ADDENDUM TO DRAFT FRAMEWORK ADJUSTMENT 53

7.0 Environmental Consequences – Analysis of Impacts

7.4 Economic Impacts

Introduction

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

The National Marine Fisheries Service (NMFS) provides a series of guidelines to be used when performing economic reviews of regulatory actions. The key dimensions for this analysis are expected changes in net benefits to fishery stakeholders, the distribution of benefits and costs within the industry, and changes in income and employment (NMFS 2007). Where possible, cumulative effects of regulation will be identified and discussed. Other social concerns are discussed in Section 7.5. The economic impacts presented here consist of both qualitative and quantitative analyses dependent on available data, resources, and the measurability of predicted outcomes. It is assumed throughout this analysis that changes in revenues will have downstream impacts on income levels and employment, however, these are only mentioned if directly quantifiable.

Alternatives addressing Annual Catch Limits, GOM Cod Spawning Area Closures, and Prohibition on the Possession of GOM cod and their sub-options are inter-related and, other than the No Action options, the impacts of each must be analyzed together. There are seven possible combinations: 1) No Action ACLs, 2) Modified (FW53) ACLs with no closures and existing GOM cod retention requirements, 3) FW53 ACLs with spawning closures Option A and existing GOM cod retention requirements, 4) FW53 ACLs with spawning closures Option B and existing GOM cod retention requirements, 5) FW53 ACLs with no closures and zero retention of GOM cod, 6) FW53 ACLs with spawning closures Option A and zero retention of GOM cod, 7) FW53 ACLs with spawning closures Option B and zero retention of GOM cod. The impacts of these combinations are addressed using the following methods.

Impacts to the sector component of the groundfish fishery

Methods

The Quota Change Model (QCM) is used to analyze the impacts of each combination of measures on the Sector portion of the groundfish fishery, which comprises over 98% of the groundfish landings and revenues. The QCM is a Monte Carlo simulation model that selects from existing records the most likely trips to take place under new regulatory conditions. To do this a large pool of actual trips is created from a reference data set. The composition of this pool is conditioned on each trip's utilization of allocated ACE, under the assumption that the most likely trips to take place in the FY being analyzed are those fishing efficiently under the new regulatory requirements. The more efficiently a trip used its ACE, the more likely that trip is to be drawn into the sample pool. ACE efficiency is determined by the ratio of ACE expended to net revenues on a trip, iterated over each of the 17 allocated stocks. Net revenues are calculated as gross revenues minus trip costs minus quota opportunity costs, where trip costs are based on observer data and quota opportunity costs are estimated from an inter-sector lease value model, based here on FY 2013 (details on the methods can be found in Murphy et al. 2013). After

the sample pool has been constructed, trips are pulled from the pool at random, summing the ACE expended for the 17 allocated stocks as each trip is drawn. When one stock's ACE reaches the Sector sub-ACL limit, no further trips from that broad stock area are selected. The model continues selecting trips until Sector sub-ACLs are achieved in all three broad stock areas or, alternatively, if sub-ACLs are reached for one of the unit stocks the trip selection process ends for all broad stock areas at once. This selection process forms a "synthetic fishing year" and a number of years are drawn to form a model. Median values and confidence intervals for all draws in a model are reported.

By running simulations based on actual fishing trips, the model implicitly assumes that:

- stock conditions, fishing practices and harvest technologies existing during the data period are representative;
- trips are repeatable;
- demand for groundfish is constant, noting that fish prices do vary between the reference population and the sample population but this variability is consistent with the underlying price/quantity relationship observed during the reference period;
- quota opportunity costs and operating costs are both constant; and,
- ACE flows seamlessly from lesser to lessee such that fishery-wide caps can be met without leaving ACE for constraining stocks stranded.

These assumptions will surely not hold—fishermen will continue to develop their technology and fishing practices to increase their efficiency, market conditions will induce additional behavior changes, and fishery stock conditions are highly dynamic. Fuel and other operating costs may change due to larger economic shifts or shoreside industry consolidation. Demand for quota lease may drop as a result of time/area closures and/or zero retention policies, but the substantial decline in GOM cod quota supply will likely outweigh the impact of these forces and, at least, GOM cod lease values will almost certainly rise.

The net effect of the constraints placed by these assumptions is unclear. The selection algorithm draws only efficient trips—fishermen making relatively inefficient trips will bias the model results high. Fishermen, however, are for the most part quite good at their job and, through a combination of technological improvement (gear rigging, equipment upgrades, etc.) or behavioral modifications, are likely to improve on their ability to avoid constraining stocks This will bias the model results low.

Additionally, the model will in general under-predict true landings and/or revenues if stock conditions for non-constraining stocks improve, if demand for groundfish rises, or if fishing practices change and fishermen become still more efficient at maximizing the value of their ACE. Conversely, the model will over-predict true landings and/or revenues if stock conditions of non-constraining stocks decline, markets deteriorate or fishing costs increase. Importantly, the model will over-predict landings if stock conditions for constraining stocks improve substantially and/or fishermen are unable to avoid the stock--in this circumstance, better than expected stock conditions will lead to worse than anticipated fishery performance. The opposite is also true—if a stock predicted to be constraining to the fishery becomes easier to avoid due to technological or behavioral improvements in targeting, or due to declining stock conditions, the model will under-predict revenues.

The model is intended to capture fishery-wide behavioral changes with respect to groundfish sub-ACL changes and it is catch of groundfish that is maximized by the constrained optimization algorithm. Catch of non-groundfish stocks on groundfish trips are captured in the model but not explicitly modeled, such that constraints on other fisheries are not incorporated.

To model the impacts of the proposed measures, several changes to standard QCM methods were made. Time/area closures were accommodated by removing from the sample pool of available trips all trips that occurred inside closure areas during closed months. Zero retention is modeled by converting all kept cod to discards, and the associated revenues are deducted from each trip's revenue. This changes the relative efficiency of trips, and the consequent probability that a trip will be drawn into a synthetic fishing year during model runs.

In this respect the behavioral changes associated with both time/area closures (i.e. the need to fish in other areas or other times) and zero retention (i.e. the reduced incentive to fish in areas of the Gulf of Maine where cod are likely to be present in significant abundance) are directly incorporated in the model results.

That said, the true impacts of zero retention policies are difficult to model. Such policies in a fishery with less than 100% catch monitoring incentivize fishing significantly differently when an observer is present. The incentive is even stronger when, as in this case, the stock is allocated and discards are the likely constraint on fishing in the broad stock area.

If observed GOM cod discard rates can be brought below the rate that would be profitable when all trips are observed, nominal GOM cod catch is reduced by that amount and, assuming GOM cod is constraining, additional fishing can then take place. Further, and more insidious, unobserved trips are free to fish as profitably as possible with no additional GOM cod ACE constraint. The net effect is both substantially higher aggregate fishery revenues, and the potential for substantial unaccounted for fishing mortality. This situation is addressed in slightly more detail in the *Discussion* section.

A last modification of the model was made to increase the likelihood, however slightly, that inefficient trips may happen. Between 1-2% of trips drawn into this version of the model would, under previous versions of the QCM, not have been drawn. This accommodation is made in deference to the possibility that an unknown number of trips may encounter unforeseen and unplanned levels of constraining stocks, primarily GOM cod. The inclusion of this modification decreases predicted aggregate fishery revenues, but this decrease is deemed appropriate given the very low allocation of GOM cod.

Groundfish vessels on groundfish trips form the unit of measurement for this analysis and gross revenues from groundfish trips and from groundfish species alone are reported metrics. Many groundfish fishermen are involved in other fisheries in addition to groundfish fishing and groundfish trip revenues may represent anywhere from 100% to a small fraction of the total revenues of individual fishing business impacted by these regulations.

The QCM is a prediction model and understanding how well it predicts may be of interest. The model was developed during FY2011 to make predictions for FW48 (FY 2012) and has been used in analyzing the impacts of all subsequent groundfish management actions that included ACL changes for the groundfish fishery. Table 1, below, summarizes its performance over the past few years.

We can glean some lessons from this table. First, model results are highly sensitive to stock conditions. For example, the model over-predicted FY 2011 by about 20% and this was almost exclusively attributed to GB haddock catch rates being higher in the reference year (FY10) than the prediction year (FY11). Back out GB haddock, and gross revenues for groundfish are over-predicted by only about 5%.

The longer the lag between the reference year and the prediction year, the more likely stock conditions are to diverge, compromising prediction accuracy. In FY 2012 and 2013 the model handled quota reductions well, over-predicting slightly in 2012 and under-predicting slightly in 2013. Stock conditions for non-constraining stocks appear to be improving for FY 2014, as both the original FW51 and subsequent models using FY 2013 input data both appear to be biased low relative to an FY14 linear catch trajectory, although given interim management measures the linear projection certainly over-estimates FY14 revenues. Nonetheless, revenues for FY 2014 will likely be higher than FY 13, and higher than those previously predicted. This is primarily driven by improved stock and fishery conditions for offshore stocks such as GB haddock and redfish.

Cost predictions are less straightforward. The QCM demonstrates a persistent low bias when predicting operations costs—those associated with making a fishing trip, such as fuel, ice and food. This is a result of the model optimizing the trips taking place in the prediction year. What we see in reality is that the model predicts total catches and revenues somewhat accurately, but arrives at these totals from a substantially lower number of trips than, in reality, it takes to obtain those catches—the model predicts on the order of 30% fewer trips than are realized. The low cost prediction bias will likely be consistent across time and year-on-year trends may prove meaningful (or, of course, they may not, and only time will tell). Between FY12 and FY13 the model predicted a six percentage point increase in operational profit (gross revenues as a percent of variable costs). This six percentage point increase emerged from the realized data as well. One year does not a trend make, but the model

predicts a substantial decrease in operational profit between FY13-14. Such a decrease would be consistent with longer steaming times for inshore vessels due to interim 2014 measures, but may be somewhat mitigated by increased fishing opportunities offshore for larger vessels. These trips will have lower quota opportunity costs (the cost of using a pound of ACE, whether leased in or not leased out) as stocks like GB haddock and redfish have low ACE lease values.

Data

Data Management and Imputation System (DMIS) data are used throughout. DMIS derives sub-trip/stock level landings and discards from Vessel, Dealer and Observer reports as well as the Sector and Permit databases maintained by NMFS GARFO and NEFSC.

General Overall Results (more specific impacts related to each alternative are discussed within each alternative)

The No Action sub-ACL option specifies no sub-ACL for pollock. Under this scenario, vessels enrolled in sectors would not be permitted to fish for groundfish. Similarly, the common pool would not be able to operate and there would be no directed groundfish fishery. As this option is inconsistent with several Magnusson-Stevens Act (MSA) provisions, a more likely outcome would be additional interim measures proposed by the Greater Atlantic Regional Office (GARFO). This option is unlikely and was not given additional consideration. For the six remaining proposed measures permutations, gross revenues on groundfish trips are predicted to decline by roughly 5-10% from an FY14 baseline of $81 million (Table 2). Gross revenues are predicted to be about $1.5mil higher under closure Option A than the FW 53 ACL option alone. Closure option B is predicted to realize about $500k less in gross revenues than option A. Zero retention options have non-linear impacts across the closure options but produce uniformly higher aggregate gross revenues than non-zero retention options. Under the FW 53 ACLs with no additional closures, the predicted aggregate gross revenues under zero retention alone are on the order of $2.5mil higher than without zero retention. Closure A with zero retention is predicted to see slightly higher revenues than zero retention without the closures. Closure B, however, is predicted to realize nearly $1mil more in aggregate benefits relative to Closure A option.

In FY14 under the interim measures, American plaice and witch flounder are predicted to be the most constraining stocks, with pollock contributing more revenues than any other stock (note that mid-FY14 projections indicate that GB haddock and not pollock will likely be the highest-grossing stock in the groundfish complex) (
Table 4-Table 9). Under all six FW 53 permutations, constraining stocks are predicted to be GB winter flounder, Southern New England (SNE) yellowtail flounder and GOM cod. Under the Closure options (both for zero and full GOM cod retention) catch of redfish, plaice, witch flounder and white hake are higher than under options with no additional closures.

Losses relative to the FY14 baseline are not distributed evenly across the fleet (Table 10,
Table 11). Gloucester and other coastal Massachusetts towns on the North and South shore of Boston, all ports in New Hampshire and the ports of Southern Maine are predicted to see disproportionate declines on the order of 20-55% from the FY14 baseline. Boston, MA and Portland, ME are predicted to experience smaller declines of 5-15%, while ports farther south such as New Bedford, MA and Point Judith, RI may actually see additional revenues under all proposed scenarios due either to additional fishing opportunities or vessels relocating to these ports in search of profits.

Similar to the port-level impacts, these measures are predicted to disproportionately affect smaller vessels (Table 12, Table 13). Vessels in the 30'-50' size class are predicted to see 30-60% declines in gross revenues fleet-wide, while vessels in the 50'-75' size class are predicted to see a more modest 10-15% reduction. Vessels 75' and larger are predicted to see very slight gains, particularly under options with additional GOM cod spawning closures.

Discussion

This modeling points to two conclusions, one relatively obvious and the other perhaps counter-intuitive. The former is the relative magnitude of the predicted impacts on small inshore GOM vessels. Economic impact statements have for years been predicting significant losses for this component of the fleet, and it has surely been disproportionately affected as the groundfish fishery saw gross revenues decline from $120mil FY 2011 to $79mil in FY 2013. But the additional declines forecasted here will present serious and perhaps unprecedented difficulties for these vessels, owners and crew. Ports may see 50-80% declines in revenues from groundfish, and many vessels will either be forced to relocate or stop fishing altogether. It seems possible that some ports from Cape Cod to southern Maine that have been active in the groundfish fishery may have no groundfish landings whatsoever in FY15, regardless of the measures ultimately selected. The impacts on shoreside businesses in ports throughout the inshore GOM are difficult to predict, but infrastructure and facilities supporting fishing operations may be forced to consolidate, but may disappear altogether. Relocation of vessels to southern New England ports is likely. The impact of relocation on fishing families is an important issue that is difficult to quantify. As Table 13 shows, the adoption of either Closure A or B may make fishing from inshore GOM ports unsustainable for vessels that do not have the range to fish in profitable areas during times of inshore spawning closures.

The second, somewhat counter-intuitive conclusion is that the opportunity cost of quota may not be reflected in the ACE leasing markets currently. The analysis shows a consistent trend where closure areas lead to an *increase* in revenues relative to the FW53 sub-ACLs with no additional closures. The reason for this may be that quota, and GOM cod quota in particular, may not be flowing to those who may most profitably utilize it. Table 14 and Figure 1 both demonstrate that larger vessels are able to generate much more revenue per pound of GOM cod ACE than smaller vessels—sometimes many multiples more. When GOM cod is a constraining stock, as it was in FY2013, this should imply that vessels could still profitably afford to spend much more on GOM cod ACE lease, though this has not been evident in the ACE leasing market (Murphy *et al* 2012). The wonder is not that GOM cod ACE leases have, historically, been so high, but rather, for FY13, how lease values remained so low in the face of constraints. The interim measures adopted mid-way through the 2014 fishing year will likely mean that GOM cod is not constraining for vessels fishing in this stock area (modeling predicts plaice and witch flounder will constrain the fishery first) and so GOM cod ACE lease values will likely remain at the low end of their historical range, but FY15 may be the year that GOM cod ACE lease prices rise substantially above the ex-vessel price for cod.

This goes a long way toward explaining why the fishery may generate more revenues under the closure scenarios than under the sub-ACL options with no closures. Further, Figure 2 shows that vessels fishing farther east are able and may be willing to pay much more than vessels fishing west of, say, 70 deg west longitude—when GOM cod ACE is highly constraining, only vessels able to use it efficiently will be fishing it. The fact that the sub-ACL options with no closures are predicted to have lower gross revenues (in aggregate) than the closure options points to a situation where inshore GOM vessels are not being offered sufficiently high ACE lease prices or, alternatively, have been (and modeling indicates will continue to be) unwilling to accept such lease arrangements. There are many reasons this may be so, the most relevant being that fisherman may simply want to fish, and prioritize their profession over higher profits.

The shift toward fishing eastward and by larger vessels under all scenarios considered in FW 53 is shown in Table 15. With cod being constraining in the GOM, the closure options effectively force vessels that would otherwise chose to fish, to no longer fish. The model assumes that their quota will flow to those (larger) vessels that can use it. Whether this proves to be the case, or not, will remain to be seen.

Zero retention options are predicted to see higher gross revenues than their full retention analogs because the assumed discard rate for trawl and gillnet vessels (75 and 80% respectively) allows captains to land 20-25% more groundfish per unit of GOM cod ACE when that ACE is discarded than they can when the ACE is landed catch. Table 15 indicates that vessels may make $40 or more per pound of GOM cod ACE in FY15—even when backing out the lost revenue from cod (say, $3/lbs) the ability to leverage 25% more revenue may mean an extra $10 or more per pound of ACE from discards than landed catch.

The analysis of zero retention options presented here will underestimate realized revenues for all size classes and GOM ports, because these models assume that cod caught and discarded will be accounted for. This is not a realistic assumption. Because GOM cod is the primary constraint on fishing in the GOM, vessels will fish under two very different sets of incentives depending on whether or not a trip is observed. If a trip is observed, the primary incentive for captains will be to minimize cod as a percent of total catch. This incentive will be strong, as there is an inverse and nearly linear relationship between a Sector's discard rate for GOM cod and the number of trips that Sector's vessels will be able to make before being closed out of the broad stock area. The variance of cod caught on a trip is high, and it is possible (even likely) that captains will be able to achieve quite low discard rates on observed trips.

Unobserved trips have no such incentive. Rather, these trips will maximize revenue on all species irrespective of GOM cod catch. If Table 14 indicates that vessels can make $10-20 or more per pound of cod caught, even backing out the $2-3 of revenue forgone to discarding marketable cod demonstrates the potential for substantial revenue increases through unaccounted cod discarding.

The net effect will be twofold:

- true discards are likely to be many multiples of imputed discards, rendering—through absolutely no fault of the fishing industry—the catch data an incomplete picture of true fishing mortality; and
- gross revenues will be substantially higher than predicted for all aspects of the GOM fishery, as the nominal cod constraint is essentially relaxed through a combination of observer effects and mandated regulatory discards on unobserved trips.

Again, there is no regulatory or compliance aspect to this situation—captains are not required to "act the same on observed and unobserved trips" as, for one thing, that sentence has no practical meaning, and fishing profitably is precisely what fisherman are expected to do.

Finally, while the models run for these analyses include a higher probability of "ACE inefficient" trips occurring in the prediction scenarios than previous year's models, the extremely low GOM cod sub-ACL carries a very real risk that a small number of trips, particularly observed trips, that encounter unexpected quantities of GOM cod will endanger fishing operations for entire Sectors. Figure 3 shows the approximate Sector-level allocations of GOM cod. Inter-sector leases of GOM cod likely to be both low in volume and high in price. This analysis has attempted to incorporate the impact of sub-optimal trips, but if more such trips than predicted do occur gross revenues for affected sectors, and the entire fishery, may be substantially lower. Table 14 may provide evidence of a second problem—higher than expected GOM cod catch rates. The decrease in revenues per GOM cod ACE from 2012 to 2013 is especially worrying in light of the fact that GOM cod was a constraining stock in FY13. If cod become difficult for fisherman to avoid, these models will surely over-state aggregate revenues and under-state predicted losses for affected vessels, ports and communities.

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

7.4.1.1 Revised Status Determination Criteria

7.4.1.1.1 Option 1: No Action

Under Option 1, the existing status determination criteria (Tables 1 and 2 from section 4.1.1.1) for GOM cod, GOM haddock, GOM winter flounder, GB yellowtail flounder, GB winter flounder, and pollock would persist. This is not expected to have any immediate economic impacts since it does not alter the current methodology used for setting the acceptable biological catch (ABC) for each species. Long term impacts of Option 1 would be that biomass targets will be based on outdated information. This does not constitute the use of best scientific information as stipulated by the Magnuson Stevens Act (Magnuson-Stevens 101-627, 104-297), and it is probable that ignoring the new SDCs determined by the latest stock assessments will result in overfishing. Over time using the existing SDCs would likely cause a decline in groundfish stocks, which would have a negative economic impact to fishermen through reduced catchability and lower annual catch limits (ACLs).

7.4.1.1.2 Option 2: Revised Status Determination Criteria

Option 2 adopts, for the FMP, the SDC for GB yellowtail flounder based on the 2014 TRAC assessment (Table 3, section 4.1.1.2). Furthermore, Option 2 would update the numerical assessments for GOM cod, GOM winter flounder, GB winter flounder, and pollock, as well as a benchmark assessment for GOM haddock (table 4, section 4.1.1.2). This would result in a lower MSY for each stock, and consequently, lower ACLs. In the short term, the lower ACLs for these species may result in fishermen experiencing lower net revenues as a result of anticipated catch reductions. Option 2 is expected to have positive long-term stock benefits through the prevention of overfishing, which would translate into higher and more sustainable future landings than expected under the No Action alternative.

7.4.1.2 Annual Catch Limits

7.4.1.2.1 Option 1: No Action

By selecting Option 1, ACLs will be based on FW51 specifications for the years 2015-2016, which have missing values for many species (**Error! Reference source not found.**, section 4.1.2.1). Specifically, GOM winter flounder, GB winter flounder, GB yellowtail flounder, and pollock would have no ACLs set and fishing would not be permitted for these species, nor would fishing be allowed in these species' broad stock areas. Additionally, there would be no quotas for FY15 for the transboundary Georges Bank stocks (GB cod, GB haddock, GB yellowtail flounder).

Economic impacts on the multispecies fishery

The No Action sub-ACL option specifies no sub-ACL for pollock. Under this scenario, vessels enrolled in sectors would not be permitted to fish for groundfish. Similarly, the common pool would not be able to operate and there would be no directed groundfish fishery.

Economic impacts on the recreational groundfish fishery

Recreational fishermen target GOM haddock, GOM cod, pollock, and GOM winter flounder. Given that the No Action sub-ACL option specifies no sub-ACL for pollock there would be negligible economic

impacts to the recreational groundfish fishery, because the recreational fishery does not have a sub-ACL and is accounted for in the other sub-component and state waters catch.

Economic impacts on the scallop fishery

The precise impacts of the No Action option on the scallop fishery are unclear. This option does not identify scallop fishery sub-ACLs for GB yellowtail flounder. While this would not prevent the scallop fishery from fishing in FY 2015, it is not clear if the absence of a sub-ACL would be treated as if the sub-ACL was zero. If this would be the case, then any catches of these stocks would lead to scallop fishery AMs being triggered in FY 2016 and/or later years. As a result, this option would result in large reductions in scallop fishery revenues when compared to Option 2. But if this is not the case and the scallop fishery catches of these stocks do not trigger AMs, then this option might allow for greater scallop fishery revenues than would be the case if AMs are triggered using the ACLs of Option 2.

Economic impacts on the Atlantic herring fishery

The Atlantic herring fishery has sub-ACLs for GOM and GB haddock. If the sub-ACLs are exceeded, AMs would be triggered for the Atlantic herring fishery. Both sub-ACLs are being revised by this action. *An analysis of the expected impacts will be provided in the final submission of FW 53.*

7.4.1.2.2 Option 2: Revised Annual Catch Limit Specifications

Under Option 2, the annual specifications for FY 2015 - FY 2017 for pollock, GOM winter flounder, GB winter flounder, GOM haddock, and GOM cod would be as specified in **Error! Reference source not found.**, section 4.1.2.2.

Economic impacts on the Sector-based commercial fishery

Under Option 2 (assuming no other closures are adopted in other alternatives and zero retention is not adopted), gross groundfish revenues for FY15 are predicted to be just over $58 million and all gross revenues on groundfish trips are predicted to be just over $75 million (Table 2). This represents approximately a 10% reduction in gross groundfish revenues and a 7% reduction in gross revenues on groundfish trips relative to those predicted in FY14 (Table 2). Final predicted revenues depend upon the combination of options selected in other alternatives. For the six remaining proposed measures permutations, gross revenues on groundfish trips are predicted to decline by roughly 5-10% from an FY14 baseline of $81 million (Table 2). On a home-port state level, New Hampshire is expected to have the largest percentage decline (42%) in gross revenues from groundfish relative to FY14 although this decline increases up to 50% depending upon other measures selected in this action (Table 11). New York and Rhode Island are expected to be positively impacted by these ACLs, with a 33% and 29% predicted increase in gross groundfish revenues relative to FY14. Depending on other measures selected, these increases could be as low as 11% for New York and 19% for Rhode Island (Table 11). For major home-ports, Gloucester, MA is expected to have the largest percentage decline (27%) in gross revenue and New Bedford, MA is expected to be the least affected with a 6% increase in gross groundfish revenues predicted (**Error! Reference source not found.**11).

The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the 30-50 foot category experiencing the largest drop in gross revenue compared to FY14, with a predicted 33% reduction resulting from just the changes in ACL, this increases up to a possible 56% reduction depending upon the other alternatives selected (Table 13). Larger vessel classes

are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft) predicted to see a 3% decline in gross revenues, although under some scenarios this may be a 3% increase (Table 13). This result is not surprising, as small vessels have less scalability in terms of landings and have a smaller geographic range.

In FY14 under the interim measures, American plaice and witch flounder are predicted to be the most constraining stocks, with pollock contributing more revenues than any other stock (note that mid-FY14 projections indicate that GB haddock and not pollock will likely be the highest-grossing stock in the groundfish complex) (
Table 4-Table 9). Under all six FW 53 permutations, constraining stocks are predicted to be GB winter flounder, Southern New England (SNE) yellowtail flounder and GOM cod. Under the Closure options (both for zero and full GOM cod retention) catch of redfish, plaice, witch flounder and white hake are higher than under options with no additional closures.

Because there would be no directed groundfish fishery under the No Action Alternative, the economic impacts of Option 2 are positive compared to No Action. The magnitude of difference depends upon the combination of sub-options selected regarding GOM Cod Spawning Area Closures, and Prohibition on the Possession of GOM cod.

Economic impacts on the Common Pool fishery

As with sectors, Option 2 could result in declines in catch for the common pool fishery, which would have negative economic impacts for this component of the fishery. However, because there would be no directed groundfish fishery under the No Action Alternative, the economic impacts of Option 2 are positive compared to No Action.

7.4.1.3 SNE/MA (southern) Windowpane Flounder Sub-ACLs for Groundfish Sectors and the Common Pool

7.4.1.3.1 Option 1: No Action

XXX

7.4.1.3.2 Option 2: **[Placeholder]** Create SNE/MA Windowpane Flounder sub-ACLs for Groundfish Sectors and the common pool

XXX

7.4.1.4 GOM/GB (northern) Windowpane Flounder Sub-ACLs for Groundfish Sectors and the Common Pool

7.4.1.4.1 Option 1: No Action

XXX

7.4.1.4.2 Option 2: **[Placeholder]** Create GOM/GB Windowpane Flounder sub-ACLs for Groundfish Sectors and the common pool

XXX

7.4.1.5 GOM/GB Windowpane Flounder Scallop Fishery Sub-ACL

7.4.1.5.1 Option 1: No Action

If the No Action alternative is chosen there would not be a new sub-ACLs created in the scallop fishery for GOM/GB windowpane flounder. Since this option maintains the status quo, it would not have any new economic impacts for the scallop fishery. The scallop fishery would be less likely to have restrictions as a result of GOM/GB windowpane flounder overages when compared to Option 2. The No Action alternative may result in a greater risk of the groundfish fishery facing AMs and economic loses relative to Option 2.

7.4.1.5.2 Option 2: Create a Scallop Fishery GOM/GB Windowpane Flounder Sub-ACL

If this option is adopted, a sub-ACL of GOM/GB windowpane flounder would be allocated to the scallop fishery. If the sub-ACL were to be based on recent catches of GOM/GB windowpane flounder in the scallop fishery, the scallop fishery would receive 2-14% of the ACL (Table 5).

This would reduce allocation uncertainty for the scallop fishery, allowing for better decision making, however it would also scallop fisheries to an AM in the event of overages. The magnitude of these impacts would ultimately depend on the yearly sub-ACLs, probability of overages, and specifics of the currently undefined scallop AM for GOM/GB windowpane flounder.

The multispecies fishery may experience a slight positive economic impact through a reduction in the risk of overages from the other sub-components segment of the fishery and the associated cost of the multispecies AM. Since the scallop sub-ACL would be subtracted from the other sub-components allocation, it does not represent any transfer of wealth from the multispecies fishery to the small-mesh fishery.

By distributing accountability for overages across the multispecies and scallop fisheries, Option 2 is expected to reduce the chance of an overage to the overall ACL. This would help prevent overfishing, which will likely have positive long-term economic benefits for both the multispecies fishery and other fisheries that land GOM/GB windowpane flounder.

7.4.2 Commercial and Recreational Fishery Measures

7.4.2.1 GOM Cod Spawning Area Closures

7.4.2.1.1 Option 1: No Action

The No Action alternative maintains the current GOM cod spawning protection area for commercial and recreational vessels.

The economic impacts associated with the No Action Alternative are similar to those analyzed under Section 7.4.1.2.2. Generally, maintaining the current GOM cod spawning closures is predicted to have lower gross revenues (in aggregate) than the predicted revenue associated with additional closures in sub-option A or sub-option B. This points to a situation where inshore GOM vessels are not being offered sufficiently high ACE lease prices or, alternatively, have been (and modeling indicates will continue to be) unwilling to accept such lease arrangements. There are many reasons this may be so, the most relevant being that fisherman may simply want to fish, and prioritize their profession over higher profits.

Economic impacts on the recreational groundfish fishery

Option 1 would not create any additional GOM cod spawning area closures for the recreational fishery. There would likely not be short term economic impacts. Long term economic impacts would likely be negative due to a decrease in cod biomass.

7.4.2.1.2 Option 2: Additional GOM cod Spawning Protection Measures

The Council may select Sub-Option A or Sub-Option B.

The shift toward fishing eastward and by larger vessels under all scenarios considered in FW 53 is shown in Table 15. With cod being constraining in the GOM, the closure options effectively force vessels that would otherwise chose to fish, to no longer fish. The model assumes that their quota will flow to those (larger) vessels that can use it. Whether this proves to be the case, or not, will remain to be seen.

Relocation of vessels to southern New England ports is likely. The impact of relocation on fishing families is an important issue that is difficult to quantify. As Table 13 shows, the adoption of either Closure A or B may make fishing from inshore GOM ports unsustainable for vessels that do not have the range to fish in profitable areas during times of inshore spawning closures.

Economic impacts on the recreational groundfish fishery

The proposed rolling area closures encompass the principal recreational bottom fishing locations in the GOM and the majority of the recreational fishing access points in the GOM. As a result, all three state management agencies will be unwilling to prohibit recreational fishermen from bottom fishing in their waters. A prohibition on any type of rod and reel recreational fishing activity has never been adopted by any state fishery management agency in the U.S. to reduce mortality.

Approximately 85-90% of GOM cod and haddock mortality generally occurs in Federal waters though, so if anglers only catch GOM cod and haddock in state waters during FY 2015 a mortality reduction would likely occur from the proposed closures. The larger unknown, however, is the level of noncompliance that will occur in federal waters under the closures. Even marginal differences in state and federal regulations increase noncompliance, so an unprecedented change of prohibiting bottom fishing in federal waters, but allowing anglers to continue to bottom fish in state waters, will almost certainly increase noncompliance in federal waters during FY 2015 – thereby reducing the conservation benefit of the closures.

The proposed prohibition on recreational bottom fishing in the closed areas will also generally be unenforceable. Currently, virtually all enforcement of recreational fishing regulations is conducted in state waters by State Law Enforcement Agencies. The United States Coast Guard (USCG) has legal authority to enforce federal recreational fishing laws, but principally only performs safety checks aboard recreational fishing boats in state waters. NOAA's Office of Law Enforcement also has legal authority to enforce federal recreational fishing laws, but their focus is almost exclusively on compliance with commercial fishing regulations. Thus, since enforcement mainly occurs only in state waters, where anglers will most certainly be allowed to bottom fish in FY 2015 during the proposed rolling closures, the potential for noncompliance in the closed areas will be high. Some of the noncompliance will be deliberate, but most will likely be from private boat anglers that are simply unaware of the prohibition on bottom fishing. The level of noncompliance associated with the closed areas is impossible to predict, but if it is high the conservation benefit of the closures will be further eroded.

The economic consequences of the spawning closures on the for-hire industry and businesses that support the recreational fishing industry in the GOM would be extensive. Table 16 shows the average annual percent of for-hire landings derived from the spatial and temporal proposed closure areas by species. The averages are based on for-hire VTR landings from 2010 through September, 2014. Landings during the proposed closure areas accounted for approximately ¾ of annual for-hire landings of Atlantic cod, haddock, pollock, white hake, and redfish. Although possession of GOM cod could be prohibited in FY 2015, with or without implementation of the closure areas, catch of the remaining species over the past 5 years is clearly concentrated in the areas and time periods under consideration for closures. This high degree of concentration implies that it will be difficult for for-hire businesses to move to alternative areas that hold bottom fish for their customers.

The sheer size of the proposed closed areas will also make it difficult for for-hire vessels, particularly the larger head boat vessels, to steam up to 60 miles through the closed areas to open water fishing sites. The travel time required to traverse through the closed areas will exceed the total time allotted for the most common type of for-hire trip offered by for-hire businesses in the GOM: 4 or 6 hour fishing trips. Thus, implementation of the proposed closures would likely have a devastating effect on for-hire businesses operating in the GOM.

The impact of the closures on private boat fishing in the GOM is less certain. Spatial data on fishing locations are not available for private boat anglers, so the extent to which private boat anglers fish in the proposed closed areas to bottom fish is unknown. However, since approximately 80-85% of private boat catch of GOM cod and haddock takes place in federal waters, it's likely that the vast majority occurs in the proposed closed areas. Although the closures would legally exclude private boat anglers from bottom fishing within the closed areas, some level of bottom fishing will likely continue by private boat anglers within the closed areas in FY 2015. Private boat anglers would also still be allowed to use pelagic gear to target bluefish, striped bass, etc. within the proposed closures, thereby exacerbating the enforcement problem. Ultimately, overall private boat fishing effort will likely decline, at least somewhat, if recreational bottom fishing is prohibited in the proposed closed areas. The magnitude of the decline though is unknown.

Businesses that support the recreational fishing industry will also be impacted if recreational fishing effort declines because of the prohibition of bottom fishing in the closed areas. Bait and tackle shops, marinas, boat repair shops, convenience stores, restaurants, hotels, and many other indirectly affected businesses would face revenue declines due to lower angler spending.

Sub-Option A:

Under Sub-Option A, gross groundfish revenues for FY15 are predicted to be over $59 million and all gross revenues on groundfish trips are predicted to be almost $77 million (Table 2). This represents approximately a 8% reduction in gross groundfish revenues and a 5% reduction in gross revenues on groundfish trips relative to those predicted in FY14 (Table 2). While these are not insignificant reductions, gross revenues are predicted to be about $1.5mil higher under closure Sub-Option A than the No Action spawning alternative.

On a home-port state level, New Hampshire is expected to have the largest percentage decline (46%) in gross revenues from groundfish relative to FY14 although this decline increases up to 50% if zero retention options are selected as well (Table 11). New York and Rhode Island are expected to be positively impacted by the closures, with a 11% and 24% predicted increase in gross groundfish revenues relative to FY14, however these increases are reduced relative to the FW53 ACL option with no additional closures (Table 11). For major home-ports, Gloucester, MA is expected to have the largest

percentage decline (20%) in gross revenue and New Bedford, MA is expected to be the least affected with a 10% increase in gross groundfish revenues predicted (**Error! Reference source not found.**11). Both Gloucester and New Bedford are predicted to have higher gross revenues with this closure option than the No Action Alternative Assuming FW53 ACLs.

The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the 30-50 foot category experiencing the largest drop in gross revenue compared to FY14, with a predicted 44% reduction resulting from the closures in Sub-Option A. This is a greater reduction than the 33% reduction associated with just the changes in ACL, and would increases up to a possible 56% reduction depending upon the zero retention alternative selected (Table 13). Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft) predicted to see a 3% increase in gross revenues resulting from closure Sub-Option A (Table 13). This result is not surprising, as small vessels have a smaller geographic range.

The overall economic impacts of Sub-option A are negative, and represent a sizable decline in revenues when compared to FY14. However, when compared to the predicted economic impacts of the ACLs associated with section 7.4.1.2.2, the economic impacts of sub-Option A are expected to be less negative. Additionally, the economic impacts of sub-Option A are expected to be less negative than those associated with Sub-Option B. The magnitude of difference also depends upon the sub-options selected regarding the Prohibition on the Possession of GOM cod.

Sub-Option B:

Under Sub-Option B, gross groundfish revenues for FY15 are predicted to be just under $59 million and all gross revenues on groundfish trips are predicted to be just over $76 million (Table 2). This represents approximately a 9% reduction in gross groundfish revenues and a 6% reduction in gross revenues on groundfish trips relative to those predicted in FY14 (Table 2). Overall revenues decline slightly further if the zero retention option is selected. While these are not insignificant reductions, gross revenues are predicted to be almost $1mil higher under closure Sub-Option B than the No Action spawning alternative (assuming FW53 ACLs).

On a home-port state level, New Hampshire is expected to have the largest percentage decline (46%) in gross revenues from groundfish relative to FY14 although this decline increases up to 50% if zero retention options are selected as well (Table 11). New York and Rhode Island are expected to be positively impacted by the closures, with a 11% and 24% predicted increase in gross groundfish revenues relative to FY14, however these increases are reduced relative to the FW53 ACL option with no additional closures (Table 11). For major home-ports, Gloucester, MA is expected to have the largest percentage decline (21%) in gross revenue and New Bedford, MA is expected to be the least affected with a 9% increase in gross groundfish revenues predicted (**Error! Reference source not found.**11). Both Gloucester and New Bedford are predicted to have higher gross revenues with this closure option than the No Action Alternative Assuming FW53 ACLs.

The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the 30-50 foot category experiencing the largest drop in gross revenue compared to FY14, with a predicted 44% reduction resulting from the closures in Sub-Option B. This is a greater reduction than the 33% reduction associated with just the changes in ACL, and would increases up to a possible 56% reduction depending upon the zero retention alternative selected (Table 13). Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft) predicted to see no change in gross revenues resulting from closure Sub-Option B (Table 13). This result is not surprising, as small vessels have a smaller geographic range.

The overall economic impacts of Sub-option B are negative, and represent a sizable decline in revenues when compared to FY14. However, when compared to the predicted economic impacts of the ACLs associated with section 7.4.1.2.2, the economic impacts of sub-Option B are expected to be less negative. Additionally, the economic impacts of sub-Option B are expected to be more negative than those associated with Sub-Option A as closure Sub-Option B is predicted to realize about $500k less in gross revenues than Sub-Option A.The magnitude of difference also depends upon the sub-options selected regarding the Prohibition on the Possession of GOM cod.

7.4.2.2 Prohibition on the Possession of GOM cod[1]

7.4.2.2.1 Option 1: No Action

Under the No Action Alternative, there would be no revision to the retention regulations of GOM cod. No new economic impacts are expected.

7.4.2.2.2 Option 2: Prohibition on the possession of GOM cod

Under Option 2, commercial and recreational vessels would be required to discard all catch of GOM cod (i.e., zero possession). There would be no change in how GOM cod is allocated, and there would be no changes made to catch accounting or accountability measures.

The true impacts of zero retention policies are difficult to model. Such policies in a fishery with less than 100% catch monitoring incentivize fishing significantly differently when an observer is present. The incentive is even stronger when, as in this case, the stock is allocated and discards are the likely constraint on fishing in the broad stock area.

Zero retention options have non-linear impacts across the closure options. Under the FW 53 ACLs with no additional closures, the predicted impact of zero retention alone is on the order of $2.5mil higher aggregate gross revenues relative to without zero retention.. Closure A with zero retention is predicted to have only slightly higher revenues than zero retention without the closures. Closure B, however, is predicted to have nearly $1mil in aggregate benefit relative to the Closure A option.

On a home-port state level, New Hampshire is expected to have the largest percentage decline (46%) in gross revenues from groundfish relative to FY14 although this decline increases up to 50% if additional spawning closure options are selected as well (Table 11). New York and Rhode Island are expected to be positively impacted by the closures, with a 33% and 29% predicted increase in gross groundfish revenues relative to FY14. These increases are no different than those associated with the FW53 ACL option, however they decrease to 11% and 19% if additional spawning closures are implemented as well (Table 11). For major home-ports, Gloucester, MA is expected to have the largest percentage decline (29%) in gross revenue and New Bedford, MA is expected to be the least affected with a 6% increase in gross groundfish revenues predicted (**Error! Reference source not found.**11). Both Gloucester and New Bedford are predicted to have even lower gross revenues if additional spawning closures are selected.

[1] A mistake was noticed in analysis of the no possession of GOM cod options last week, and it has been corrected in this version. Those model runs did not incorporate the influence of the discard mortality rate assumptions for GOM cod

The impacts to gross revenues are expected to be distributed non-uniformly across different vessel length categories as well, with the 30-50 foot category experiencing the largest drop in gross revenue compared to FY14, with a predicted 33% reduction resulting from zero retention. This is the same reduction associated with just the changes in ACL, and would increases up to a possible 56% reduction if additional spawning closures are selected (Table 13). Larger vessel classes are predicted to experience smaller declines in gross revenues, with the largest vessel size class (75+ ft) predicted to see anincrease in gross revenues resulting from the zero retention option, an increase that gets larger with the implementation of additional closures(Table 13). This result is not surprising, as small vessels have a smaller geographic range.

Zero retention options are predicted to see higher gross revenues than their full retention analogs because the assumed discard rate for trawl and gillnet vessels (75 and 80% respectively) allows captains to land 20-25% more groundfish per unit of GOM cod ACE when that ACE is discarded than they can when the ACE is landed catch. Table 15 indicates that vessels may make $40 or more per pound of GOM cod ACE in FY15—even when backing out the lost revenue from cod (say, $3/lbs) the ability to leverage 25% more revenue may mean an extra $10 or more per pound of ACE from discards than landed catch.

The analysis of zero retention options presented here will underestimate realized revenues for all size classes and GOM ports, because these models assume that cod caught and discarded will be accounted for. This is not a realistic assumption. Because GOM cod is the primary constraint on fishing in the GOM, vessels will fish under two very different sets of incentives depending on whether or not a trip is observed. If a trip is observed, the primary incentive for captains will be to minimize cod as a percent of total catch. This incentive will be strong, as there is an inverse and nearly linear relationship between a Sector's discard rate for GOM cod and the number of trips that Sector's vessels will be able to make before being closed out of the broad stock area. The variance of cod caught on a trip is high, and it is possible (even likely) that captains will be able to achieve quite low discard rates on observed trips.

Unobserved trips have no such incentive. Rather, these trips will maximize revenue on all species irrespective of GOM cod catch. If Table 14 indicates that vessels can make $10-20 or more per pound of cod caught, even backing out the $2-3 of revenue forgone to discarding marketable cod demonstrates the potential for substantial revenue increases through unaccounted cod discarding.

The net effect will be twofold:

- true discards are likely to be many multiples of imputed discards, rendering—through absolutely no fault of the fishing industry—the catch data an incomplete picture of true fishing mortality; and
- gross revenues will be substantially higher than predicted for all aspects of the GOM fishery, as the nominal cod constraint is essentially relaxed through a combination of observer effects and mandated regulatory discards on unobserved trips.

Again, there is no regulatory or compliance aspect to this situation—captains are not required to "act the same on observed and unobserved trips" as, for one thing, that sentence has no practical meaning, and fishing profitably is precisely what fishermen are expected to do.

The economic impacts of Option 2 relative to the No Action Alternative are expected to be negative.

Economic impacts on the recreational groundfish fishery

Under Option 2, the recreational fishery would be prohibited from landing GOM cod. According to a bioeconomic model developed by the Northeast Fisheries Science Center's Social Sciences Branch GOM cod mortality would still exceed the sub-ACL due to high levels of discarding. The model also projected haddock catch to surpass the sub-ACL given current bag and size limits. Additionally, cod is a popular

species for party/charter trips and the inability to land any GOM cod would likely significantly reduce the number of trips. Short term economic impacts would be negative, as cod can no longer be landed. Long term impacts would be uncertain, as high levels of discarding could harm the GOM cod stock in the future.

7.4.2.3 Observer Requirements in the Gulf of Maine

7.4.2.3.1 Option 1: No Action

Option 1 would not change the existing regulatory requirements for observers. No new economic impacts are expected.

7.4.2.3.2 Option 2: Revised Observer Requirements on trips in the GOM

Option 2 proposes allowing only vessels carrying an observer to fish in multiple broad stock areas if fishing in the GOM stock area at all. This measure is intended to improve catch accounting by documenting the proportions of catch from different stock areas within a trip. The provision for allowing a waiver for trips carrying an observer is intended to enhance flexibility and profitability when an observer is allocated to that trip. The benefits of accurate catch accounting and enhanced data quality are difficult to over-state—the ACL system relies on accurate catch information for assessment and Allowable Biological Catch setting and the costs of getting either of these wrong are bounded only by the sum of all benefits derived from the fishery. The costs of restricting non-observed trips to one side or the other of 70 deg 15 min West latitude include potentially increased steaming time and search costs.

7.4.2.4 Rollover of Groundfish Specifications

7.4.2.4.1 Option 1: No Action

Under the No Action alternative, there is no rollover of groundfish specs. As fishing cannot occur until the specs are finalized, there are potential negative economic impacts.

7.4.2.4.2 Option 2: Percentage Rollover Provisions for Specifications

The Council may select either sub-option A, B, or C.

Sub-Option A: Rollover 35% of all groundfish stocks to the following FY.

Under Sub-Option A, a situation where there is no ACE available to fish due to a delay in the specs being implemented would likely be avoided. Fishermen may make adjustments to the time of the year they fish. The economic impacts of Sub-Option A are likely to be positive as it is more likely than the No Action Alternative to allow fishermen the ability to fish in the following FY.

Sub-Option B: Rollover 20% of all groundfish stocks to the following FY.

Under Sub-Option B, a situation where there is no ACE available to fish due to a delay in the specs being implemented would likely be avoided. Fishermen may make adjustments to the time of the year they fish.

The economic impacts of Sub-Option A are likely to be positive as it is more likely than the No Action Alternative to allow fishermen the ability to fish in the following FY.

Sub-Option C: Rollover 10% of all groundfish stocks to the following FY.

Under Sub-Option C, a situation where there is no ACE available to fish due to a delay in the specs being implemented would likely be avoided, though less certainly than Sub-Options A and B. Fishermen may make adjustments to the time of the year they fish. The economic impacts of Sub-Option C are likely to be positive although less positive than Sub-Option B or A.

7.4.2.5 Sector ACE Carryover

7.4.2.5.1 Option 1: No Action

The No Action alternative would continue to allow groundfish sectors to carry over up to 10% of their unused sector ACE, as outline in Amendment 16 to the Northeast multispecies FMP. There would no new economic impacts.

7.4.2.5.2 Option 2: Modification to Sector ACE carryover

Option 2 would allow groundfish sectors to carry forward up to 10% of unused ACE provided that the total unused sector ACE carried forward for all sectors from the previous FY plus the total ACL does not exceed the ABC for the fishing year in which the carryover would be harvested. The accountability measure criteria previously adopted by NMFS' May 2014 carryover action would not be affected. The economic impacts of Option 2 are uncertain. If the unused ACE in a FY is followed by a FY with a decreased ABC (and ACE), then negative economic impacts are possible.

Table 1 – QCM predictions, FY2011 – 2014 (2014 $ millions)

		FY2010	FY2011^ Model calibration		FY2012 FW 47 (modified)		FY2013 FW 48		FY2014 FW 51		FY2014 GOM had/cod EA^^	
		Realized	Predicted*	Realized	Predicted**	Realized	Predicted***	Realized	Predicted***	Realized	Predicted****	Projected^^^
Revenues	Gross revenue	110.2	137.8	121.4	92.3	93.1	75.5	79.2	71.0	n/a	81.0	90.0
	Gross groundfish revenue	*89.1*	*114.4*	*93.7*	*73.5*	*70.4*	*57.0*	*58.6*	*55.6*	*n/a*	*64.3*	*70.5*
Costs	Operations cost	25.1	30.4	32.9	17.8	31.5	15.0	26.1	21.6	n/a	24.3	n/a
	Quota opportunity cost	21.0	29.4	28.4	21.4	17.6	12.4	11.3	12.0	n/a	12.0	n/a
	Sector cost	2.5	3.3	2.7	1.9	2.0	1.8	1.8	1.6	n/a	1.7	n/a
Pct gross revenues net of variable costs		*56%*	*54%*	*47%*	*55%*	*45%*	*61%*	*51%*	*50%*		*53%*	

All estimates based on FY 2010-2013 DMIS data

Values reported in millions, 2014 dollars

^ FY2011 revenues from GB haddock were predicted at $25.2 million. Realized revenues from GB haddock were $11.7 million

Gross groundfish revenues less GB haddock were predicted at $82.7mil and realized $76.7mil

* Reference pool = FY 2010

** Refence pool = FY 2010-11 (last six months FY10, first six months FY11)

*** Reference pool = FY2012

**** Reference pool = FY2013

^^ Based on updated GOM haddock ACL and GOM cod interim measures

^^^Linear projection from Oct 23, 2014

Table 2 – Summary of median predicted gross revenues for seven models ($, millions, median values with 5th and 9th percentile confidence intervals from 500 simulations)

	All groundfish trips, gross			All groundfish, gross				
Model	Revenues	p5 Revenues	p95 Revenues	Revenues	p5 Revenues	p95 Revenues	% Change from FY14 - Groundfish trips	% Change from FY14 - Groundfish
FY14 Baseline	81.0	77.8	84.0	64.6	61.8	67.1		
FW 53 ACLs	75.3	71.1	79.4	58.1	54.5	61.5	-7%	-10%
FW 53 ACLs + Closure A	76.9	72.6	80.4	59.6	56.0	62.5	-5%	-8%
FW 53 ACLs + Closure B	76.1	71.8	80.0	58.8	55.3	62.0	-6%	-9%
FW 53 ACLs + Zero retention GOM cod	78.0	73.9	81.5	60.4	56.9	63.1	-4%	-7%
FW 53 ACLs + Zero retention GOM cod + Closure A	77.8	73.8	81.6	60.3	56.8	63.3	-4%	-7%
FW 53 ACLs + Zero retention GOM cod + Closure B	78.1	74.3	81.0	60.5	57.6	63.2	-4%	-6%

Table 3 –FY14 Baseline, predicted stock level catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,138	4,793	36%	10.9	10.2	11.5
GB Winter Flounder	3,364	1,587	47%	6.0	5.4	6.9
GB Haddock West	18,666	4,208	23%	10.7	9.8	11.8
GB Cod West	1,584	1,482	94%	5.6	5.3	6.0
White Hake	4,308	1,964	46%	5.8	5.5	6.1
Plaice	1,359	1,329	98%	4.6	4.3	4.7
Redfish	10,522	4,504	43%	5.0	4.5	5.5
SNE Winter Flounder	968	758	78%	2.5	2.2	2.8
Witch Flounder	601	590	98%	3.1	3.0	3.2
GB Haddock East	9,971	1,034	10%	2.5	2.0	3.0
SNE/MA Yellowtail Flounder	450	365	81%	1.1	1.0	1.2
GOM Cod	814	700	86%	3.6	3.4	3.8
CC/GOM Yellowtail Flounder	467	372	80%	1.1	1.0	1.2
GOM Haddock	432	187	43%	0.7	0.6	0.8
GOM Winter Flounder	690	163	24%	0.6	0.6	0.7
Halibut	0	51	.	0.2	0.2	0.2
GB Yellowtail Flounder	252	40	16%	0.2	0.1	0.2
GB Cod East	145	25	17%	0.1	0.1	0.1
Northern Windowpane	0	218	.	0.0	0.0	0.0
Ocean Pout	0	32	.	.	.	.
Southern Windowpane	0	112	.	.	.	.
Wolffish	0	16	.	.	.	.
Non groundfish	0	9,331	.	16.3	15.6	17.1

Table 4 – FW 53 sub-ACLs (no closures), predicted stock level catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,632	3,803	28%	8.6	8.0	9.2
GB Winter Flounder	1,875	1,869	100%	7.0	6.5	7.3
GB Haddock West	16,206	4,454	27%	11.3	9.6	13.2
GB Cod West	1,629	1,531	94%	5.8	5.2	6.1
White Hake	4,313	1,643	38%	4.9	4.5	5.2
Plaice	1,382	1,156	84%	3.9	3.6	4.2
Redfish	10,988	3,924	36%	4.3	3.8	4.9
SNE Winter Flounder	1,147	838	73%	2.7	2.3	3.1
Witch Flounder	598	512	86%	2.6	2.5	2.8
GB Haddock East	5,402	1,067	20%	2.6	2.1	3.2
SNE/MA Yellowtail Flounder	457	457	100%	1.4	1.3	1.5
GOM Cod	202	201	100%	1.0	1.0	1.0
CC/GOM Yellowtail Flounder	443	215	48%	0.6	0.5	0.7
GOM Haddock	948	122	13%	0.4	0.4	0.5
GOM Winter Flounder	375	97	26%	0.4	0.3	0.4
Halibut	0	46	.	0.2	0.2	0.2
GB Yellowtail Flounder	192	53	28%	0.2	0.1	0.4
GB Cod East	124	30	24%	0.1	0.1	0.1
Northern Windowpane	0	250	.	.	.	.
Ocean Pout	0	35	.	.	.	.
Southern Windowpane	0	148	.	.	.	.
Wolffish	0	14	.	.	.	.
Non groundfish	0	9,932	.	16.9	15.8	18.1

Table 5 – FW 53 sub-ACLs with Closure A, predicted stock level catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,632	3,880	28%	8.7	8.0	9.3
GB Winter Flounder	1,875	1,867	100%	6.9	6.4	7.3
GB Haddock West	16,206	4,597	28%	11.6	10.0	13.2
GB Cod West	1,629	1,550	95%	5.8	5.2	6.1
White Hake	4,313	1,757	41%	5.2	4.8	5.6
Plaice	1,382	1,235	89%	4.2	3.9	4.5
Redfish	10,988	4,306	39%	4.8	4.2	5.3
SNE Winter Flounder	1,147	839	73%	2.7	2.3	3.1
Witch Flounder	598	533	89%	2.7	2.5	2.9
GB Haddock East	5,402	1,122	21%	2.7	2.2	3.3
SNE/MA Yellowtail Flounder	457	457	100%	1.4	1.3	1.5
GOM Cod	202	201	100%	1.0	1.0	1.0
CC/GOM Yellowtail Flounder	443	147	33%	0.4	0.4	0.5
GOM Haddock	948	128	13%	0.4	0.4	0.5
GOM Winter Flounder	375	82	22%	0.3	0.2	0.3
Halibut	0	47	.	0.2	0.2	0.2
GB Yellowtail Flounder	192	52	27%	0.2	0.1	0.4
GB Cod East	124	30	24%	0.1	0.1	0.1
Northern Windowpane	0	245	.	0.0	0.0	0.0
Ocean Pout	0	35	.	.	.	.
Southern Windowpane	0	138	.	.	.	.
Wolffish	0	14	.	.	.	.
Non groundfish	0	9,369	.	17.1	16.1	18.3

Table 6 – FW 53 sub-ACLs with Closure B, predicted stock level catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,632	3,749	28%	8.4	7.8	9.0
GB Winter Flounder	1,875	1,869	100%	7.0	6.4	7.3
GB Haddock West	16,206	4,535	28%	11.5	10.0	13.2
GB Cod West	1,629	1,526	94%	5.7	5.2	6.0
White Hake	4,313	1,700	39%	5.0	4.6	5.4
Plaice	1,382	1,233	89%	4.2	3.9	4.5
Redfish	10,988	4,181	38%	4.6	4.0	5.2
SNE Winter Flounder	1,147	820	72%	2.6	2.3	3.1
Witch Flounder	598	531	89%	2.7	2.5	2.9
GB Haddock East	5,402	1,095	20%	2.7	2.2	3.3
SNE/MA Yellowtail Flounder	457	457	100%	1.4	1.3	1.5
GOM Cod	202	201	100%	1.0	1.0	1.0
CC/GOM Yellowtail Flounder	443	195	44%	0.5	0.5	0.6
GOM Haddock	948	129	14%	0.5	0.4	0.5
GOM Winter Flounder	375	91	24%	0.3	0.3	0.4
Halibut	0	46	.	0.2	0.2	0.2
GB Yellowtail Flounder	192	54	28%	0.2	0.1	0.4
GB Cod East	124	29	24%	0.1	0.1	0.1
Northern Windowpane	0	243	.	0.0	0.0	0.0
Ocean Pout	0	34	.	.	.	.
Southern Windowpane	0	137	.	.	.	.
Wolffish	0	14	.	.	.	.
Non groundfish	0	9,330	.	17.1	16.1	18.1

Table 7 – FW 53 sub-ACLs with zero GOM cod retention, predicted catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,632	3,811	28%	8.6	8	9.2
GB Winter Flounder	1,875	1,870	100%	7	6.5	7.4
GB Haddock West	16,206	4,428	27%	11.3	9.7	13.2
GB Cod West	1,629	1,522	93%	5.7	5.2	6.2
White Hake	4,313	1,640	38%	4.8	4.5	5.2
Plaice	1,382	1,153	83%	3.9	3.6	4.3
Redfish	10,988	3,908	36%	4.3	3.8	4.9
SNE Winter Flounder	1,147	824	72%	2.6	2.3	3
Witch Flounder	598	515	86%	2.7	2.5	2.9
GB Haddock East	5,402	1,058	20%	2.6	2	3.3
SNE/MA Yellowtail Flounder	457	457	100%	1.4	1.3	1.5
GOM Cod	202	201	100%	0	0	0
CC/GOM Yellowtail Flounder	443	210	47%	0.6	0.5	0.7
GOM Haddock	948	126	13%	0.4	0.4	0.5
GOM Winter Flounder	375	95	25%	0.4	0.3	0.4
Halibut	0	46	.	0.2	0.2	0.2
GB Yellowtail Flounder	192	54	28%	0.2	0.1	0.4
GB Cod East	124	29	23%	0.1	0.1	0.1
Northern Windowpane	0	254	.	0	0	0
Ocean Pout	0	35	.	.	.	.
Southern Windowpane	0	147	.	.	.	.
Wolffish	0	14	.	.	.	.
Non groundfish	0	9,928	.	16.9	15.9	18

Table 8 - FW 53 sub-ACLs with zero GOM cod retention and Closure A, predicted catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,632	4,030	30%	9	8.2	9.7
GB Winter Flounder	1,875	1,866	100%	6.9	6.1	7.2
GB Haddock West	16,206	4,477	28%	11.4	10	13.3
GB Cod West	1,629	1,553	95%	5.8	5.4	6.1
White Hake	4,313	1,821	42%	5.3	4.8	5.7
Plaice	1,382	1,268	92%	4.3	4	4.6
Redfish	10,988	4,384	40%	4.9	4.2	5.5
SNE Winter Flounder	1,147	866	75%	2.7	2.3	3.1
Witch Flounder	598	544	91%	2.7	2.5	2.9
GB Haddock East	5,402	1,109	21%	2.7	2.2	3.3
SNE/MA Yellowtail Flounder	457	457	100%	1.4	1.2	1.5
GOM Cod	202	196	97%	0	0	0
CC/GOM Yellowtail Flounder	443	164	37%	0.5	0.4	0.5
GOM Haddock	948	135	14%	0.5	0.4	0.5
GOM Winter Flounder	375	89	24%	0.3	0.3	0.4
Halibut	0	48	.	0.2	0.2	0.2
GB Yellowtail Flounder	192	56	29%	0.2	0.1	0.4
GB Cod East	124	26	21%	0.1	0.1	0.1
Northern Windowpane	0	244	.	0	0	0
Ocean Pout	0	34	.	0	0	0
Southern Windowpane	0	137	.	.	.	.
Wolffish	0	15	.	.	.	.
Non groundfish	0	9,407	.	17.3	16	18.4

Table 9 – FW 53 sub-ACLs with zero GOM cod retention and Closure B, predicted catch, utilization and revenues

	Sub-ACL	Catch	Utilization	Revenue	p5 Revenue	p95 Revenue
Pollock	13,632	3,987	29%	8.9	8.2	9.6
GB Winter Flounder	1,875	1,867	100%	6.9	6	7.3
GB Haddock West	16,206	4,550	28%	11.5	10.2	13.1
GB Cod West	1,629	1,543	95%	5.7	5.3	6.1
White Hake	4,313	1,791	42%	5.3	4.9	5.7
Plaice	1,382	1,285	93%	4.4	4	4.7
Redfish	10,988	4,297	39%	4.8	4.3	5.5
SNE Winter Flounder	1,147	842	73%	2.7	2.3	3
Witch Flounder	598	554	93%	2.8	2.6	3
GB Haddock East	5,402	1,115	21%	2.7	2.2	3.3
SNE/MA Yellowtail Flounder	457	457	100%	1.4	1.2	1.5
GOM Cod	202	197	97%	0	0	0
CC/GOM Yellowtail Flounder	443	219	49%	0.6	0.5	0.7
GOM Haddock	948	142	15%	0.5	0.5	0.6
GOM Winter Flounder	375	106	28%	0.4	0.3	0.4
Halibut	0	48	.	0.2	0.2	0.2
GB Yellowtail Flounder	192	52	27%	0.2	0.1	0.4
GB Cod East	124	29	23%	0.1	0.1	0.1
Northern Windowpane	0	247	.	0	0	0
Ocean Pout	0	34	.	.	.	.
Southern Windowpane	0	136	.	.	.	.
Wolffish	0	15	.	.	.	.
Non groundfish	0	9,492	.	17.4	16	18.3

Table 10 – Homeport state and port predicted gross revenues from groundfish ($, millions, median values with 5th and 95th percentile confidence intervals from 500 simulations)

	FY14 Baseline			FW 53 ACLs			FW 53 ACLs + Closure A			FW 53 ACLs + Closure B			FW 53 ACLs + Zero Retention GOM cod			FW 53 ACLs + ZR GOM cod + Closure A			FW 53 ACLs + ZR GOM cod + Closure B		
	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev
Connecticut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts	43.7	39.6	48.1	40	35	45.2	41.1	36.5	46	40.9	36	45.9	40.6	36	45.3	40.9	36.8	45.6	41.3	36.9	46.4
Boston	*12.9*	*11.8*	*14.1*	*12.1*	*10.4*	*13.8*	*12.9*	*11.3*	*14.7*	*12.8*	*11*	*14.7*	*12.3*	*10.6*	*13.8*	*12.8*	*11.5*	*14.6*	*12.9*	*11.3*	*14.6*
Gloucester	*10.3*	*9.4*	*11.4*	*7.4*	*6.4*	*8.4*	*8.2*	*7.2*	*9.3*	*8.1*	*7.1*	*9.1*	*7.7*	*6.9*	*8.8*	*8.1*	*7*	*9.1*	*8.3*	*7.3*	*9.2*
New Bedford	*15.4*	*14*	*16.8*	*16.4*	*14.9*	*18.1*	*16.9*	*15.5*	*18.2*	*16.8*	*15.4*	*18.1*	*16.5*	*15.2*	*17.9*	*16.9*	*15.6*	*18.1*	*16.9*	*15.6*	*18.4*
Maine	14.7	13.2	16.4	12.4	10.6	14.1	12.9	11	14.6	12.4	10.9	14.1	12.7	11.1	14.4	12.8	11.2	14.6	12.6	10.9	14.4
Portland	*12.3*	*11*	*13.6*	*10.6*	*9.1*	*12*	*11.4*	*9.8*	*13*	*11.1*	*9.7*	*12.6*	*10.9*	*9.5*	*12.3*	*11.5*	*10.1*	*12.9*	*11.3*	*9.8*	*12.9*
New Hampshire	2.4	2.1	2.7	1.4	1.2	1.6	1.3	1.1	1.5	1.3	1.1	1.5	1.4	1.2	1.6	1.3	1	1.4	1.3	1.1	1.4
New Jersey	0.3	0.2	0.3	0.2	0.1	0.3	0.2	0.1	0.3	0.2	0.2	0.3	0.2	0.1	0.3	0.2	0.2	0.3	0.2	0.2	0.3
New York	0.9	0.7	1.2	1.2	0.9	1.6	1	0.7	1.3	1	0.7	1.3	1.2	0.9	1.6	1	0.7	1.3	1	0.7	1.4
Rhode Island	2.1	1.8	2.4	2.7	2.3	3.2	2.6	2.1	3	2.6	2.1	3.1	2.7	2.3	3.2	2.5	2	3	2.5	2	3
Point Judith	*1.6*	*1.4*	*1.8*	*2.1*	*1.8*	*2.4*	*1.9*	*1.7*	*2.2*	*1.9*	*1.7*	*2.2*	*2.1*	*1.9*	*2.4*	*1.9*	*1.6*	*2.1*	*1.9*	*1.6*	*2.1*
Other Northeast	0.1	0	0.1	0	0	0	.	.	.	0	0	0	0	0	0	.	.	.	0	0	0.1

Table 11 – Homeport state and port level predicted percent change in gross revenues from groundfish, relative to FY14 Baseline

	FW 53 ACLs	FW 53 ACLs + Closure A	FW 53 ACLs + Closure B	FW 53 ACLs + Zero Retention GOM cod	FW 53 ACLs + ZR GOM cod + Closure A	FW 53 ACLs + ZR GOM cod + Closure B
Connecticut	n/a	n/a	n/a	n/a	n/a	n/a
Massachusetts	-8%	-6%	-6%	-7%	-6%	-5%
Boston	-6%	0%	-1%	-5%	-1%	0%
Gloucester	-28%	-20%	-21%	-25%	-21%	-19%
New Bedford	6%	10%	9%	7%	10%	10%
Maine	-16%	-12%	-16%	-14%	-13%	-14%
Portland	-14%	-7%	-10%	-11%	-7%	-8%
New Hampshire	-42%	-46%	-46%	-42%	-46%	-46%
New Jersey	-33%	-33%	-33%	-33%	-33%	-33%
New York	33%	11%	11%	33%	11%	11%
Rhode Island	29%	24%	24%	29%	19%	19%
Point Judith	31%	19%	19%	31%	19%	19%
Other Northeast	n/a	n/a	n/a	n/a	n/a	n/a

Table 12 – Vessel size class predicted gross revenues from groundfish ($, millions, median values with 5th and 95th percentile confidence intervals from 500 simulations)

	FY14 Baseline			FW 53 ACLs			FW 53 ACLs + Closure A			FW 53 ACLs + Closure B			FW 53 ACLs + Zero Retention GOM cod			FW 53 ACLs + ZR GOM cod + Closure A			FW 53 ACLs + ZR GOM cod + Closure B		
Length class	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev	Rev	p5 rev	p95 rev
<30'	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30'to<50'	9.0	9.0	10.0	6.0	6.0	7.0	5.0	4.0	5.0	5.0	4.0	5.0	6.0	6.0	7.0	4.0	4.0	5.0	5.0	4.0	5.0
50'to<75'	19.0	18.0	20.0	16.0	15.0	18.0	17.0	16.0	19.0	17.0	16.0	18.0	17.0	16.0	18.0	17.0	16.0	18.0	17.0	16.0	18.0
75'+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	36.0	34.0	38.0	35.0	32.0	38.0	37.0	34.0	40.0	36.0	34.0	39.0	36.0	33.0	38.0	37.0	34.0	40.0	37.0	34.0	39.0

Table 13 – Vessel size class predicted percent change in gross revenues from groundfish, relative to FY14 Baseline

Length class	FW 53 ACLs	FW 53 ACLs + Closure A	FW 53 ACLs + Closure B	FW 53 ACLs + Zero Retention GOM cod	FW 53 ACLs + ZR GOM cod + Closure A	FW 53 ACLs + ZR GOM cod + Closure B
<30'	n/a	n/a	n/a	n/a	n/a	n/a
30'to<50'	-33%	-44%	-44%	-33%	-56%	-44%
50'to<75'	-16%	-11%	-11%	-11%	-11%	-11%
75'+	-3%	3%	0%	0%	3%	3%

Table 14 – Median nominal gross revenues per pound of GOM cod ACE for all trips by vessels in four size classes

len_cat	2010	2011	2012	2013
30' and u	4.38	5.56	85.43	33.58
30'to<50'	5.87	6.67	24.23	10.10
50'to<75'	9.03	8.69	34.45	21.18
75'+	68.42	88.88	300.20	140.72

Table 15 – Predicted median gross revenues per pound GOM cod ACE and reported longitude

model	Revenue per lbs cod ACE	p5_rev	p95_rev	longitude	p5_lon	p95_lon
FY14 Baseline	21	3	427	-69.90	-70.55	-67.93
ALCs no Closures	47	13	529	-69.72	-70.50	-67.68
Closure A	49	11	529	-69.67	-70.44	-67.68
Closure B	44	11	512	-69.70	-70.47	-67.70
Zero ret no Closures	47	13	529	-69.72	-70.50	-67.70
Zero ret Closure A	49	11	529	-69.67	-70.45	-67.68
Zero ret Closure B	46	12	512	-69.69	-70.47	-67.68

Table 16. Average Annual Percent of For-Hire Landings Derived from the Proposed Spatial and Time Area Closures by Speciesa

Species	Option 2 Proposed GOM Spawning Closure Areas and WGOM
Atlantic cod	75%
Haddock	77%
Pollock	73%
White hake	68%
Redfish	79%
Winter flounder	22%
Yellowtail flounder	12%

a Based on average annual VTR landings (numbers of fish) from 2010-2014

Figure 1- Average nominal gross revenues generated per pound of GOM cod ACE for fishing trips by vessels in four size classes, FY 2010-2013

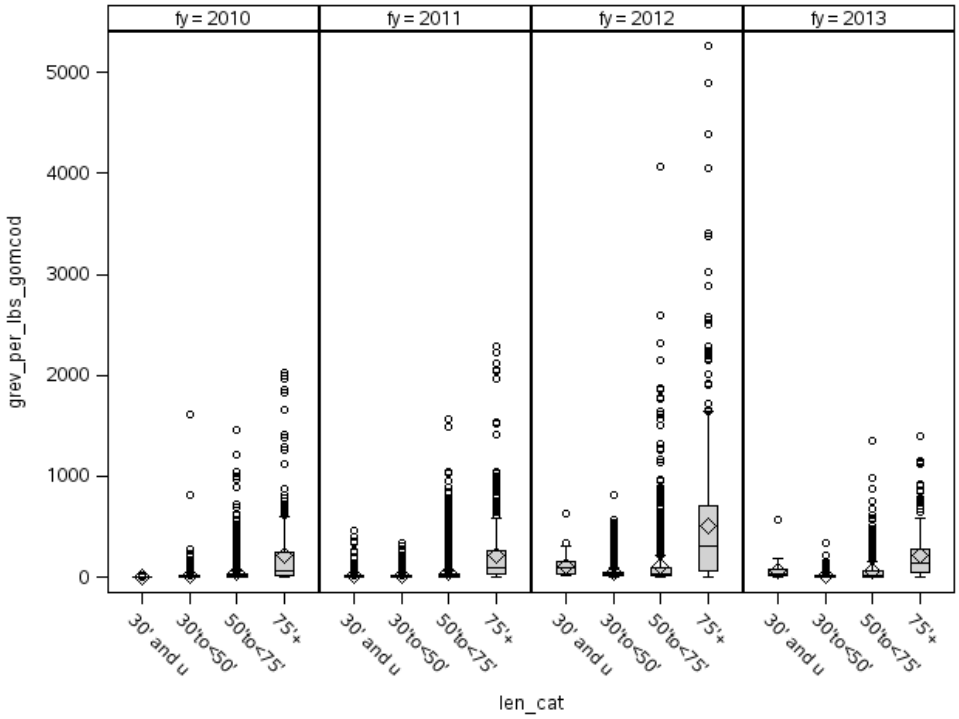

Figure 2 – Average nominal gross revenues generated per pound of GOM cod ACE for fishing trips by longitude, FY 2010-13

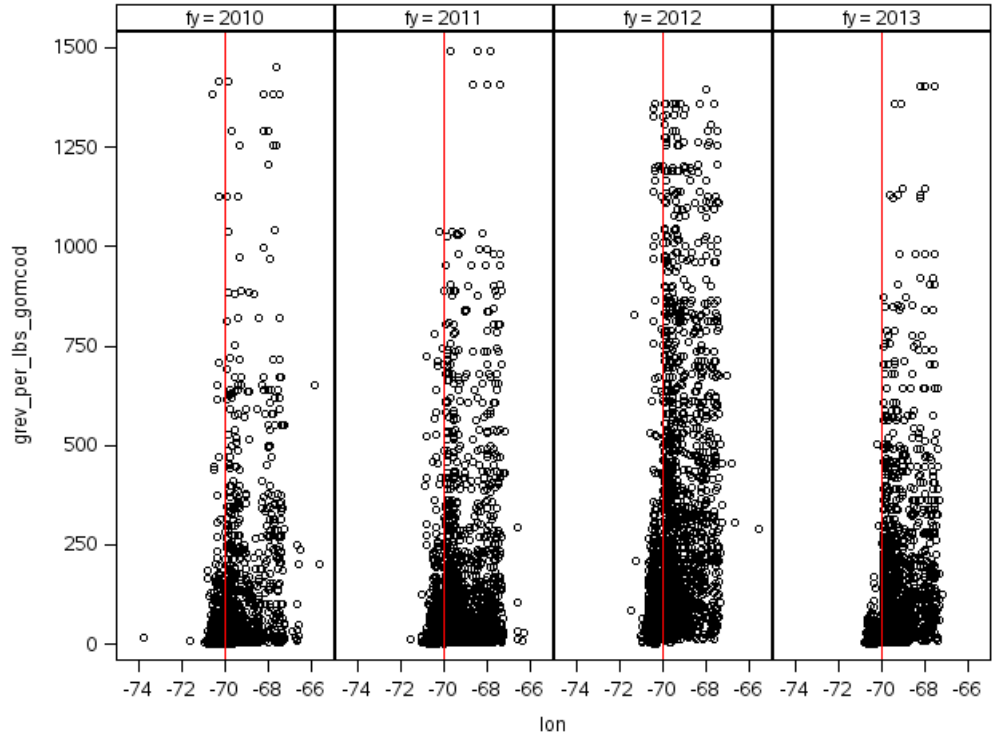

Figure 3 – Sector-level allocations of GOM cod at an ABC of 400mt (slightly higher than the actual ABC of 386mt)

	FY13 Allocation	400
Common	40,297	10,399
Fixed Gear Sector	44,396	11,457
Maine Coast Community Sector	84,065	21,694
Maine Permit Bank	21,018	5,424
NCCS	13,679	3,530
NEFS 10	96,165	24,817
NEFS 11	205,153	52,943
NEFS 12	44,349	11,445
NEFS 13	17,340	4,475
NEFS 2	336,353	86,801
NEFS 3	263,112	67,900
NEFS 4	175,681	45,337
NEFS 5	233	60
NEFS 6	53,313	13,758
NEFS 7	7,169	1,850
NEFS 8	8,986	2,319
NEFS 9	31,729	8,188
New Hampshire Permit Bank	20,797	5,367
Sustainable Harvest Sector 1	356,549	92,013
Sustainable Harvest Sector 3	9,452	2,439