NORTHEAST MULTISPECIES CATCH SHARE REVIEW: EXECUTIVE SUMMARY

April 2020

Purpose Need and Scope

National Oceanic and Atmospheric Administration's (NOAA) catch share policy explains that Councils should periodically review catch share programs to evaluate whether a program is meeting its goals and objectives. The policy also states, "NOAA recommends Councils apply the LAPP [limited access privilege program] review and duration principles to all catch share programs".

This program review is focused on the sector program of the Northeast multispecies fishery; however, some of the analyses provided in this report combine both sector program and common pool program data. The evaluation period of review is focused on fishing years 2010 to 2015 (May 1, 2010, to April 30, 2016), covering the first six years of the catch share program since implementation in 2010 via Amendment 16 to the Northeast Multispecies Fishery Management Plan. Information prior to program establishment will cover fishing years 2007 to 2009 (May 1, 2007, to April 30, 2010), adhering to NOAA Guidance for Conducting Review of Catch Share Programs that "a baseline period of at least three years is preferable[1]".

The Northeast multispecies sector program review follows the eight elements outlined in NOAA's Guidance and addresses the key goals and objectives of the program. The sector program, unlike other catch share programs nationally, does not have independent goals and objectives by which to measure success. However, FMP-level goals and objectives have important implications for evaluating the success of the catch share program.

In the development of this review, given the tight timeline for completion, the evaluation relies primarily on those existing analyses where available, and identifies limitations and gaps for consideration in future evaluations. In most instances this work represents a review of available work. In a few instances, data and analysis were updated to cover the evaluation period, or extend beyond the review period, depending on data availability. All work has been attributed to its source. Recent Council actions (and supporting documents) serve as the basis for much background and additional data.

Northeast Multispecies Fishery

Management History

The Northeast multispecies fishery targets a diverse group of species, several of which are managed as two or more separate stocks, based on geographic region. Thirteen species, subdivided into twenty stocks, are managed as large mesh species based on fish size and type of gear used to harvest the fish, and three

[1] NOAA Guidance for Conducting Review of Catch Share Programs: https://www.fisheries.noaa.gov/national/laws-and-policies/catch-shares

species — silver hake (whiting), red hake, and offshore hake — are managed as a separate unit; known as small mesh multispecies program.

The Northeast Multispecies FMP (implemented in 1986) has been updated through a series of Amendments and Framework Adjustments. Several of these have implemented significant changes to the FMP. Amendment 5 (1994) established a moratorium on groundfish permits, reduced days-at-sea (DAS) and adopted large area closures to help reduce mortality. Shortly after, the Sustainable Fisheries Act (SFA) amended the MSA in 1996 and required FMPs to define and eliminate any overfishing of managed stocks, reduce bycatch, identify and protect Essential Fish Habitat (EFH), and minimize adverse effects of fishing on EFH to the extent practicable. Amendment 7 (1999) accelerated the DAS reduction schedule, extended large area closures throughout the year, eliminated some exemptions from the effort control program, and implemented other conservation measures. Amendment 13 (2004) addressed overfishing definitions, stock rebuilding, reduced fishing effort and capacity in the fishery. This amendment also specified a process for the formation of sectors within the Northeast groundfish fishery.

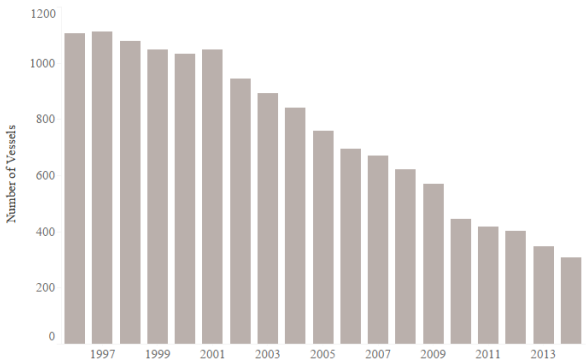
In 2006, amendments to the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSA) implemented additional requirements to prevent and end overfishing and rebuild overfished stocks. The added measures require regional fishery management councils to amend their FMPs to include a mechanism for specifying annual catch limits (ACL) for all stocks or stock complexes at a level such that overfishing does not occur, as well as to implement measures to ensure accountability for adhering to these limits.

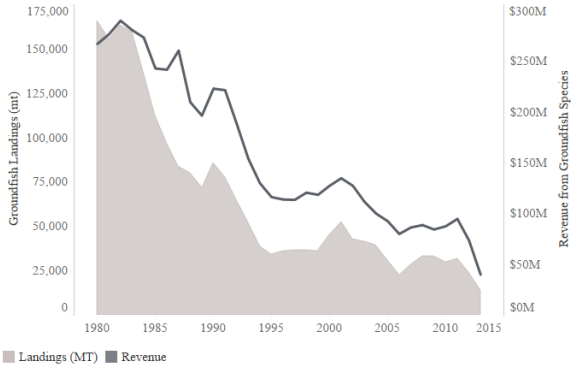
Summary of Groundfish Resources

At implementation of the sector program in 2010, thirteen stocks were experiencing overfishing (six were not, and two unknown) and twelve stocks were overfished (6 were not, and one unknown). The most recent stock assessment (2018 or 2019), estimated the current status of stocks at three stocks experiencing overfishing (16 were not and one unknown) and twelve stocks are overfished (seven are not and one unknown).

Historical Activity

The size of the groundfish fleet has steadily declined since the mid-1990s as fishing restrictions became more stringent and groundfish catch and revenue declined. These downward trends were apparent well before development of Amendment 16 and expansion of the sector program in 2010.





Changes in the number of vessels with limited access multispecies permits that landed groundfish in each fishing year (right) and changes in groundfish landings (landed weight) and revenue (2016 dollars) from groundfish species.

Northeast Multispecies Sector Program

In 2010, Amendment 16 to the Northeast Multispecies Fishery Management Plan (FMP) made major changes to the Northeast Multispecies FMP: setting acceptable biological catches (ABCs), ACLs, and accountability measures (AMs) for all 20 regulated groundfish stocks in compliance with 2006 revisions to the MSA and expansion of the existing sector-based approach into a system of catch share management. The designation of the sector program revised a previously existing framework for sector management and established 17 new sectors and modified two existing sectors. Participants who do not join a sector have the right to continue fishing under the "common pool" system. The expanded sector program included provisions allowing groundfish quota (called annual catch entitlement, or ACE) to be traded between members of the same sector or between different sectors, and a provision allowing inactive permits held in confirmation of permit history (CPH) to join sectors.

Allocations: Of the 20 stocks managed under the Northeast Multispecies FMP, 15 are allocated to sectors and evaluated against the sector sub-ACL. Five stocks are unallocated and catches by sector and common pool vessels are measured against the commercial groundfish sub-ACL for these stocks. Possession is prohibited for four of the non-allocated stocks (northern windowpane flounder, southern windowpane flounder, ocean pout, and Atlantic wolffish), while one-legal size fish per trip is permitted for Atlantic halibut.

The acceptable biological catch (ABC) for each regulated groundfish species is set based on the overfishing limit (OFL), as reduced for scientific uncertainty. The ABC is divided into sub-ABCs for the commercial groundfish fishery, state water fisheries and other fisheries, including those that receive allocations. Sub-ABCs are reduced to account for management uncertainty, to become sub-ACLs for the commercial groundfish fishery and other fisheries that receive allocations.

- Catch limits are allocated to sectors for all regulated species based on an individual's contribution. The allocation a fisherman brings to a sector is determined by the proportion of the total landings for each allocated groundfish stock, with the exception of GB cod[2], during the time period 1996-2006 as calculated by a Northeast multispecies permit's landings history recorded in the NOAA Fisheries commercial dealer database. This allocation is the individual's potential sector contribution (PSC). There is also no permanent allocation that can be fished or transferred; allocations are granted to a sector based upon the collective catch history of participating vessels and each stock's ACL, and because membership in sectors can change every year, the annual allocations to sectors can change as well. A sector is allocated ACE for each allocated groundfish stock, based on the sum of its members' PSC. Sectors are responsible for managing the combined allocation of groundfish stocks by developing its own set of rules in the sector operations plan to distribute the sector's allocation among its membership. Groundfish sectors can carry forward up

[2] For vessels participating in one of the previous existing sectors (GB Hook Sector or GB Cod Fixed Gear Sector, as established in Amendment 13) before March 1, 2008, the GB cod PSC is calculated based on landings history from FYs 1996 – 2001.

to 10% of unused annual catch entitlement (ACE) provided that the total unused sector ACE carried forward for all sectors from the previous fishing year plus the total annual catch limit (ACL) does not exceed the acceptable biological catch (ABC) for the fishing year in which the carryover would be harvested, e.g., from FY2019 to FY2020. If the total exceeds the ABC, NMFS adjusts the maximum amount of unused carryover, down from 10%, to an amount equal to or less than the ABC of the following fishing year.

Accountability measures: As mandated by the MSA, accountability measures (AMs) were implemented with the sector program to minimize both the frequency and magnitude of ACL overages and to correct or mitigate in as short a time as possible overages that occur. A number of AMs have applied to sectors since the beginning of the program, and there have been changes to some over the initial years in operation. For example, GOM haddock overages in FY 2013 and 2014 triggered AMs. In FY 2013, overages in both the common pool (108.9%) and the recreational fishery (312.2%) contributed to the overall catch over the stock ACL; in FY 2014 it was the recreational overage (380.7%) that contributed. In both years, accountability measures were implemented on these fishery components.

Sector Participation: Sector membership is annual, and participants who join a sector or opt to remain in the common pool must remain in that sector (or the common pool) for the entire fishing year. Prior to the start of each fishing year (May 1 – April 30) every groundfish fishery participant must either apply to join a sector or elect to fish in the common pool. Sectors differ in terms of membership size, vessel type, predominant gear type and geographic distribution. Sectors are typically managed by a sector manager that conducts daily operations and fulfills agency reporting requirements. All sector vessels are exempt from certain regulations that apply to common pool vessels.

All permit holders with a limited access Northeast multispecies permit that was valid as of May 1, 2008, are eligible to participate in a sector. There are no established programs to assist new entrants into the groundfish sector fishery - opportunities to enter into the groundfish fishery remain the same as in the past (purchase of a vessel with an eligible limited access permit. There are no auctions or royalties applicable to the Northeast multispecies sector program, and there is no cost recovery provision associated with the sector program. Sector members are contractually required to adhere to joint and several liability and indemnification, under their signed sector contracts, making sector members collectively responsible for sector ACE overages, discarding of legal-sized fish and misreporting of catch landings or discards.

Sector Fees: Participants in the sector program typically incurred fees in order to help cover sector operating costs, in addition to costs associated with general fishing operations. Fees include those associated with entrance or application fees, sector dues/membership fees, landings fees, ACE leasing fees, at-sea monitoring (ASM) cost.

Transferability: Transferability of quota is permitted both within and between sectors; this is a temporary transfer of catch privileges between permitted sector fishermen. ACE transfers are governed both by sector defined procedures and NOAA Fisheries' approval.

Catch Monitoring: At the onset of the program, the monitoring system added at-sea and dockside monitors to enhance coverage on sector vessels, in addition to the existing observer program. Revisions to dealer reporting and industry reporting requirements were also enhanced, however, the dockside monitoring program was ended in 2011. Currently, the Council is considering making further changes to the monitoring program under Amendment 23.

Sector Operations: Sector operations plans must detail strategies for monitoring, reporting, and enforcing catch and landings for all members within the sector. The plans are required to detail how a sector would monitor its catch to assure that sector catch does not exceed the sector allocation. Sectors are required to report all landings and discards by sector vessels to NOAA Fisheries on a weekly basis, along with submission of annual year-end reports.

Challenges during Sector Management: Since implementation of the program, there have been some major issues directly and indirectly to the fishery that increases the challenges with attributing change to a given intervention. These include fishery disaster declarations in 2011-2012; convicted misreporting of catch (species and weight) by a sector member of IX Northeast Fishery Sector Inc. (NEFS 9), this has economic and ecological implications and included the determination that NEFSC 9 failed to uphold their sector operations plan; and failure of GOM and GB cod stocks to recover, with estimates indicating biomass at the lowest points ever, which forced emergency management measures reducing quotas and updating closures.

Evaluation of the Sector Program

As the first of its kind for the sector program, the evaluation provides an opportunity to understand effects from and changes to the program since implementation and isolate gaps to develop recommendations for more thorough future reviews.

Groundfish Fishery Participation

Declines in the number of northeast multispecies permits and active participation in the groundfish fishery were observed both prior to and after the implementation of the catch share program. Concurrently there was an increase in the number of sector permits held in CPH, corresponding with continued reductions in active participation, total revenues, and landings.

The number of operational sectors varied slightly during the evaluation period from 17 to 19 by FY 2015. Over the six-year review period there was an increase in sector participation as more MRIs left the common pool, but this does not equate to active participation, as participants can enroll in a sector just to lease quota.

Permit banks provide a mechanism to create additional opportunities to participate in the fishery and to promote and maintain diversity across the fishery; permit banks in New Hampshire and Maine make ACE and DAS available to assist fishermen in their respective states; whereas Massachusetts and Rhode Island developed revolving loan funds to offer capital to support fishermen in leasing ACE and vessel repairs. Only NH and ME have permits banks in operation today. Several private entities have also developed their own permit bank models for assisting their communities.

Fleet Activity, Diversity and Consolidation

The number of vessels taking groundfish trips has been declining since the mid-1990s and continued during the nine-year review period. During the three-year baseline prior to the implementation of the sector program, there was a 14% decrease in the overall number of vessels taking groundfish trips, compared with a 37% decrease between FY 2010 and 2015. The largest overall year to year decline

(22%) was observed in the transition of management systems between FY 2009 and FY 2010. And a 58% decline in all groundfish vessels was recorded across the review period, FY 2007 through FY 2015.

Similarly, during the pre-catch share period, there was a 4% decrease in the overall number of groundfish trips, compared with a 38% decrease between FY 2010 and 2015; the largest single year to year decline in groundfish trips (48%) was observed during the transition of management systems between FY 2009 and FY 2010 – as with the decrease in number of vessels. A 69 % decline in all groundfish trips was recorded across the entire nine-year review period.

Different components of the groundfish fishery experienced different rates of decline in the number of vessels participating in the groundfish fishery and the number of groundfish trips across the nine-year review period, and there was some similarity. By vessel size class, 30' to < 50' vessels had the largest decline in participation by percentage and numbers (65% and 233 vessels, respectively), and the largest decline in groundfish trips by percentage and numbers (74% and 676 trips, respectively). The largest vessel size class (75' and above) had the lowest rate of decline in numbers of vessels (41%) and groundfish trips (31%), across vessel size classes. The lowest decline in number of vessels and groundfish trips was in the < 30' size class (14 vessels and 110 trips, respectively).

New Jersey registered vessels had the largest rate of decline (94%) while Massachusetts had the largest decline in number of vessels (188 vessels). Number of trips taken was not available by home port state. By major homeport city, Boston had the highest rate of decline in groundfish vessels (55%) but the lowest decline in groundfish trips by percentage and number of trips (6% and 28 trips, respectively). Gloucester had the highest decline in the number of vessels (48 vessels) and the highest rate of decline in groundfish trips by percentage and number (80% and 7,233 trips, respectively). Point Judith had the lowest rate of decline (24%) while Portland had the lowest decline in the number of vessels (9 vessels). By gear type, the rate of decreasing participation and groundfish trips was highest in longline vessels (84% and 95%, respectively) while by number, decreases by trawl vessel participation was greatest (168 vessels) and trips taken by gillnet vessels had the greatest decline in groundfish trips (5,263 trips). The lowest decrease in groundfish participation and number of trips taken was observed in the handline/rod-reel gear type by rate and number (9% of vessels removed and 39% of trips).

Declines in fleet activity prior to the sector program can be attributed in part to increased fishing restrictions and poor stock recruitment due to overfishing along with other factors such as changing behaviors in response to oncoming management changes; the continued decline indicates a lack of stabilization during the six years under the sector program.

While the number of vessels taking groundfish trips declined, the diversity of the fleet did not appreciably change, as measured by both richness and effective diversity over 2007-2015. The actual number of vessel types ('richness' – as measured across four vessel characteristics: 4 gear types, 4 vessel sizes, and 23 regions, potentially resulting in 368 unique vessel types), in any given fishing year ranged from a high of 98 in 1996 to a low of 47 vessel types in 2015. Thirty-one vessel types were present in every year from 2007 – 2015 and represent the "core" groundfish fleet.

While there is no explicit definition of what would comprise a diverse fleet for the groundfish fishery (as presented in Objective 7 "*To the extent possible, maintain a diverse groundfish fishery, including different gear types, vessel sizes, geographic locations, and levels of participation*"), analyses illustrates

that there were unequal reductions across vessel size classes and geographic locations; however, over the nine-year period there was little variation in fleet diversity (i.e., in terms of types of vessels within the groundfish fishery).

Further, there is no evidence of consolidation in ownership, despite declines in the number of vessels and the number of valid northeast multispecies permits (1,210 in 2010 to 820 permits as of July 1, 2015); the majority of the decline is accounted for by permits that have been transferred into CPH. Between 2012-2015 the proportion of limited access northeast multispecies permits owned by smaller affiliated businesses increased rather than the other way around. That is, the proportion of groundfish permits owned by a single owner or owner group increased from 50% in 2011 to an average of nearly 56% during 2012 to 2015. Both the number of affiliates with active groundfish permits and the total number of active groundfish permits declined over time. In terms of changes in the distribution of active permits among larger and smaller affiliated business size there was relatively no difference in the proportion of active groundfish vessels by affiliated business size in any year from 2010 to 2015.

Employment and Crew Survey

Accurate estimates of employment are challenging to attain, a picture of crew and employment does speak to the participation in the fishery, but there are known limitations with these analyses, which are further detailed in the recommendations and methods. VTR information that reports on trip-specific crew information found a 29% decrease over the nine-year period. Decreases in the number of crew trips (as an indicator of earning opportunities for crew) were generally experienced across all vessel size categories and home port states in the region over the period of analysis.

Crew surveys were conducted in 2012-13 and 2018-19, therefore one wave fell within the evaluation period and one outside. For the purposes of analysis, the report compared findings between the two survey waves. Groundfish crew and hired captains have a higher mean age than crew in other fisheries, indicating a possible "graying of the fleet" at a higher rate among those in the groundfish fishery. While incomes increased for crew across all fisheries between 2012 and 2018, groundfish crew incomes did not increase as much as those in other fisheries, gross revenues were known to decrease over the evaluation period, but there is no related analysis comparing with all other fisheries in which crew and captains may participate. Without health insurance or purchased private health insurance plans, health care costs may be a substantial burden on crew, especially given the health risks associated with commercial fishing as an occupation. While groundfish crew were generally more satisfied with several aspects of their work over time, there were substantial gaps in satisfaction by fishery. For example, groundfish crew were much less likely than crew in other fisheries to be satisfied with the predictability of their earnings.

Groundfish crew surveyed were mostly concentrated in Gloucester and New Bedford, but with substantial proportions also working out of Portland and Boston. These survey data correspond with commercial fisheries data that indicate these to be among the most highly engaged ports in terms of groundfish landings. Longer working hours among groundfish crew seem to correspond to smaller crew sizes than for those in other fisheries. Results identified that the majority of groundfish crew were paid through a share system and on average groundfish crew had slightly smaller shares than crew in other fisheries. Groundfish crew tend to hold less favorable views about fisheries management than crew in other fisheries.

Monitoring, Enforcement and Compliance and Shared Management Responsibility

Over the course of the catch share program, additional monitoring has been put in place to improve catch accounting. While this has added some valuable data streams, it has contributed to redundant reporting recognized by the fishing industry and managers and an inability of the monitoring program (observers and monitors) to provide sufficient coverage to verify catch data in some years. This has led to issues associated with documented non-compliance to suspected non-compliance with retention requirements.

At implementation, additional reporting and monitoring requirements were instituted including: trip notifications and additional VMS reporting, additional observer coverage (at-sea monitoring program) and dockside monitoring program (removed in 2011), as well as sector level reporting of weekly trip issues, and ACE status and detail reports, and year-end reports.

In most years the target combined observer coverage levels were not achieved (when combining realized coverage levels for ASM and NEFOP) between FY 2010 – 2018. The funding source for the costs associated with increased monitoring have been variable over the years, with some portion of funding covered by the federal government in all years. Enforcement of unlawful discards and stock area misreporting are primary concerns for enforcement of the sector program.

Enforcement has noted these measures may still not be sufficient to ensure compliance with increased catch accounting requirements instituted under the sector program. Limitations to the monitoring program affect the ability for enforcement agents to ensure compliance with regulations, as evident through analysis of VMS and VTR data. Differences identified in VMS estimated catch and VTR reported catch beginning in FY 2010 for several quota limited stocks occurred even with improved compliance with statistical area reporting on VTRs over the same time period. The current regulation regime is vulnerable to stock area misreporting, which has been revealed by the US Coast Guard to have occurred on sector fishing trips and limits the ability of enforcement to detect and document misreporting of stock areas.

The sector-led development of Inshore Gulf of Maine Declaration provision, adopted by all sectors in FY 2013, was to hinder fishing vessels from misreporting catch of species of concern found in the inshore GOM region as from other broad stock areas.

A key feature of catch share programs, specifically cooperative-style programs, is the ability for self-governance. Aspects of self-governance are difficult to measure, sectors do provide critical services in self-reporting, organization and enforcement, and literature has illustrated reduced time spent on decision making. Sector members are contractually required to adhere to joint and several liability and indemnification, under their signed sector contracts, making sector members collectively responsible for sector ACE overages, discarding of legal-sized fish and misreporting of catch landings or discards. While member compliance with sector operations plans and regulations is not public information, various reporting mechanisms have been developed so that sectors can report violations/incidents/issues both during and at the conclusion of each fishing year to NOAA Fisheries. This may indicate an increase in stewardship of the fishery; however, ‘stewardship’ is not necessarily a clear term that can be effectively measured against.

Landings and Gross Revenues

Landings and gross revenues can be assessed across various units, such as vessel size categories, ports, states, gear types, and species/ stocks (including groundfish and non-groundfish species), which can generate a more holistic perspective of the realized economic impacts.

We can consider these results, along with catch utilization, as indicators to whether the sector program met aspects of Goal 3 to "*Maintain a directed commercial and recreational fishery for northeast multispecies*." The groundfish fishery experienced declines in landings and revenues since the 1980s. Though decreased revenues and landings were larger across groundfish trips compared with all trips taken by the limited access groundfish fleet. On groundfish trips, aggregate landings of non-groundfish and revenue from non-groundfish exceeded those of groundfish landings and groundfish revenue across the nine-year review period.

Across the review period, groundfish landings and revenue from groundfish stock landings were at a nine-year low in FY 2015, with 41.5 million pounds and $51.1 million (2010 dollars) respectively. Total revenue from groundfish trips (including all species) was also at a nine-year low in FY 2015 at $72.1 million. Geographically (by port of landing), gross revenue from groundfish landings were highest in Massachusetts and increased between FY 2007 through FY 2011 but then declined in FY 2012 and 2013 and reached a nine-year low in FY 2015 at $42.7 million. Maine was the second highest ranked state with respect to gross revenue from groundfish landings, with the highest revenue (of $10.9 million) observed in FY 2008, while two years later a low of $4.3 million was recorded in the first year of the sector program. Groundfish gross revenue in New Hampshire (by port of landing) declined considerably, from $3.3 million in FY 2010 to $0.6 million in FY 2015. Rhode Island groundfish revenues declined between FY 2007 and 2009 from $5.6 million to $1.8 million and remained relatively stable through FY 2015. By major port (of landing), New Bedford and Gloucester alternated as the top groundfish revenue ports in Massachusetts followed by Boston across the review period.

By groundfish species, Atlantic cod generated the highest fleetwide revenue from FY 2007 through FY 2012, pollock was the top revenue species in FY 2013, followed by haddock in FY 2014 and 2015, and redfish generated the lowest aggregate revenue across the nine-year period.

While average gross revenue varied by vessel size class, the larger the vessel size class the greater the overall average gross revenue was achieved. Average gross revenue for vessels below 30' varied greatly across the nine-year time period, while vessels in the 30' to <50' and 50' to < 75' category remained relatively stable across the evaluation period. Average gross revenue for vessels 75' and above were higher during the catch share time period (FY 2010-2015) than in the previous three fishing years.

With the implementation of catch shares in FY 2010, the total average ex-vessel price for groundfish stocks returned to the FY 2007 level of $ 1.43/lb. and remained steady through FY 2012. The lowest price during the evaluation period was in FY 2015 at $1.23/lb. Simple average ex-vessel prices of all groundfish species combined to compare yearly changes can be misleading, as these prices do not take into account species landed, quantities of each species, market categories by species, or gear type used to harvest.

Productivity, the value of output obtained with one unit of input, was generally was lower under the sector program than during the baseline period, decreasing sharply between 2011 and 2012. The Lowe Index (a measure of productivity comparing inputs and outputs) increased steadily from 2012-2015,

despite the decreasing output index in 2014 and 2015, largely driven by decreases in the input (e.g. labor, capitol stock and energy) indexes. The decline in inputs was caused in part by decreases in the number of active vessels.

Analysis on reliance of active northeast multispecies permit holders on other sources of fishery revenue were available for 2016-2018, looking at sector and common pool participation and days absent on groundfish trips. Even though this extends beyond the review period, during this time sector vessels were generally more reliant on groundfish revenue than common pool vessels. However, the proportion of revenue from groundfish species for a typical sector vessel ranged from 24% to 31%, whereas the typical common pool vessel, received 0% to 4% of its total revenue from groundfish species.

Net Revenues and Costs

Estimating profitability in commercial fishing requires a full account of revenues, variable costs (costs associated with at-sea operation) and fixed costs (costs that are constant despite vessel operation). Cost data applied considers costs associated with trips (e.g. supplies, groceries, bait, fuel, ice, water and oil), but does not account for the costs associated with ACE leasing, crew remuneration, sector fees, or ASM costs due to data limitations. However, net revenues are valuable to track the financial performance of the groundfish fleet.

Overall, net revenues are higher during the post-catch share period comparatively to the pre-catch share period when assessed at the groundfish trip and vessel-level. A greater difference between mean and median net revenues at the trip level during the post-catch share period relative to the pre-catch share period and a shift in of the interquartile ranges in the positive direction suggest that there are a few trips and vessels which earn much higher net revenues relative to the majority of groundfish trips and vessels, particularly during the post-catch share period.

There is greater variability in groundfish trip and vessel net revenues during the post-catch share period, with overall higher maximum and lower minimum net revenues comparatively to the pre-catch share period. Increases in trip and vessel net revenues in conjunction with decreases in fishing effort may indicate decreases in overcapacity within the groundfish fleet following the implementation of catch share management. On average, median net revenues are higher across all vessel size classes during the post-catch share time period relative to the pre catch share period. Net revenues reflect only a partial view of the economic performance of the groundfish fleet. Additional economic analyses and indicators, such as profitability, are restricted by data limitations.

Status of Regulated Stocks

The status of groundfish stocks has not changed considerably over the period of evaluation. It is not clear whether measures have constrained fishing mortality to MSA compliant levels, as the proportion of stocks subject to overfishing has decreased only from 42% (from 2003 to 2012) to 36% in 2015. Only three stocks – GB haddock, pollock, and redfish – did not experience overfishing in any year. Overfishing at levels greater than 150% F_{MSY} remained common for some stocks, such as eastern GB cod, western GB cod, GOM cod, and witch flounder, which experienced these high levels of overfishing for all six years of the catch share period.

There was variability in the proportion of stocks overfished, with an increase to a high of 52.6% of stocks overfished following implementation of the catch share program, down to 36% in FY 2015. Although the average biomass ratio of allocated stocks increased from 2010 to 2015 by 21%. The aggregate picture of stock status masks considerable differences in individual stock status. Both GB and GOM cod stocks remained overfished during 2010 through 2015, as did SNE/MA yellowtail flounder. In contrast, other stocks have recovered from historical overfishing, and other stocks have reached high abundances (e.g. haddock).

Groundfish Catch Utilization

Accountability measures (AMs) implemented together with the increased levels of at-sea observer coverage were expected to contribute to a reduction in uncertainty. However, the ACLs for many stocks have fluctuated or decreased, and biomass estimates for some stocks have decreased since the implementation of the catch share program. Utilization across sector, common pool and recreational components of the fishery can describe the program's ability to "*Maintain a directed commercial and recreational fishery for northeast multispecies*" (Goal 3).

The ACLs for many stocks had dramatic changes across the first six years of the sector program. Several high-utilization stocks saw large reductions in the sector-sub ACL, particularly between FY 2011 and FY 2012 (GB yellowtail flounder) and between FY 2012 and FY 2013 (GOM cod, GOM haddock, American plaice, CC/GOM yellowtail flounder, and witch flounder). Some stocks saw increases overall, such as redfish, GOM haddock, white hake, GOM winter flounder, and SNE/MA yellowtail flounder.

Across all fishing years, allocated groundfish stocks were caught below their total ACLs with the exception of GOM haddock in FY 2013 and 2014. These overages were associated with common pool catch (FY 2013) and recreational catch (FY 2013 and 2014). For non-allocated stocks, Atlantic halibut, northern and southern windowpane flounder each had overages of their total ACLS in multiple fishing years. AMs were triggered for both windowpane stocks in multiple fishing years. Approximately 97% of all groundfish allocation and landings were attributed to sector vessels versus common pool vessels even though the common pool maintained 38-48% of the MRIs in the groundfish fishery.

Sectors participants stayed within the sector sub-ACLs for all allocated stocks with the exception of witch flounder in FY 2013 and white hake in FY 2011. The witch flounder overage was a result of changes in carryover rules late in the fishing year and resulted in the pound for pound payback AM for those individual sectors that had overages. For white hake, there was sufficient FY 2010 carryover to cover the FY 2011 overage, therefore no AM was applied. Sector utilization rates fluctuated by stock and fishing year, sometimes reflecting sub-ACL trends and at other times in opposite of sub-ACL trends. GOM cod and witch flounder were the most utilized stock across the six-year period for sectors followed by CC/GOM yellowtail flounder and then western GB cod and American plaice. Eastern and western haddock were consistently the least utilized stocks by sectors across the six-year followed by redfish, GOM winter flounder and pollock. FY 2014 saw the lowest combined utilization rate for all allocated stocks for sector vessels.

Total common pool utilization was highest in FY 2010 with a rate of 53% but declined to 20-30% thereafter. GOM cod and SNE/MA winter flounder (FY 2014-2016) were the most utilized stocks by the common pool. Eastern and western GB haddock, GB winter flounder and redfish were the least utilized

stocks in the common pool. Common pool catch resulted in overages for witch flounder (FY 2010), western GB cod (FY 2013), GOM haddock (FY 2013) and eastern GB cod (FY 2014). Appropriate AMs were applied as necessary to account for the overages, the following fishing year.

The recreational fishery had poor performance of staying within recreational sub-ACLs for GOM cod (catch exceeded sub-ACL in FY 2013 and 2014) and GOM haddock (catch exceeded sub-ACL in FY 2012, 2013, 2014, and 2015) during the period of evaluation. AMs triggered included increasing minimum fish sizes, decreasing bag limits including no possession, and increasing the length of prohibited seasons.

Discards and Bycatch in the Groundfish Fishery

Implementation of catch shares appears to have reduced discards of regulated groundfish species. Sector vessels are required to retain all legal-sized groundfish catch, and results from total observer discards for groundfish trips indicate a reduction in discards of all allocated groundfish stocks combined, compared to pre-catch share program levels. This reduction in discards was not seen for other, non-groundfish species that are frequently caught on groundfish trips, as they do not have the same discard prohibitions.

Total discards across all allocated groundfish stocks by sectors ranged between 3.0 and 6.3% of total ACE utilization. Three stocks had discards of more than 20% of total ACE used, eastern GB cod (FY 2011, 2012 and 2013) and eastern and western GB haddock (FY 2012). Low discards (< 5% of total ACE usage) were seen in all six years for three species representing five allocated stocks, white hake, pollock, and winter flounder (GOM, GB and SNE/MA). The scallop fishery exceeded its bycatch allocation five times over the six-year period across three stocks, GB yellowtail flounder (FY 2012 and 2014), SNE/MA yellowtail flounder (FY 2011 and 2013) and southern windowpane flounder (FY 2015). Only the 2015 southern windowpane flounder overage triggered an AM. The Atlantic herring midwater trawl fishery exceeded its bycatch allocation of GB haddock in fishing years (FY 2012, 2013 and 2015). Only the FY 2013 overage resulted in the pound for pound payback AM. The GB small mesh fishery had no overages of its GB yellowtail bycatch allocation in the six-year review period.

Non-groundfish discards for certain species stayed the same or increased across the period of evaluation. Across non-groundfish observed discards, discards of all skates combined remained steady (62-70%) across the nine-year review period. Spiny dogfish observed discards increased during the six-year sector program with respect to the previous three years.

Numerous protected species have been observed/documented to interact with the groundfish fishery or with gear type(s) similar to those used in the fishery (bottom trawl or gillnet gear). Cusk, a species of concern, showed a decrease in observed bycatch on groundfish trips with the implementation of the sector system. Limited information is available on Atlantic sturgeon bycatch since the implementation of the catch share program. Between 1989 and 2013, fifteen Atlantic salmon have been incidentally caught in gillnet and trawl gear, with five being reported as fatalities; no interactions have been documented in any fishery dependent data since. Protected species bycatch rates (mammals & sea turtles) are very low but no analysis has been completed to attribute catch rates to any specific fishery. Observed harbor porpoise incidental takes has been on the decline since FY 2013.

Quota Market and Leasing

An important component of the catch share system is the ability to transfer individual allocations (PSC) of groundfish stocks between fishermen. Transfer can occur internally within a sector (intra-sector) or between approved sectors (inter-sector) and may be done for a variety of reasons. Many types of inter- and intra-sector ACE transfers occur among sectors and participants, ranging from fish-for-cash, fish-for-fish, basket trades, or gifts.

Inter-sector transfers are governed by a Right of First Offer process in all sectors, allowing sector members to accept the terms on any ACE transfer that results in ACE leaving that sector, and could result in higher inter-sector leasing costs versus intra-sector leasing costs. Further, inter-sector leasing can be restricted by NMFS under certain conditions.

There were 2,531 distinct inter sector transfer between FY 2010 and 2015. GOM cod was the most common stock traded (770 individual transfers) followed by witch flounder (730 transfers), while eastern and western GB haddock were the least transferred. A total of 95,017,350 live pounds were transferred between sectors in six years; with the most weight (21,432,767 live lbs.) transferred in FY 2012 and the least (10,027,309 live lbs.) transferred in FY 2014. Pollock and redfish had the greatest weight transferred between sectors in the six years, while GOM winter flounder and eastern GB cod had the fewest pounds moved between sectors. No stock had more than 50% of the sector sub-ACL by live weight transferred between sectors in any given year. Transfers of CC/GOM yellowtail flounder, eastern and western GB cod, GOM cod, GOM haddock, SNE/MA yellowtail flounder and witch flounder ranged between 20% and 50% of the overall yearly stock specific sector sub-ACL.

Modelled average annual ACE lease prices declined across the six-year period for most stocks with the exceptions of GOM cod, American plaice and witch flounder. For these three stocks, current data indicates increase in ACE lease price most likely were the result of high utilization rates and significant reductions in ACLs; however, the increases in lease price appear to be delayed by a fishing year after the reductions have occurred. A network analysis of all inter sector leases indicates that level of leasing quota in and out of individual sector varied by sector.

Community Impacts

Analysis of fleet activity, landings and gross revenues illustrated disproportionate impacts across communities, but do not reveal the reliance of those communities on the fishery. According to the commercial engagement (metrics that look at the value, landings, permits, dealer purchases, and vessels) and reliance (metrics that look at the value, landings, permits, dealer purchases, and vessels per unit of population) indicator factor scores, New Bedford and Gloucester, MA, were far more engaged in commercial groundfish activities than any other ports in the region. Both ports had twice the level of engagement than the next highest engagement port, Boston, MA. In terms of reliance on commercial groundfish, Chatham and Gloucester, MA, demonstrated by far the highest levels of reliance on this fishery over the period of 2012 to 2016. Both ports were more than two times more reliant on commercial groundfish activities than the next most reliant port, Montauk, NY. New Bedford, MA, had the greatest level of social vulnerability among highly engaged commercial groundfish ports over the period under consideration, including high poverty, moderate-high housing instability, moderate-high population composition vulnerability, and moderate-high personal disruption. Chatham, MA, and Montauk, NY, had the highest levels of gentrification pressure vulnerability among highly engaged commercial groundfish ports.

Data available on shoreside infrastructure is very limited and only capture number of dealers that reported purchasing groundfish stocks. Between FY 2010 and 2015, the total number of dealers that reported purchasing groundfish stocks increased from 95 to 128 with increases observed mostly in Maine and the Mid-Atlantic States and decreases in dealers purchasing groundfish in New Hampshire. Between 2006 and 2015, the annual occupational fatality rate in the groundfish fishery declined; however, there are many factors (including an overall decrease in groundfish effort) that may have contributed to this decline.

Industry perspective on safety and the catch share system varies widely, with some believing it has improved safety while others believe the sector system has decreased safety and still other lie somewhere in between.

Stakeholder Engagement and Cooperation

The new system was a considerable dissent from management under DAS, and therefore required both engagement and collaboration between management and stakeholders along with dedicated resources, particularly in the development of sector operational plans, environmental assessments and monitoring program details. A regional assessment and management review of the NE fishery management process identified the need to improve science collaboration, simplify governance, maximize collaboration and simplify communications. The NEFSC Population Dynamics Branch conducts pre-assessment meetings to ensure (1) that the process is understood, and that (2) there is opportunity for input. Pre-assessment outreach meetings to allow for industry and other stakeholder input have been held both prior to and following the change in management. Assistance was provided throughout the NE region to sectors through a number of cooperative research projects funded by the NEFSC Cooperative Research Program or private NGO foundations. Engagement opportunities were increased to help the sectors sift through the processes of operating under the management regime, these have included monthly phone conferences for sector managers and NMFS Sustainable Fisheries Division staff (since FY 2011); in person meetings scheduled as needed; and workshops convened throughout the region during the evaluation period (and continue to be convened) bringing together fishermen, scientists, managers and other stakeholders to discuss groundfish related issues

Essential Fish Habitat

In order to determine whether the implementation of the catch share system had an effect on EFH, analysis must consider changes to fishing operations that occurred with implementation. The general decline in groundfish effort since implementation of the sector program, both by total number of groundfish vessels and number of groundfish trips, would imply that there was less bottom disturbance and thus disturbance of EFH as there was less bottom tending gear used in the fishery. Effort reductions were seen across all vessel size classes following implementation of the sector program, with the smallest reduction in the 75’ and greater vessel size class both number of vessels and number of groundfish trips. These larger vessels are generally equated to offshore, multi-day trip vessels. Across gear types, trawl vessels experienced the least consolidation, with a 27.9% reduction in number of vessels since implementation of the sector program. This potential decrease in EFH impacts as a result of the decrease in effort was not proportional throughout the groundfish fishery. Observer data indicates a shift in fishing effort for large trawl vessels from inshore to offshore following implementation of the catch share program, though for small vessels most fishing occurred in coastal statistical areas and this pattern did not

change with implementation of the program. Implementation of the catch share system may have displaced some effort into both other federally managed fisheries and state water fisheries thus further reducing potential realized gains to EFH with the implementation of the catch shares.

Recommendations for Future Reviews

The working group that developed this report along with contacts that provided valuable information and review have provided recommendation to be considered prior to the undertaking of future evaluations. Some recommendations broadly relate to the process of evaluation, while others are applied to specific needs to further certain analyses; the complete list of recommendations are provided in the main report. A key recommendation is to dedicate sufficient resources to provide for closer alignment in fishing years with evaluation years, to the extent feasible. A monitoring and evaluation program should be developed – and doesn't have to be extensive beyond much of the key information already maintained – but should provide for the tracking of progress against FMP goals and objectives using measurable metrics that both track the progress and recognize information gaps.