Appendix I

SSC's Recommendations on ABCs for the Northeast Multispecies Fishery

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New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

To: Paul J. Howard, Executive Director
From: Steve Cadrin, Chairman, Scientific and Statistical Committee
Date: September 20, 2010

Subject: **Acceptable Biological Catch Recommendations for Pollock, Georges Bank Yellowtail Flounder, Southern Windowpane Flounder, Northern Windowpane Flounder, Ocean Pout and Gulf of Maine Winter Flounder**

The Scientific and Statistical Committee (SSC) was asked to:

1) Consider the pollock assessment results of the 50th Stock Assessment Workshop (SAW50) and provide the Council FY 2011 – 2014 Acceptable Biological Catch (ABC) recommendations consistent with the interim control rules adopted in Amendment 16 and the following levels of risk:
    a. An ABC that has approximately a 40 percent probability of overfishing (i.e. less than a median risk of overfishing) in any single year for FY 2011 – FY 2014.
    b. An ABC that has approximately a 10 percent probability of overfishing in any single year for FY 2011 – FY 2014.
    c. Low risk that the stock will be overfished during FY 2011 – FY 2014.
2) Review Gulf of Maine winter flounder catches for 2009 and additional survey information collected since the 3rd Groundfish Assessment Review Meeting (GARM III) and evaluate whether this information affects the current ABC recommendation. If so, provide an updated ABC recommendation for fishing years 2011 – 2012.
3) Review the 2010 assessment of Georges Bank yellowtail flounder from the 2010 Transboundary Resources Assessment Committee (TRAC) and recommend ABCs for the fishing mortality that is consistent with the following rebuilding strategies under Council consideration:
    a. Rebuild by 2014 with a 75 percent probability of success (this is current approved rebuilding strategy and must be considered as the No Action alternative).
    b. Rebuild by 2016 with a 50 percent probability of success.
    c. Rebuild by 2016 with a 60 percent probability of success.
    d. Rebuild by 2016 with a 75 percent probability of success.
4) Review additional survey information, if available, and recommend revised 2011-2012 ABCs for ocean pout, as well as northern and southern windowpane flounder, as appropriate.

On August 25-26, 2010 the SSC reviewed the following information and associated presentations developed by the Groundfish Plan Development Team (PDT), SAW50, GARM III, and the 2010 TRAC for groundfish species:

1. Terms of Reference Memo to the SSC from Paul Howard.
2. Groundfish PDT memo dated August 6, 2010 (with attachments): Multispecies ABCs for 2011-2014
3. Northeast Fisheries Science Center. 2010. 50th Northeast Regional Stock Assessment Workshop (50th SAW): Assessment Summary Report. NEFSC Ref. Do. 10-09.
4. NEFSC 2010. 50th Northeast Regional Stock Assessment Workshop: (50th SAW) Assessment Report.

5. O'Boyle, Robert. 2010. SARC 50 Panel Summary Report.
6. Bell, Michael C. 2010. 50th Northeast Regional Stock Assessment Workshop (50th SAW): reviewer comments.
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9. Wheeler, John P. 50th Northeast Regional Stock Assessment Workshop (50th SAW): reviewer comments.
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11. Transboundary Resource Assessment Committee. 2010. Georges Bank Yellowtail Flounder: TRAC Status Report 2010/03.
12. Assessment of GB Yellowtail Flounder for 2010. TRAC Ref. Doc. XX-XX. When published, will be available at: http://www2.mar.dfo-mpo.gc.ca/science/TRAC/rd.html
13. Northeast Fisheries Science Center. 2008. Report of the 3d Groundfish Assessment Review Meeting (GARM III): O.: Ocean Pout. NEFSC Ref. Doc. 08-16.
14. Northeast Fisheries Science Center. 2008. Report of the 3d Groundfish Assessment Review Meeting (GARM III): P.: Gulf of Maine/Georges Bank Windowpane Flounder. NEFSC Ref. Doc. 08-16.
15. Northeast Fisheries Science Center. 2008. Report of the 3d Groundfish Assessment Review Meeting (GARM III): Q.: Southern New England/Mid-Atlantic Bight Windowpane Flounder. Gulf of Maine Winter Flounder. NEFSC Ref. Doc. 08-16.
16. Groundfish PDT memo dated July 13, 2009: Groundfish ABCs/OFLs
17. Groundfish PDT memo dated August 7, 2009: Groundfish ABCs/OFLs

<u>Pollock</u>
A new benchmark stock assessment was developed for pollock by SAW50. Pollock was previously assessed using a survey index method by GARM III in 2008 and was determined to be overfished and subject to overfishing. In 2009, the SSC established the ABC for fishing years 2010–2012 by applying 75%F_{MSY} to the most recent 3-year average survey estimate of exploitable stock biomass. The SAW50 assessment is based on an age-structured model, and stock status was revised to not overfished and overfishing not occurring.

The SSC endorses the SAW50 Review Panel's recommendation to accept the revised assessment of pollock as a basis for revising ABC recommendations. However, there were considerable uncertainties in the assessment, an important one being the apparent partial selection of larger and older pollock by the fisheries and surveys (termed 'dome-shaped selectivity'). A domed-shaped selectivity implies that there are fish in the population that are not available to either the fishery or the survey. This could be due to larger Pollock out swimming the survey and fishing gears or to them being in untrawlable or untrawled areas. As a result of the domed - shaped selectivity, only 39% of total stock biomass in 2009 is exploitable, and 61% of total stock biomass is not vulnerable to the fishery. A sensitivity analysis that assumed complete survey retention of large, old pollock (termed 'flat-topped selectivity') resulted in lower biomass estimates and suggests that uncertainty associated with selectivity is greater than statistical estimates of imprecision. However the sensitivity analysis also indicated that the stock is not overfished.

Although sensitivity analyses provide a crude evaluation of uncertainty, they cannot be used to quantify probability of overfishing, as requested in the terms of reference. In June 2009, the SSC concluded that "*in the absence of better information on what an appropriate buffer should be between the OFL and the ABC, a relatively simple ABC and robust specification could be applied to all groundfish stocks, in all stages of rebuilding or long-term maintenance of optimum yield… ABC should be determined as the catch associated with 75% of F_{MSY}.*" The SSC noted that despite the major changes in stock assessment methods and the change in perception of stock status, the revised estimate of maximum sustainable yield (MSY) is similar to previous estimates.

Using projections from the SAW50 assessment at 75%F_{MSY}, the ABC recommendations are 16,900 mt in 2011; 15,400 mt in 2012 mt; 15,600 mt in 2013; and 16,000 mt in 2014. Scenario analyses indicate that ABCs based on 75%F_{MSY} have low risk of overfishing and low risk of leading to an overfished stock by 2015 if the domed survey selectivity estimated by the SAW50 assessment is true. However, if selectivity is actually flat-topped, ABCs based on the SAW50 assessment and 75%F_{MSY} have high risk of overfishing (risk>50%) and a moderate risk of leading to an overfished stock by 2015 (risk between 25% and 50%).

1. **The SSC recommends that Acceptable Biological Catch of pollock is 16,900 mt in 2011; 15,400 mt in 2012 mt; 15,600 mt in 2013; and 16,000 mt in 2014.**

<u>Gulf of Maine Winter Flounder</u>
In 2008, GARM III attempted to assess Gulf of Maine winter flounder but none of the alternative assessment models was accepted by the review panel. Panelists concluded that "*…it is highly likely that biomass is below B_{MSY}, and that there is a substantial probability that it is below ½ B_{MSY}.*" In 2009, the SSC recommended ABC based on 75% of the most recent three-year average catch (238 mt). In June 2010, the Council approved a motion to ask the SSC to examine any recent fisheries independent and fisheries dependent data collected since GARM III for Gulf of Maine winter flounder and to evaluate whether this new information would affect their current ABC recommendation for Gulf of Maine winter flounder.

Conflicting signals persist in the updated information provided by the PDT which continue to confound attempts to assess the Gulf of Maine winter flounder stock. The PDT developed an alternative approach to deriving ABC that is consistent with the ABC control rule for groundfish and which is based on survey data that have been used to assess Gulf of Maine winter flounder. Area-swept survey estimates of exploitable biomass suggest that the current ABC (238 mt) represents a more conservative exploitation rate than 75%F_{MSY}. The SSC concluded that an area-swept survey approach to deriving ABC may provide a better scientific basis for ABC than the current approach, which is based on recent average catch, and is appropriate for the uncertainties in the data and the possibility that the stock is overfished.

The SSC requested an evaluation by the PDT of candidate ABCs for 2011 based on area-swept survey biomass estimates, including a 75%F_{MSY} option and further exploration of survey data properties (e.g., confidence intervals, geographic distributions, inter-annual variability, trawl mensuration) to be considered by the SSC in November 2010. A benchmark assessment is scheduled for spring 2011, so any revision for ABC would be an interim until a peer-review assessment is developed.

2. **The SSC recommends that a revised interim Acceptable Biological Catch of Gulf of Maine winter flounder in 2011 that is based on area-swept survey biomass be considered.**

Georges Bank Yellowtail Flounder

Georges Bank yellowtail flounder was assessed by the TRAC in July 2010. Based on the new assessment and the rebuilding alternatives under consideration by the Council, the SSC was asked to review the ABC for this stock and recommend new ABCs consistent with the assessment and the fishing mortality that is consistent with the rebuilding strategies under consideration.

The 2010 TRAC assessment has a retrospective inconsistency in which recent estimates of stock size were revised downward approximately 40% when the analysis was updated with new data. Despite considerable uncertainties in the assessment and the systematic overestimation of stock size, the SSC endorses the 2010 TRAC estimates as the basis for ABC recommendations. The accepted assessment method for Georges Bank yellowtail flounder does not adjust for retrospective inconsistency. Using the 2010 TRAC assessment and projection methods, the stock cannot rebuild to B_{MSY} by 2014 with a 75% probability of success, even if ABC=0. An ABC of 1,998 would allow rebuilding to B_{MSY} by 2016 with 50% probability. Probability of successful rebuilding by 2016 is expected to increase to 60% if ABC is 1,486 mt and to 75% if ABC is 590 mt.

The inconsistency in estimates of recent stock size primarily results from over-estimating the abundance of the 2005 yearclass. The catches associated with rebuilding options have low probability of overfishing, even if recent overestimation of abundance continues. However, the expected rebuilding under these catch options may not be realized if overestimation continues. Similarly, if future recruitment is less than that assumed in the projections, then the expected rebuilding will not be realized. Estimates of recruitment for the last 30 years have been less than the median recruitment assumed in projections and the B_{MSY} estimate. Although there are uncertainties in the stock assessment and stock projections, the SSC concludes that these are insufficient to modify catch advice based on rebuilding scenarios. Although recent retrospective inconsistency is substantial, it may not continue if it was indeed associated with the 2005 year class. Concerns about recent recruitment affect both the short-term projections and the rebuilding target (B_{MSY}), so alternative assumptions of future recruitment would require re-estimation of B_{MSY}. Therefore the SSC recommends consideration of a revised estimate of B_{MSY} at the next benchmark assessment that accounts for lower recruitment in the last 30 years.

The Transboundary Management Guidance Committee (TMGC) concluded that the most appropriate Total Allowable Catch for the combined Canadian and USA fishery for Georges Bank yellowtail for the 2011 fishing year is 1,900 mt. This catch is expected to allow rebuilding in the short-term (10% increase in 2011), and result in a low risk of overfishing, even if the retrospective inconsistency persists.

3. **The SSC recommends that Acceptable Biological Catch for Georges Bank yellowtail in 2011 depends on the Council's desired rebuilding objectives:**
    a. **The current rebuilding strategy (rebuild by 2014 with a 75% probability of) requires that ABC=0 mt;**
    b. **rebuilding by 2016 with a 50% probability of success requires that ABC=1,998 mt;**
    c. **rebuilding by 2016 with a 60% probability of success requires that ABC=1,486 mt; and**
    d. **rebuilding by 2016 with a 75% probability of success requires that ABC=590mt.**
    e. **The rebuilding target, B_{MSY}, should be reconsidered by the next benchmark assessment to account for lower recruitment in the last 30 years.**

Index-Based Stocks

Ocean pout and the two windowpane flounder stocks are assessed using a trawl survey index. In 2009, the SSC recommended ABCs for 2010 to 2012 fishing years based on 75% of the F_{MSY} proxy applied to the most recent three-year average estimate of stock size and agreed to review these ABCs as new survey information became available. Updated surveys indicate approximately a 5% reduction in ocean pout and greater reductions for windowpane stocks. However, updated survey data are from the new Bigelow survey system, and conversions between the Albatross survey and the Bigelow survey are considered to be preliminary. More extensive evaluation of other flatfish species (e.g., Georges Bank yellowtail flounder) indicate that survey conversion factors should vary by fish length. Therefore the SSC does not recommend revising ABCs for index-based groundfish stocks.

4. The SSC recommendations that Acceptable Biological Catch for index-based groundfish stocks should not be revised.

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6) Review Gulf of Maine winter flounder catches for 2009 and additional survey information collected since the 3rd Groundfish Assessment Review Meeting (GARM III) and evaluate whether this information affects the current ABC recommendation. If so, provide an updated ABC recommendation for fishing years 2011 – 2012.
7) Review the 2010 assessment of Georges Bank yellowtail flounder from the 2010 Transboundary Resources Assessment Committee (TRAC) and recommend ABCs for the fishing mortality that is consistent with the following rebuilding strategies under Council consideration:
    a. Rebuild by 2014 with a 75 percent probability of success (this is current approved rebuilding strategy and must be considered as the No Action alternative).
    b. Rebuild by 2016 with a 50 percent probability of success.

c. Rebuild by 2016 with a 60 percent probability of success.
d. Rebuild by 2016 with a 75 percent probability of success.

8) Review additional survey information, if available, and recommend revised 2011-2012 ABCs for ocean pout, as well as northern and southern windowpane flounder, as appropriate.

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The inconsistency in estimates of recent stock size primarily results from over-estimating the abundance of the 2005 yearclass. The catches associated with rebuilding options have low probability of overfishing, even if recent overestimation of abundance continues. However, the expected rebuilding under these catch options may not be realized if overestimation continues. Similarly, if future recruitment is less than that assumed in the projections, then the expected rebuilding will not be realized. Estimates of recruitment for the last 30 years have been less than the median recruitment assumed in projections and the B_{MSY} estimate. Although there are uncertainties in the stock assessment and stock projections, the SSC concludes that these are insufficient to modify catch advice based on rebuilding scenarios. Although recent retrospective inconsistency is substantial, it may not continue if it was indeed associated with the 2005 year class. Concerns about recent recruitment affect both the short-term projections and the rebuilding target (B_{MSY}), so alternative assumptions of future recruitment would require re-estimation of B_{MSY}. Therefore the SSC recommends consideration of a revised estimate of B_{MSY} at the next benchmark assessment that accounts for lower recruitment in the last 30 years.

The Transboundary Management Guidance Committee (TMGC) concluded that the most appropriate Total Allowable Catch for the combined Canadian and USA fishery for Georges Bank yellowtail for the 2011 fishing year is 1,900 mt. This catch is expected to allow rebuilding in the short-term (10%

increase in 2011), and result in a low risk of overfishing, even if the retrospective inconsistency persists.

7. **The SSC recommends that Acceptable Biological Catch for Georges Bank yellowtail in 2011 depends on the Council's desired rebuilding objectives:**
    a. **The current rebuilding strategy (rebuild by 2014 with a 75% probability of) requires that ABC=0 mt;**
    b. **rebuilding by 2016 with a 50% probability of success requires that ABC=1,998 mt;**
    c. **rebuilding by 2016 with a 60% probability of success requires that ABC=1,486 mt; and**
    d. **rebuilding by 2016 with a 75% probability of success requires that ABC=590mt.**
    e. **The rebuilding target, B_{MSY}, should be reconsidered by the next benchmark assessment to account for lower recruitment in the last 30 years.**

Index-Based Stocks

Ocean pout and the two windowpane flounder stocks are assessed using a trawl survey index. In 2009, the SSC recommended ABCs for 2010 to 2012 fishing years based on 75% of the F_{MSY} proxy applied to the most recent three-year average estimate of stock size and agreed to review these ABCs as new survey information became available. Updated surveys indicate approximately a 5% reduction in ocean pout and greater reductions for windowpane stocks. However, updated survey data are from the new Bigelow survey system, and conversions between the Albatross survey and the Bigelow survey are considered to be preliminary. More extensive evaluation of other flatfish species (e.g., Georges Bank yellowtail flounder) indicate that survey conversion factors should vary by fish length. Therefore the SSC does not recommend revising ABCs for index-based groundfish stocks.

8. **The SSC recommendations that Acceptable Biological Catch for index-based groundfish stocks should not be revised.**

Appendix II

Groundfish Plan Development Team (PDT)

Development of Annual Catch Limits (ACLs)

for

2011 to 2014

I. Document Purpose:

Pursuant to Amendment 16, this PDT document describes pertinent information regarding the development of ACLs for the 2010 to 2012 specification period.

II. Background:

The ACLs were developed based upon the Science and Statistical Committee's (SSC) recommended Acceptable Biological Catch (ABC) for 2010 to 2012, and in accordance with the draft Amendment 16 "Administrative Process for Setting Multispecies ACLs". The focus of this discussion is the consideration of management uncertainty, but is built upon the recommendations of the SSC and the previous work of the PDT (August 7, 2009 Memorandum from PDT to SSC; July 13, 2009 Memorandum from PDT to SSC).

III. Abstract:

From the single recommended ABC values for each stock, ACLs were calculated in a two step process: (1) The division of the ABC into fishery components, and (2) downward adjustment of components to account for management uncertainty. The division of the ABC into subcomponents is based upon Amendment 16 allocation decisions, and percentages assigned by the PDT that reflect anticipated groundfish and non-groundfish fisheries (in order to categorize and account for all sources of fishing mortality). A working concept of management uncertainty was created to facilitate discussions, and qualitative elements with which to evaluate management uncertainty defined. A common default percentage reduction of the ABC subcomponent was set (5 %) to account for management uncertainty, and then particular stocks or stock/subcomponent combinations were identified that should have a higher or lower percentage reduction (based upon the defined elements of management uncertainty).

IV. Details:

Subdivision of ABC into subcomponents.

Amendment 16 contains the percentage splits of the ABC among fishery subcomponents (i.e. commercial and recreational), which are not intended to be subject to modification by the PDT. Other subdivisions of the ABC are recommendations of the PDT, made in conjunction with the development of ACLs, based upon pertinent fishery information and, in consultation with pertinent Council committees. For example, there may be calculations for Canada catch, state "off-the-top" subtraction, non-specified fisheries, herring fishery, scallop fishery, groundfish common pool, groundfish private recreational, groundfish charter/party, and U.S./Canada. Further information on the proposed subcomponents are in the September 14, 2009 memorandum from the PDT to the Groundfish Committee.

Create a simplified working concept of management uncertainty and identify qualitative elements of management uncertainty.

Management uncertainty is the likelihood that management measures will result in a level of catch ≥ catch objective. The *effectiveness* of management measures is a useful term that is related to management uncertainty (lower effectiveness of management measures results in greater management uncertainty, i.e., greater likelihood that measures will result in a catch that exceeds the catch level objective). The national standard guidelines state that two sources of management uncertainty should be accounted for: (1) Uncertainty in the ability of managers to constrain catch so the ACL is not exceeded; and (2) uncertainty in quantifying the true catch amounts (i.e., estimation errors). The purpose of setting an ACL(s) is to prevent catch from exceeding the ABC.

> The principal elements relating to management uncertainty that may be considered are the following:
>
> **Enforceability** - Can the management measures be effectively enforced at sea or on land through the use of uniform and unambiguous criteria that can be easily complied with by fishery participants?
> **Monitoring Adequacy -** Timeliness **–** Are all relevant data collected, recorded, and made available shortly after completion of fishing operations? Completeness **–** Is all information related to all aspects of fishing operations and relevant to management of the fishery (e.g., kept catch, discards, landings, species composition, amount/type/size of gear used, area fished, effort expended, etc.) collected and recorded? Accuracy **–** Does the information collected correctly reflect fishing operations (e.g., area fished, species and amounts kept/discarded, days-at-sea fished, etc.) or is verifiable and/or automated in order to minimize the possibility of data entry errors?]
> **Precision** - Can the management tools be used in a manner that will result in the desired amount of catch, or is there an inherent weakness or imprecision to the tool (complexity of FMP, no mechanism to slow or stop fishing effort, etc). Are there other factors that are pertinent to determining the effectiveness of management measures?
> **Latent Effort –** Is there excessive latent fishing effort in the FMP that could be reactivated and undermine effectiveness of FMP, or is the latent effort eliminated or controlled (e.g., Category C DAS)?
> **Other Fishery Catch –** Can the FMP regulate or limit catch of groundfish by other fisheries, including state, exempted, and recreational fisheries? Is the level of such catch highly variable, stable, or of a deminimus nature?

Set a default percentage reduction of the ABC to account for management uncertainty for most stocks, and identify relative uncertainty among stocks and stock/fishery components.

The PDT discussion focused on two aspects of accounting for management uncertainty: (1) Distinguishing relative amounts of management uncertainty between stocks, and stock/fishery component combinations, and (2) Determining the appropriate percentage adjustment of the ABC.

<u>Distinguishing relative amounts of management uncertainty between stocks and stock/fishery component combinations</u>:
This evaluation includes determining whether particular stock and fishery segment combination are associated with greater or lesser management uncertainty than others (e.g., sector GOM cod versus common pool GOM cod, versus private recreational vs party/charter). Most stocks and segments of the fishery will be categorized identically with respect to management uncertainty due to the common management measures applied to many stocks and/or a current lack of information to assign management uncertainty with more precision, and be assigned a standard percentage reduction from the ABC. If a particular stock or fishery segment may be subject to notable uncertainty, then an alternate adjustment from the ABC would apply to account for notable uncertainty (relatively high or low management uncertainty).

For this initial development of ACLs, for most stocks and stock/fishery component combinations it is difficult to predict whether there will be meaningful differences in management uncertainty among such components. Management measures for vessels fishing in either the common pool or sectors will be substantially different from the status quo management measures. Furthermore, the number of permits that will actually participate in sectors, and the number that will remain in the common pool, will not be known until just prior to the start of the fishing year. Amendment 16 analysis indicates that for most stocks, measures will achieve the desired fishing mortality goals. Due to the substantive changes in management measures in the future, analysis of historic performance of fishery management measures is of limited use for predicting future management uncertainty at this time.

In most cases there is no strong evidence that justifies a conclusion that different stocks or stock/fishery components have different management uncertainty. For example, evaluating whether the management uncertainty associated with the common pool versus sectors: Although there is the hypothesis that the sector management regime of Amendment 16 will result in the more effect control of catch (as well as more efficient fishing operations, approaching optimal yield, etc), that system will be new, and the level of management uncertainty associated with that system may not be substantively different from the common pool. The success of sectors will depend upon many novel fishing behaviors, organizations, monitoring systems etc. Not-withstanding the limitation of current data, the PDT did evaluate past catch information in order to glean insights into the fishery as a whole.

Comparisons were made between recent catches and target TACs (TTACs), using a calendar year basis since that is how mortality is calculated: since Amendment 13, 87 TTACs have been specified and 9 have been exceeded. Since the amendment was in effect for a full calendar year (e.g. since 2005), the SNE/MA yellowtail flounder TTAC was exceeded three times (2006, 2007, 2008), white hake was exceeded in 2008, and GB yellowtail flounder was exceeded in 2007. While these comparisons suggest the management system generally controlled catches, fishing mortality still exceeded targets, and measures were designed to achieve mortality targets, not to attain a particular catch. In addition to past management uncertainty (due to various elements of the FMP), scientific uncertainty also was relevant to historic catch levels. It is impossible to parse out the relative roles of scientific and management uncertainty in evaluating past catch levels. For that reason, comparisons of historic catch to TTAC are not particularly useful in providing guidance on estimating management uncertainty.

After various fishery-dependant data from the 2010 fishing year has been compiled and analyzed, it is more likely that evidence of differences in the elements of management uncertainty among components of the fishery could be used to further distinguish management uncertainty. It is anticipated that future ACL specification cycles may be able to better distinguish management certainty among stocks or stock/fishery components. Although it is conceivable that adjustments to ACLs prior to the next specification cycle may be desired, it may be difficult to make such adjustments due to the time required to analyze data and implement modified ACLs.

Determining the appropriate percentage adjustment of the ABC:
The amount of adjustment of the ABC was the second topic. One theoretical method discussed was to base the amount of adjustment down from ABC based upon the consequences of exceeding the ABC. Based upon a particular amount of catch in excess of the ABC, and the resultant impact on future catch levels, the ACL could be determined. This method was not pursued because it would have been based upon an assumed amount of overage for each stock. For the reasons discussed above, it is very difficult to determine the appropriate assumptions. A similar rationale for GB haddock was discussed that would have set management uncertainty to close to zero, based on the fact that it is highly unlikely that catch will approach ABC, given the stock size and multiple aspects of the FMP and fishery that will constrain haddock catch. It was concluded however that this approach, based on stock status and the nature of the fishery, was more of a risk assessment evaluation that would be difficult to apply across all stocks.

A third approach discussed briefly by the PDT was the use of a discard rate or observer coverage rate as a numerical basis upon which to derive management uncertainty, particular for sectors. This approach is rooted in the assumption that management uncertainty for sectors (fishing under hard TACs) will be closely related to the ability of managers to accurately monitor the fishery catch. Specifically, accurate monitoring will relate to both the amount of illegal and/or under-reported discards, and the level of observers or at-sea monitors in the fishery. This method, although logical, would rely heavily upon untested assumptions.

The PDT recommendation of a five percent adjustment for management uncertainty as a default was based upon several factors. The adjustment should be meaningful, and serve the function of a buffer, so that if the management measures and monitoring of the catch result in excessive catch, the catch will not exceed the ABC. Arguably, an adjustment in the ABC of only one or two percent may not serve its purpose, given the FMP uncertainties previously discussed. Secondly, five percent is within the range of uncertainty attributed to the closed area model (10%), used to analyze the effectiveness of most of the management measures. Notwithstanding the uncertainties of the FMP, a default percentage of greater than five percent is not warranted, given the more restrictive management measures proposed (compared to status quo), the Amendment 16 analysis, and the recent levels of fishing mortality, many of which are at historic lows.

The PDT next considered deviations from the default. Ideally, any deviations should be tailored to the management history of individual stocks, but as already noted there is limited information with which to base such differences. The PDT decided to recommend a standard adjustment for stocks with less uncertainty of 3 percent, setting the ACL at 97 percent of the ABC. Fro stocks with more uncertainty, the PDT originally recommended a standard adjustment of 10 percent, setting the ACL at 90 percent of the ABC. The Council noted, however, that there was no justification presented by the PDT to justify a larger adjustment for stocks with more uncertainty than is used for stocks with less uncertainty and directed the PDT to us an adjustment of 7 percent.

Analyze individual stocks in the context of the FMP for *elements* of management uncertainty to determine if particular stocks will be subject to more or less uncertainty than most.

<u>Georges Bank yellowtail flounder</u>
Georges Bank yellowtail flounder has been managed under a hard TAC in the context of the U.S./Canada Management Area rules since 2004. The Regional Administrator has the authority to modify management measures in-season (including trip limits, closures, days-at-sea, trips, and gear) in order to prevent both over-harvest and under-harvest of the TAC. The incorporation of in-season adjustment capability in the FMP is essentially an in-season accountability measure, and provides a relatively high level of *management precision*. Of the five completed fishing years since 2004, the TAC was only exceeded once (FY 2007, total catch was 9% over TAC). The principal reason for that overage was due to reporting and monitoring delays. Since that time, NMFS implemented changes to the monitoring procedures that will reduce the likelihood that *monitoring adequacy* will contribute to a TAC overage. For these reasons, the management uncertainty for GB yellowtail flounder is less than the fishery-wide uncertainty, and an adjustment of 3% is recommended.

<u>Southern New England (SNE) Yellowtail Flounder</u>
As discussed above, although there are limitations to the utility of historic information in assessing management uncertainty, the PDT considered historical catch patterns for this stock as relevant. That the catch of this stock exceeded the target TAC three times since 2004 is of concern. For fishing years 2006, 2007, and 2008, the catch to TAC ratio was 2.53, 1.86, and 1.62, respectively. The *management precision* of the FMP with respect to SNE yellowtail flounder has been relatively low historically. Secondly, there are higher discard rates of this stock than many other groundfish stocks, including *discards from other fisheries* such as fluke and scallop. For these reasons, the PDT concluded that the stock has greater management uncertainty than the fishery wide level, and an adjustment of 7% is recommended.

Gulf of Maine Haddock and Gulf of Maine Cod (Recreational sub-ACLs)
The proportional standard errors (pse) associated with the recreational data for these stocks is approximately 10%, and there is consensus that the *monitoring adequacy* of the recreational fishery is less than that associated with the commercial fishery. For these reasons, the PDT concluded that the fishery sub-components for these stocks have greater management uncertainty than the fishery wide level, and an adjustment of 7% is recommended.

SNE winter flounder, windowpane north, windowpane south, ocean pout, and Atlantic wolfish: These stocks either need significant reductions in fishing mortality or continued low levels of fishing mortality. Newly proposed management measures such as the restricted gear areas for the common pool, prohibitions on retention, and expanded sector management as well as the difficulty in achieving high *monitoring adequacy* of stocks that are either not targeted and/or encountered in low numbers, combine to create a situation where there is less *management precision* and greater management uncertainty. For these reasons, the PDT concluded that these stocks have greater management uncertainty than the fishery wide level, and an adjustment of 7% is recommended.

Gulf of Maine Haddock and GB Haddock Sub-Components for the Herring Fishery
The herring fishery is allocated .2 percent of the "TAC" for these haddock stocks. Although there is a haddock monitoring system in place in the herring fishery, the system was not designed to distinguish one haddock stock from another. Due to this weakness in the *monitoring adequacy* the PDT concluded that these ACL-subcomponents should be subject to the 7% adjustment.

Yellowtail Flounder Sub-Component for the scallop fishery
For FY 2010, there will be no downward adjustment of the yellowtail founder sub-component for scallop fishery (3 stocks of yellowtail). For future years, the downward adjustment may depend on the specific AMs adopted. Further work is needed on this issue, including whether the adjustment should be determined by the scallop or groundfish FMPs.

Appendix III

Calculation of Northeast Multispecies Annual Catch Limits, FY 2011 - FY 2014

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This appendix documents the calculation of Northeast Multispecies Overfishing Levels (OFLs), Acceptable Biological Catches (ABCs), and Annual Catch Limits (ACLs) for FY 2010 - FY 2014 that are implemented in Framework Adjustment 45. The general approach for all stocks is to first determine the OFL, then determine the ABC. 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.

In this management action, new OFLs/ABCs/ACLs are proposed for GB yellowtail flounder and pollock because of the completion of updated assessments. In addition, revised US/Canada area TACs modified the U.S. ABCs and ACLs for GB cod and GB haddock. White hake OFLs/ABCs/ACLs were republished without change in order to correct an error published in the *Federal Register*. This appendix only describes the calculations for these stocks. For other stocks, please see Appendix III to FW 44.

This action sets OFLs/ABCs/ACLs for different time periods. Pollock values are set for the period FY 2011 – 2014. Pollock specifications will be revisited in FY 2013 with all other groundfish stocks, placing this stock on the same adjustment schedule as other stocks. GB yellowtail flounder is set for FY 2011 – 2012; this stock is assessed each year by the TRAC and the specifications will be revisited in FY 2011.

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:

GB cod
GB haddock
GB yellowtail flounder
White Hake
Pollock

For most stocks, the projections were performed using the Northeast Fisheries Science Center’s (NEFSC) AGEPRO projection model; the exception is white hake which used a projection model developed by SCAA/ASP. For GB cod, GB haddock, and white hake the most recent assessment was completed in GARM III (NEFSC 2008), and the terminal year in the assessment is 2007. GB yellowtail flounder was assessed by the Transboundary Resource Assessment Committee (TRAC) in 2010, with a terminal year of 2009. Pollock was assessed by the Stock Assessment Review Committee (SARC) in 2010 with a terminal year of 2009.

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, and other initial conditions that were used were those recommended by the GARM and TRAC review panels.

For GB cod, GB haddock, and white hake, since the first year for ACLs is 2010 an additional assumption must be made in the projections for the years between the terminal year and 2010. For the assessments with a terminal year of 2007, an estimate of 2008 catch developed by the NEFSC was input into the projection model. While these catches were calculated using the same techniques as were used by GARM III, the values have not been subject to a peer review and could be modified in the future when an assessment is completed. The 2008 catches used are shown in Table 3.

For GB Cod, GB haddock, ad white hake, the catch assumption for 2009 was based on an estimate of 2009 fishing mortality. This estimate was developed after considering the expected impacts of the Northeast Multispecies interim action that was implemented May 1, 2009. For most stocks, the expected change in exploitation predicted to result from the interim action were applied to the 2008 mortality that results from the updated 2008 catch to get an estimate of the 2009 mortality. An exception was made for two stocks affected by the U.S./Canada Resource Sharing Understanding. The first exception is for GB haddock. The interim action analysis could not reliably predict GB haddock mortality because much of the catch comes from the Canadian fishery in recent years and this is not affected by U.S. management measures. The Canadian fishery has nearly harvested its TAC in recent years, so the 2009 TAC of 19,000 mt was assumed caught. The 2009 U.S. catch was assumed to be the same as the 2008 catch of 6,000 mt. Total 2009 GB haddock catch assumed was 25,000 mt. The 2009 catch assumption is not as critical for this stock since recent catches are well below catch projections for future years. The second exception is for Atlantic halibut. The 2009 catch was assumed to be 100 mt, a 40 percent increase from the four year average catch but only a 20 percent increase from the 2007 catch. An increase seems warranted since the Canadian TAC is increasing by 15 percent from 2008 to 2009 (only a small portion of this TAC is taken from the stock area used in the U.S. assessment).

For GB yellowtail flounder, the terminal year is 2009 and an assumption for catch is needed for 2010. For GB yellowtail flounder, consistent with the approach of the TRAC, the catch in 2010 was assumed to be the combined U.S. and Canadian quotas of 1,956 mt.

For pollock the ABC is being calculated for 2011 and beyond and the terminal year of the assessment is 2009; an assumption must be made for the catch in 2010 (the “bridge” year). In the past, the PDT has estimated annual catch for the bridge year using at least six or seven months of preliminary landings data. These landings were expanded to the full year based on the proportion of landings that occurred during the six or seven month period in previous years. This approach is not possible this year for two reasons. First, the preliminary landings data has not been published by NERO. Second, the implementation of sectors on May 1, 2010, creates doubt over whether past temporal landings patterns will persist.

Because of this uncertainty over estimating the 2010 catch the PDT examined the sensitivity of the 2011 ABC to the 2010 catch assumption. As shown in Figure 1 and Table 1, the 2011 catch at 75 percent of F_{MSY} is not very sensitive to the 2010 catch assumption. Catching only half the ABC in 2010 increases the 2011 catch by only 9 percent, and increases the 2011 SSB_{MSY} by only 7 percent. Given the insensitivity of the projection to the 2010 catch assumption, the PDT used the catch at 75 percent of F_{MSY} for 2010 (19,839 mt) for the short term projections. This is a conservative assumption by the PDT as pollock catches have not exceeded 12,200 mt since 1989.

Figure 1 – Pollock projection sensitivity to 2010 catch assumption.

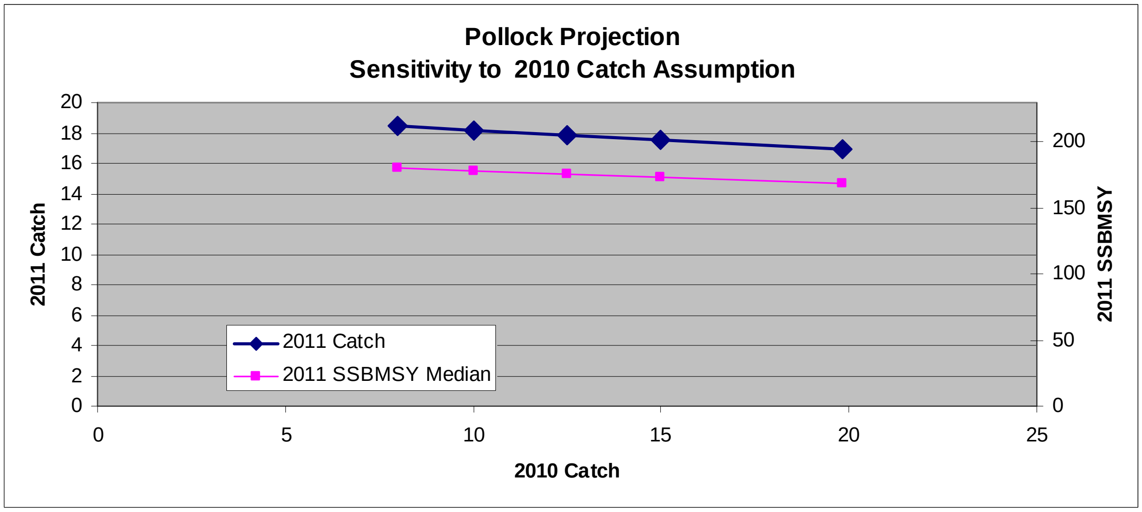

Table 1 – Pollock projection sensitivity to 2010 catch assumption

2010 F	2010 Catch (K mt)	% Change from 19.8K mt	2011 Catch at 75% FMSY	% Change from 16.9K mt	2011 SSBMSY	% change from 168.273
0.31	19.839		16.914		168.273	
0.23	15	-24.4%	17.525	3.7%	173.118	2.9%
0.19	12.5	-37.0%	17.841	5.5%	175.58	4.3%
	10	-49.6%	18.162	7.4%	178.045	5.8%
0.119	8	-59.7%	18.419	9.0%	180.02	7.0%

When calculating the OFL in future years, F_{MSY} is used as the fishing mortality in the projection. An iterative approach is used where the ABC is input as the catch in year 1 to determine the OFL for year 2, etc. When calculating the ABC, either 75% of F_{MSY} or Frebuild is used (whichever is lower; this is consistent with the ABC control rules recommended by the Science and Statistical Committee (SSC) and adopted in Amendment 16).

Mortality targets used for setting ABCs are shown in Table 4. Projection output used for setting ABCs is in Appendix IV for GB yellowtail flounder and pollock. Since the OFLs and ABCs for GB cod, GB haddock, and white hake have not been changed, please see Appendix IV of FW 44 for the relevant projection output.

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 the management uncertainty adjustment in setting ACLs. In effect, this creates "sub-ABCs" for each stock. A brief description of the components follows:

> <u>ABC</u>: Acceptable Biological Catch for the entire stock.
>
> <u>Canadian Share/Allowance</u>: 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). For other stocks with substantial Canadian catches this is based on an estimate of Canadian catch.
>
> <u>U.S. ABC</u>: That portion of the ABC available to U.S. fishermen after accounting for Canadian harvests.
>
> <u>State waters</u>: Portion of the U.S. ABC expected to be harvested from state waters, outside of the federal management plan.
>
> <u>Other sub-components</u>: 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.
>
> <u>Scallops</u>: Portion of U.S. ABC either allocated to, or expected to be harvested by, the U.S. scallop fishery.
>
> <u>Groundfish</u>: Portion of the U.S. ABC available to the groundfish fishery (including recreational and commercial vessels). This ABC has several sub-components:
>
> > <u>Commercial</u>: Portion of the U.S. ABC available to commercial vessels; this is further sub-divided into sector and common-pool portions.
> >
> > <u>Recreational</u>: Portion of the U.S. ABC available to commercial vessels.
>
> <u>MWT</u>: Portion of the ABC available to herring mid-water trawl vessels. Currently only applies to the two haddock stocks.

Table 5 summarizes the distribution of the U.S. ABC to the various sub-components, while Table 6 provides the resulting ABCs. Details for specific stocks are provided below.

a. GB cod: The Canadian fishery harvests a portion of the ABC as specified by the US/Canada Understanding; in FY 2011 the Canadian share is 850 mt. A similar percentage was assumed for FY 2012, though this may be changed next year by the TMGC. This is the only change from the ABC distribution in FW 44, but it affects the calculation of other elements.

b. GB haddock: The Canadian fishery harvests a portion of the ABC as specified by the US/Canada Understanding; in FY 2011 the Canadian share is 12,540 mt. A similar percentage was assumed for FY 2012, though this may be changed next year by the TMGC. This is the only change from the ABC distribution in FW 44, but it affects the calculation of other elements.

c. GB yellowtail flounder: The Canadian fishery harvests a portion of the ABC as specified by the US/Canada Understanding; in FY 2011 the Canadian share is 855 mt. A similar percentage was assumed for FY 2012, though this may be changed next year by the TMGC. There is no state waters component because the stock area does not include state waters. Five percent is considered an “other subcomponent” caught in other fisheries. As described in the framework text, there is an allocation to the scallop fishery that is based on an estimate of the amount the fishery is expected to harvest if the scallop yield is taken. These amounts were set in FW 44 and are not changed by this action.

d. Pollock: The 2009 ACL process for pollock described adjustments to the ABC as follows:

“h. Pollock: Recreational harvest increased to 912 mt in 2008, about 2.5 times the harvest from 2005 through 2007 and 24 percent of the ABC. Since 2001, about half of the recreational harvest has been from state waters. The PDT allowed 400 mt for recreational harvest, reflecting the approximate average amount harvested from 2003 through 2007. This value is split between state waters and the “other sub-components” category. Canadian catches in 2008 were 650 mt, but Canadian TACs are expected to decline on the order of 20 percent in 2010. The PDT allowed 520 mt for Canadian catches (80 percent of 2008).” (FW 44; NEFMC 2010). The NERO emergency action followed a similar approach, but used the percentages that result from the 2009 adjustments and applied them to the new ABC.

There are two changes to the assessment that affect the ABC and ACL calculations. First, Canadian catches are not included so there isn’t an adjustment for Canadian catch. Second, the assessment assumes 100 percent discard mortality of recreational pollock, so recreational catches are based on A+B1+B2, and not just harvest (A+B1) as in 2009.

Recreational catch (A+B1+B2) of pollock has averaged 1,008 mt for the period 2004 – 2009 (using assessment values; st. dev = 425 mt). The 2008 catch was more than double this average, at 1,867 mt, but this seems to have been an anomalous year. The recreational catch, on average, was 11.8 percent of the removals (range 8 percent t o 15.3 percent).

If the recreational catch allowance is based on recent catches, a value of 1,200 mt would be consistent with recent catches (2007-2009 average of 1,174 mt). If the recreational catch allowance is based on a percentage, 11.8 percent translates into 1,999 mt, a catch that has not been observed. An alternative might be to use the average plus one standard deviation, or 1,425 mt. The PDT agreed to use 1,200 mt based on the recent 2007-2009 average. It is important to note that this is not an explicit allocation, but it does affect the amount of catch available to the commercial fishery. Should recreational catch continue to exceed five percent of the removals the Council may consider a specific allocation to the recreational fishery.

On average, 50 percent of the recreational catch has been outside three miles. 600 mt of the estimated recreational catch will be assumed to come from state waters and 600 mt will be included in the "other subcomponents" in federal waters.

A NMFS analysis of commercial catches of pollock in state waters outside the FMP concluded that 2005 catches were less than one percent of the harvest. Total state waters pollock catch will be assumed to be 600 mt (recreational catch) plus one percent of the ABC.

Amendment 16 allows for 5 percent for "other subcomponents" in federal waters. The total will be 5 percent of the ABC plus an additional 600 mt for recreational catches.

To summarize the pollock adjustments:

The updated pollock assessment does not include Canadian catches so no adjustment is made to the ABC for Canadian catches. One percent of the ABC was allowed for commercial catches in state waters, and five percent was allowed for incidental catches by other fisheries in federal waters. The 2007-2009 average of recreational catch is 1,174 mt; this was rounded up to 1,200 mt. Half of this catch was added to the state waters sub-component and half was added to the federal waters other subcomponent.

ACLs

After the ABCs are distributed to the various components, they are adjusted for management uncertainty. As discussed in Appendix II, the default sets the ACL at 95 percent of the ABC. For stocks with less management uncertainty the ACL is set at 97 percent of the ABC; for stocks with more uncertainty it is set at 93 percent of the ACL. Adjustments are shown in Table 7. The rationale for deviation from 95 percent for specific stocks is provided below for GB yellowtail flounder. FW 44 describes the management uncertainty adjustments for GB cod, GB haddock, and white hake.

a. GB yellowtail flounder: The management uncertainty is less for this stock because this stock has been successfully managed with a hard TAC for several years and there are in-season AMs (Regional Administrator authority to modify in-season measures including trip limits, closures, gear restrictions, etc.). Therefore, the PDT set the ACL at 97 percent of the ABC. The same percentage is used for the scallop fishery in FY 2011 and FY 2012.

In addition to reducing the GB yellowtail flounder ABC for management uncertainty an additional adjustment is required in order to comply with the TACs established under the provisions of the U.S./Canada Resource Sharing Understanding. The total U.S. and Canadian catch for 2011 is 1,900 mt, slightly less than the ABC of 1,998 mt. When the ABC is distributed and management uncertainty adjustments are applied the result is a U.S. total ACL of 1,067.6 mt. The total U.S. ACL cannot exceed the TAC for the U.S., or 1,045 mt in FY 2011, so the U.S. ACL must be reduced by 23 mt. A proportional reduction is taken from the other sub-components and groundfish sub-ACLs; since the scallop sub-ACL specified in FW 44 was an amount this remains unchanged.

Table 2 – Adjustment to GB yellowtail flounder to comply with TMGC guidance

ABC	US ABC	Scallop ABC	Scallop ACL	Other Subc	Groundfish ABC	Groundfish ACL	Total US ACL
Before adjustment for TMGC guidance							
1998	1098.9	207	200.8	54.9	837.0	811.8	**1067.6**
After adjustment for TMGC guidance							
			200.8	53.5		790.7	**1045.0**

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 8 and Table 9 are reproduced from Amendment 16, but remove pollock since that stock is no longer a stock of concern.

Table 3 – 2008 catch used in age-based projections

	Actual 2008 Catch[1]				
Stock	Landings	Commercial discards[2]	Recreational Landings or Harvest[3]	Canada	Total 2008 Catch
GB Cod	3,207	366	32	1,529	5,134
GB Haddock	5,744	343		14,814	20,901
White Hake	1,876				1,876

Notes:
1. Actual 2008 catch as calculated by NEFSC in July 2009. These numbers are preliminary until incorporated into an assessment.

Table 4 – Mortality targets used to calculate ABCs, FY 2011 – 2014

Species	Stock	Basis for Target Fishing Mortality	Targeted Fishing Mortality	F_{msy}
Cod	**GB**	75% F_{MSY}	0.184	0.2466
Haddock	**GB**	75% F_{MSY}	0.26	0.35
Yellowtail Flounder	**GB**	Frebuild	0.138	0.254
White Hake	**GB/GOM**	Frebuild	0.084	0.125
Pollock	**GB/GOM**	75% F_{MSY}	0.31	F_{5-7}=0.25 (F_{FR7}=0.41)

Table 5 – Distribution of ABC to fishery components. Values in gray text may change in future as a result of US/CA negotiations. Sector PSC is based on preliminary sector rosters and may change.

Stock	Year	ABC	Canadian Share/ Allowance	US ABC	State Waters	Other Sub-Components	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	MWT
GB Cod	2011	5,616	850	4,766	0.01	0.04		0.95	0.95		0.96	
	2012	6,214	850	5,364	0.01	0.04		0.95	0.95		0.96	
GB Haddock	2011	46,784	12,540	34,244	0.01	0.04		0.948	0.95		0.98	0.002
	2012	39,846	10,830	29,016	0.01	0.04		0.948	0.95		0.98	0.002
GB Yellowtail	2011	1,998	855	1,099	0.00	0.05	0.188	0.762	0.76		0.97	
	2012	2,222	855	1,222	0.00	0.05	0.259	0.691	0.69		0.97	
White Hake	2011	3,295		3,295	0.01	0.04		0.95	0.95		0.98	
	2012	3,638		3,638	0.01	0.04		0.95	0.95		0.98	
Pollock	2011	16,900		16,900	0.05	0.09		0.87	0.87		0.96	
	2012	15,400		15,400	0.05	0.09		0.86	0.86		0.96	
	2013	15,600		15,600	0.05	0.09		0.86	0.86		0.96	
	2014	16,000		16,000	0.05	0.09		0.87	0.87		0.96	

Table 6 – Distribution of ABC to fishery components. Values in gray text may change in future as a result of US/CA negotiations.

Stock	Year	ABC	Canadian Share/ Allowance	US ABC	State Waters	Other Sub-Compo-nents	Scallops	Groundfish	Comm Groundfish	Rec Groundfish	Sector PSC	Non-Sector	MWT
GB Cod	2011	5,616	850	4,766	48	191	0	4,528	4,528	0	4,347	181	0
	2012	6,214	850	5,364	54	215	0	5,096	5,096	0	4,892	204	0
GB Haddock	2011	46,784	12,540	34,244	342	1,370	0	32,463	32,463	0	31,814	649	68
	2012	39,846	10,830	29,016	290	1,161	0	27,507	27,507	0	26,957	550	58
GB Yellowtail	2011	1,998	855	1,099	0	55	207	837	837	0	812	25	0
	2012	2,222	855	1,222	0	61	317	844	844	0	819	25	0
White Hake	2011	3,295		3,295	33	132	0	3,130	3,130	0	3,068	63	0
	2012	3,638		3,638	36	146	0	3,456	3,456	0	3,387	69	0
Pollock	2011	16,900		16,900	769	1,445	0	14,686	14,686	0	14,099	587	0
	2012	15,400		15,400	754	1,370	0	13,276	13,276	0	12,745	531	0
	2013	15,600		15,600	756	1,380	0	13,464	13,464	0	12,925	539	0
	2014	16,000		16,000	760	1,400	0	13,840	13,840	0	13,286	554	0

Table 7 – ACL adjustments

Stock	Year	State Waters	Other Sub-Components	Scallops	Groundfish	Comm/Non_Sector Groundfish	Rec Groundfish	Sector PSC	MWT
GB Cod	1	1	1	0.95	0.95	0.95	0.95	1	1
	1	1	1	0.95	0.95	0.95	0.95	1	1
GB Haddock	1	1	1	0.95	0.95	0.95	0.95	0.93	1
	1	1	1	0.95	0.95	0.95	0.95	0.93	1
GB Yellowtail	1	1	0.97	0.97	0.97	0.95	0.97	1	1
	1	1	0.97	0.97	0.97	0.95	0.97	1	1
White Hake	1	1	1	0.95	0.95	0.95	0.95	1	1
	1	1	1	0.95	0.95	0.95	0.95	1	1
Pollock	1	1	1	0.95	0.95	0.95	0.95	1	1
	1	1	1	0.95	0.95	0.95	0.95	1	1
	1	1	1	0.95	0.95	0.95	0.95	1	1
	1	1	1	0.95	0.95	0.95	0.95	1	1

Table 8 – 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 ACL
GB cod	Two
GOM cod	One
GB Yellowtail	Two
CC/GOM yellowtail	One
SNE/MA Yellowtail	One
Plaice	Five
Witch Flounder	Five
SNE/MA Winter Flounder	One
GB Winter Flounder	Two
White Hake	Two

Table 9 - 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 Yellowtail	100%	NA	NA	
SNE/MA Winter Flounder	100%	NA	NA	
Witch Flounder	100%	NA	NA	
GB Yellowtail	50%	NA	50%	
GB Winter Flounder	50%	NA	50%	

Appendix IV

Acceptable Biological Catch (ABC)

Projection Output

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AGEPRO VERSION 3.3

 PROJECTION RUN: fish at Fref=0.25

 INPUT FILE: C:\DOCUMENTS AND SETTINGS\TAN\MY DOCUMENTS\PROJECTION_FILES\GB_YTF\GBYT_TRAC2010_50%2016.IN
 OUTPUT FILE: C:\DOCUMENTS AND SETTINGS\TAN\MY DOCUMENTS\PROJECTION_FILES\GB_YTF\GBYT_TRAC2010_50%2016.OUT
 NUMBER OF SIMULATIONS PER BOOTSTRAP REALIZATION:   10
 TOTAL NUMBER OF SIMULATIONS:   10000
 NUMBER OF FEASIBLE SIMULATIONS:   10000
 PROPORTION OF SIMULATIONS THAT ARE FEASIBLE:   1.00000000000000
 NUMBER OF BOOTSTRAP REALIZATIONS:   1000

 NUMBER OF RECRUITMENT MODELS:   1
 PROBABLE RECRUITMENT MODELS:   15
 RECRUITMENT MODELS BY YEAR
 YEAR    RECRUITMENT MODELS
   2010  15
   2011  15
   2012  15
   2013  15
   2014  15
   2015  15
   2016  15
   2017  15
   2018  15
   2019  15
   2020  15

 RECRUITMENT MODEL PROBABILITIES BY YEAR
 YEAR    MODEL PROBABILITY
   2010  1.00000000000000
   2011  1.00000000000000
   2012  1.00000000000000
   2013  1.00000000000000
   2014  1.00000000000000
   2015  1.00000000000000
   2016  1.00000000000000
   2017  1.00000000000000
   2018  1.00000000000000
   2019  1.00000000000000
   2020  1.00000000000000

 RECRUITMENT MODEL SAMPLING FREQUENCIES BY YEAR
 YEAR    MODEL SAMPLING FREQUENCIES
   2010  10000
```

2011	10000
2012	10000
2013	10000
2014	10000
2015	10000
2016	10000
2017	10000
2018	10000
2019	10000
2020	10000

MIXTURE OF F AND QUOTA BASED CATCHES

YEAR	F	QUOTA (THOUSAND MT)
2010		1.956
2011	0.138	
2012	0.138	
2013	0.138	
2014	0.138	
2015	0.138	
2016	0.138	
2017	0.191	
2018	0.191	
2019	0.191	
2020	0.191	

SPAWNING STOCK BIOMASS (THOUSAND MT)

YEAR	AVG SSB (000 MT)	STD
2010	15.173	2.383
2011	16.164	2.533
2012	19.783	3.827
2013	25.934	7.565
2014	32.242	9.878
2015	38.531	11.599
2016	44.270	12.901
2017	47.525	13.309
2018	48.521	13.207
2019	48.960	13.084
2020	49.212	13.019

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	10.312	11.645	12.234	13.407	15.031	16.603	18.474	19.362	21.536
2011	10.802	12.439	13.083	14.284	15.985	17.781	19.536	20.685	22.995
2012	13.187	14.579	15.386	16.941	19.114	22.093	25.363	27.015	30.064
2013	14.911	16.778	17.946	20.183	23.925	30.192	37.625	41.018	46.560

2014	16.952	19.478	20.947	24.227	30.461	38.931	45.760	50.330	59.569
2015	19.281	22.400	24.411	29.404	37.399	45.914	54.144	59.688	69.359
2016	22.026	25.435	28.061	34.478	43.189	52.470	61.860	67.614	78.608
2017	23.598	27.669	30.921	37.861	46.211	55.921	65.577	71.088	82.835
2018	24.249	28.859	32.147	38.870	47.334	57.091	66.346	72.061	83.580
2019	24.641	29.506	32.787	39.316	47.744	57.133	66.669	72.493	83.250
2020	25.290	29.932	32.956	39.595	48.069	57.662	66.730	72.427	83.234

ANNUAL PROBABILITY THAT SSB EXCEEDS THRESHOLD: 43.200 THOUSAND MT

YEAR	Pr(SSB >= Threshold Value) FOR FEASIBLE SIMULATIONS
2010	0.000
2011	0.000
2012	0.000
2013	0.029
2014	0.146
2015	0.325
2016	0.500
2017	0.597
2018	0.628
2019	0.643
2020	0.648

Pr(SSB >= Threshold Value) AT LEAST ONCE:= 0.797

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2010

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	261.4	352.9	400.7	506.5	649.5	810.4	1019.7	1143.9	1378.3
3	783.5	1037.7	1173.9	1481.9	1913.5	2433.6	3029.9	3326.5	4064.9
4	2442.8	3062.6	3443.8	4048.2	4943.3	5987.9	7023.4	7694.5	9428.2
5	2803.1	3322.0	3563.9	4009.8	4592.8	5224.2	5884.2	6267.7	6900.8
6+	1612.2	1910.7	2049.8	2306.2	2641.5	3004.7	3384.3	3604.9	3969.0

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2011

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1235.7	1292.3	1323.3	1383.0	1442.3	1511.5	1571.8	1610.1	1672.7
3	576.9	778.7	885.0	1119.2	1436.0	1787.4	2252.8	2530.5	3050.7
4	758.5	994.7	1134.9	1419.0	1850.4	2360.7	2958.5	3247.6	3944.8
5	2272.5	2913.3	3268.9	3870.3	4729.8	5784.2	6830.8	7516.1	9310.4
6+	3691.0	4413.9	4755.2	5389.0	6206.9	7109.9	8080.3	8613.1	9499.2

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2012

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	821.9	1119.8	1220.6	2098.3	2590.0	5635.6	9223.0	10615.6	12269.2
3	2734.3	2859.5	2928.2	3060.3	3191.6	3344.6	3478.1	3562.8	3701.3
4	559.5	755.3	858.3	1085.5	1392.8	1733.6	2185.0	2454.4	2958.9
5	730.7	958.2	1093.3	1367.0	1782.6	2274.2	2850.1	3128.5	3800.2
6+	5690.2	6561.2	7078.5	7912.5	8975.9	10247.7	11632.0	12454.9	14257.1

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2013

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	847.8	1124.0	1244.7	2104.3	2596.9	5657.9	9304.0	10616.5	12413.7
3	1818.7	2477.8	2700.8	4643.1	5731.0	12470.4	20408.4	23490.0	27149.0
4	2652.0	2773.4	2840.1	2968.1	3095.5	3243.9	3373.3	3455.5	3589.9
5	539.0	727.6	826.9	1045.7	1341.8	1670.1	2104.9	2364.4	2850.4
6+	5311.5	6123.9	6486.3	7222.5	8261.2	9183.6	10382.3	11086.2	12216.6

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2014

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	797.9	1119.0	1231.5	2108.9	2598.5	5717.2	9399.5	10616.2	12392.0
3	1876.0	2487.1	2754.2	4656.3	5746.3	12519.8	20587.8	23492.0	27468.8
4	1763.9	2403.2	2619.5	4503.3	5558.5	12094.9	19793.9	22782.8	26331.6
5	2554.8	2671.8	2736.0	2859.3	2982.0	3125.0	3249.7	3328.8	3458.3
6+	4783.4	5422.8	5778.9	6387.2	7174.6	8050.4	8874.9	9447.4	10527.8

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2015

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	804.3	1119.5	1238.4	2109.5	2593.8	5637.7	9267.3	10616.3	12274.2
3	1765.6	2476.1	2724.9	4666.5	5749.8	12650.8	20798.9	23491.4	27420.6
4	1819.5	2412.2	2671.3	4516.1	5573.3	12142.8	19967.9	22784.7	26641.8
5	1699.3	2315.1	2523.5	4338.3	5354.7	11651.6	19068.4	21947.7	25366.5
6+	5868.4	6414.9	6735.2	7272.2	7951.1	8709.6	9394.9	9892.5	10784.5

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2016

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	800.3	1120.4	1232.4	2096.1	2593.1	5653.7	9643.9	10616.9	12388.6

3	1779.8	2477.1	2740.4	4668.0	5739.4	12474.9	20506.4	23491.5	27160.2
4	1712.4	2401.6	2642.9	4526.0	5576.7	12269.9	20172.7	22784.1	26595.1
5	1752.8	2323.8	2573.4	4350.6	5369.0	11697.7	19236.0	21949.5	25665.2
6+	6840.4	7588.0	8181.5	9569.8	11055.5	16875.2	23914.5	26467.9	29969.8

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2017

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	841.4	1118.3	1259.1	2098.6	2584.3	5668.8	9407.6	10565.0	12351.2
3	1745.3	2443.5	2687.7	4571.4	5655.3	12330.2	21032.4	23154.4	27018.3
4	1688.5	2350.1	2599.8	4428.5	5445.0	11835.0	19454.6	22286.5	25767.0
5	1613.6	2263.0	2490.4	4264.9	5254.9	11562.0	19008.8	21469.5	25060.6
6+	7583.6	8974.8	9891.7	11581.5	15774.2	22278.3	27756.0	30928.7	37334.4

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2018

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	836.4	1114.7	1226.0	2101.0	2580.7	5618.0	9135.6	10555.1	12318.1
3	1822.6	2422.4	2727.5	4546.0	5598.0	12279.6	20378.6	22885.7	26754.9
4	1622.5	2271.6	2498.6	4249.8	5257.4	11462.6	19552.4	21525.1	25117.1
5	1542.6	2147.1	2375.2	4046.0	4974.7	10812.7	17774.1	20361.4	23541.2
6+	8208.8	9885.3	10897.5	13237.2	18256.9	24073.9	29509.4	32893.4	39379.7

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2019

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	832.3	1117.5	1230.8	2095.8	2583.2	5674.3	9226.5	10554.9	12216.7
3	1811.8	2414.6	2655.7	4551.2	5590.3	12169.6	19789.4	22864.3	26683.3
4	1694.4	2252.0	2535.6	4226.1	5204.1	11415.5	18944.6	21275.3	24872.2
5	1482.3	2075.4	2282.8	3882.7	4803.2	10472.4	17863.4	19665.7	22947.4
6+	8804.0	10492.8	11594.2	14559.9	19104.9	24651.0	30143.2	33503.4	39551.5

PERCENTILES OF SPAWNING BIOMASS AT AGE VECTOR (MT)
IN YEAR: 2020

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	820.5	1113.9	1222.2	2099.1	2580.5	5632.8	9246.7	10555.5	12386.5
3	1802.8	2420.6	2666.1	4540.0	5595.7	12291.6	19986.3	22863.9	26463.6
4	1684.3	2244.7	2468.9	4230.9	5196.9	11313.2	18396.9	21255.4	24805.7
5	1548.0	2057.4	2316.5	3861.1	4754.5	10429.4	17308.2	19437.5	22723.7
6+	9181.5	10955.0	12164.9	15160.2	19416.5	24987.1	30237.8	33434.3	39440.0

MEAN BIOMASS (THOUSAND MT) FOR AGES: 1 TO 6

YEAR	AVG MEAN B (000 MT)	STD
2010	17.097	2.511
2011	21.482	3.943
2012	28.146	7.440
2013	34.479	9.943
2014	40.617	11.688
2015	46.721	13.056
2016	52.376	14.226
2017	55.374	14.590
2018	56.322	14.511
2019	56.777	14.409
2020	56.995	14.365

PERCENTILES OF MEAN STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	11.766	13.379	14.013	15.238	16.942	18.702	20.391	21.540	23.874
2011	14.402	16.009	16.844	18.569	20.891	23.899	27.079	28.791	31.964
2012	16.863	18.918	20.059	22.487	26.381	32.412	39.393	42.952	48.318
2013	18.865	21.528	23.118	26.478	32.712	41.151	48.155	52.740	62.081
2014	21.167	24.374	26.415	31.418	39.462	48.052	56.417	61.940	71.504
2015	24.200	27.664	30.291	36.808	45.653	55.003	64.449	70.366	81.174
2016	26.670	31.007	34.496	42.045	50.990	61.418	71.378	77.810	90.281
2017	28.226	33.402	37.219	44.748	54.036	64.759	74.844	81.204	94.497
2018	28.979	34.516	38.342	45.855	55.043	65.476	75.882	82.221	94.214
2019	29.607	35.097	38.700	46.350	55.663	66.022	76.283	82.123	94.469
2020	30.221	35.280	38.893	46.495	55.775	66.554	76.099	82.376	94.088

ANNUAL PROBABILITY THAT MEAN BIOMASS EXCEEDS THRESHOLD: 0.000 THOUSAND MT

YEAR	Pr(MEAN B >= Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	1.000
2013	1.000
2014	1.000
2015	1.000
2016	1.000
2017	1.000
2018	1.000
2019	1.000
2020	1.000

Pr(MEAN B >= Threshold Value) AT LEAST ONCE:= 1.000

F WEIGHTED BY MEAN BIOMASS FOR AGES: 1 TO 6

YEAR	AVG F_WT_B	STD
2010	0.117	0.017
2011	0.095	0.012
2012	0.083	0.014
2013	0.084	0.012
2014	0.091	0.013
2015	0.097	0.013
2016	0.101	0.013
2017	0.143	0.017
2018	0.144	0.016
2019	0.145	0.016
2020	0.145	0.016

PERCENTILES OF F WEIGHTED BY MEAN BIOMASS FOR AGES: 1 TO 6

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	0.082	0.091	0.096	0.105	0.115	0.128	0.139	0.146	0.163
2011	0.065	0.071	0.076	0.087	0.099	0.104	0.108	0.110	0.112
2012	0.055	0.061	0.064	0.071	0.083	0.094	0.101	0.104	0.109
2013	0.058	0.064	0.068	0.074	0.085	0.094	0.099	0.102	0.107
2014	0.062	0.069	0.073	0.081	0.092	0.101	0.108	0.112	0.118
2015	0.067	0.074	0.079	0.088	0.098	0.107	0.114	0.117	0.122
2016	0.070	0.079	0.084	0.093	0.102	0.111	0.117	0.120	0.124
2017	0.102	0.113	0.120	0.132	0.145	0.156	0.164	0.168	0.173
2018	0.104	0.115	0.122	0.134	0.146	0.157	0.164	0.168	0.173
2019	0.105	0.116	0.123	0.134	0.146	0.157	0.164	0.168	0.173
2020	0.105	0.117	0.123	0.134	0.147	0.157	0.165	0.168	0.173

ANNUAL PROBABILITY THAT F WEIGHTED BY MEAN BIOMASS EXCEEDS THRESHOLD: 0.000

YEAR	Pr(F_WT_B > Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	1.000
2013	1.000
2014	1.000
2015	1.000
2016	1.000
2017	1.000
2018	1.000
2019	1.000
2020	1.000

TOTAL STOCK BIOMASS (THOUSAND MT)

YEAR	AVG TOTAL B (000 MT)	STD

2010	14.927	2.273
2011	15.659	2.581
2012	17.094	2.572
2013	22.999	6.937
2014	29.160	9.461
2015	35.617	11.246
2016	42.170	13.024
2017	46.962	13.843
2018	48.329	13.749
2019	48.862	13.599
2020	49.185	13.522

PERCENTILES OF TOTAL STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	10.311	11.589	12.075	13.244	14.783	16.300	18.053	18.929	20.974
2011	10.251	11.871	12.495	13.767	15.477	17.275	19.031	20.225	22.638
2012	11.735	13.301	14.050	15.250	16.921	18.684	20.505	21.614	24.020
2013	13.705	15.208	16.177	17.984	20.600	26.741	34.654	37.447	41.814
2014	15.250	17.554	18.886	21.460	27.098	35.859	42.178	46.598	55.948
2015	17.720	20.555	22.269	26.229	34.471	42.767	50.996	56.273	65.838
2016	20.225	23.662	25.810	32.113	41.233	50.293	59.864	65.609	76.683
2017	22.721	26.490	29.380	36.726	45.682	55.772	65.626	71.644	84.090
2018	23.548	27.743	31.120	38.227	47.118	57.005	66.747	73.062	85.074
2019	24.148	28.916	31.976	38.846	47.465	57.651	67.484	73.015	84.235
2020	24.371	29.137	32.347	39.179	48.033	57.867	67.358	73.276	85.061

ANNUAL PROBABILITY THAT TOTAL STOCK BIOMASS EXCEEDS THRESHOLD: 0.000 THOUSAND MT

YEAR	Pr(B >= Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	1.000
2013	1.000
2014	1.000
2015	1.000
2016	1.000
2017	1.000
2018	1.000
2019	1.000
2020	1.000

Pr(B >= Threshold Value) AT LEAST ONCE:= 1.000

RECRUITMENT UNITS ARE: 1000.00000000000 FISH

YEAR AVG

CLASS	RECRUITMENT	STD
2010	38485.442	28668.288
2011	39163.524	29003.230
2012	39488.953	29129.036
2013	38817.261	28759.533
2014	39199.314	29378.076
2015	39277.657	29099.073
2016	38837.671	28727.417
2017	39202.253	28866.820
2018	39081.174	29012.600
2019	38924.510	29064.179
2020	39035.873	29019.347

PERCENTILES OF RECRUITMENT UNITS ARE: 1000.00000000000 FISH

YEAR CLASS	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	7808.663	10638.685	11596.353	19935.845	24606.780	53543.023	87625.755	100857.071	116567.468
2011	8054.749	10678.770	11825.482	19992.345	24672.396	53755.116	88395.992	100865.531	117940.417
2012	7580.769	10631.555	11699.810	20036.319	24687.402	54317.642	89302.423	100862.883	117733.654
2013	7641.620	10635.818	11766.113	20042.425	24642.913	53562.552	88046.854	100863.474	116615.332
2014	7603.145	10644.928	11708.718	19914.928	24636.777	53714.976	91625.048	100869.210	117701.738
2015	8032.715	10676.166	12020.671	20035.437	24671.694	54119.151	89813.381	100862.657	117915.024
2016	7992.132	10651.212	11714.965	20076.087	24660.029	53682.504	87295.026	100858.909	117705.488
2017	7952.563	10677.926	11760.918	20026.723	24683.574	54220.627	88163.470	100857.162	116736.245
2018	7840.100	10644.094	11678.540	20058.207	24657.669	53824.056	88356.225	100863.272	118358.524
2019	7864.147	10617.689	11687.601	19920.801	24634.613	54051.729	88724.003	100859.131	116239.649
2020	7565.710	10610.033	11585.786	19956.398	24670.493	53899.930	89596.723	100859.889	119048.539

LANDINGS (000 MT)

YEAR	AVG LANDINGS (000 MT)	STD
2010	1.956	0.000
2011	2.022	0.328
2012	2.253	0.363
2013	2.830	0.691
2014	3.671	1.101
2015	4.521	1.375
2016	5.298	1.577
2017	7.923	2.257
2018	8.119	2.235
2019	8.203	2.210
2020	8.246	2.196

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	1.956	1.956	1.956	1.956	1.956	1.956	1.956	1.956	1.956

2011	1.349	1.539	1.622	1.779	1.998	2.225	2.472	2.606	2.902
2012	1.538	1.714	1.810	1.988	2.222	2.485	2.739	2.900	3.202
2013	1.779	1.970	2.089	2.318	2.658	3.215	3.913	4.224	4.680
2014	2.019	2.301	2.465	2.792	3.431	4.391	5.255	5.738	6.752
2015	2.300	2.674	2.896	3.410	4.355	5.409	6.391	7.052	8.206
2016	2.640	3.041	3.337	4.079	5.167	6.294	7.436	8.167	9.448
2017	3.950	4.578	5.094	6.258	7.720	9.370	10.962	11.946	13.893
2018	4.065	4.804	5.330	6.482	7.911	9.546	11.132	12.109	14.059
2019	4.150	4.931	5.468	6.581	7.991	9.613	11.182	12.170	14.006
2020	4.234	5.014	5.510	6.621	8.052	9.633	11.218	12.161	14.024

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2010

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	11745.7	12281.9	12577.5	13142.3	13706.3	14358.7	14926.7	15289.2	15882.5
2	2031.9	2742.6	3114.3	3936.0	5044.6	6293.2	7891.3	8883.7	10693.5
3	2185.6	2923.1	3289.8	4147.0	5357.9	6775.6	8404.1	9304.5	11326.9
4	5409.8	6696.7	7498.8	8786.0	10668.6	12849.8	14963.3	16423.0	19862.2
5	4590.1	5360.3	5744.1	6427.1	7320.5	8309.3	9287.8	9919.2	10863.8
6+	1986.8	2320.2	2486.4	2782.0	3168.7	3596.7	4020.3	4293.6	4702.5

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2011

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7808.7	10638.7	11596.4	19935.8	24606.8	53543.0	87625.8	100857.1	116567.5
2	9589.4	10028.6	10269.5	10732.6	11193.1	11729.8	12197.8	12494.9	12980.9
3	1607.1	2169.3	2465.5	3117.9	4000.6	4979.6	6276.0	7049.8	8499.0
4	1629.2	2136.4	2437.5	3047.9	3974.4	5070.5	6354.5	6975.3	8472.9
5	3613.6	4632.5	5197.9	6154.3	7521.0	9197.5	10861.8	11951.4	14804.6
6+	4417.1	5282.3	5690.7	6449.1	7427.9	8508.6	9669.8	10307.4	11367.9

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2012

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	8054.7	10678.8	11825.5	19992.3	24672.4	53755.1	88396.0	100865.5	117940.4
2	6378.2	8689.8	9472.0	16283.8	20099.1	43734.6	71573.8	82381.3	95213.7
3	7617.4	7966.3	8157.7	8525.5	8891.3	9317.6	9689.4	9925.4	10311.5
4	1201.7	1622.2	1843.6	2331.4	2991.5	3723.6	4693.0	5271.6	6355.3
5	1162.0	1523.7	1738.4	2173.7	2834.5	3616.2	4532.0	4974.7	6042.8
6+	6809.6	7852.0	8471.0	9469.1	10741.7	12263.6	13920.3	14905.1	17061.8

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2013

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7580.8	10631.6	11699.8	20036.3	24687.4	54317.6	89302.4	100862.9	117733.7

2	6579.2	8722.6	9659.2	16330.0	20152.7	43907.8	72202.9	82388.2	96335.2
3	5066.6	6902.8	7524.2	12935.2	15965.9	34740.9	56855.2	65440.2	75633.7
4	5696.0	5956.9	6100.0	6375.1	6648.6	6967.4	7245.4	7421.9	7710.6
5	857.1	1156.9	1314.8	1662.8	2133.6	2655.6	3347.0	3759.7	4532.5
6+	6356.4	7328.6	7762.3	8643.3	9886.3	10990.3	12424.7	13267.1	14619.9

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2014

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7641.6	10635.8	11766.1	20042.4	24642.9	53562.6	88046.9	100863.5	116615.3
2	6192.1	8684.0	9556.5	16365.9	20165.0	44367.3	72943.3	82386.0	96166.3
3	5226.2	6928.8	7672.9	12971.8	16008.5	34878.5	57354.9	65445.7	76524.5
4	3788.6	5161.7	5626.3	9672.5	11938.7	25978.0	42514.3	48933.9	56556.3
5	4062.4	4248.4	4350.5	4546.7	4741.8	4969.1	5167.4	5293.2	5499.1
6+	5724.4	6489.5	6915.7	7643.7	8586.0	9634.1	10620.8	11305.9	12598.9

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2015

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7603.1	10644.9	11708.7	19914.9	24636.8	53715.0	91625.0	100869.2	117701.7
2	6241.8	8687.5	9610.7	16370.9	20128.6	43750.5	71917.8	82386.5	95252.8
3	4918.7	6898.2	7591.3	13000.4	16018.2	35243.5	57943.0	65443.9	76390.4
4	3908.0	5181.1	5737.5	9699.9	11970.6	26080.9	42888.0	48938.0	57222.4
5	2702.0	3681.3	4012.7	6898.4	8514.6	18527.4	30321.0	34899.4	40335.7
6+	7022.8	7676.9	8060.2	8702.9	9515.3	10422.9	11243.1	11838.5	12906.0

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2016

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	8032.7	10676.2	12020.7	20035.4	24671.7	54119.2	89813.4	100862.7	117915.0
2	6210.3	8694.9	9563.8	16266.8	20123.6	43875.1	74840.5	82391.2	96140.2
3	4958.2	6901.0	7634.3	13004.3	15989.3	34753.6	57128.4	65444.3	75664.8
4	3678.0	5158.2	5676.5	9721.2	11977.8	26353.9	43327.8	48936.7	57122.1
5	2787.2	3695.2	4092.0	6917.9	8537.4	18600.8	30587.5	34902.4	40810.8
6+	8186.0	9080.7	9791.0	11452.4	13230.4	20194.9	28619.0	31674.7	35865.5

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2017

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7992.1	10651.2	11715.0	20076.1	24660.0	53682.5	87295.0	100858.9	117705.5
2	6561.2	8720.4	9818.6	16365.2	20152.1	44205.2	73360.7	82385.9	96314.4
3	4933.2	6906.9	7597.1	12921.6	15985.3	34852.5	59450.1	65448.1	76369.7
4	3707.6	5160.3	5708.7	9724.2	11956.3	25987.5	42718.6	48937.0	56579.5
5	2623.2	3678.8	4048.5	6933.1	8542.5	18795.5	30901.2	34901.4	40739.2
6+	9278.1	10980.2	12102.0	14169.3	19298.9	27256.2	33957.9	37839.6	45676.6

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2018

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7952.6	10677.9	11760.9	20026.7	24683.6	54220.6	88163.5	100857.2	116736.2
2	6522.2	8692.2	9560.3	16383.6	20124.5	43809.0	71239.4	82308.6	96056.7
3	5151.8	6847.2	7709.5	12849.8	15823.3	34709.5	57602.1	64688.6	75625.2
4	3562.7	4988.0	5486.4	9331.7	11544.2	25169.6	42933.4	47265.0	55152.3
5	2507.7	3490.3	3861.2	6577.3	8087.0	17577.4	28894.0	33100.0	38269.3
6+	10043.0	12094.1	13332.4	16195.0	22336.4	29453.1	36103.2	40243.3	48178.8

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2019

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7840.1	10644.1	11678.5	20058.2	24657.7	53824.1	88356.2	100863.3	118358.5
2	6489.9	8714.0	9597.8	16343.3	20143.7	44248.2	71948.1	82307.2	95265.7
3	5121.2	6825.0	7506.7	12864.3	15801.5	34398.4	55936.5	64627.9	75422.8
4	3720.5	4944.9	5567.6	9279.8	11427.2	25066.3	41598.8	46716.5	54614.7
5	2409.7	3373.8	3710.9	6311.8	7808.3	17024.2	29039.3	31969.1	37303.9
6+	10771.2	12837.4	14184.9	17813.3	23373.8	30159.2	36878.5	40989.5	48389.0

PERCENTILES OF POPULATION NUMBERS AT AGE VECTOR (000s FISH)
IN YEAR: 2020

AGE	1%	5%	10%	25%	50%	75%	90%	95%	99%
1	7864.1	10617.7	11687.6	19920.8	24634.6	54051.7	88724.0	100859.1	116239.6
2	6398.1	8686.4	9530.6	16369.0	20122.5	43924.6	72105.5	82312.2	96589.6
3	5095.8	6842.2	7536.1	12832.6	15816.6	34743.3	56493.0	64626.8	74801.7
4	3698.4	4928.9	5421.1	9290.3	11411.5	24841.7	40396.0	46672.7	54468.5
5	2516.5	3344.6	3765.8	6276.7	7729.1	16954.4	28136.6	31598.1	36940.3
6+	11233.1	13402.9	14883.1	18547.7	23755.0	30570.4	36994.3	40905.1	48252.7

REALIZED F SERIES

YEAR	AVG F	STD
2010	0.145	0.023
2011	0.138	0.000
2012	0.138	0.000
2013	0.138	0.000
2014	0.138	0.000
2015	0.138	0.000
2016	0.138	0.000
2017	0.191	0.000
2018	0.191	0.000
2019	0.191	0.000
2020	0.191	0.000

PERCENTILES OF REALIZED F SERIES

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	0.098	0.110	0.115	0.129	0.142	0.160	0.176	0.184	0.208
2011	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
2012	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
2013	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
2014	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
2015	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
2016	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138
2017	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191
2018	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191
2019	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191
2020	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191	0.191

ANNUAL PROBABILITY FULLY-RECRUITED F EXCEEDS THRESHOLD: 0.250

YEAR	Pr(F > Threshold Value) FOR FEASIBLE SIMULATIONS
2010	0.000
2011	0.000
2012	0.000
2013	0.000
2014	0.000
2015	0.000
2016	0.000
2017	0.000
2018	0.000
2019	0.000
2020	0.000

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 AGEPRO VERSION 3.3

 PROJECTION RUN: new base, fixw8   0.75*F40 projection

 INPUT FILE: C:\DOCUMENTS AND SETTINGS\TAN\MY
DOCUMENTS\PROJECTION_FILES\POLLOCK\POLLOCK_NEW_BASE_075XF40_FW45.IN
 OUTPUT FILE: C:\DOCUMENTS AND SETTINGS\TAN\MY
DOCUMENTS\PROJECTION_FILES\POLLOCK\POLLOCK_NEW_BASE_075XF40_FW45.OUT
 NUMBER OF SIMULATIONS PER BOOTSTRAP REALIZATION:   100
 TOTAL NUMBER OF SIMULATIONS:   100000
 NUMBER OF FEASIBLE SIMULATIONS:   100000
 PROPORTION OF SIMULATIONS THAT ARE FEASIBLE:   1.00000000000000
 NUMBER OF BOOTSTRAP REALIZATIONS:   1000

 NUMBER OF RECRUITMENT MODELS:   1
 PROBABLE RECRUITMENT MODELS:   14
 RECRUITMENT MODELS BY YEAR
 YEAR    RECRUITMENT MODELS
   2010  14
   2011  14
   2012  14
   2013  14
   2014  14
   2015  14
   2016  14
   2017  14
   2018  14
   2019  14

 RECRUITMENT MODEL PROBABILITIES BY YEAR
 YEAR    MODEL PROBABILITY
   2010  1.00000000000000
   2011  1.00000000000000
   2012  1.00000000000000
   2013  1.00000000000000
   2014  1.00000000000000
   2015  1.00000000000000
   2016  1.00000000000000
   2017  1.00000000000000
   2018  1.00000000000000
   2019  1.00000000000000
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RECRUITMENT MODEL SAMPLING FREQUENCIES BY YEAR

YEAR	MODEL SAMPLING FREQUENCIES
2010	100000
2011	100000
2012	100000
2013	100000
2014	100000
2015	100000
2016	100000
2017	100000
2018	100000
2019	100000

MIXTURE OF F AND QUOTA BASED CATCHES

YEAR	F	QUOTA (THOUSAND MT)
2010		19.839
2011	0.310	
2012	0.310	
2013	0.310	
2014	0.310	
2015	0.310	
2016	0.310	
2017	0.310	
2018	0.310	
2019	0.310	

SPAWNING STOCK BIOMASS (THOUSAND MT)

YEAR	AVG SSB (000 MT)	STD
2010	196.136	28.512
2011	169.946	26.696
2012	152.900	23.146
2013	141.498	20.553
2014	134.150	18.414
2015	128.799	16.761
2016	124.742	16.085
2017	121.302	16.075
2018	118.945	16.006
2019	116.888	16.183

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	138.506	153.837	160.766	175.906	194.339	213.491	233.043	249.508	270.663
2011	116.873	130.383	136.639	150.742	168.365	185.819	205.397	220.453	241.569
2012	107.934	118.130	124.075	136.459	151.375	166.330	183.572	196.653	216.034
2013	100.551	110.121	116.143	127.272	140.068	153.637	168.831	179.465	197.064
2014	97.633	106.097	111.437	121.499	132.834	145.051	158.482	167.289	184.002
2015	95.301	103.312	108.250	117.115	127.565	139.045	151.004	158.521	173.860
2016	92.598	100.558	105.226	113.394	123.415	134.752	146.188	153.275	167.673
2017	89.603	97.442	101.847	109.860	119.890	131.321	142.678	149.957	164.289
2018	87.556	95.270	99.612	107.532	117.539	128.932	140.298	147.483	161.814
2019	85.391	92.923	97.346	105.327	115.444	127.055	138.488	145.757	160.475

ANNUAL PROBABILITY THAT SSB EXCEEDS THRESHOLD: 91.000 THOUSAND MT

YEAR	Pr(SSB >= Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	0.999
2013	0.999
2014	0.998
2015	0.997
2016	0.994
2017	0.986
2018	0.978
2019	0.965

Pr(SSB >= Threshold Value) AT LEAST ONCE:= 1.000

MEAN BIOMASS (THOUSAND MT) FOR AGES: 1 TO 9

YEAR	AVG MEAN B (000 MT)	STD
2010	196.731	29.073
2011	176.542	26.394
2012	163.598	23.258
2013	154.288	20.672
2014	147.633	18.819
2015	142.621	17.799
2016	138.785	17.612
2017	135.763	17.653
2018	133.698	17.630
2019	131.897	17.774

PERCENTILES OF MEAN STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	139.534	152.975	160.583	175.780	194.745	213.991	235.528	251.560	274.055
2011	124.655	136.663	143.733	157.934	174.763	191.904	211.355	226.063	247.848
2012	117.312	128.116	134.840	147.436	162.062	177.229	194.382	206.312	225.940
2013	113.223	122.772	128.879	140.028	152.822	166.584	181.669	191.474	210.001
2014	109.927	118.963	124.550	134.502	146.239	159.205	172.559	181.057	197.893
2015	106.731	115.674	120.930	130.072	141.278	153.768	166.248	173.980	189.572
2016	103.584	112.400	117.388	126.288	137.373	149.832	162.155	169.968	185.459
2017	100.883	109.433	114.338	123.181	134.302	146.811	159.165	167.171	182.842
2018	99.047	107.352	112.316	121.133	132.204	144.801	157.102	164.914	180.533
2019	97.031	105.359	110.246	119.293	130.369	143.088	155.595	163.428	179.061

ANNUAL PROBABILITY THAT MEAN BIOMASS EXCEEDS THRESHOLD: 0.000 THOUSAND MT

YEAR	Pr(MEAN B >= Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	1.000
2013	1.000
2014	1.000
2015	1.000
2016	1.000
2017	1.000
2018	1.000
2019	1.000

Pr(MEAN B >= Threshold Value) AT LEAST ONCE:= 1.000

F WEIGHTED BY MEAN BIOMASS FOR AGES: 1 TO 9

YEAR	AVG F_WT_B	STD
2010	0.103	0.015
2011	0.096	0.003
2012	0.095	0.003
2013	0.102	0.005
2014	0.110	0.007
2015	0.116	0.008
2016	0.118	0.008
2017	0.117	0.012
2018	0.116	0.014
2019	0.116	0.014

PERCENTILES OF F WEIGHTED BY MEAN BIOMASS FOR AGES: 1 TO 9

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	0.072	0.079	0.084	0.093	0.102	0.113	0.124	0.129	0.142
2011	0.089	0.092	0.093	0.095	0.097	0.098	0.100	0.101	0.103
2012	0.087	0.090	0.091	0.093	0.095	0.097	0.099	0.100	0.102
2013	0.090	0.094	0.096	0.099	0.102	0.105	0.108	0.109	0.113
2014	0.093	0.098	0.100	0.105	0.110	0.114	0.118	0.121	0.125
2015	0.097	0.102	0.105	0.110	0.116	0.121	0.127	0.130	0.135
2016	0.099	0.104	0.107	0.113	0.118	0.124	0.129	0.131	0.137
2017	0.093	0.099	0.103	0.109	0.116	0.125	0.133	0.139	0.150
2018	0.088	0.095	0.099	0.106	0.115	0.124	0.134	0.140	0.151
2019	0.088	0.095	0.099	0.107	0.116	0.125	0.135	0.141	0.152

ANNUAL PROBABILITY THAT F WEIGHTED BY MEAN BIOMASS EXCEEDS THRESHOLD: 0.000

YEAR	Pr(F_WT_B > Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	1.000
2013	1.000
2014	1.000
2015	1.000
2016	1.000
2017	1.000
2018	1.000
2019	1.000

TOTAL STOCK BIOMASS (THOUSAND MT)

YEAR	AVG TOTAL B (000 MT)	STD
2010	209.991	29.982
2011	185.141	28.283
2012	168.881	24.644
2013	157.601	21.731
2014	149.968	19.513
2015	144.435	18.023
2016	140.321	17.463
2017	136.870	17.482
2018	134.508	17.427
2019	132.446	17.605

PERCENTILES OF TOTAL STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	150.166	165.491	172.708	188.819	207.884	228.251	249.712	266.810	289.220
2011	129.775	142.853	149.843	164.828	183.397	201.525	222.516	239.023	261.725
2012	120.032	131.306	138.335	151.607	167.191	183.329	201.244	214.417	235.279
2013	114.392	124.496	130.810	142.538	156.124	170.397	186.355	197.070	216.018
2014	110.991	120.210	125.967	136.456	148.552	161.755	175.848	184.799	202.507
2015	108.095	117.028	122.380	131.827	143.097	155.646	168.300	176.366	192.148
2016	105.201	114.020	119.083	127.989	138.964	151.283	163.492	171.159	186.366
2017	101.982	110.762	115.638	124.437	135.456	147.823	160.121	167.839	183.411
2018	100.107	108.489	113.377	122.083	133.057	145.436	157.667	165.496	180.883
2019	97.822	106.117	111.068	119.908	130.906	143.611	155.847	163.653	179.095

ANNUAL PROBABILITY THAT TOTAL STOCK BIOMASS EXCEEDS THRESHOLD: 0.000 THOUSAND MT

YEAR	Pr(B >= Threshold Value) FOR FEASIBLE SIMULATIONS
2010	1.000
2011	1.000
2012	1.000
2013	1.000
2014	1.000
2015	1.000
2016	1.000
2017	1.000
2018	1.000
2019	1.000

Pr(B >= Threshold Value) AT LEAST ONCE:= 1.000

RECRUITMENT UNITS ARE: 1000.00000000000 FISH

YEAR CLASS	AVG RECRUITMENT	STD
2010	20858.431	10135.925
2011	20855.715	10147.301
2012	20866.268	10165.038
2013	20935.568	10182.315
2014	20857.808	10117.210
2015	20932.443	10256.242
2016	20907.712	10156.169
2017	20836.449	10188.119
2018	20848.144	10129.011

2019	20935.524	10205.664

PERCENTILES OF RECRUITMENT UNITS ARE: 1000.00000000000 FISH

YEAR CLASS	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	7383.738	8350.831	10429.448	13660.782	19253.094	24290.830	34872.183	42378.975	54795.335
2011	7385.157	8352.685	10461.037	13663.069	19246.940	24282.490	34890.231	42625.129	54628.610
2012	7388.598	8307.931	10438.468	13665.701	19244.744	24285.602	34877.937	42732.090	54779.126
2013	7385.099	8384.385	10474.506	13674.456	19266.573	24288.142	34907.252	42724.655	54861.803
2014	7388.053	8355.289	10485.872	13668.514	19255.065	24290.912	34881.028	42047.046	54817.863
2015	7387.039	8368.315	10465.166	13669.880	19251.848	24289.049	34916.834	43261.166	55000.291
2016	7391.101	8363.928	10504.687	13679.767	19256.436	24286.171	34879.578	42652.260	54746.476
2017	7383.690	8294.311	10414.599	13653.447	19228.447	24281.605	34888.183	42837.449	54813.711
2018	7386.711	8352.705	10439.475	13665.995	19249.487	24280.923	34859.308	42489.246	54733.511
2019	7390.206	8374.457	10476.713	13672.921	19264.028	24294.555	34938.992	42995.746	54832.754

LANDINGS (000 MT)

YEAR	AVG LANDINGS (000 MT)	STD
2010	19.839	0.000
2011	17.043	2.692
2012	15.553	2.299
2013	15.714	2.248
2014	16.176	2.326
2015	16.505	2.263
2016	16.379	2.288
2017	15.956	2.808
2018	15.533	3.029
2019	15.398	3.040

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	19.839	19.839	19.839	19.839	19.839	19.839	19.839	19.839	19.839
2011	11.684	12.977	13.700	15.099	16.913	18.615	20.496	21.893	24.439
2012	10.939	12.036	12.689	13.977	15.396	16.912	18.560	19.799	21.568
2013	11.085	12.333	12.904	14.148	15.558	17.033	18.716	19.703	21.576
2014	11.616	12.760	13.364	14.582	15.957	17.610	19.320	20.286	22.568
2015	12.093	13.160	13.784	14.911	16.269	17.938	19.493	20.530	22.706
2016	12.028	13.062	13.657	14.759	16.137	17.732	19.455	20.591	22.695
2017	10.983	12.072	12.740	13.966	15.551	17.498	19.809	21.334	24.019
2018	10.128	11.323	12.035	13.360	15.111	17.270	19.696	21.226	24.181
2019	9.991	11.176	11.894	13.220	14.956	17.161	19.564	21.102	24.037

REALIZED F SERIES

YEAR	AVG F	STD
2010	0.316	0.048
2011	0.310	0.000
2012	0.310	0.000
2013	0.310	0.000
2014	0.310	0.000
2015	0.310	0.000
2016	0.310	0.000
2017	0.310	0.000
2018	0.310	0.000
2019	0.310	0.000

PERCENTILES OF REALIZED F SERIES

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2010	0.216	0.241	0.258	0.283	0.310	0.346	0.380	0.397	0.439
2011	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2012	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2013	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2014	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2015	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2016	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2017	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2018	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
2019	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310

ANNUAL PROBABILITY FULLY-RECRUITED F EXCEEDS THRESHOLD: 0.410

YEAR	Pr(F > Threshold Value) FOR FEASIBLE SIMULATIONS
2010	0.037
2011	0.000
2012	0.000
2013	0.000
2014	0.000
2015	0.000
2016	0.000
2017	0.000
2018	0.000
2019	0.000

Appendix V

Summary of Past, Present, or Reasonably Foreseeable Future Actions

APPENDIX V

The actions summarized in the table below are presented in chronological order, and codes indicate whether an action relates to the past (P), present (Pr), or reasonably foreseeable future (RFF). When any of these abbreviations occur together, it indicates that some past actions are still relevant to the present and/or future. A brief explanation of the rationale for concluding what effect each action has (or will have) had on each of the VECs is provided in the table and is not repeated here.

Table I-1. Impacts of Past, Present and Reasonably Foreseeable Future Actions on the five VECs. These actions do not include those which were considered to have little impact on the fishery or actions under consideration in this frameworkt.

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS						
P Prosecution of the groundfish fisheries by foreign fleets in the area that would become the U.S. EEZ (prior to implementation of the MSA)	Foreign fishing pressure peaked in the 1960s and slowly declined until passage of the MSA in 1974 and implementation of the Multispecies FMP	**Direct High Negative** Foreign fishing depleted many groundfish stocks	**Potentially Direct High Negative** Limited information on discarding, but fishing effort was very high and there were no gear requirements to reduce bycatch	**Potentially Direct High Negative** Limited information on protected resources encounters, but fishing effort was very high	**Potentially Direct High Negative** Limited information on habitat, but fishing effort was very high	**Potentially Indirect Negative** Revenue from fishing was split between foreign and domestic communities, rather than just domestic communities
P Original FMP implemented in 1977	Established management of cod, haddock and yellowtail via catch quotas, quota allocations by vessel class and catch limits	**Direct Positive** Provided slight effort reductions and regulatory tools available to rebuild and manage stocks	**Indirect Positive** Reduced directed fishing effort on cod, haddock and yellowtail which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Indirect Positive** Increased probability of long term sustainability

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P Interim Plan (1982)	Implemented GB seasonal closed areas, minimum fish size requirements in GB and GOM and permit requirements	**Direct Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Indirect Positive** Increased probability of long term sustainability
P Multispecies Plan (1986)	Revised FMP to include pollock, redfish, winter flounder, American plaice, witch flounder, windowpane flounder and white hake. Allowed additional minimum fish size restrictions, extended GB spawning area closures and a SNE closure to protect yellowtail flounder	**Direct Positive** Reduced directed fishing effort and provided the opportunity to manage additional groundfish species	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Indirect Positive** Increased probability of long term sustainability

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[P] Amendments 1-4 to the Multispecies FMP (1987-1991)	Implemented closure in SNE/MA to protect yellowtail, extended GB RMA, added minimum mesh size requirements to SNE, excluded scallop dredge vessels from SNE closure, incorporated silver hake, red hake and ocean pout into the FMP	**Direct Positive** Reduced directed fishing effort and provided the opportunity to manage additional groundfish species	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Indirect Positive** Increased probability of long term sustainability
[P] Multispecies Emergency Action (1994)	Implemented 500-lb haddock trip limit, expanded CA II closure time and area, prohibited scallop dredge vessels from possessing haddock from Jan-Jun and prohibited pair-trawling for multispecies	**Direct Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Indirect Positive** Increased probability of long term sustainability

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr Amendment 5 to the FMP (1994)	Made the above Emergency Action measures permanent, enacted a moratorium on new participants in the fishery, reduced DAS for most vessels by 50% over a 5-7 year period, implemented mandatory reporting and observer requirements, etc.	**Direct High Positive** Reduced directed fishing effort and capped the number of participants allowed to direct on the fishery	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Mixed** Increased probability of long term sustainability by limiting the number of participants in the directed fishery. However, there was a negative impact for fishermen and communities where participation was reduced
, Pr Emergency Action (1994)	Implemented additional closed areas, prohibited scallop vessels from fishing in the closed areas, disallowed any fishery using mesh smaller than minimum mesh requirements, prohibited retaining regulated species with small mesh, etc.	**Direct High Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Mixed** Increased probability of long term sustainability but effort reductions result in short term lost revenues for fishermen and communities

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[P, Pr] Framework 9 (1985)	Made the above Emergency Action measures permanent	**Direct High Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Mixed** Increased probability of long term sustainability but effort reductions result in short term lost revenues for fishermen and communities
[P, Pr] Amendment 7 to the Multispecies FMP (1996)	Accelerated Amendment 5 DAS reduction schedule, implemented seasonal GOM closures, implemented 1,000 lb haddock trip limit, expanded the 5% bycatch rule, etc.	**Direct High Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Reduced fishing effort, thus reduced interactions with protected species	**Indirect Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Mixed** Increased probability of long term sustainability but effort reductions result in short term lost revenues for fishermen and communities

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[P, Pr] Framework 20 (1997)	Implemented GOM cod daily trip limit of 1,000 lb, increased the haddock daily trip limit to 1,000 lb and added gillnet effort-reduction measures such as net limits	**Mixed** Reduced directed fishing effort but allowed for an increase in haddock landings	**Mixed** Gillnet restrictions and reduced effort on cod helped reduce discards/bycatch but this may have been offset by increased effort on haddock	**Indirect Positive** Although the haddock daily trip limit increased, gillnet restrictions provide an overall positive impact	**Mixed** Reduced cod daily trip limit would be offset by increase haddock daily landing limit	**Mixed** Reduced revenues from a smaller cod daily trip limit could be offset by the increased haddock daily landing limit but gillnet effort reductions also have negative eco/soc impacts
[P, Pr] Framework 24 (1998)	Implemented an adjustment to GOM cod daily trip limit by requiring vessels to remain in port and run their DAS clock for a cod overage and implemented the DAS carryover provisions	**Direct Low Positive** Implemented minor effort reductions	**Indirect Low Positive** Implemented minor effort reductions which resulted in minor discard/bycatch reductions	**Indirect Low Positive** Slightly reduced fishing effort, thus reduced interactions with protected species	**Indirect Low Positive** Reduced fishing effort, thus reduced gear interactions with habitat	**Mixed** Vessels must remain in port with their clock running for a cod overage which has a negative impact but vessels may carryover DAS from one fishing year into the next.
[P, Pr] Framework 25 (1998)	Implemented GOM inshore closure areas, the year-round WGOM closure, the CLCA and reduced the GOM cod daily trip limit to 700 lb	**Direct Low Positive** Implemented effort reductions via reduced cod trip limit and closure areas	**Indirect Low Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Positive** Effort controls result in reduced interactions with protected species	**Indirect High Positive** Closure areas and effort controls reduce gear interactions with habitat	**Mixed** Increased probability of long term sustainability but short term negative eco/soc impacts

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr Framework 26 (1999)	Expansion of April GOM inshore closure area and, additional seasonal inshore GOM and GB area closures	**Direct Low Positive** Implemented effort reductions via closure areas	**Indirect Low Positive** Reduced directed fishing effort which resulted in discard bycatch reductions	**Indirect Positive** Effort controls result in reduced interactions with protected species	**Indirect High Positive** Closure areas and effort controls reduce gear interactions with habitat	**Mixed** Increased probability of long term sustainability but short term negative eco/soc impacts
P, Pr, RFF Amendment 11 (1998)	Designated EFH for all species in the multispecies FMP and required Federal agencies to consult with NMFS on actions that may adversely effect EFH	**Indirect Low Positive** A consultation with NFMS that leads to the protection of multispecies EFH is beneficial to multispecies stocks	**Indirect Low Positive** A consultation with NFMS that leads to the protection of multispecies EFH is beneficial to other stocks that share the same EFH as multispecies stocks	**Indirect Low Positive** Consultation with NFMS that leads to the protection of multispecies EFH is beneficial to protected resources that share a need for the same habitat that multispecies stocks require	**Direct High Positive** Consultation with NMFS on activities that may adversely effect habitat provides NMFS the opportunity to mitigate or even prevent EFH impacts	**Indirect Low Positive** For instances where NMFS consults on projects impacting multispecies EFH, the overall health of the stocks should improve which would lead to long term sustainability

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr Framework 27 (1999)	Established large GOM rolling closures, modified CLCA, decreased GOM daily trip limit to 200 lb with subsequent reduction to 30 lb, increased haddock trip limit to 2,000 lb and increased minimum mesh size	**Mixed** Reduced directed fishing effort while also allowing the haddock trip limit to increase	**Mixed** A reduction in directed effort helped minimize bycatch and discards but increased haddock trip limit was somewhat offsetting	**Mixed** Reduced directed effort helps minimize protected species encounters but this was somewhat offset by the increased haddock trip limit	**Indirect Positive** Reduced directed effort and closed areas help improve habitat, this may be slightly offset by the increased haddock trip limit	**Mixed** Short term negative from closed areas and the reduced cod trip limit which were not offset by the increased haddock trip limit. Long term positive because of increased probability of sustainable stocks
P Interim Rule (1999)	Revised GOM cod trip limit to 100 lb/day up to 500 lb max and revised the DAS running clock to allow a 1-day overage only	**Direct Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Low Positive** Effort controls result in reduced interactions with protected species	**Indirect Low Positive** Effort controls result in reduced habitat interactions	**Mixed** Increased probability of long term sustainability but short term negative eco/soc impacts
P, Pr, RFF Amendment 9 (1999)	Prohibited used of brush sweep trawl gear, added halibut to the FMP with a 1-fish per trip possession limit	**Direct Positive** Reduced directed fishing effort	**Indirect Positive** Reduced directed fishing effort which resulted in discard/bycatch reductions	**Indirect Low Positive** Effort controls result in reduced interactions with protected species	**Indirect High Positive** Effort controls result in reduced habitat interactions	**Mixed** Increased probability of long term sustainability but short term negative eco/soc impacts

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[P, Pr] Framework 31 (2000)	Increased GOM Daily limit to 400 lb/day up to 4,000/lb per trip, added Feb GOM inshore closure and extended 1999 Interim Rule running clock measure	**Mixed** Increased cod directed fishing effort while also reducing effort via closure area and cod running clock measure	**Mixed** Increased effort on cod could lead to greater discards/bycatch which would be somewhat offset by effort reductions via closure area and cod running clock measure	**Mixed** Increased cod effort could increase interactions but somewhat offset by effort reductions via closure area and cod running clock measure	**Indirect Low Positive** Minor positive impacts from inshore closure area	**Mixed** Short term positive from increased cod trip limit but long-term sustainability of the cod resource was effected
[P, Pr] Framework 33 (2000)	Added GB seasonal closure area, added conditional GOM closure areas and increase haddock trip limit to 3,000 lb	**Mixed** Increased haddock directed fishing effort while also reducing effort via closure areas	**Mixed** Increased effort on haddock could lead to greater discards/bycatch which would be somewhat offset by effort reductions via closure areas	**Mixed** Increased haddock effort could increase interactions but somewhat offset by effort reductions via closure areas	**Indirect Low Positive** Minor positive impacts from closure areas	**Mixed** Short term positive from increased haddock trip limit but negative impacts resulting from closure areas

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr, RFF Interim Action (Settlement Agreement; 2002)	Restricted DAS use, modified DAS clock for trip vessels, added year-round closure of CLCA, expanded rolling closures, prohibited front-loading DAS clock, increased GOM trawl and gillnet mesh size, added new limitations on Day gillnets and further restricted charter/party vessels	**Direct High Positive** Implemented substantial directed fishing reductions	**Indirect High Positive** Implemented substantial directed fishing reductions which also reduced discards/bycatch	**Indirect Positive** Fishing reductions and expanded closure areas reduce protected species interactions	**Indirect High Positive** Fishing reductions and expanded closure areas reduce negative impacts to habitat	**Mixed** Short term impacts due to restrictions were highly negative but positive regarding the long term sustainability of the fishery

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr, RFF Interim Action (Settlement Agreement Continued; 2002)	Continued above interim measures, further reduced DAS allocations, prohibited issuance of additional handgear permits, eliminated GOM Jan and Feb closures, increased SNE trawl and GB/SNE gillnet mesh sizes, further limited day and trip gillnets, added longline gear restrictions, added possession limit and restrictions on yellowtail catch and increased GOM cod daily trip limit to 500/4,000 lb max	**Direct High Positive** Implemented substantial directed fishing reductions	**Indirect High Positive** Implemented substantial directed fishing reductions which also reduced discards/bycatch	**Indirect Positive** Fishing reductions reduce protected species interactions	**Indirect Positive** Fishing reductions reduce negative impacts to habitat	**Mixed** Short term impacts due to restrictions were highly negative but improving the long term sustainability of the fishery was positive

Action	Description	Impacts on Regulated Groundfish Stocks	Impacts on Non-groundfish species	Impacts on Endangered and Other Protected Species	Impacts on Habitat – Including Non-fishing Effects	Impacts on Human Communities
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr, RFF Amendment 13 (2004)	Adopted new rebuilding periods and a new rebuilding program that included periodic adjustments and default DAS reductions to reduce effort over time, allowed DAS to be leased or transferred, created sector allocation and special access programs to allow access to stocks that can support an increase in catch	**Direct High Positive** Implemented substantial directed fishing reductions	**Mixed** Implemented substantial directed fishing reductions which also reduced discards/bycatch. However, the mores stringent restrictions created pressure to direct on other stocks (e.g., monkfish)	**Indirect Positive** Fishing reductions reduce protected species interactions	**Indirect Positive** Fishing reductions reduce negative impacts to habitat	**Mixed** Short term impacts due to restrictions were highly negative but improving the long term sustainability of the fishery was positive
P, Pr, RFF Framework 40A (2004)	Created additional SAPs to target healthy stocks	**Direct Positive** Directing effort toward healthy stocks relieved pressure on stocks of concern	**Indirect Negative** Increased bycatch of monkfish and skates	**Negligible** Although effort increased slightly, no effort shifts impacting protected species are known to have occurred	**Negligible** Although effort increased slightly, no effort shifts impacting habitat are known to have occurred	**Indirect Positive** Provided vessels the opportunity for greater revenue while relieving pressure on stocks of concern

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MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr, RFF Framework 40B (2005)	Relaxed DAS leasing and transfer requirements, created new yellowtail flounder SAP, provided greater opportunity for vessels to participate in the GB Cod Hook Sector, removed the net trip limit for gillnets, etc.	**Negligible** Mix of alternatives, some of which slightly increased effort and others that slightly decreased effort. Overall, changes did not threaten rebuilding targets established by Amendment 13	**Indirect Low Negative** Mix of alternatives that primarily had little impact on discards/bycatch with the exception of removing the net trip limit for gillnets which increased monkfish effort	**Negligible** Slight effort changes did not have measurable impacts to protected species	**Negligible** Slight effort changes did not have measurable impacts to habitat	**Indirect Low Positive** Slight changes to the leasing and transfer programs along with greater opportunities to participate in SAPs provides an opportunity for greater revenue
P, Pr, RFF Framework 41 (2005)	Allowed for participation in the Hook Gear Haddock SAP by non-Sector vessels	**Direct Low Positive** Encouraged effort on haddock, a healthy stock, and thus away from other stocks of concern	**Indirect Low Negative** Although directed effort shifted to a healthier stock, there was an overall effort increase resulting in a greater opportunity for bycatch/discards	**Negligible** Slight effort changes did not have measurable impacts to protected species	**Negligible** Slight effort changes did not have measurable impacts to habitat	**Indirect Low Positive** Greater opportunity to fish for a healthy stock provides increased revenue

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[P] Emergency Action (2006)	Implemented differential A DAS of 1.4:1, restricted the B Regular DAS program and US/CA Haddock SAP and reduced trip limits on cod, yellowtail, etc.	**Direct High Positive** Implemented effort reductions that anticipated achieving mortality reductions needed to keep stocks on track to rebuild	**Mixed** Effort reductions lead to reduced discards/bycatch but the B Regular DAS program increased monkfish and skate bycatch	**Negligible** Effort changes did not have measurable impacts to protected species	**Negligible** Effort changes did not have more than minimal impacts to habitat	**Mix** Short term effort reductions have a negative impact on revenues but increase long term sustainability of stocks
MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[P, Pr, RFF] Framework 42 (2006)	Reduced the number of A DAS available, modified differential DAS counting to 2:1 in the GOM and SNE, reduced trip limits for several stocks, increased recreations minimum fish sizes, required use of VMS by all vessels, modified the SAPs, limited the bycatch of monkfish and skates for vessels using a haddock separator trawl, etc.	**Direct High Positive** Implemented effort reductions that anticipated achieving mortality reductions needed to keep stocks on track to rebuild	**Indirect Positive** Effort reductions lead to reduced discards/bycatch and measures were implemented to control monkfish and skate bycatch	**Indirect Low Positive** Overall effort reductions have a positive impact, particularly to protected species in high use areas such as the GOM and SNE where strict differential counting rules are in effect	**Indirect Low Positive** Overall effort reductions have a positive impact	**Mixed** Effort reductions have a significant negative impact to vessel owners and communities, primarily due to loss of revenues. Over the long term however, stocks should remain sustainable

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MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
P, Pr, RFF Framework 43 (2006)	Established a haddock incidental bycatch limit in the herring fishery on GB	**Mixed** While the incidental haddock allowance allows some legal catch of haddock which has a negative impact, the area is closed after the bycatch cap is reached which prohibits further harvest (positive impact)	**Negligible** The herring fishery is fairly clean and the increased haddock bycatch problem arose from strong 2003 and 2004 year classes. Allowing legal retention of haddock bycatch should not alter fishing practices in a manner that would impact species taken as bycatch	**Negligible** Although attaining the bycatch cap could reduce effort on GB, the extent of this reduction was not expected to have an overall impact on protected species	**Negligible** Gear used to target herring have been found not to have an impact on habitat	**Mixed** Allowing herring vessels to continue fishing practices on GB has a positive impact on those vessels and communities. However, the loss of the potential haddock catch has a negative impact on fishermen targeting groundfish
P, P, RFF Amendment 16 (2010)	Modifies rebuilding mortality targets and status determination criteria, adopts ACL/AM requirements, modifies effort controls, expands sector policies, implements 17 additional sectors, modifies SAPs, changes DAS leasing and transfer programs	**Direct High Positive** Suite of measures reduces fishing mortality on groundfish stocks to continue rebuilding	**Indirect Positive** Reduced effort from common-pool and sector measures expected to reduce discards of non-target species	**Indirect Low Postive** If common pool and sector measures reduce overall groundfishfishing effort, this will likely reduce protected species impacts	**Direct Low Positive** Fishing effort reductions from common pool and sector measurres should reduce interactions with EFH	**Mixed** Combination of effort controls and sector measures likely to reduce number of vessels, crew, communities participating in fishery, but remaining participants may be more profitable

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MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[P, P, RFF] Framework 44 (2011)	Specify OFLs/ABC/ACLs for groundfish; authroized in-season adjustments for common pool vessels;adopted YTF allocations for scallop fishery	**Positive** Established catch limits consistent with mortality targets and measures to insure targets are not exceeded	**No impact/neutral**	**Mixed** YTF allocations may reduce scallop effortif they limit fishery, reduce interactions with protected species	**Negligible**	**Minor/Mixed** Revenues should increase over time but short term losses expeceted
[RFF] Framework 46	Specify OFLs/ABC/ACLs for groundfish, FY 2012 -2014	**Direct Positive** Continue stock rebuiding	**Negligible** Analysis not complete but minimal impacts expected	**Negligible** Analysis not complete but minimal impacts expected	**Negligible** Analysis not complete but minimal impacts expected	
[RFF] Framework 47	Adjust MWT haddock cap measures	**Unknown/minor** Measures not yet developed; will not increase total catch so impacts expected to be minor	**Negligble** Changes in distribution ofMWT effort possible, depending measures	**Unknown/minor** Depending on measures may shift MWT fishing effort	**Negligible**	**Minor/Mixed** Measurs may be vieweddifferently by herringand groundfish industries
[RFF] Amendment 17	Consider accumulation limits and measures to maintain fleet diversity	**Negligble** Will not change total groundfish catch	**Minor/Mixed** Will not change total catch but could conceivably divert effort into other fisheries	**Minor** May change types of fishing activity	**Minor** May change distribiution of catch by gears used in the fishery	**Mixed** While some communities may support ownership caps or other measures to maintaint fleet diversity, others my view this as an inefficient way to manage

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MULTISPECIES FISHERY-RELATED ACTIONS CONTINUED						
[RFF] Sector EAs (2011)	Sector EAs would be prepared for each sector approved under this Amendment. These documents would assess impacts from exemptions granted to individual sectors that go beyond the universal exemptions	**Negligible** Because exemptions granted to sectors must strive to have neutral impacts compared to common pool vessels, impacts would be negligible	**Negligible** Because exemptions granted to sectors must strive to have neutral impacts compared to common pool vessels, impacts would be negligible	**Negligible** Because exemptions granted to sectors must strive to have neutral impacts compared to common pool vessels, impacts would be negligible	**Negligible** Because exemptions granted to sectors must strive to have neutral impacts compared to common pool vessels, impacts would be negligible	**Low Positive** Because one of the intents of sectors is to provide participants greater freedom to maximize their operations, revenues would be expected to be slightly higher
OTHER FISHERY-RELATED ACTIONS						
[P, Pr, RFF] Atlantic Sea Scallop FMP – a series of amendment and framework actions from the mid-1990s through the present	Implementation of the Atlantic Sea Scallop FMP and continued management of the fishery, primarily through effort controls	**Direct Positive** Effort reductions taken over time have resulted in a sustainable scallop fishery	**Indirect Positive** Effort reductions taken over time also reduced bycatch, including gear modifications that improved bycatch escapement	**Mixed** Effort reductions taken over time reduced interactions with protected species however, turtle interactions remain problematic	**Indirect Positive** Effort reductions reduced gear contact with habitat and the current rotational access program focuses fishing effort on sandy substrates which are less susceptible to habitat impacts	**Indirect Positive** Initial negative impacts due to effort reductions have been supplanted by a sustainable, profitable fishery

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OTHER FISHERY-RELATED ACTIONS CONTINUED						
[P, Pr, RFF] Monkfish FMP – a series of amendment and framework actions from implementation of the FMP in 1999 through the present	Implementation of the monkfish FMP and continued management of the fishery, primarily through effort controls	**Direct Positive** Effort reductions have resulted in a fishery that is no longer overfished, nor is overfishing occurring	**Indirect Positive** Effort reductions taken over time also reduced bycatch	**Indirect Positive** Reducing effort reduced opportunities for interactions with protected species	**Indirect Positive** Reducing effort reduced opportunities for habitat interactions	**Indirect Positive** Reducing effort has created a sustainable fishery
[Pr, RFF] Large Whale Take Reduction Plan Amendment (2008)	Removed the DAM program, will implement sinking ground lines for lobster gear, includes more trap/pot and gillnet fisheries under the protection plan and requires additional markings on gear to improve information regarding where and how entanglements occur	**Negligible** Changes implemented through the amendment are not expected to have substantial changes on groundfish	**Negligible** Changes implemented through the amendment are not expected to have substantial changes on non-groundfish species	**Direct Positive** New regulations implemented to protect large whales are expected to have a positive impact on large whales by reducing incidental takes	**Negligible** Changes implemented through the amendment are not expected to have substantial changes to habitat	**Indirect Negative** Changes implemented through the amendment require some gear changes for gillnet fisheries which have minor negative economic impacts

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OTHER FISHERY-RELATED ACTIONS CONTINUED						
RFF Harbor Porpoise Take Reduction Plan Amendment (~2010)	Options are currently under development to reduce takes of harbor porpoise toward the long-term zero mortality rate goal	**Unknown** If current measures such as closure areas and the use of pingers are expanded upon or modified, it could impact groundfish	**Unknown** If current measures such as closure areas and the use of pingers are expanded upon or modified, it could impact non-groundfish species	**Direct Positive** Changes to protect harbor porpoise have a positive impact on protected species	**Unknown** If current measures such as closure areas and the use of pingers are expanded upon or modified, it could impact habitat	**Unknown** If current measures such as closure areas and the use of pingers are expanded upon or modified, it could impact human communities
RFF Essential Fish Habitat Omnibus Amendment (~2010/2011)	This amendment would revised EFH designations for all New England fisheries, possibly establish new HAPCs and consider measures to further protect critical habitat	**Unknown** If new measures are implemented to protect habitat, they would likely have a positive impact on groundfish	**Unknown** If new measures are implemented to protect habitat, they could have a positive impact non-groundfish species	**Unknown** If new measures are implemented to protect habitat, they could potentially impact protected species	**Direct Positive** New measures implemented to protect habitat would have a positive impact on habitat	**Unknown** If new measures are implemented to protect habitat, they would likely impact human communities
P, Pr RFF Amendment 3 to the Skate FMP (2010)	This amendment addresses rebuilding of winter and thorny skates and reduce mortality on little and smooth skates; reduces trip limits, adopts ACLs and AMs	**Minor Negative** Lower skate possession limits and closures may cause vessels to use DAS for groundfish	**Mixed** Actions taken to reduce skate mortality; they could leadto increased targeting of non-groundfish species	**Unknown** If actions are taken to reduce skate mortality, they could impact protected species	**Unknown** If actions are taken to reduce skate mortality, they could impact habitat	**Minor negative** Actions taken to reduce skate mortality negatively impact human communities

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NON FISHERY-RELATED ACTIONS						
P, Pr, RFFA Agriculture runoff	Nutrients applied to agriculture land are introduced into aquatic systems	**Indirect Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Reduced habitat quality in the immediate project area	**Direct Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Reduced habitat quality negatively affects resource viability and can lead to reduced income from fishery resources
P, Pr, RFFA Port maintenance	Dredging of wetlands, coastal, port and harbor areas for port maintenance	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Indirect Negative** Reduced habitat quality negatively affects resource viability in the immediate project area
P, Pr, RFFA Offshore disposal of dredged materials	Disposal of dredged materials	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Direct Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Indirect Negative** Reduced habitat quality negatively affects resource viability in the immediate project area

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NON FISHERY-RELATED ACTIONS CONTINUED						
P, Pr, RFFA Beach nourishment	Offshore mining of sand for beaches	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Direct Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Mixed** Positive for mining companies, possibly negative for fisheries
	Placement of sand to nourish beach shorelines	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Direct Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Positive** Improves beaches and can help protect homes along the shore line
P, Pr, RFFA Marine transportation	Expansion of port facilities, vessel operations and recreational marinas	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Direct Negative** Reduced habitat quality in the immediate project area	**Indirect Negative** Localized decreases in habitat quality in the immediate project area	**Mixed** Positive for some interests, potential displacement for others
P, Pr, RFFA Installation of pipelines, utility lines and cables	Transportation of oil, gas and energy through pipelines, utility lines and cables	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Potentially Direct Negative** Initially reduced habitat quality in the immediate project area	**Mixed** End users benefit from improved pipelines, cables, etc., but reduced habitat quality may impact fisheries and revenues

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NON FISHERY-RELATED ACTIONS CONTINUED						
Pr, RFFA Liquefied Natural Gas (LNG) terminals (w/in 5 years)	Transportation of natural gas via tanker to terminals located offshore and onshore (Several LNG terminals are proposed, including ME, MA, NY, NJ and MD)	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Potentially Direct Negative** Localized decreases in habitat quality possible in the immediate project area	**Mixed** End users benefit from a steady supply of natural gas but reduced habitat quality may impact fisheries and revenues
RFFA Offshore Wind Energy Facilities (w/in 5 years)	Construction of wind turbines to harness electrical power (Several facilities proposed from ME through NC, including off the coast of MA)	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Indirect Negative** Initially localized decreases in habitat quality in the immediate project area	**Potentially Direct Negative** Localized decreases in habitat quality possible in the immediate project area	**Potentially Direct Negative** Localized decreases in habitat quality possible in the immediate project area	**Mixed** End users benefit from a clean energy production but reduced habitat quality may impact fisheries and revenues