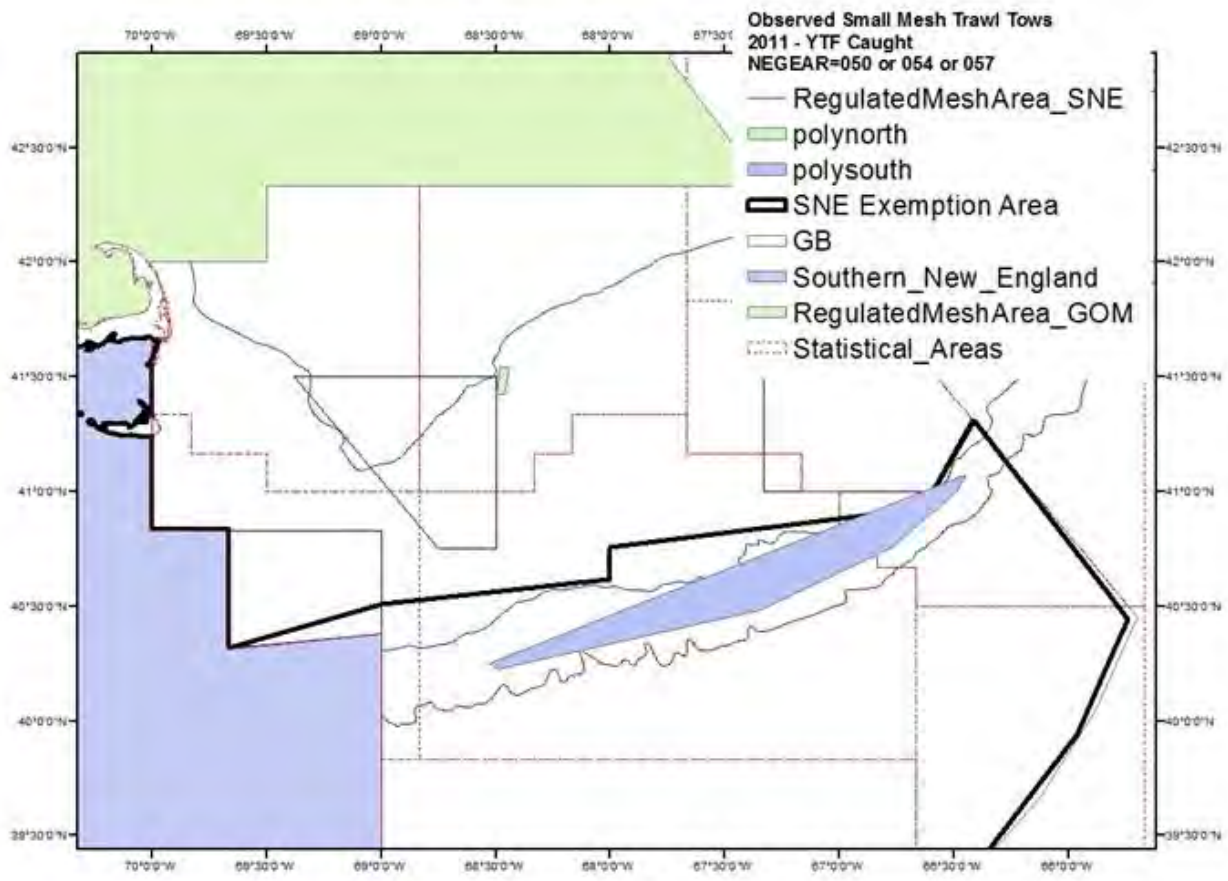
Fishing Year	Total U.S./Canada Quota	U.S.	
		% Share	Quota
2004	7,900	76%	6,000
2005	6,000	71%	4,260
2006	3,000	69%	2,070
2007	1,250	72%	900
2008	2,500	78%	1,950
2009	2,100	77%	1,617
2010	1,500	64%	1,200
2011	2,650	55%	1,458
2012	1,150	49%	564
2013	500	43%	215

<u>Observed Small Mesh Tows that Caught GB Yellowtail Flounder</u>

- In 2011, about 80 percent of the observed small-mesh discards of GB yellowtail flounder came from stat area 525, and in 2010, about 50 percent of the observed discards came from this area.
- Figure 1 shows the 2011 observed small-mesh tows that caught GB yellowtail flounder. The smallest polygons possible were drawn around tows with GB yellowtail flounder catch.

- "Polynorth" is a small area outside of Closed Area I. This area is the Cultivator Shoal whiting fishery.
- "Polysouth" is a larger area on the southern flank of Georges Bank. Trips in this area are a mix of squid and whiting.

Figure 1. 2011 Observed Small-Mesh Tows with GB Yellowtail Flounder Catch



Northeast Regional Office (NERO) Quota Monitoring

- Prior to the adoption of the small-mesh fisheries sub-ACL for GB yellowtail flounder, these catches were attributed to the "other sub-component." This portion of the annual quota is set aside to account for groundfish catch that occurs in non-groundfish fisheries that do not have an allocation. There is no accountability measure for the other sub-component if the sub-component value is exceeded.
- NERO has developed "binning rules" to attempt to apportion the other sub-component catch to various FMPs/fisheries (Table 3).

- For non-VMS fisheries, NERO relies on permit type, gear type, mesh size, and revenue by species. However, for mixed fisheries, it is difficult to identify a directed trip for one fishery, and revenue by species does not necessarily indicate the intended target species for a trip.

Table 3. FY 2010 and FY 2011 "Other sub-Component" GB Yellowtail Flounder Catch (mt)

Fishing Year	Total	FLUKE	HERRING	SCUP	SQUID	SQUID/ WHITING	WHITING	UNKNOWN
2010	43.2	0.1	1.0	0.2	0.2	40.7	-	1.0
2011	34.4	0.1	0.6	0.0	0.9	30.8	0.1	1.9

- Squid/Whiting Binning Rules
  - Squid Trips
    - SMB-1 or SMB-5; no MUL
    - Otter trawl
    - Mesh size ≥ 1 7/8"
    - Squid (*Illex* or *Loligo*) highest revenue by species
    - *Additional criteria*: If vessel has MUL permit, but no hake landed, trip is assumed to be squid trip if meets all the other above criteria
  - Whiting Trips
    - MUL-A or MUL-C or MUL-D or MUL-E or MUL-F or MUL-K; no SMB
    - Otter trawl
    - Mesh size ≥ 2 but ≤ 3"
    - Whiting highest revenue by species
    - *Additional criteria*: If vessel has SMB permit, but no squid landed, trip is assumed to be whiting trip if meets all the other above criteria
    -
  - Squid/Whiting Trips
    - SMB-1 or SMB-5
    - MUL-A or MUL-C or MUL-D or MUL-E or MUL-F or MUL-K
    - Otter trawl
    - Mesh size ≥ 1 7/8"
    - Combined revenue of squid (*Illex* and *Loligo*) and whiting highest by species

APPENDIX I

Overview of Transboundary Management Guidance Committee (TMGC)

Purpose

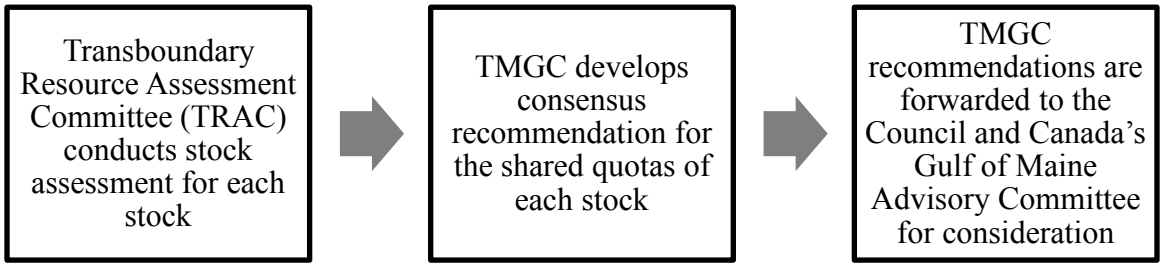
- Develop non-binding annual guidance on catch levels for three transboundary stocks:
    1. Georges Bank (GB) yellowtail flounder;
    2. Eastern GB cod; and
    3. Eastern GB haddock

Membership

- 6 members from each country (2 government and 4 industry)
- US Members:

Industry	Government
Terry Stockwell (co-chair)	Sarah Heil (NERO)
Terry Alexander	Fred Serchuk (NEFSC)
Tom Dempsey	
Mary Beth Tooley	

Annual Process



Note: The U.S./Canada Management Area encompasses the entire stock area for GB yellowtail flounder. As a result, the shared U.S./Canada quota is also the total ABC for the stock. Each year, usually prior to the TMGC meeting, the New England Fishery Management Council's Scientific and Statistical Committee meets to recommend an ABC for GB yellowtail flounder. This recommendation is the upper bound for the U.S. when negotiating the shared quota for GB yellowtail flounder.

Harvest Strategy

- Maintain a low to neutral risk of exceeding the fishing mortality limit
- When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding

Sharing the Fish

- Each year the TRAC calculates the percentage of the shared quota that each country will receive
- A pre-determined sharing formula splits the shared quota between the U.S. and Canada
    - Two components to the sharing formula:
        1. Historical catch (fixed value)
        2. Current distribution of stock between U.S. and Canadian waters (DFO and NEFSC surveys)
- Each component is weighted based on its importance

- Distribution of stock has gradually become more important over time
  - 2004: 60/40 weighting (Distribution/Historical Catch)
  - 2010 and beyond: 90/10 weighting (Distribution/Historical Catch)

Item 3:

Georges Bank yellowtail flounder Sub-ACL tables

FY 2013 Total ACLs, sub-ACLs, and ACL sub-components (mt, live weight)

Stock	Total ACL	Groundfish sub-ACL	Preliminary Sector sub-ACL	Common Pool sub-ACL	Recreational Fishery sub-ACL	Midwater Trawl Fishery sub-ACL	Scallop Fishery sub-ACL	Small-Mesh Fisheries sub-ACL	State Waters sub-component	Other sub-component
	A to H	A+B+C	A	B	C	D	E	F	G	H
GB Cod	1,907	1,807	1,777	30					20	80
GOM Cod	1,470	1,316	814	16	486				103	51
GB Haddock	27,936	26,196	26,124	72		273			293	1,173
GOM Haddock	274	261	186	1	74	3			4	6
GB Yellowtail Flounder Emergency Action	208.5	116.8	115.4	1.3			83.4	4.0		4.3
SNE/MA Yellowtail Flounder	665	570	456	114			61		7	28
CC/GOM Yellowtail Flounder	523	479	467	12					33	11
American Plaice	1,482	1,420	1,396	24					31	31
Witch Flounder	751	610	601	9					23	117
GB Winter Flounder	3,641	3,528	3,508	20						113
GOM Winter Flounder	1,040	715	690	24					272	54
SNE/MA Winter Flounder	1,612	1,210	1,068	142					235	168
Redfish	10,462	10,132	10,091	41					110	220
White Hake Emergency Action	3,974	3,849	3,818	31					42	84
White Hake Proposed in Framework 50	3,462	3,352	3,326	27					36	73
Pollock	14,921	12,893	12,810	83					936	1,092
Northern Windowpane Flounder	144	98		98					2	44
Southern Windowpane Flounder	527	102		102			183		55	186
Ocean Pout	220	197		197					2	21
Atlantic Halibut	96	52		52					40	5
Atlantic Wolffish	65	62		62					1	3

Item 4:

Georges Bank yellowtail flounder catch estimates for the small-mesh fisheries

To be distributed at meeting

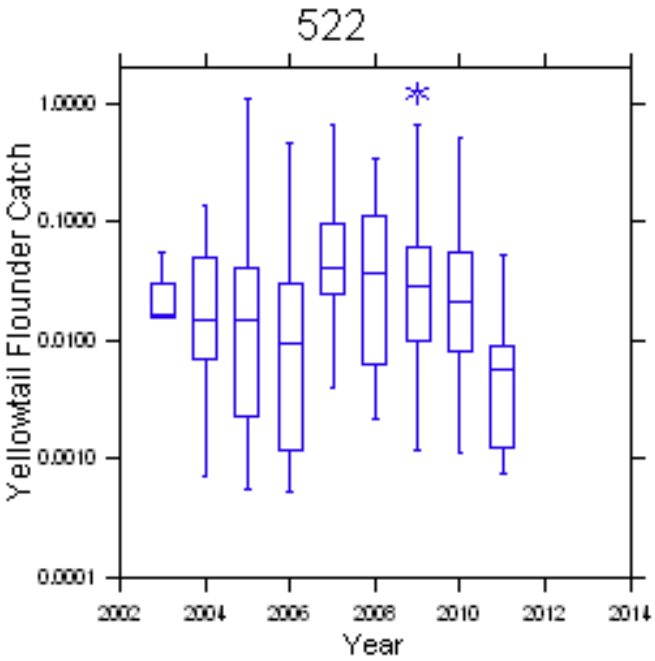
Item 5:

Yellowtail flounder catch ratio statistics

Table 4. Georges Bank yellowtail flounder catch per pound landed of all species by statistical area (see Maps) Catch rates are highes in SA 522. N of cases is number of observed hauls. Coefficient of variation is high due to variability in catch rates and outliers

2010-2013	Statistical Area		
Statistics	522	525	562
N of Cases	113	148	140
Mean	0.028	0.012	0.010
95.0% LCL of Mean	0.013	-0.003	-0.006
95.0% UCL of Mean	0.042	0.026	0.026
75th Percentile	0.021	0.000	0.000
80th Percentile	0.034	0.000	0.000
90th percentile	0.065	0.004	0.000
95th Percentile	0.111	0.018	0.004
99th Percentile	0.480	0.259	0.293
Maximum	0.500	1.028	1.119
Median	0.003	0.000	0.000
Minimum	0.000	0.000	0.000
Coefficient of Variation	2.794	7.577	9.484

Log Scale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Yellowtail Flounder Catch
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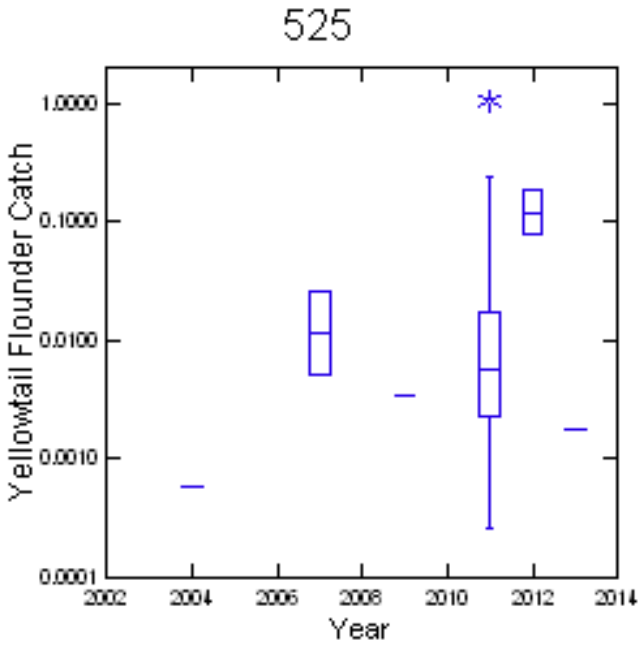
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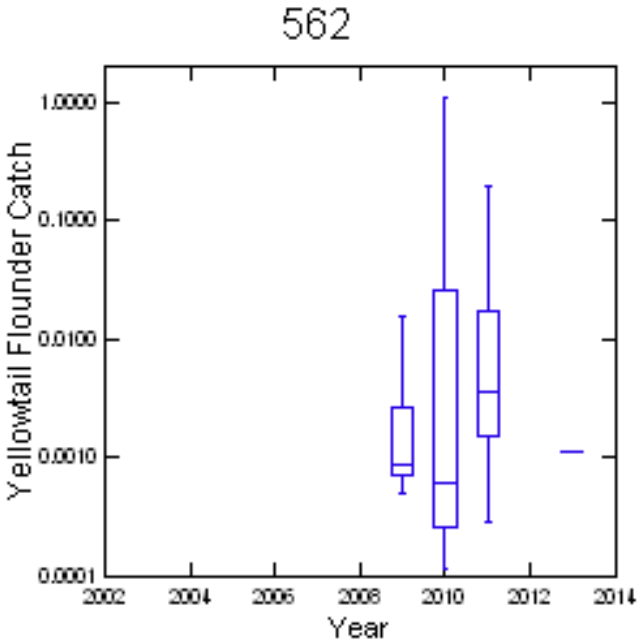
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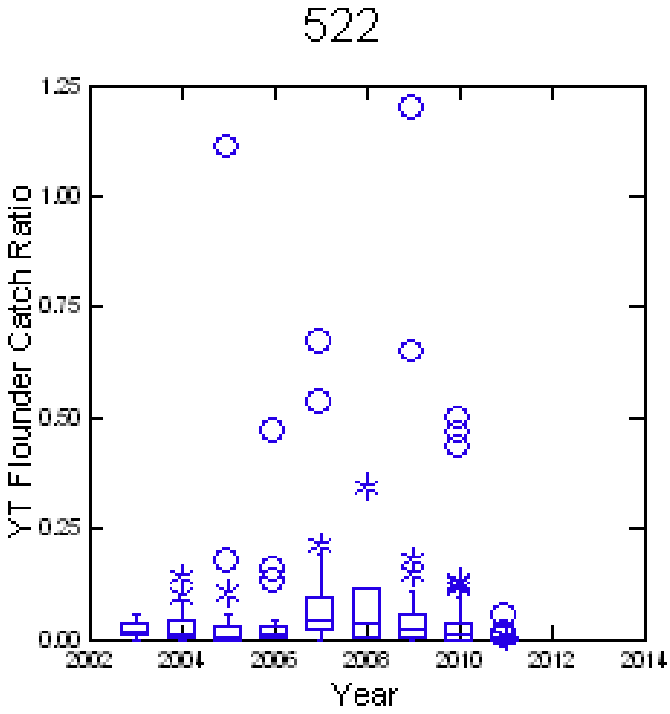
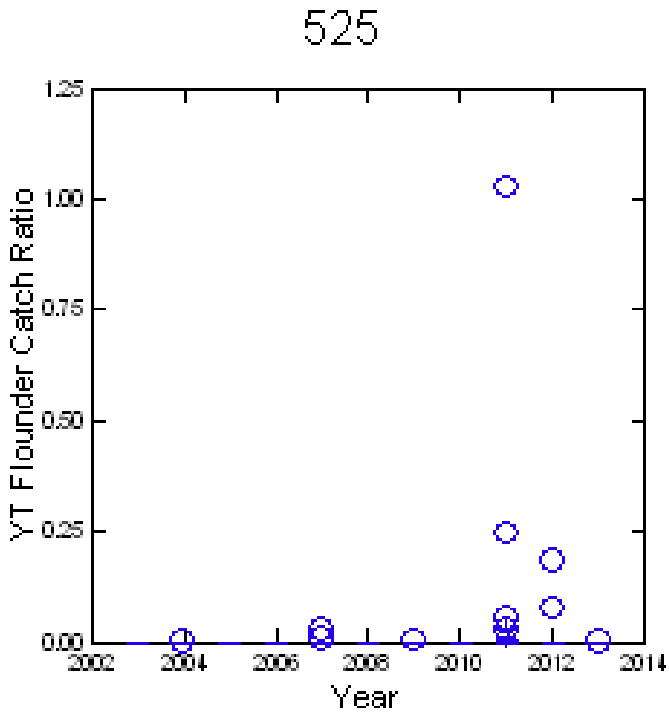
Normal Scale





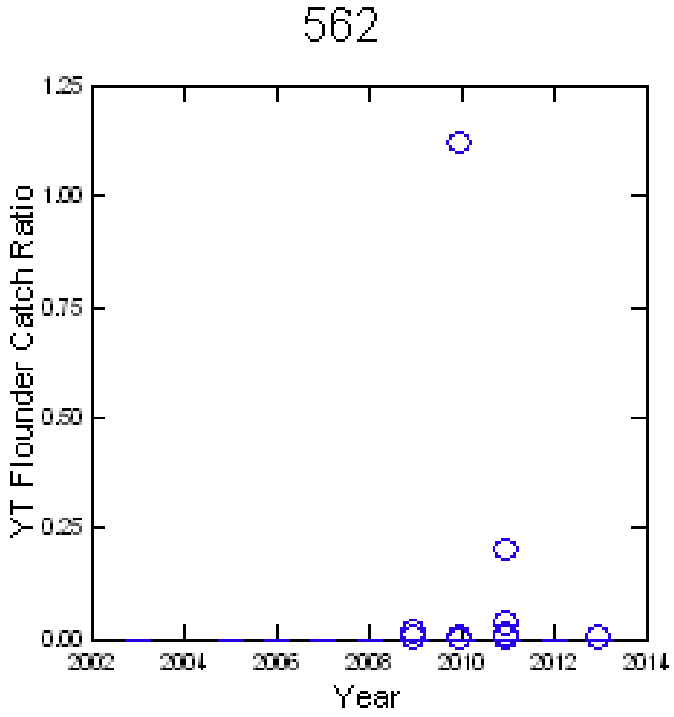


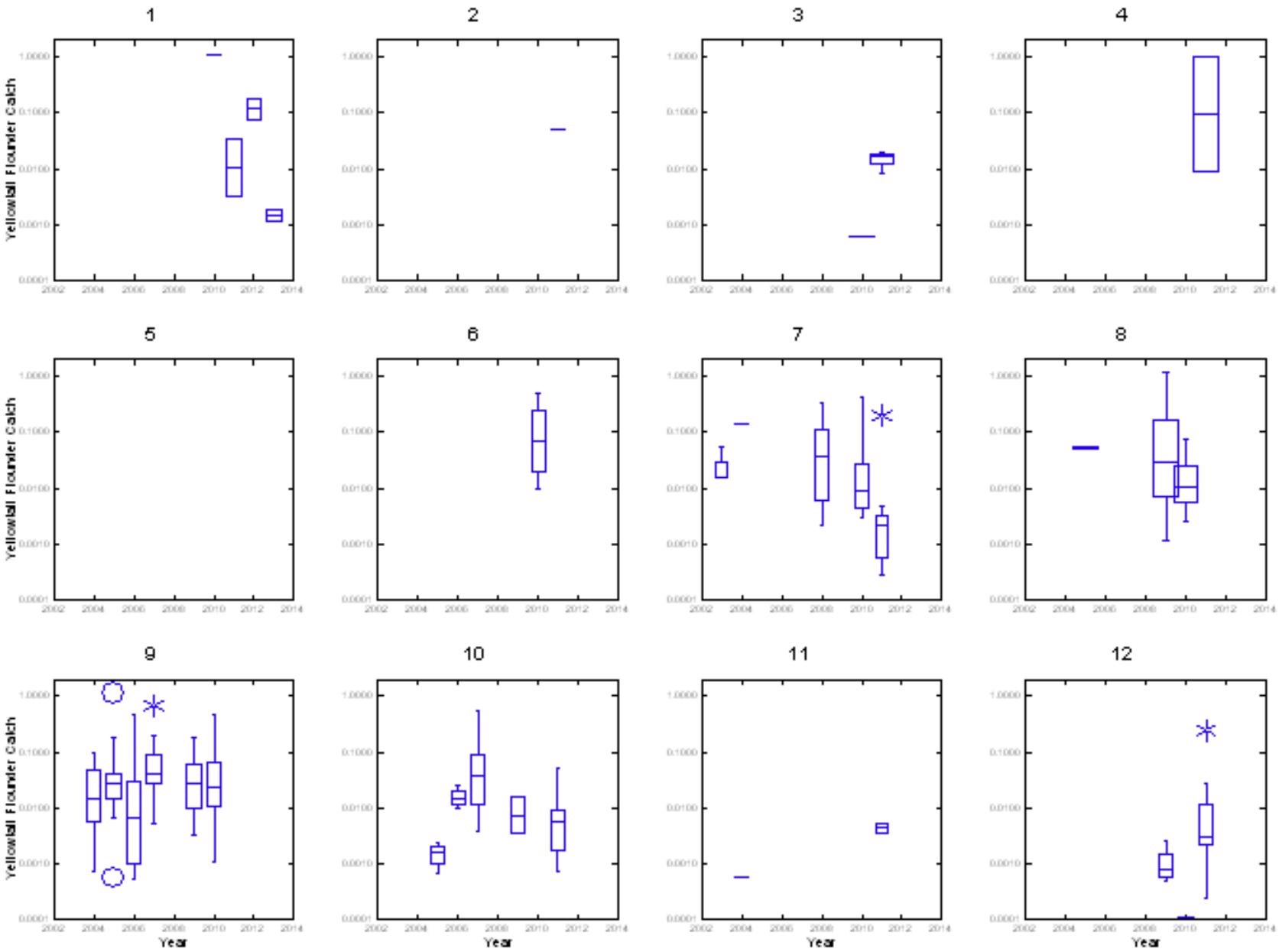
Table 5. Georges Bank yellowtail flounder catch per pound landed of all species by calendar year. Catch rates were lower in 2012 and 2013 due to fewer Cultivator Shoals Area observed trips. N of cases is number of observed hauls. Coefficient of variation is high due to variability in catch rates and outliers.

Areas 522, 525 and 562 from 2010-2013	Year			
Statistics	2010	2011	2012	2013
N of Cases	226	121	28	26
Mean	0.018	0.015	0.009	0.000
95.0% LCL of Mean	0.006	-0.002	-0.005	0.000
95.0% UCL of Mean	0.031	0.033	0.023	0.000
75th Percentile	0.001	0.003	0.000	0.000
80th Percentile	0.004	0.005	0.000	0.000
90th Percentile	0.034	0.013	0.000	0.000
95th Percentile	0.068	0.033	0.087	0.001
99th Percentile	0.475	0.471	0.182	0.002
Maximum	1.119	1.028	0.182	0.002
Median	0.000	0.000	0.000	0.000
Minimum	0.000	0.000	0.000	0.000
Coefficient of Variation	5.048	6.298	3.985	3.636

Table 6. Georges Bank yellowtail flounder catch per pound landed of all species by month. Catch rates were highest in June to August. N of cases is number of observed hauls. Coefficient of variation is high due to variability in catch rates and outliers.

Areas 522, 525 and 562 from 2010-2013	Month											
Statistics	1	2	3	4	5	6	7	8	9	10	11	12
N of Cases	57	23	34	34	45	29	42	13	49	43	14	18
Mean	0.025	0.002	0.001	0.030	0.000	0.023	0.017	0.017	0.033	0.004	0.001	0.017
95.0% LCL of Mean	-0.015	-0.002	0.000	-0.031	0.000	-0.013	-0.005	0.004	0.013	0.001	0.000	-0.011
95.0% UCL of Mean	0.065	0.007	0.003	0.092	0.000	0.060	0.040	0.030	0.054	0.007	0.002	0.046
75th Percentile	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.023	0.047	0.003	0.000	0.005
80th Percentile	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.037	0.059	0.006	0.000	0.008
90th Percentile	0.002	0.000	0.001	0.000	0.000	0.027	0.013	0.047	0.080	0.010	0.004	0.024
95th Percentile	0.061	0.018	0.016	0.007	0.000	0.149	0.102	0.070	0.114	0.021	0.005	0.157
99th Percentile	1.054	0.052	0.019	1.028	0.000	0.500	0.434	0.075	0.468	0.053	0.005	0.244
Maximum	1.119	0.052	0.019	1.028	0.000	0.500	0.434	0.075	0.468	0.053	0.005	0.244
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.011	0.000	0.000	0.001
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coefficient of Variation	6.029	4.796	3.385	5.778	0.000	4.055	4.176	1.293	2.160	2.456	2.590	3.298

Log Scale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Yellowtail Flounder Catch
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Normal Scale

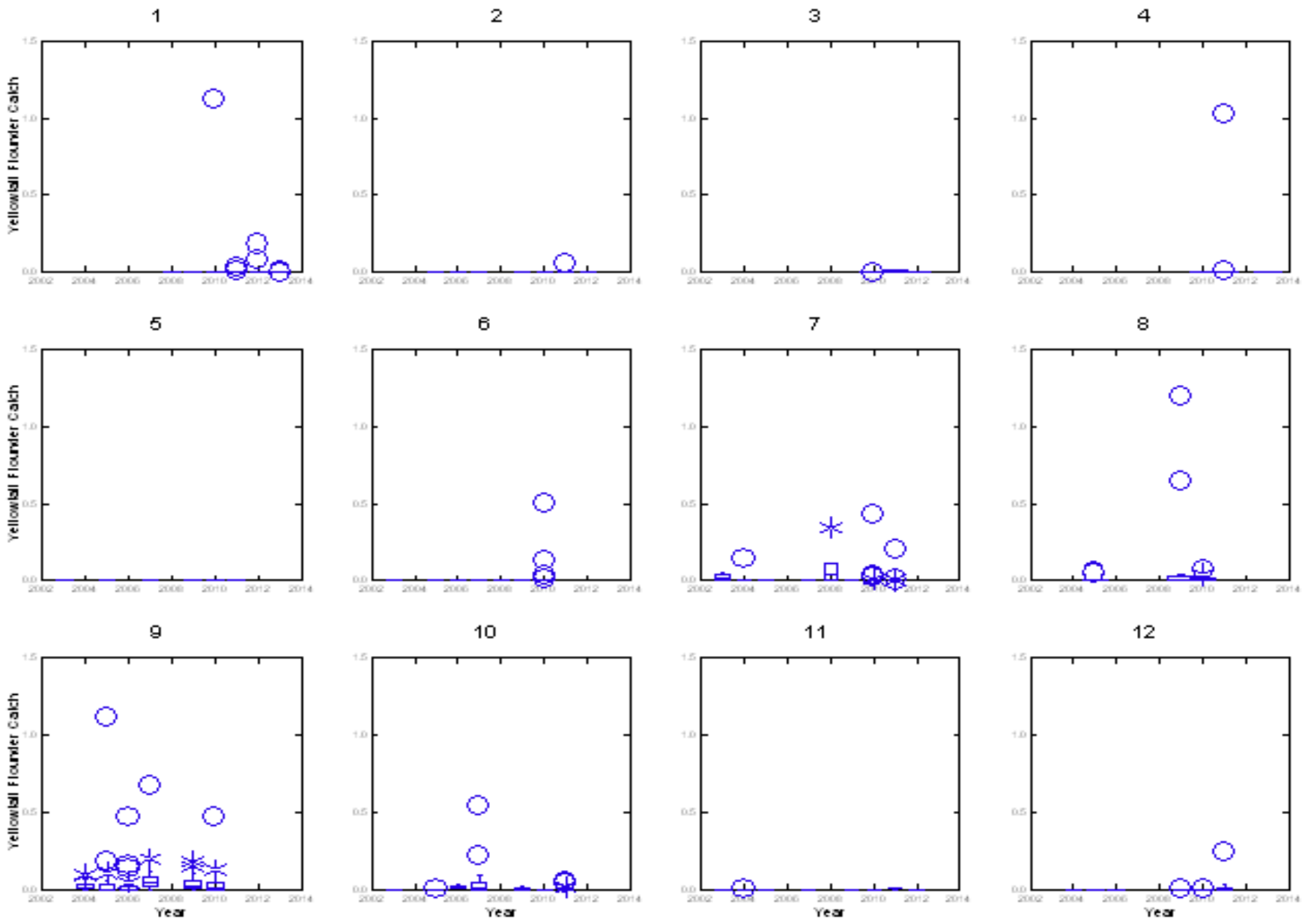
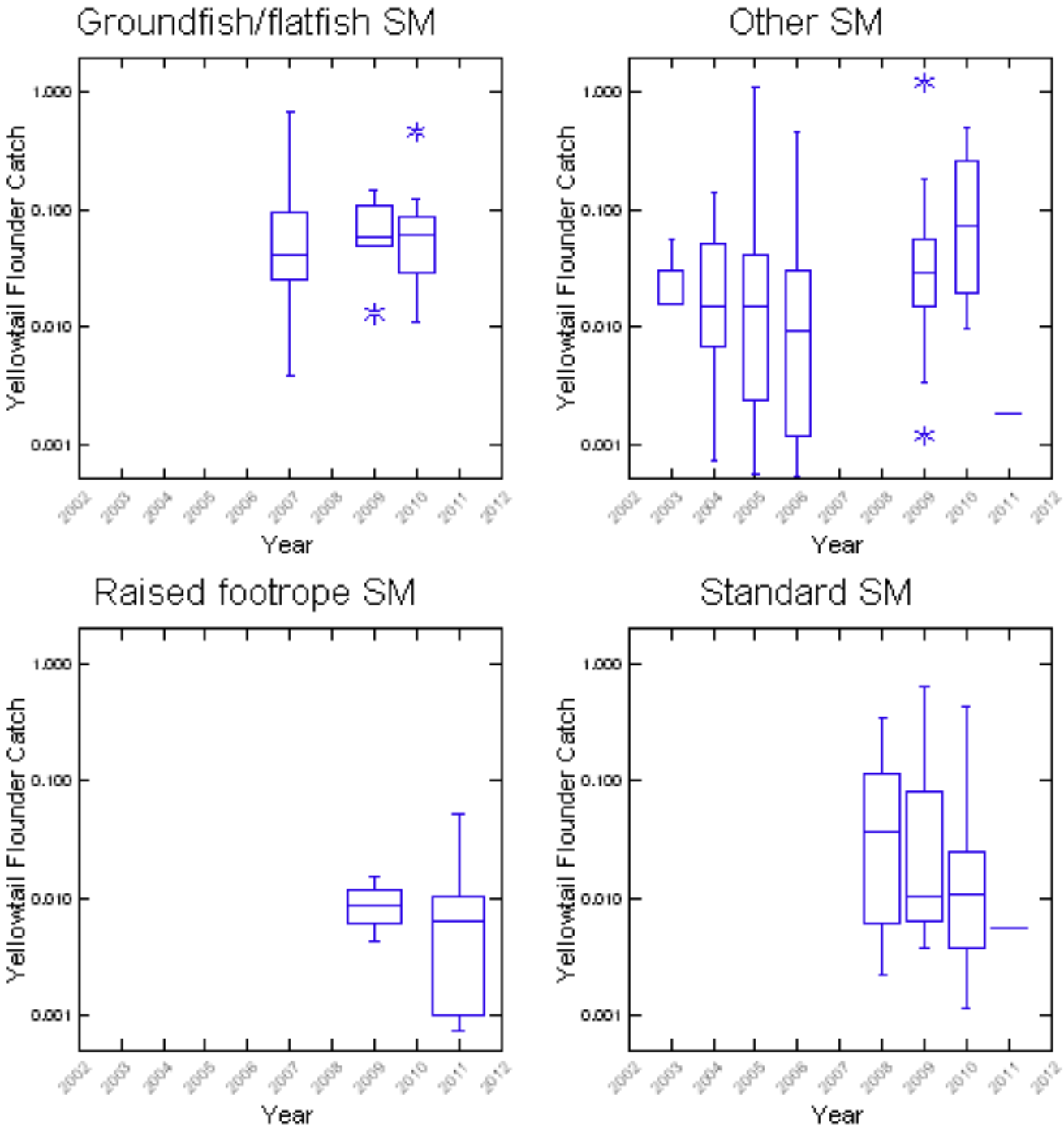


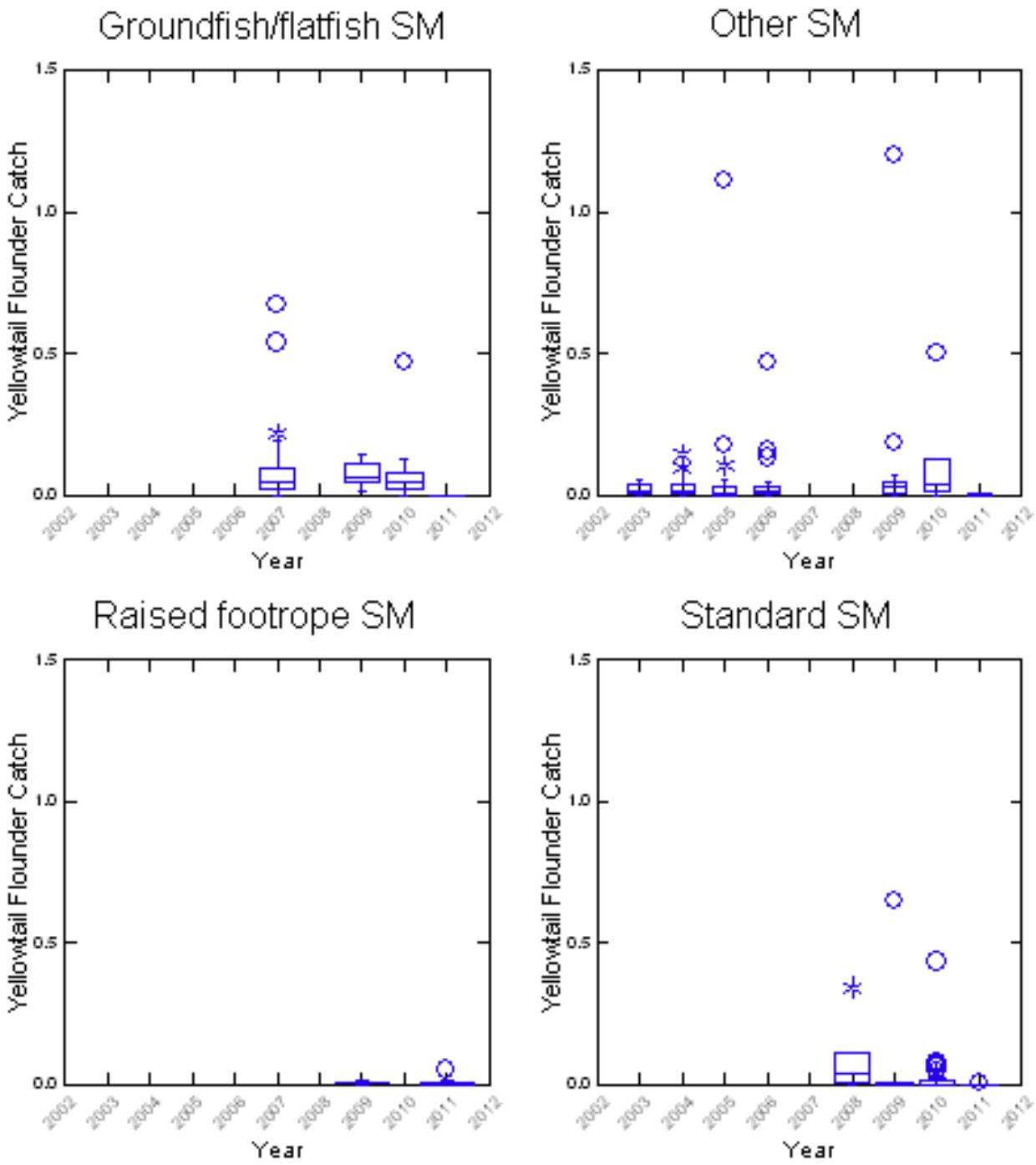
Table 7. Georges Bank yellowtail flounder catch per pound landed of all species by trawl type. Catch rates using a raised footrope trawl (3 observed trips) were one-third of those using a standard small-mesh net, but there is considerable overlap in confidence intervals. N of cases is number of observed hauls. Coefficient of variation is high due to variability in catch rates and outliers.

Area 522 from 2010-2013	Net Group			
Statistics	Standard SM	Groundfish/flatfish SM	Raised footrope SM	Other SM
N of Cases	63	23	18	9
Arithmetic Mean	0.017	0.056	0.006	0.076
95.0% LCL of Arithmetic	0.003	0.013	0.000	-0.051
95.0% UCL of Arithmetic	0.031	0.098	0.012	0.202
75th Percentile	0.012	0.065	0.008	0.062
80th Percentile	0.017	0.078	0.009	0.103
90th Percentile	0.039	0.116	0.013	0.352
95th Percentile	0.069	0.244	0.037	0.500
99th Percentile	0.388	0.468	0.053	0.500
Maximum	0.434	0.468	0.053	0.500
Median	0.003	0.023	0.001	0.002
Minimum	0.000	0.000	0.000	0.000
Coefficient of Variation	3.260	1.763	2.097	2.176

Log Scale (Area 522 Only)

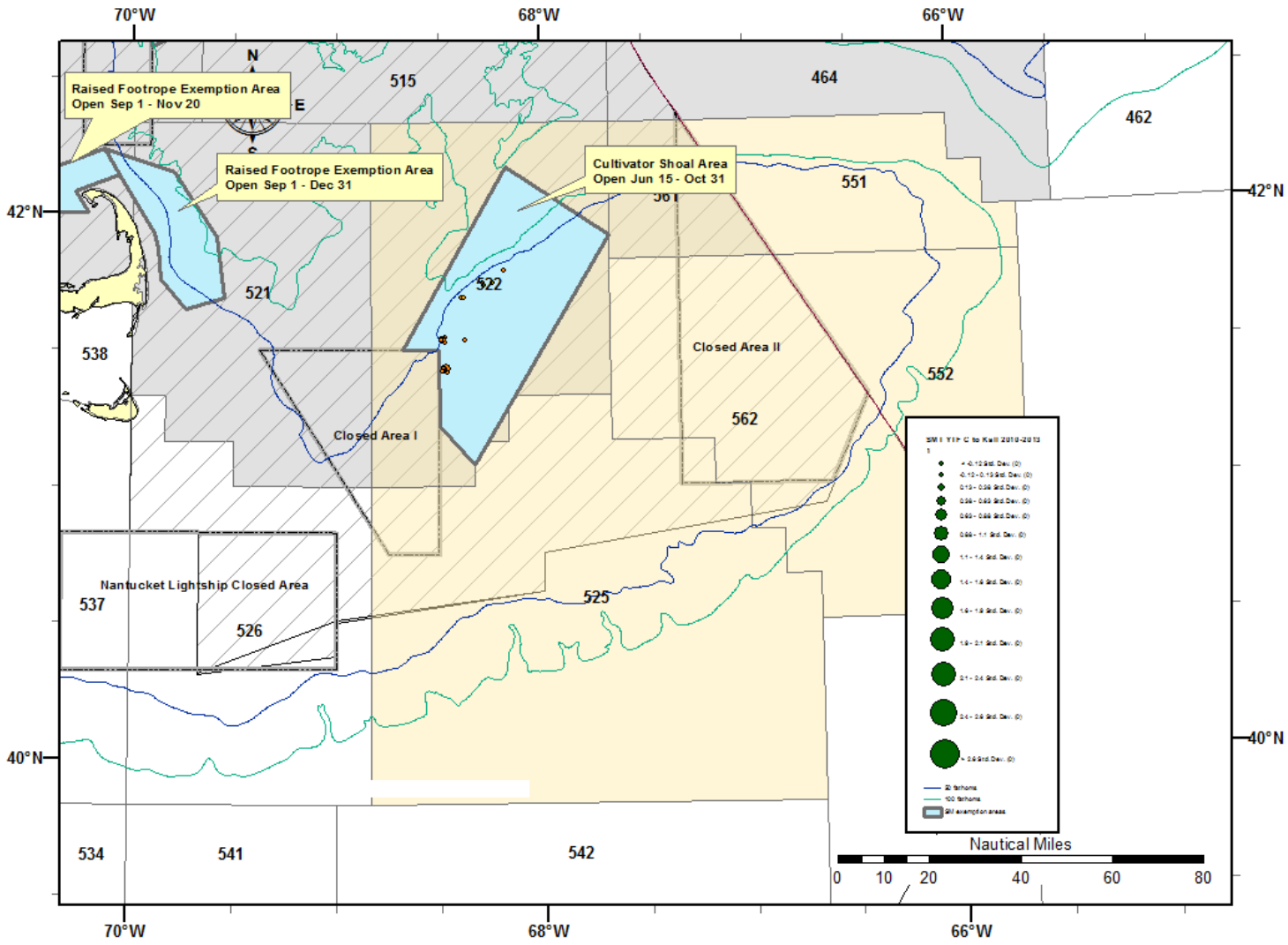


Normal Scale (Area 522 Only)



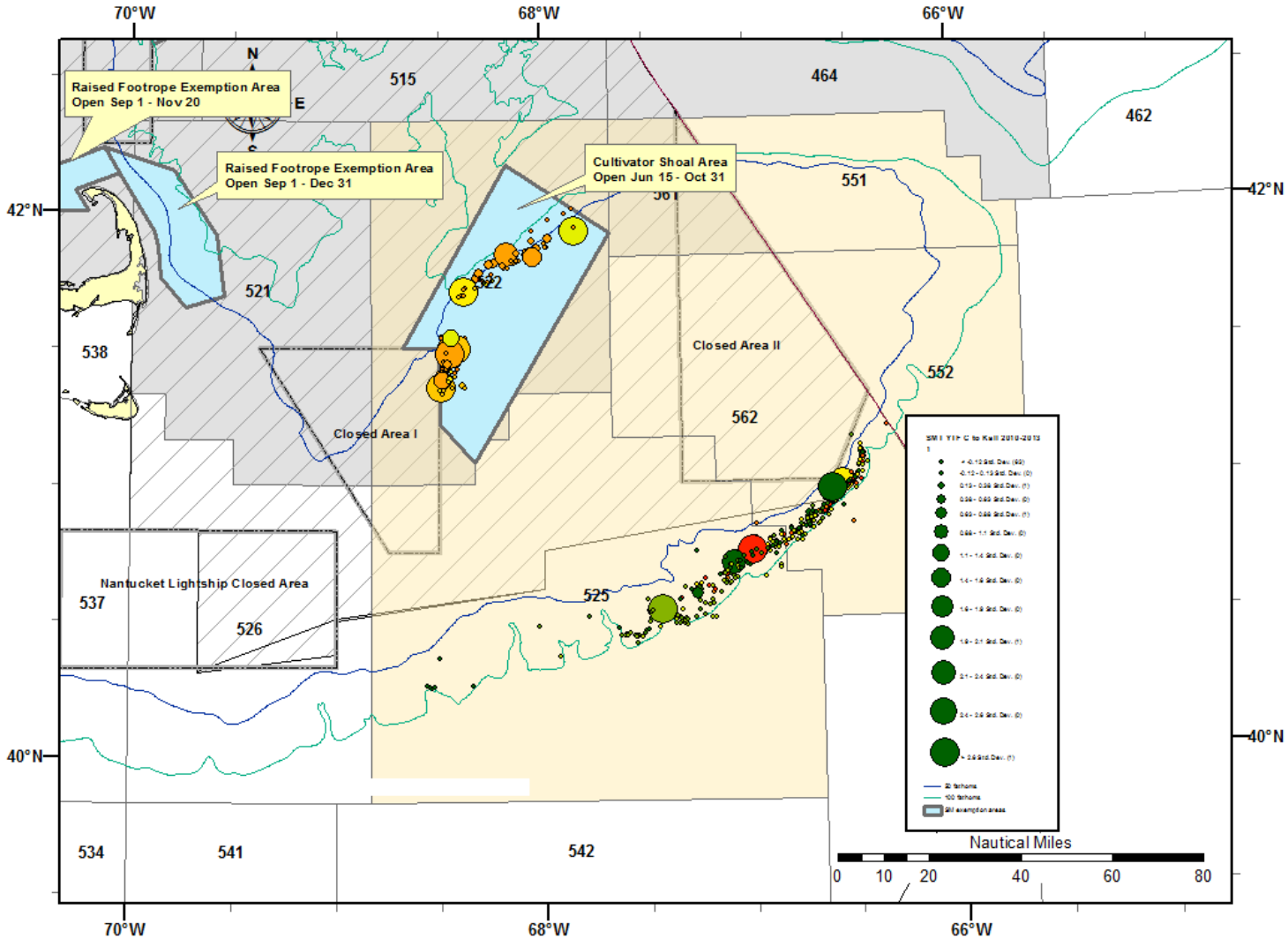
Item 6a:

Map 1. Distribution of observed tows for trips using a raised footrope trawl in 2009 and 2011.



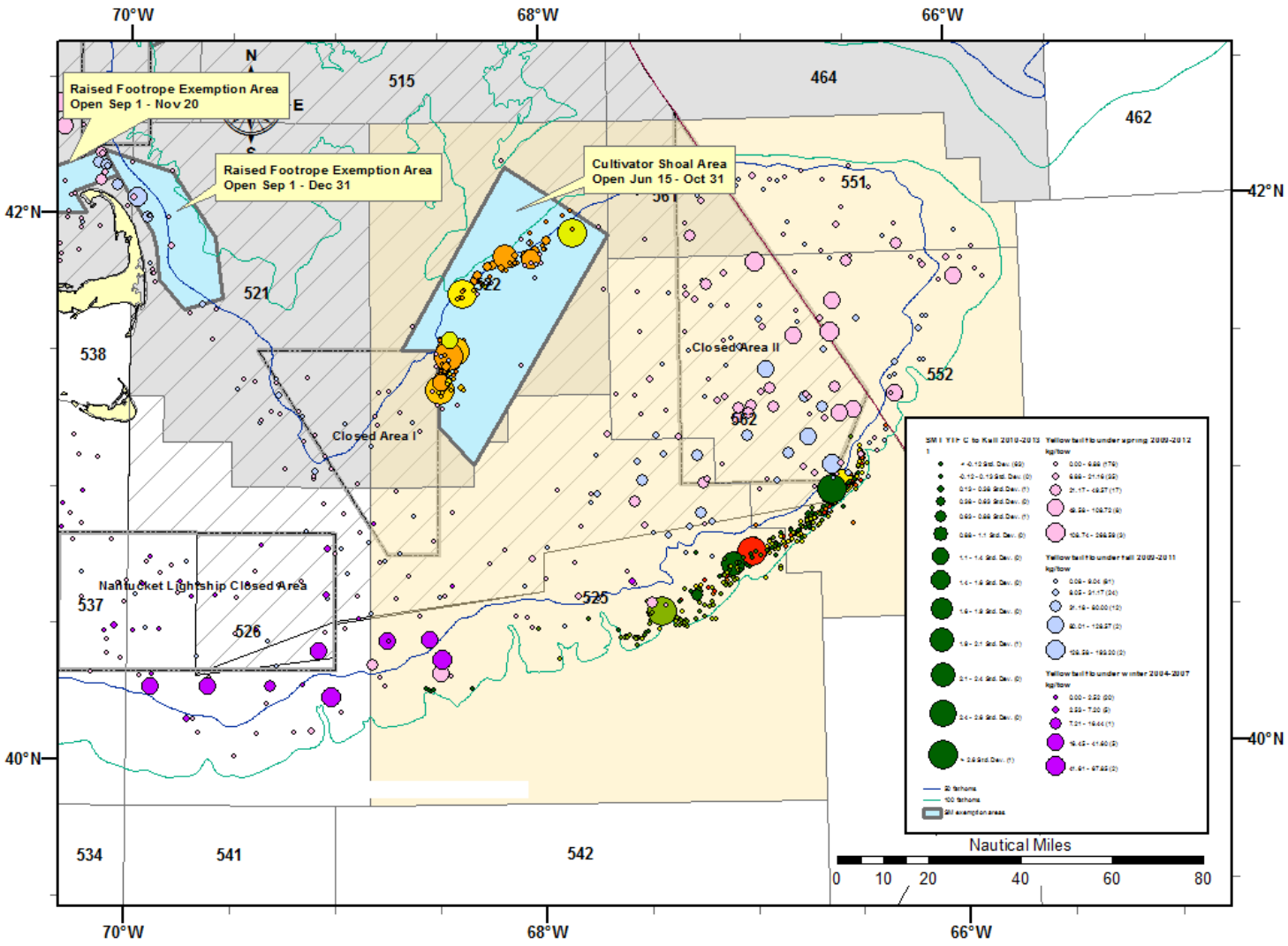
Item 6b:

Map 2. Distribution of yellowtail flounder catch per pound landed of all species. Size of circles represent the yellowtail flounder catch rate, while colors represent months (dark green = Jan; yellows = late spring and summer; oranges = fall; red = Dec).



Item 6c:

Map 3 Same as item 6b but with yellowtail flounder fl catch per tow in the spring, fall, and winter trawl surveys.



Item 7: Test of significant difference of yellowtail flounder catch rates between trawl types.

Note: In 2009, there were 39 total trips. 1 trip w/ 5 tows using the raised footrope trawl.
In 2011, there were 33 total trips. 2 trips w/ 18 tows using the raised footrope trawl.

Data for Year 2009 in Area 522

Results for YEAR_OBS = 2009

Data for the following results were selected according to
SELECT (SAREA = 522) AND (YEAR_OBS >= 2009)

H0: Mean1 = Mean2 vs. H1: Mean1 <> Mean2

Grouping Variable = NETCATEGORY$

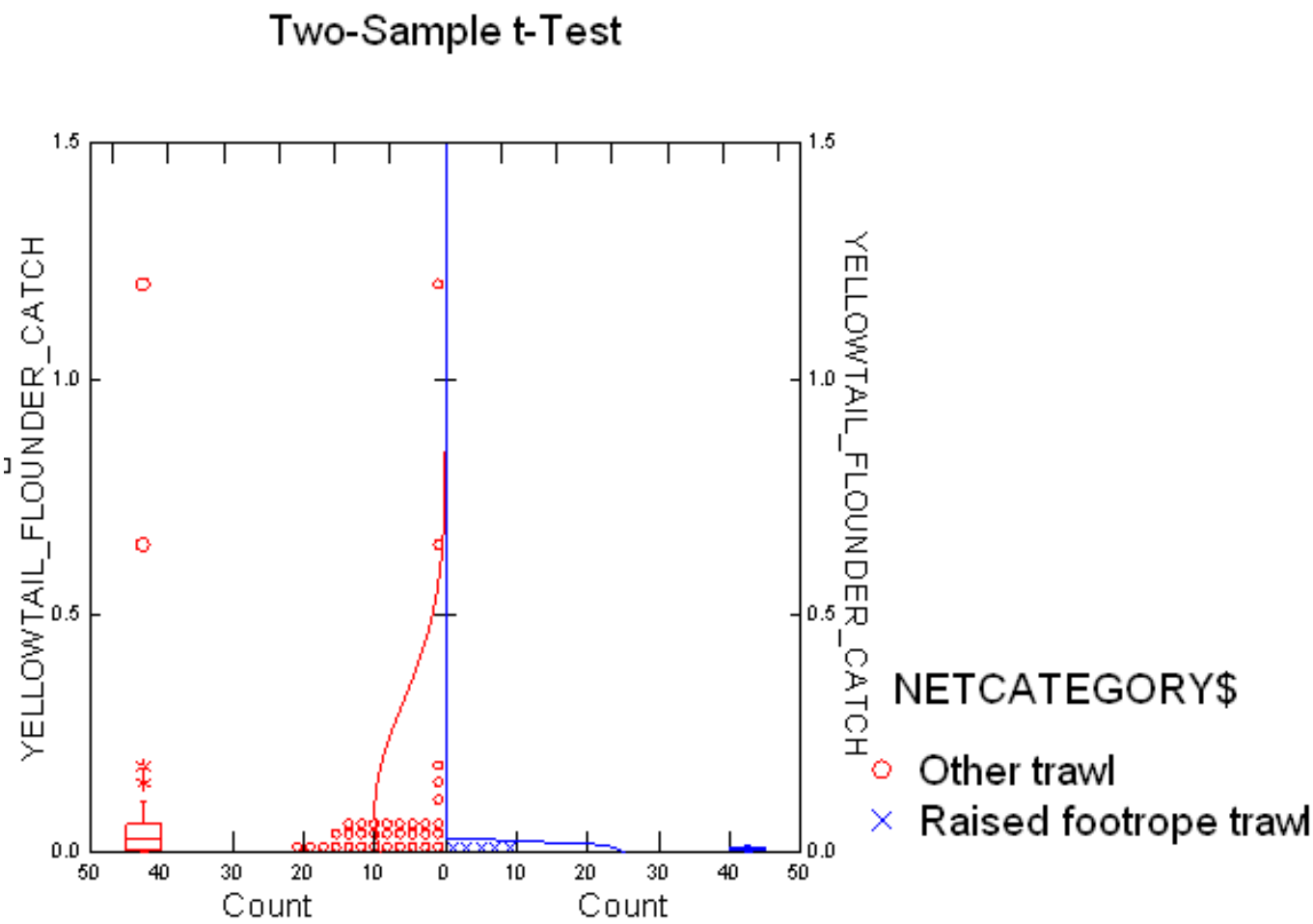
Variable	NETCATEGORY$	N	Mean	Standard Deviation
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	34.000	0.088	0.226
	Raised footrope trawl	5.000	0.007	0.006

Separate Variance

Variable	NETCATEGORY$	Mean Difference	95.00% Confidence Interval		t	df	p-Value
			Lower Limit	Upper Limit			
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	0.080	0.001	0.160	2.066	33.274	0.047
	Raised footrope trawl						

Pooled Variance

Variable	NETCATEGORY$	Mean Difference	95.00% Confidence Interval		t	df	p-Value
			Lower Limit	Upper Limit			
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	0.080	-0.127	0.288	0.785	37.000	0.437
	Raised footrope trawl						



Data for Year 2011 in Area 522

Results for YEAR_OBS = 2011

Data for the following results were selected according to
SELECT (SAREA = 522) AND (YEAR_OBS >= 2009)

H0: Mean1 = Mean2 vs. H1: Mean1 <> Mean2

Grouping Variable = NETCATEGORY$

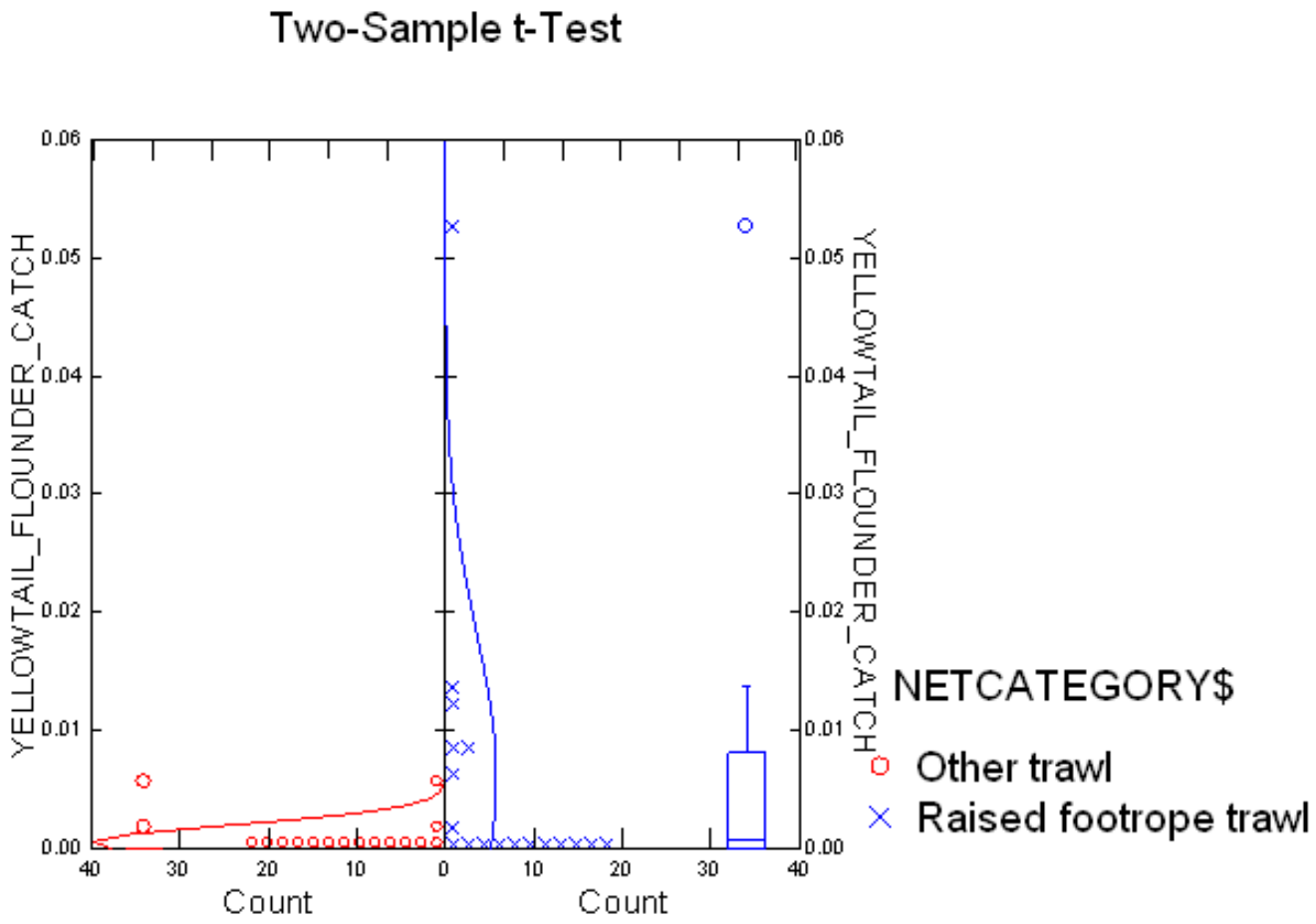
Variable	NETCATEGORY$	N	Mean	Standard Deviation
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	15.000	0.000	0.002
	Raised footrope trawl	18.000	0.006	0.013

Separate Variance

Variable	NETCATEGORY$	Mean Difference	95.00% Confidence Interval		t	df	p-Value
			Lower Limit	Upper Limit			
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	-0.005	-0.012	0.001	-1.838	17.588	0.083
	Raised footrope trawl						

Pooled Variance

Variable	NETCATEGORY$	Mean Difference	95.00% Confidence Interval		t	df	p-Value
			Lower Limit	Upper Limit			
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	-0.005	-0.012	0.001	-1.678	31.000	0.103
	Raised footrope trawl						



<u>Pooled data for Years 2009 and 2011 in Area 522</u>

Data for the following results were selected according to
SELECT (SAREA = 522) AND (YEAR_OBS >= 2009) AND (YEAR_OBS <> 2010) AND (YEAR_OBS <> 2012)

H0: Mean1 = Mean2 vs. H1: Mean1 <> Mean2

Grouping Variable = NETCATEGORY$

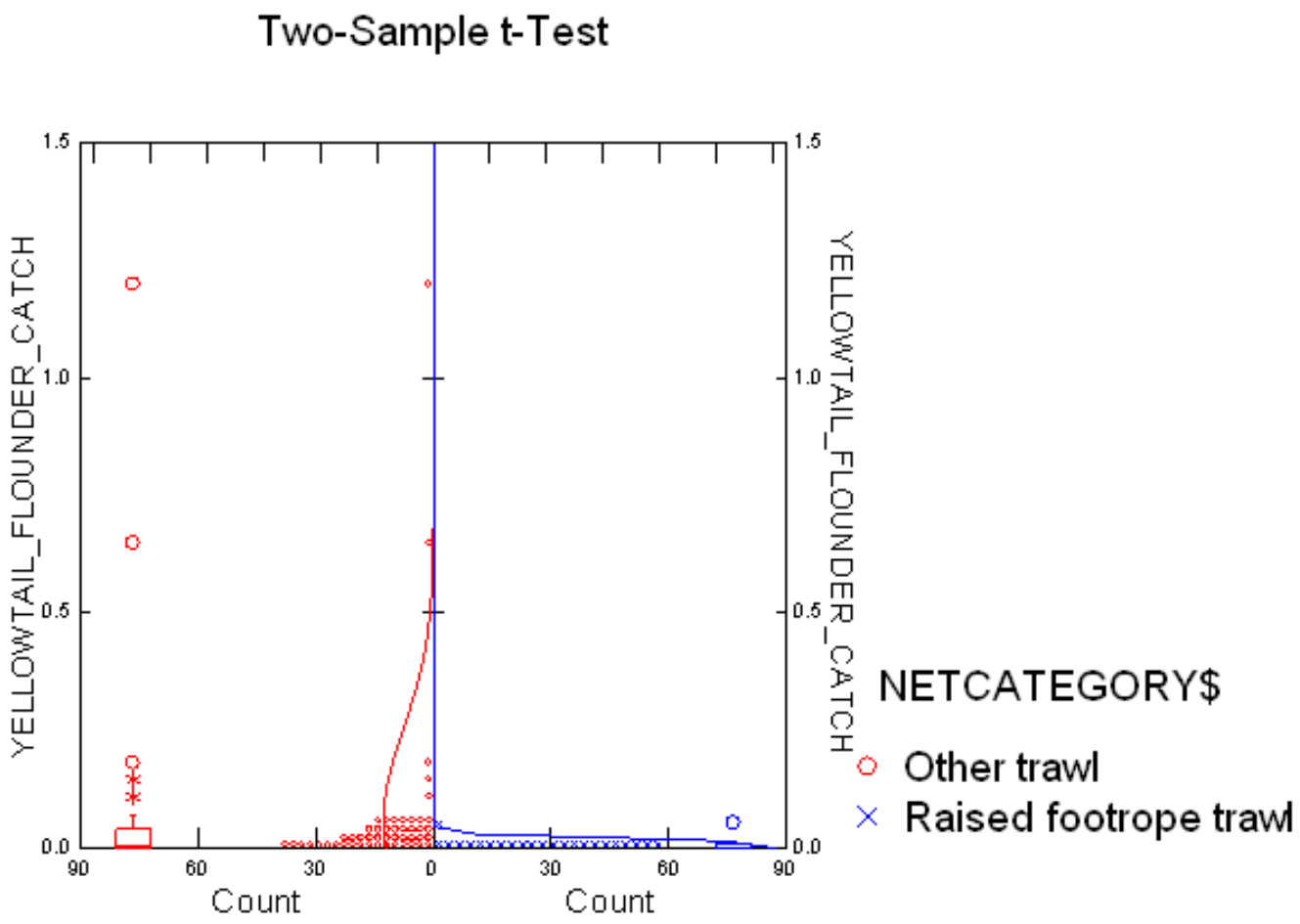
Variable	NETCATEGORY$	N	Mean	Standard Deviation
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	49.000	0.061	0.192
	Raised footrope trawl	23.000	0.006	0.011

Separate Variance

Variable	NETCATEGORY$	Mean Difference	95.00% Confidence Interval		t	df	p-Value
			Lower Limit	Upper Limit			
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	0.055	-0.001	0.110	1.988	48.701	0.052
	Raised footrope trawl						

Pooled Variance

Variable	NETCATEGORY$	Mean Difference	95.00% Confidence Interval		t	df	p-Value
			Lower Limit	Upper Limit			
YELLOWTAIL_FLOUNDER_CATCH	Other trawl	0.055	-0.025	0.135	1.361	70.000	0.178
	Raised footrope trawl						


Two-Sample t-Test
YELLOWTAIL_FLOUNDER_CATCH
YELLOWTAIL_FLOUNDER_CATCH
1.5
1.0
0.5
0.0
90
60
30
0
30
60
90
Count
Count
NETCATEGORY$
Other trawl
Raised footrope trawl

Item 8:

Quota monitoring reports

Longfin squid

Longfin Squid (formerly Loligo) Coastwide Weekly Landings Report	For week ending:	August 24, 2013
	For data reported through:	August 28, 2013
	Quota Period:	Trimester II
	Quota Period Dates:	05/01/13 to 08/31/13

	Commercial						**Research**
State	**Previously Reported Landings (Pounds)**	**Previous Weeks' Updates (Pounds)**	**Current Week's Landings (Pounds)**	**Cumulative Landings (Pounds)**	**Quota (Pounds)**	**Percent of Quota (%)**	**Annual Set-Aside Landings (Pounds)**
ME	897	0	0	897			0
NH	209	0	49	258			0
MA	101,909	15	983	102,907			0
RI	2,023,460	14,408	282,755	2,320,623			0
CT	125,881	0	17,909	143,790			0
NY	1,856,161	88,236	147,650	2,092,047			0
NJ	45,059	0	47,799	92,858			0
DE	0	0	0	0			0
MD	103	0	15	118			0
VA	38,851	1,700	0	40,551			0
NC	0	0	0	0			0
Other	0	0	0	0			0

	Commercial						Research
State	Previously Reported Landings (Pounds)	Previous Weeks' Updates (Pounds)	Current Week's Landings (Pounds)	Cumulative Landings (Pounds)	Quota (Pounds)	Percent of Quota (%)	Annual Set-Aside Landings (Pounds)
Total	*4,192,530*	*104,359*	*497,160*	*4,794,049*	*12,394,388*	*39*	*0*

Regulations

Notice

1. **The 2013 specifications for longfin squid are effective as of January 16, 2013.**

   In Trimester II, the directed longfin squid fishery is closed if:
   - Longfin squid landings are projected to reach 5,060 mt (11,154,950 lb) (from May 1 to August 15)
   -OR-
   - Longfin squid landings are projected to reach 5,341 mt (11,774,669 lb) (from August 15 to August 31)
   -OR-
   - The butterfish mortality cap reaches 2,913 mt (6,422,066 lb) (75% of the annual butterfish mortality cap allocation)

   The Trimester II closure threshold will change on August 15 of each year from 90 to 95% to avoid 1-2 week closures at the end of a Trimester.

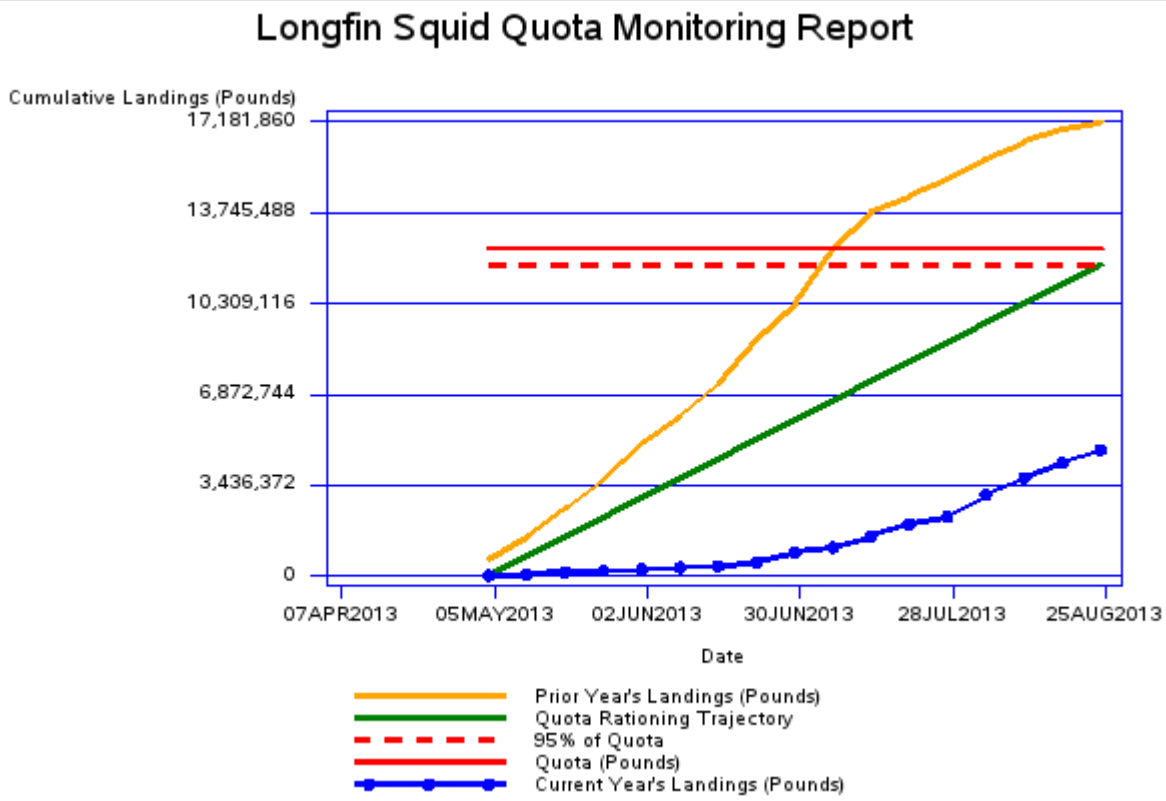
   NOTE:
   The longfin squid pre-trip observer notification requirement changed from 72 to 48 hours as of February 15, 2013.

   For information on the current status of the butterfish mortality cap quota Click Here.

Negative landings can be the result of updates to the database (e.g. reported Research Set-Aside landings are subtracted from the Commercial Current Week's Landings or Previous Weeks' Updates). As a result, the Commercial Current Week's Landings or Previous Weeks' Updates can be negative.

2. These data are the best available to NOAA Fisheries Serv when this report was compiled. Data are supplied to NOA Fisheries Service by dealers via Dealer Electronic Reporti the Standard Atlantic Fisheries Information System (SAF

and/or by state agencies and may be preliminary. Discrepancies with data from previous Weekly Landings Reports are due to corrections made to the database.



Commercial Summary Table (Sector and Common Pool) Catch Monitoring

Report run on:	August 29 2013
For data reported through:	August 28 2013
Quota Period:	2013
Quota Period Dates:	May 1, 2013 to April 30, 2014

Stock	Cumulative Kept (mt)	Cumulative Discard (mt)	Cumulative Catch (mt)	Sub-ACL* (mt)	Percent Caught
GB Cod East	7.8	6.8	14.6	92	15.9
GB Cod	340.2	21.0	361.2	1,807	20.0
GOM Cod	175.3	5.2	180.4	830	21.7
GB Haddock East	60.3	19.6	79.9	3,754	2.1
GB Haddock	415.8	77.9	493.7	26,196	1.9
GOM Haddock	55.0	5.3	60.3	187	32.2
GB Yellowtail Flounder	13.9	1.9	15.8	116	13.6
SNE/MA Yellowtail Flounder	37.8	1.0	38.7	570	6.8
CC/GOM Yellowtail Flounder	95.4	6.6	102.0	479	21.3
Plaice	395.0	36.8	431.8	1,420	30.4
Witch Flounder	191.4	7.8	199.2	610	32.7
GB Winter Flounder	1,072.1	3.2	1,075.3	3,528	30.5
GOM Winter Flounder	63.6	3.4	67.0	714	9.4
SNE Winter Flounder	289.3	6.9	296.2	1,210	24.5
Redfish	1,116.4	127.4	1,243.8	10,132	12.3
White Hake	718.3	13.6	731.9	3,849	19.0
Pollock	1,498.7	40.8	1,539.4	12,893	11.9
Northern Windowpane	0.0	173.1	173.1	98	176.7
Southern Windowpane	0.0	36.5	36.6	102	35.9
Ocean Pout	0.0	18.0	18.0	197	9.1
Halibut	6.0	13.6	19.6	52	37.7
Wolffish	0.0	10.9	10.9	62	17.7

* Does not include Sector Carryover

Effective July 3, 2013, NOAA Fisheries reinstated the Eastern U.S./Canada Area quota monitoring methodology where catch is attributed to area fished based on vessel monitoring system (VMS), vessel trip reports (VTRs), and interactive voice recording (IVR) information. This change was retroactively applied to all data since the May 1, 2013, start of the fishing year.

For additional information contact the Sustainable Fisheries Division at (978) 281-9315.

Notice

The 2013 Quota Period began on May 1, 2013, therefore this report does not contain any landings reported prior to May 1, 2013.

Management actions for the Common Pool Program, under the authority of the Regional Administrator (such as closures and possession limits) are based upon Vessel Monitoring System (VMS) reports and other available information.

Small-Mesh Multispecies Weekly Report

For week ending: August 24, 2013
For data reported through: August 28, 2013
Quota Period: 2013
Quota Period Dates: 05/01/13 to 04/30/14

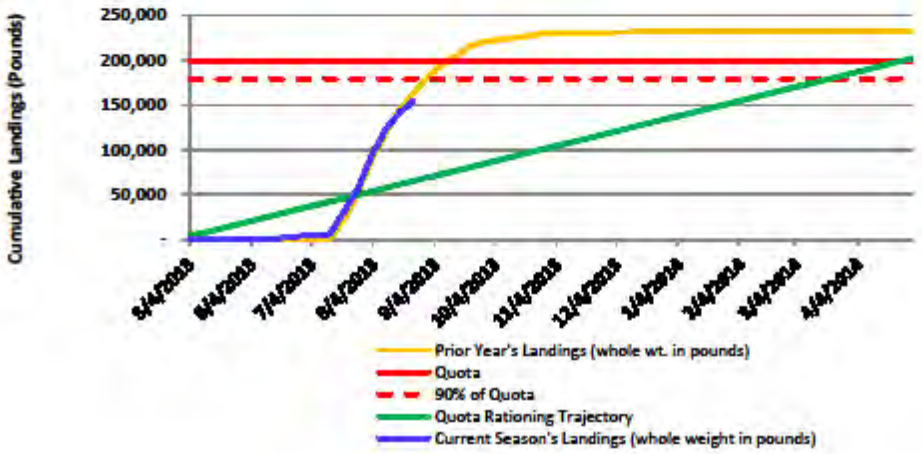
Stock	Year to Date Landings (Pounds)	Quota (Pounds)	Percent of Quota (%)
Northern Red Hake	*154,562*	*199,077*	*78*

Notice: If 90 percent of the total allowable landings are landed for a small-mesh multispecies stock, the possession limit for that stock will be reduced to the incidental possession limit for the remainder of the fishing year. The incidental possession limit for red hake is 400 lb and silver hake and offshore hake, combined, is 1,000 lb.

National Oceanic and Atmospheric Administration

These data are the best available to NOAA Fisheries Service when this report was compiled. Data are supplied to NOAA Fisheries Service by dealers via Dealer Electronic Reporting to the Standard Atlantic Fisheries Information System (SAFIS) and/or by state agencies and may be preliminary. Discrepancies with data from previous Weekly Landings Reports are due to corrections made to the database.

Northern Red Hake



Small-Mesh Multispecies Weekly Report

For week ending: August 24, 2013
For data reported through: August 28, 2013
Quota Period: 2013
Quota Period Dates: 05/01/13 to 04/30/14

Stock	Year to Date Landings (Pounds)	Quota (Pounds)	Percent of Quota (%)
Southern Red Hake	*390,726*	*2,945,376*	*13*

Notice: If 90 percent of the total allowable landings are landed for a small-mesh multispecies stock, the possession limit for that stock will be reduced to the incidental possession limit for the remainder of the fishing year. The incidental possession limit for red hake is 400 lb and silver hake and offshore hake, combined, is 1,000 lb.

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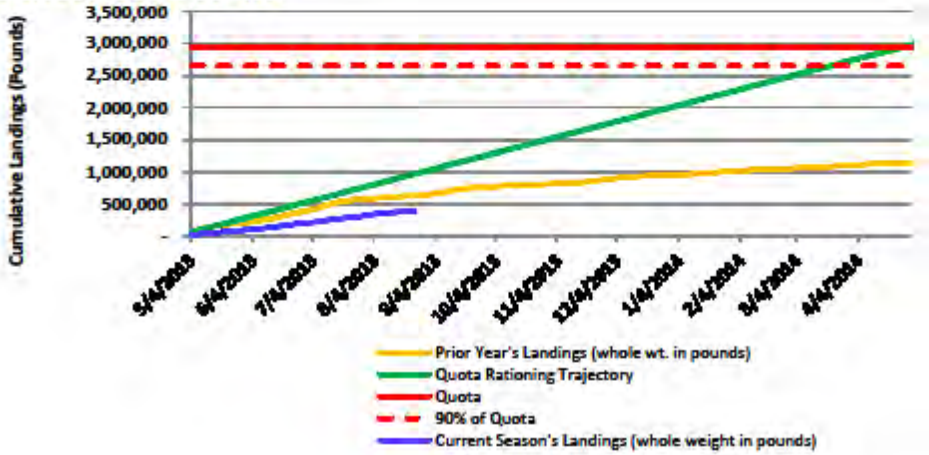
Southern Red Hake



Small-Mesh Multispecies Weekly Report

For week ending: August 24, 2013
For data reported through: August 28, 2013
Quota Period: 2013
Quota Period Dates: 05/01/13 to 04/30/14

Stock	Year to Date Landings (Pounds)	Quota (Pounds)	Percent of Quota (%)
Northern Silver Hake	*962,785*	*19,809,243*	*5*

Notice: If 90 percent of the total allowable landings are landed for a small-mesh multispecies stock, the possession limit for that stock will be reduced to the incidental possession limit for the remainder of the fishing year. The incidental possession limit for red hake is 400 lb and silver hake and offshore hake, combined, is 1,000 lb.

National Oceanic and Atmospheric Administration

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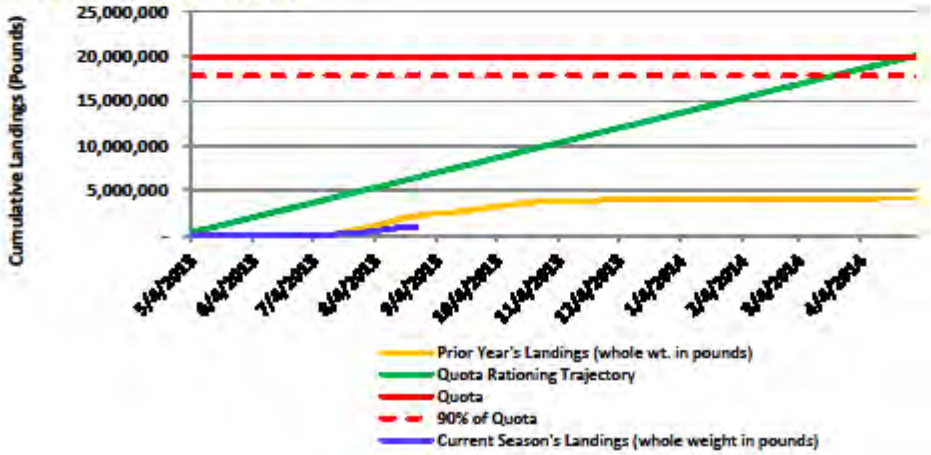
Northern Silver Hake



Small-Mesh Multispecies Weekly Report

For week ending: August 24, 2013
For data reported through: August 28, 2013
Quota Period: 2013
Quota Period Dates: 05/01/13 to 04/30/14

Stock	Year to Date Landings (Pounds)	Quota (Pounds)	Percent of Quota (%)
Southern Whiting	*3,718,700*	*60,086,990*	*6*

Notice: If 90 percent of the total allowable landings are landed for a small-mesh multispecies stock, the possession limit for that stock will be reduced to the incidental possession limit for the remainder of the fishing year. The incidental possession limit for red hake is 400 lb and silver hake and offshore hake, combined, is 1,000 lb.

National Oceanic and Atmospheric Administration

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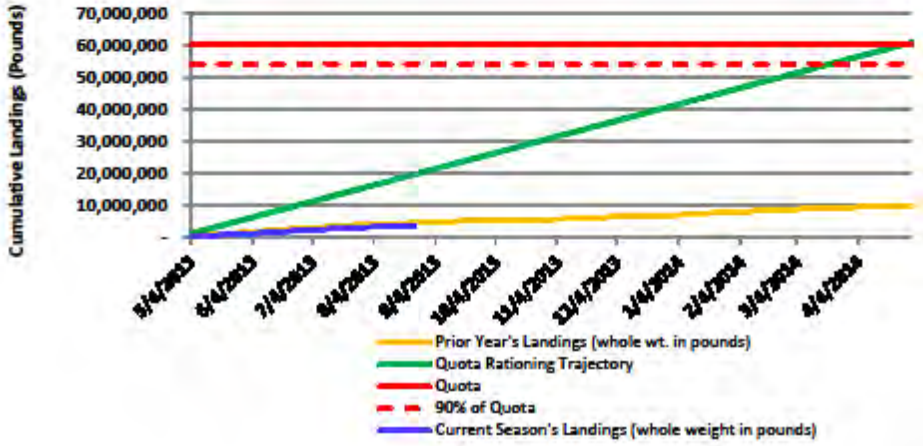
Southern Whiting