Break-Even Analysis of the New England Groundfish Fishery for FY2009 and FY2010

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Table of Contents

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Executive Summary

The purpose of this Break-Even Analysis was to evaluate the financial performance of the multispecies fishery in fishing years (FY) 2009 and 2010. This analysis does not attempt to evaluate the effect or performance of either sector management or annual catch limits (ACLs), both of which were implemented in FY2010.

Break-even analysis is a business tool typically used to project the minimum level of production at expected prices needed to cover both variable and overhead costs for a specified time period (typically one year). This approach has been used in past fishery management analyses (Northeast Multispecies Fishery Management Plan Amendments 7, 13, and 16) to evaluate the effect of changes in days-at-sea (DAS) allocations on break-even for vessels in the groundfish fishery. We use break-even analysis to assess the financial position of selected vessels that participated in the groundfish fishery during FY2009 or FY2010. This is a departure from prior break-even analyses in that our study evaluates actual as compared to projected or forecasted outcomes.

Unless stated otherwise, in this report we use the term groundfish to refer to all species/stocks that are managed under the Northeast Multispecies Fishery Management Plan (FMP) for which a Potential Sector Contribution (PSC) was allocated to each permit holder. These stocks include Gulf of Maine (GOM) cod, GOM haddock, GOM winter flounder, Georges Bank (GB) cod, GB haddock, GB yellowtail flounder, GB winter flounder, Cape Cod/Gulf of Maine yellowtail flounder, Southern New England/Mid-Atlantic yellowtail flounder, pollock, white hake, Acadian redfish, American plaice, and witch flounder. The term groundfish vessel refers to any limited access vessel that participates in the groundfish fishery by landing one or more pounds of allocated groundfish.

This report estimates the number and percentage of vessels that broke even during FY2009 and FY2010. Breaking-even means that the total vessel revenue equaled or surpassed all costs paid by vessel owners including crew payments and other trip costs, marketing costs, overhead costs, and payments made by vessel owners to cover sector costs during the fishing year. Break-even was estimated separately for FY2009 and FY2010 for a sample of limited access groundfish vessels. Vessels included in our sample had to have 1) landed one or more pounds of allocated groundfish; 2) used either gillnet, bottom longline, or otter trawl as the primary gear when harvesting allocated groundfish; and 3) the same moratorium right ID (MRI) for the entire fishing year.

These criteria were applied for both fishing years FY2009 and FY2010 resulting in a total of 468 eligible vessels during FY2009 and 357 vessels during FY2010. These vessels represented 83% and 79%, respectively, of all vessels that landed groundfish on at least one trip during FY2009 and FY2010. Even though our study includes the majority of groundfish vessels, nothing should be inferred from our study about the financial position of the 20% of participating vessels that were not included in the analysis.

Our study sample was further broken down into seven categories based on primary gear and vessel size, where primary gear was determined by the gear type used when landing the majority of allocated groundfish in terms of revenue. These categories include gillnet vessels less than 40

feet, gillnet vessels 40 feet and above, bottom longline vessels less than 40 feet, bottom longline vessels 40 feet and above, otter trawl vessels less than 50 feet, otter trawl vessels between 50 and 65 feet inclusive, and otter trawl vessels above 65 feet.

Estimation of the number and percentage of vessels that broke even measures the performance of the multispecies fishery for FY2009 and FY2010. Since it was not possible in the context of this analysis to fully consider and evaluate every possible factor contributing to the performance of the fishery, the break-even analyses should not be construed as measuring the performance of sector management as a fishery management system. The cumulative effects of management and external changes affected the financial viability for New England groundfish vessels in complex ways that are difficult to untangle. Sector management may have allowed fishermen to selectively target higher priced fish stocks at opportune times that may have increased revenues and mitigated reductions in ACLs. Low ACLs in fish stocks that have technical and biological interactions with high ACL stocks may have constrained the catch of those stocks under a management system with hard catch limits. Increased flexibility to target species under sector management without DAS restrictions and trip limits may have dampened the effects of higher fuel prices in FY2010 relative to FY2009.

Data to support the break-even analysis were obtained from several sources. Vessel activity data were obtained from data bases maintained by the National Marine Fisheries Service Northeast Regional Office. These data included landed pounds and revenue for both allocated groundfish and non-groundfish species as well as number of trips by day trips (trips 24-hours or less) and multi-day trips (trips exceeding 24-hours). These data were summed for fishing years FY2009 and FY2010 by vessel.

However, unlike vessel revenue and activity data that were available for all vessels, cost data were available only for a sample of trips or a sample of vessels. This meant that cost data for the break-even sample were subject to considerable uncertainty. To assess the level of uncertainty in trip and overhead costs, a series of interviews was conducted with vessel owners to ascertain whether available cost data were reasonable or representative. The interviews also informed us that some costs were not collected by existing data collection programs. Based on these interviews we found that 1) neither auction nor trucking fees were part of any data collection program and should be added to the break-even analysis; 2) available trip cost data were consistent with the range of trip costs experienced by vessel owners except that fuel consumption for larger vessels tended to be underestimated; and 3) available overhead cost data incurred by larger vessels were particularly difficult to collect due to substantial differences in terminology and large variability among vessel owners even within the same vessel gear/size categories. The findings from the interviews were utilized to inform how the input data were used and how the analysis was performed.

Trip cost data were obtained from NMFS Northeast Fisheries Science Center observer data. Costs collected on observed trips include gallons of fuel used, fuel price, use and price of ice, as well as the total costs of food, oil, water, bait, and general supplies purchased for the trip. These sample data were used to construct average trip costs by vessel category for day trips and multi-day trips. Trip costs for multi-day trips were converted to a cost per day by dividing total trip costs by the trip duration. Data for observed trips during fishing years 2008 to 2011 were used in

order to obtain sufficient sample size to estimate trip costs for all seven vessel categories for both day and multi-day trips. Trip costs in these years were adjusted by the CPI to compute trip costs in 2009 dollars to estimate FY2009 break-even and 2010 dollars for FY2010 break-even. A simplifying assumption was made to apply average trip costs to both groundfish and non-groundfish trips.

Data for overhead costs were obtained from NMFS Northeast Fisheries Science Center. Overhead costs include insurance, dockage, vessel maintenance, etc. These data were based on a mail survey sent to all permit holders as part of the permit application package during FY2007 – FY2009 seeking overhead costs for 2006-2007. The survey was discontinued in 2009 due to low response rates. As the vessel owner interviews indicated these data presented serious problems because samples were small relative to the populations, standard deviations were large, especially in individual categories of overhead costs, observations were not normally distributed but skewed, and often had large outliers.

Auction fees based on an average of $0.03 per pound, as reported during the vessel owner interviews, were applied to landings sold at display auctions in Portland, Gloucester, Boston, or New Bedford. A simplifying assumption was made to apply the proportion of all pounds landed in the Northeast region at these auctions by vessel category for all vessels. This proportion was estimated separately for both FY2009 and for FY2010. In a similar manner, a trucking fee of $0.10 per pound was applied to all pounds landed outside the ports of New Bedford or Boston where the majority of processing companies are located.

Estimated sector costs were based on a combination of vessel owner interviews and the sector reports. Most sectors charged a one-time membership fee of $10,000, but allowed the fee to be paid in equal installments of $2,500 per year. This fee was treated as an additional overhead cost. Sector fees were also charged on a per pound basis applied only to allocated groundfish. This fee averaged $0.04 per pound during FY2010 and was applied to allocated groundfish landings for each vessel in the break-even study sample.

Crew share was based on a 50/50 lay system where all trip costs and any per pound fees including sector fees were deducted from gross revenues and the remainder was split between the vessel owner and crew at a 50/50 rate.

Because we did not have any reliable way to separate vessels likely to have high versus low overhead costs, we used a Monte Carlo simulation to assign overhead costs for each vessel category. The simulation was conducted using 1,000 iterations where each iteration resulted in an estimate of the number of vessels above break-even depending on the randomly drawn overhead cost by vessel category.

The mean values using the Monte Carlo simulation for overhead costs show higher percentages of vessels in most vessel categories above break-even in FY2010 than in FY2009. On a *fleet-wide basis* 49% (227 of 468) of vessels were above break-even during FY2009 as compared to 55% (196 of 357) of vessels above break-even during FY2010 after accounting for sector costs. Our estimates should be interpreted with caution because we were unable to reliably match vessel categories with overhead costs that led to large uncertainty in estimation. For all vessel

categories, the upper and lower bound estimates using the 90% confidence intervals for FY2009 and FY2010 including sector costs overlap.

On a vessel-category basis the number of vessels above break-even during FY2009 tended to be larger than in FY2010 for nearly all vessel categories except for longline vessels and trawl vessels greater than 65 feet. For longline vessels the mean number of vessels above break-even was the same in both FY2009 and FY2010 while the mean number of large trawl vessels above break-even increased. These results are subject to the same level of uncertainty as the percentages reported above. For all vessel categories the upper and lower bound estimates using the 90% confidence intervals for FY2009 and FY2010 including sector costs overlap.

Note that at least part of the difference in mean values between FY2009 and FY2010 is due to differences in numbers of vessels that met our criterion, but is also due to the decline in the numbers of vessels participating in the groundfish fishery. Specifically of the vessels included in our study data, 111 fewer vessels fished for groundfish in FY2010 than in FY2009. Some of these vessels withdrew from fishing in New England federal waters and others left the groundfish fishery but participated in other fisheries. We did not apply break-even analysis for these vessels because they targeted a wide assortment of other fisheries, which would have made sample size for observer data on trip costs from these vessels too small for this analysis when spread out across different fisheries.

While leasing costs and revenue may have been large for many vessel owners, leasing costs were not included in the break-even analysis due to lack of data on intra-sector trading as well as uncertainty in the price data submitted for inter-sector trades. Leasing quota has implications for the financial position of any given fishing business. While we cannot provide a formal analysis of leasing impacts on break-even due to missing data on leasing in-flows and out-flows by vessel, and missing prices for many transactions, there is sufficient data to estimate the in-flow of quota that would have been required for the vessels included in the break-even analysis. This estimate was obtained for each vessel by summing catches during FY2010 and subtracting the initial quota by stock for each vessel.

During FY2010, the 357 vessels included in the FY2010 break-even data needed to acquire either through monetary or in-kind trades a combined 13.5 million pounds over their initial allocations to cover their catch (landings plus discards). This leased quota, the majority of which was likely to have been leased for monetary compensation (according to sector reports), represented 23% of total catch. Gulf of Maine (GOM) cod represented the largest need for all gillnetters, for small longliners, and for small otter trawl vessels. Georges Bank (GB) cod represented 84% of the annual catch entitlement (ACE) needed for larger longline vessels. For mid-size and large otter trawl vessels the stocks with the largest trading needs were GB cod, GOM cod, GB winter flounder, white hake, and pollock.

The break-even analysis for FY2010 did not include costs of managing sectors not paid by vessel owners or crew and subsidized by NOAA for FY2010 that are likely to be discontinued at some future date. Each sector was given $65,129 to cover sector operating costs for FY2010. Dockside monitoring was also reimbursed by NMFS up to $75,204. The cost of sector membership per vessel paid for by NMFS would depend on the composition of each sector, specifically by the

number of vessels over which the cost would be distributed and the vessel's total groundfish catch.

In addition to sector costs, vessels may be expected at some future date to pay the significant costs of at-sea monitoring (ASM). Using the current observer coverage rate, the current days absent, and the current monitoring cost per day, we estimate a total ASM cost for FY2010 of $3.67 million, which represents 4% of total groundfish revenue, 4% of total groundfish trip revenue, and 2% of total fishing revenue from all species including groundfish and non-groundfish trips. The ASM coverage rate required for FY2012 (8% provided by Northeast Fishery Observer Program, 17% provided by contracted at-sea monitors) instead of the current observer coverage rate would result in lower overall monitoring costs. At FY2010 activity levels for the vessels included in the break-even analysis, the 17% coverage rate would have cost $2.35 million. This level would represent approximately 3% of FY2010 groundfish revenue and 1.4% of total fishing revenue.

The uncertainty in the break-even results, particularly related to sector costs, makes definitive conclusions regarding financial performance during FY2009 as compared to FY2010 challenging. Available data on overhead costs in particular also hamper our ability to determine with certainty the financial condition of the vessels included in the break-even analysis. Nevertheless, while we recognize other potential factors it is clear that fewer vessels participated in the groundfish fishery during FY2010 than did so during FY2009. It is also clear that under any circumstances, results show large numbers and percentages of vessels not breaking even during either FY2009 or FY2010.

To accurately determine the financial condition of the multi-species fishery, data must be more reliable and of better quality, especially overhead cost data. The NEFMC and other interested management bodies should pay greater attention to this critical need.

List of Tables

Document

Appendix A

Appendix B

List of Figures

Document

No Figures are presented in the Document Text

Appendix A

Appendix B

No Figures are presented in the Document Text

Appendix C

No Figures are presented in the Document Text

I. Introduction

Starting on 1 May 2010, the management system for New England groundfish known as the Northeast Multispecies Fishery Management Plan (Multispecies FMP) transitioned from an input-only type control to a mix of input and output-type control systems. Specifically, the sector management program initially established by Amendment 13 was applied to the entire fishery, with most vessels moving from a management system based on days-at-sea (DAS) to a system in which catch (Annual Catch Entitlement or ACE) for 14 the 20 fish stocks included in the Multispecies Plan was allocated to sectors. Each vessel permit within the sector was assigned a potential sector contribution (PSC) for each stock based on its fishing history. With some exceptions, the ACE for each stock allocated to a sector for the 2010 fishing year (FY2010: from 5/1/2010 to 4/30/2011) was determined by member vessels' PSC and current catch limits. Sectors could allocate their ACE to vessels as they wished and buy or sell ACE from other sectors for that fishing year. In accordance with sector operation plans, vessel owners retained the quota they contributed to the sector as an initial allocation. If a sector met or exceeded its ACE during the fishing year (landings plus discards) for any stock managed under the sector program, it would be required to stop fishing in that stock area for all stocks managed under the Multispecies FMP. The sector could resume fishing if it bought quota from another sector of the stock for which it had exhausted or exceeded its ACE.

Vessel owners who decided not to enroll in a sector became part of the common pool. These vessels were managed by DAS and other effort controls developed by the New England Fishery Management Council (NEFMC) and implemented by the National Marine Fisheries Service (NMFS). Vessels in the common pool could not exchange quota with vessels in a sector and could not lease DAS from vessels in a sector but could lease DAS from another common pool member. Vessels in sectors and vessels in the common pool were included in this report if they met certain criteria for inclusion in the break-even analysis (see Section 2.2 Vessel Selection).

In addition to these changes in the Multispecies FMP, fishery management for all fisheries in federal waters changed as a result of revisions to the Magnuson Stevens Act (MSA). The 2006 Reauthorization of the MSA made the development of annual catch limits (ACLs) a new priority[1]. The MSA strengthened the objective of National Standard 1 to prevent overfishing and rebuild overfished stocks. Regional Councils were required to establish a mechanism for determining ACLs and accountability measures (AMs) for fisheries that exceed their ACLs for all federally-managed fisheries.

Under the Multispecies FMP prior to 2010, annual target catches were set based on desired fishing mortality rates for each stock managed[2]. Exceeding these targets was an indicator that fishing mortality rates may have been higher than desired, which may require an adjustment to the effort controls measures to be implemented during the subsequent fishing year. For the first time in FY2010, limits were set for each of the stocks in the Multispecies fishery that triggered

[1] The requirement to prevent overfishing and rebuilding overfished stocks has been in the Act since 1976, but the priority for preventing overfishing and rebuilding overfished stocks was incorporated in 1996.

[2] GB stocks of cod, haddock, and yellowtail flounder subject to the US/CA resource sharing agreement were and continue to be managed under a hard TAC.

accountability measures that would reduce catch limits in subsequent years if the total catch of that stock surpassed its ACL. The likelihood that the total commercial ACL would be exceeded was mitigated by the fact that any sector that met or exceeded its ACE for a stock must cease fishing in the stock area until additional ACE could be acquired through an exchange with another sector. In this manner, it was possible for one or more sectors to exceed their ACE in one or more stocks without exceeding the total commercial ACL for those stocks.

Catch limits for FY2010 were reduced for most fish stocks in the multispecies fishery from catch limits set for FY2009 (See Table 1.1). For simplicity in this report, multispecies stocks will be called groundfish stocks, a more common term to describe these stocks. Also, unless otherwise noted, we base our study on the allocated groundfish stocks for which sectors received ACE.

Table 1.1 Summary of FY2009 Target TACs and FY2010 ACLs by Allocated Stock *(in metric tons)*

Stock	2009 Total Allowable Catch[1]	2010 ACLs[3]	Change from 2009 to 2010	2009 Landings[4]	2010 Commercial ACLS[5]	2009 Landings as % of 2010 ACL
GB Cod	4,328	3,620	-708	3,290	3,430	95.9
GOM Cod	10,724[2]	8,088[2]	-2,636	7,173	4,567	157.1
Plaice	3,214	3,006	-208	1,513	2,848	53.1
GB Winter	2,004	1,955	-49	1,781	1,852	96.2
GOM Winter	379	230	-149	239	158	151.3
Witch Flounder	1,129	899	-230	980	852	115.0
CC/GOM Yellowtail	860	822	-38	577	779	74.1
GB Yellowtail	1,617	1,021	-596	998	823	121.3
SNE/MA Yellowtail	389	470	81	157	310	50.6
GB Haddock	70,155	42,768	-27,387	7,462	40,440	18.5
GOM Haddock	1,564[2]	1,197[2]	-367	556	825	67.4
White Hake	2,376	2,697	321	1,955	2,556	76.5
Pollock	6,346	18,929	12,583	7,269	16,553	43.9
Redfish	8,614	7,226	-1,388	1,489	6,846	21.7
Total	113,699	92,928	-20,771	35,439	82,839	42.8

Notes
1. 2009 TAC NERO Report Summary US TAC shown for GB Cod, Haddock, and Yellowtail http://www.nero.noaa.gov/ro/fso/reports/TAC/TAC_1997_2009/TAC_FY2009_WEB.pdf
2. Includes recreational catch
3. 2010 Total ACL's Federal Register (75 FR 18360: April 9, 2011.
4. 2009 Landings http://www.nero.noaa.gov/ro/fso/reports/2009_2010_Comparison.htm, the Combined Sector and Common Pool Groundfish by Stock.
5. 2010 Commercial ACL's Federal Register (75 FR 18360: April 9, 2011

In the aggregate total, the FY2010 ACL was 20,711 mt less than the FY2009 target total TAC. However, the majority of this difference was Georges Bank (GB) haddock at -27,387 mt and pollock at +12,583. At least some of the difference in haddock ACL was caused by the change in the procedures by which the FY2010 ACL was derived, but was also caused by the aging of the

large 2003 year class, which no longer comprises a large component of the population. Note that the MSY reference point for GB Haddock was 32,700 mt, which means that the FY2010 ACL was still well above the expected long term yield from the stock. If we remove the dominant negative effect of the reduced FY2010 GB haddock ACL and the large positive effect for pollock, the aggregate difference between FY2009 TACs and FY2010 ACLs falls to a reduction of 5,967 mt[3].

Due to these constraints on catch, fishermen require a "portfolio" of ACE for fish stocks to fish, or the funds and willingness to purchase ACE for those stocks they need. Under hard catch limits, this problem is exasperated as stocks with low ACLs may be difficult to avoid when targeting stocks with high ACLs and may ultimately limit the effort on more abundant stocks. These species have been referred to as "choke stocks". Comparing FY2009 landings to the FY2010 commercial ACLs (combined sector and common pool) provides some indication of which species may be expected to be most problematic in this regard (Table 1.1). Choke species include Gulf of Maine (GOM) cod, GOM winter flounder, GB Yellowtail flounder, and, to a lesser extent, GB cod and GB winter flounder. The ACLs for the GB stocks, GB cod, in particular, are likely to constrain the ability to take advantage of the large GB haddock ACL.

The comparison of landings of groundfish stocks by vessels in sectors between FY2009 and FY2010 reflect reductions in catch limits and constraints in catching stocks with high ACLs. GB cod and haddock and redfish accounted for almost all of the increases in commercial landings during FY2010, which indicate some success in targeting these species (See Table 1.2). Revenues did not follow the same scale from FY2009 to FY2010 as changes in landings. Total groundfish revenue declined by only 2% compared to the 16% decline in landings due to shifts in composition of landings and ex-vessel price increases, especially for cod.

This report estimates the number and percentage of vessels that at least broke even in each of seven categories of vessels based on gear and vessel size engaged in the groundfish fishery during FY2009 and FY2010. A vessel broke even if its annual total revenue equaled its annual total cost, where total revenue was revenue from all commercial landings for a fishing year, and total costs were all costs paid in the same fishing year, including trip costs, marketing costs, labor costs, fixed costs, and payments made by vessel owners to cover sector costs. Vessel owners paid sector costs only in FY2010.

While leasing costs and revenue were likely significant for many vessel owners, lack of data on intra-sector trading as well as uncertainty in the price data submitted for inter-sector trades makes inclusion of leasing costs difficult for this break-even analysis. For this reason, leasing costs and revenues were not included in the breakeven analysis. A discussion about the potential impacts of leasing is included in the Discussion section of this report.

[3] The biological reference points for pollock were changed in FY2010 as a result of a recent stock assessment. The revised reference points resulted in substantial increases in the OFL, ABC, and ACL for pollock. Given the revised scientific understanding of pollock status, it is likely that the 2009 target TAC would have been larger than it was.

Table 1.2 Comparison of New England Groundfish Landings, Revenues and Prices for FY2009 and FY2010

Stock	2009 Landings (000 lbs)	2010 Landings (000 lbs)	% Change	2009 Revenue ($000)	2010 Revenue ($000)	% Change	2009 $/lb	2010 $/lb	% Change
GB Cod	8,479	6,940	-18%	9,030	10,370	15%	$1.06	$1.49	40%
GOM Cod	18,486	9,618	-48%	20,037	15,847	-21%	$1.08	$1.65	52%
Plaice	3,336	2,985	-11%	4,385	4,336	-1%	$1.31	$1.45	10%
GB Winter Flounder	3,948	3,020	-24%	6,506	6,024	-7%	$1.65	$1.99	21%
GOM Winter Flounder	527	223	-58%	885	415	-53%	$1.68	$1.86	11%
Witch Flounder	2,161	1,464	-32%	4,216	3,537	-16%	$1.95	$2.42	24%
CC/GOM Yellowtail	1,272	1,142	-10%	1,945	1,562	-20%	$1.53	$1.37	-11%
GB Yellowtail	2,200	1,499	-32%	2,585	1,778	-31%	$1.17	$1.19	1%
SNE/MA Yellowtail	346	359	4%	561	467	-17%	$1.62	$1.30	-20%
GB Haddock	18,737	20,839	11%	15,437	19,511	26%	$0.82	$0.94	14%
GOM Haddock	1,396	942	-33%	1,694	1,357	-20%	$1.21	$1.44	19%
White Hake	5,775	6,570	14%	4,028	4,831	20%	$0.70	$0.74	5%
Pollock	18,157	13,775	-24%	10,941	9,974	-9%	$0.60	$0.72	20%
Redfish	3,283	4,405	34%	1,608	2,528	57%	$0.49	$0.57	17%
Totals	88,103	73,782	-16%	83,858	82,537	-2%	$0.95	$1.12	18%

Source. http://www.nero.noaa.gov/ro/fso/reports/2009_2010_Comparison.htm, the Combined Sector and Common Pool Groundfish by Stock. Landings converted to landed weight

The purpose of this report is to identify the financial condition of vessels in vessel categories for FY2009 and FY2010. Estimation of the number and percentage of vessels that broke even measures the performance of the multispecies fishery for FY2009 and FY2010, but does not necessarily measure the performance of sector management because other changes occurred in the fishery and in fishery management that were not considered. In addition to the change in management and institution of hard catch limits, two other financial variables changed substantially in FY2010. Fuel costs, a major cost for groundfish fishing trips, increased sharply during FY2010. Data from observed groundfish trips from FY2009 and FY2010 show an average increase in price from $2.58 during FY2009 to $3.35 during FY2010. Fish prices for most New England fish stocks also increased sharply during FY2010, which would have boosted vessel revenue. The weighted average of groundfish prices increased by 18% during FY2010, for example.

The cumulative effects of management and external changes affected the financial viability for New England groundfish vessels in complex ways that are difficult to untangle. Sector management allowed fishermen to selectively target higher priced fish stocks at opportune times that may have increased revenues and mitigated reductions in ACLs. Low ACLs in fish stocks that have technical and biological interactions with high ACL stocks may have constrained the catch of those stocks under a management system of hard catch limits. Increased flexibility to target species under sector management without DAS restrictions and trip limits may have dampened the effects of higher fuel prices.

This report includes sections on Methods and Data, Results, and Discussion.

II. Methods and Data

2.1. Break-Even Analysis

Break-even analysis is a business tool usually used to project the amount of units sold over some time period (usually a year) necessary to cover all costs paid over the same period. Projections are necessary for output prices, variable costs, fixed costs, and any technical changes in the production process.

For economic impact analysis of fishery management actions, fishing effort or landed pounds are the units typically used for estimating break-even points. For example, the Environmental Impact Statements for Amendments 13 and 16 of the Multispecies Fishery Management Plan estimated break-even as the average number of DAS necessary for vessels in specific categories to meet fixed costs after paying trip costs and estimated crew salary (Multispecies FMP Amendment 16, NEFMC). Revenue and cost values were projected forward using models using data from past values for these variables. The break-even analysis for these management actions estimated the Contribution Margin per day fished **(**the projected average gross revenue per day fished minus projected average trip costs including crew payments per day fished) to calculate the number of days fished that would be necessary to equal estimated annual fixed costs for various management options. Costs were averaged for break-even because trip costs and fixed costs were not available for all vessels. Given the large variance in fixed costs, Amendment 16 constructed estimates of average fixed costs for vessels with low, medium, and high fixed costs and then estimated break-even DAS necessary for each of these vessel categories. Note that these vessel categories were only hypothetical because then, as now, it was not possible to reliably link vessel activity levels with fixed costs.

While this report uses similar methods in estimating break-even, we estimated annual vessel revenue necessary to cover costs for the same fishing year for the vessel, including trip costs (including crew payments), marketing costs, fixed costs, and payments made by vessel owners to cover sector costs in order to estimate the number of vessels and percentage of vessels that broke even or better by vessel category. Fixed costs are generally considered costs that do not vary with output, such as insurance, permit fees, association costs etc. However, some costs vary with output, such as repairs and maintenance, yet are not associated with any specific trip. For this report, we will refer to these costs collectively as overhead.

As a secondary goal, this report discusses the economic impact on break-even for sector vessels from transferring more of the sector costs to vessel owners, such as monitoring costs that are currently paid by NMFS.

Unlike estimates of profitability, break-even analysis does not include the opportunity cost of capital (also called the return to equity) as a cost. More specifically, break-even analysis includes payments for repairs, maintenance, and interest on loans as costs, but does not include payments to vessel owners for their equity. Break-even analysis is more similar to cash flow than profitability.

For this report, we estimated the number of vessels in each vessel category whose revenues for FY2009 and FY2010 at least equaled all costs paid by vessel owners for FY2009 and FY2010. While it was not necessary to forecast revenues and costs because we are estimating break-even for past years, similar processes were used to collect revenue and cost data as were used to forecast break-even for previous management actions. We added some categories of cost that were not used for break-even analysis for previous management actions, specifically marketing costs and sector costs.

In order to estimate break-even points, we selected vessel categories and vessels for each category, estimated trip costs, labor costs, overhead costs, marketing costs, and sector costs paid by member vessels.

2.2 Vessel Selection

The break-even analysis was developed for vessel categories from the population of vessels that met three criteria. First, they had to have landed one or more pounds of allocated groundfish. Second, they had to have used either gillnet, bottom longline, or otter trawl as the primary gear when harvesting allocated groundfish[4]. For this criterion, primary gear was determined by summing allocated groundfish revenue by gear used and selecting the gear associated with the majority of allocated groundfish revenue. Third, the vessel had to have the same moratorium right ID (MRI) for the entire fishing year. These criteria were applied for both fishing years 2009 and 2010 resulting in a total of 468 vessels during 2009 and 357 vessels during 2010. These vessels represent 83% and 79% respectively of all vessels that landed groundfish on at least one trip during 2009 and 2010. Note that since the criterion was applied separately for each fishing year even though a significant number of vessels fished in both years there were some vessels included in our 2010 sample that did not fish for groundfish during 2009 and some vessels that fished during 2009 that did not fish during 2010. Furthermore, since the selection criteria removed about 20% of vessels that fished for groundfish during either 2009 or 2010, nothing should be inferred from our study about the financial position of vessels that were not included in the analysis. Our analysis does include the majority of vessels participating in the groundfish fishery.

As was done in previous analyses conducted in the EIS for Amendments 13 and 16 the gear categories were further broken out by vessel size. Size categories were selected by reviewing the

[4] Handline gear were initially included in the gear selection criterion, but were subsequently dropped from the analysis due to a lack of adequate cost data.

size classes used in prior analyses and an evaluation of the size distribution of active vessels in more recent years. Based on this assessment approximately one-half of both longline and gillnet size categories were less than 40 feet in length overall (LOA) while the other half were above 40 feet LOA. For otter trawl vessels, we based the size categories for trawlers on separation between vessels that usually fish near shore and multi-day trip vessels that usually fish off shore. These are essentially different fisheries with different revenue and cost structures.

Table 2.2.1 Descriptive statistics for vessel categories.

Vessel Category	Number of Vessels	Average Length	Average Gross Tons	Average Horsepower
		Fishing Year 2009		
Gillnet < 40 Feet	58	35	14	278
Gillnet >= 40 Feet	83	44	27	359
Longline < 40 feet	10	35	16	316
Longline >= 40 Feet	11	45	31	411
Trawl < 50 Feet	85	45	24	292
Trawl >= 50 and <= 65 Feet	80	57	60	390
Trawl > 65 Feet	141	77	133	627
		Fishing Year 2010		
Gillnet < 40 Feet	42	36	15	297
Gillnet >= 40 Feet	66	45	27	345
Longline < 40 feet	8	36	16	356
Longline >= 40 Feet	9	42	22	422
Trawl < 50 Feet	58	42	26	297
Trawl >= 50 and <= 65 Feet	63	57	61	384
Trawl > 65 Feet	111	77	135	643

Examination of the relationship between percentage of days fished on day trips and size of vessel showed breaks at 50' and 65' in length (see scatter plot in Appendix, Figure A1). Vessels below 50' showed the highest percentage of days absent on day trips, vessels between 50' and 65' showed predominance of days absent on day trips, and vessels greater than 65' showed predominance of days absent on multi-day trips.

The descriptive statistics for the vessel categories are depicted in Table 2.2.1 (above).

2.3 Fishing Effort and Revenue Data

Fishing effort in terms of trips and days fished on groundfish and non-groundfish trips were calculated from the Vessel Trip Reports. Groundfish trips were defined as any trip where one or more of the allocated groundfish species were landed. A non-groundfish trip was defined as any trip where none of the allocated groundfish species was landed. Average total fishing effort, in terms of days absent, declined between FY2009 and FY2010 for all categories except longliners and trawl vessels greater than 65' (Table A1 in the Appendix). On average, fishing effort shifted to non-groundfish trips. Average total days absent on non-groundfish trips increased for all

vessel categories while average total days absent on groundfish trips declined for all vessel categories except for trawl vessels greater than 65'.

Dealer reports were used to estimate average total vessel revenue and average revenue from groundfish trips and non-groundfish trips. We summed the values for all trips taken during FY2009 and FY2010 into categories of groundfish and non-groundfish revenue for each vessel. Average total revenue increased for all vessel categories from FY2009 to FY2010 except for gillnet vessels greater than 40 feet (Table A2 in the Appendix). The pattern of revenue between groundfish and non-groundfish trips shifted toward non-groundfish trips reflecting the pattern of effort. The average percentage of non-groundfish revenue in total revenue increased for all vessel categories.

2.4 Trip Costs

In addition to collecting data on catch and taking biological samples, observers collect data on trip costs (ice, fuel, oil, water, food, bait, and miscellaneous supplies) from the vessel's captain during the observed trip[5]. Observers collect information on total dollars spent on the trip for oil, water, food, bait and miscellaneous supplies including hooks, twine, knives, gloves, cleaning supplies, etc.

We selected data from observed groundfish trips that used sink gillnet, bottom longline, or otter trawl from calendar years 2008 to 2011 for day trips and multi-day trips for each vessel category were used to estimate trip costs. Data from these years were pooled in order to obtain sufficient sample size to estimate trips costs for all combinations of single day and multiple day trips for all vessel categories. Trip cost data collected during 2008, 2010, and 2011 were converted to 2009 dollars using the CPI to estimate 2009 trip costs. In a similar manner, 2008, 2009, and 2011 cost data were converted to 2010 dollars.

For ice (tons) and fuel (gallons), observers collect information on both the quantities used for the trip and the price paid for each. Trips where either tons of ice or gallons of fuel were not recorded were eliminated from the sample because ice and fuel are used for every fishing trip. Average monthly fuel price and monthly price of ice were substituted for missing prices in the data. Categories of trip costs were summed for each trip by vessel category. See Tables A3-A5 for sample descriptive statistics of trip costs by vessel category.

In order to compute the average for trip costs, average trip costs for day trips and for multi day trips were calculated separately. We computed average trip costs for day trips and average cost per day for multi-day trips for in 2009 and 2010 dollars. To estimate total trip costs these averages were multiplied by the sum of day trips and the sum of days absent for multi-day trips for each vessel.

Average trip costs for groundfish trips by gear/size category and trip type were applied to all trips, groundfish or non-groundfish, and for all gears that may have actually been used on any given trip. This simplifying assumption was adopted for two reasons. First, the break-even

[5] Trip cost data included data collected by the Northeast Fisheries Observer Program as well as data collected through the At-Sea Monitoring Program during 2010 and 2011.

analysis was conducted based on fishing year totals (revenue, trips, etc) and not on a trip-level basis. We readily acknowledge that a trip level analysis for trip cost would likely be more accurate, but would also have substantially increased the data and time required to conduct the analysis. Second, the overhead cost data (described in Section 2.6 below) were estimated for vessels that used either trawl, gillnet or longline gears. In order to match fixed cost by vessel with trip costs it was expedient to hold average trip cost constant across all trips.

2.5 Lay System

Fishermen are paid according to lay systems that vary between port and among vessels within a port. Two of the most common remuneration systems are a 60/40 split where 60% of gross revenue goes to the captain and crew and 40% goes to the vessel owner, and a 50/50 split between the owner and the captain and crew of net revenue after trip costs have been deducted. In the 60/40 lay system, trip costs are paid from the captain and crew share. Based on interviews with vessel owners and sector managers we found that the 50/50 split was the predominate lay system where trip costs are explicitly included. Under this system, trip costs including fuel, ice, food, etc., are deducted as well as any costs that are based on a per pound or per trip basis. These costs include marketing costs, auction costs, sector fees, and leasing costs.

2.6 Overhead Costs

In 2007, 2008, and 2009, the Northeast Fisheries Science Center (NEFSC) mailed questionnaires to vessel owners with federal permits covered by New England FMPs in order to collect overhead (fixed) costs. The questionnaire was framed to collect annual overhead costs for the previous year. For example, the survey mailed during 2007 asked for overhead costs incurred during 2006. Due to low and declining response rates the survey was discontinued after 2009. The return rate for surveys for all vessels fell from 21% in 2007 to 8% in 2009 (NEFSC, personal communication).

A total of 1,300 survey responses were returned by vessel owners from all fisheries: 635 during 2007, 430 during 2008, and 235 during 2009. We selected observations from the vessels that were included in the break-even analysis to assure that the data used to estimate average overhead costs would come from vessels that were included in the analysis and adjusted values to 2009 and 2010 based on the CPI. This procedure narrowed the available data to 267 observations. Since the survey was implemented for three years there was more than one observation for some vessels, because they may have returned the survey in more than one year. We averaged multiple observations from the same vessel into a single observation leaving a final sample size of 193 vessel observations.

The fixed cost survey collected data on a number of cost categories, some that the majority of vessel owners may be expected to incur every year (travel, permit fees, communication, etc.) while other costs, such as major overhauls, engine replacements and other improvements, may not be incurred in every year.

Safety costs were not listed on the fixed-cost survey, but some vessel owners specifically listed safety costs as either an improvement or investment or in the “other expense” category. Unlike some repair and maintenance expenses that may be discretionary or perhaps deferred, vessel owners are required to maintain safety equipment according to the applicable schedule.

Averaging safety costs listed in the other expense category resulted in a zero statistical mean for some vessel categories and very low numbers for others, far lower than would cover legally mandated safety requirements. We averaged safety cost responses from the fixed cost survey over the vessels that specifically listed safety costs, which resulted in $1,233 for all vessels.

Placing the cost in the correct category was another problem with these data. From interviews, we concluded that some owners considered repairs as maintenance and others considered maintenance as repairs. In order to mitigate these problems, we combined all categories of overhead costs from the same observation into a single observation for overhead cost without excluding any observation with zero cost in any of the categories of overhead costs. See Table A8 in the Appendix for descriptive statistics of overhead costs by vessel category.

Data for overhead costs present the most problems because samples are small relative to the populations, standard deviations are large, especially in individual categories of overhead costs, observations are not normally distributed, often have large outliers, and observations cover only 2006 – 2008. The overhead cost data exhibits large variance as well as a tendency to be skewed for most vessel categories (more observations below the mean than above the mean). Additionally, we could not come up with any reliable way to match up vessels that were likely to have high overhead costs with vessels that have comparatively low overhead costs. For these reasons, we used a Monte Carlo simulation on the overhead sample for each vessel category to assign overhead costs. Monte Carlo simulation chooses observations randomly and converts the choices into a frequency distribution for each vessel in the vessel category. We ran the Monte Carlo simulation 1,000 times to determine the distribution of results.

2.7 Marketing Costs

Interviews with vessel owners and survey responses indicated that marketing costs (trucking and auction fees) may be significant for break-even analysis, but neither auction nor trucking fees were included in the trip or overhead costs collected by observers or by any other NMFS survey. The information from vessel owners and surveys indicated that trucking fees in FY 2010 were $0.08 - $0.12 per pound for landed species that were trucked to other ports for sale or processing, which we averaged to $0.10 per pound. Previous studies of New England processors showed that almost all processing of groundfish takes place in Boston and New Bedford (Georgianna et al, 2006).

To estimate the proportion that would be subject to a trucking fee we calculated the percentage of total regional landings outside of these ports by vessel category and by fishing years 2009 and 2010 (See Appendix A, Table A6). These proportions were held constant for all vessels to simplify the analysis. Trucking fees for each vessel was calculated as the average trucking fee for that vessel category (total annual landings times the average trucking fees ($0.10) times the proportion of landings subject to trucking all divided by the number of vessels in the vessel category).

Auctions also charge fees; the average derived from survey and interview responses was $0.03 per pound. Annual total auction fees were estimated by first calculating the proportion of total regional landings that were landed at the display auctions in Portland, Gloucester, Boston, or New Bedford (See Appendix A, Table A6). Separate estimates were calculated by vessel

category and fishing year. As was the case for trucking fees these proportions were held constant for all vessels in each category to simplify the analysis. Auctions fees were calculated as the product of total landings of all species, the auction fee, and the proportion landed at auction. Interviews also reported that some dealers charge fees, but we were unable to estimate these fees because we could not reliably determine which dealers charge fees.

2.8 Sector Costs

Fees paid by vessel owners to sectors are private contracts, which vary by sector. However, the majority of vessel owners are members of one of the Northeast Sector Service Network's (NESSN) sectors and have similar fee structures. From interviews, the NESSN sectors required a onetime $10,000 membership fee to help recoup start-up costs. Vessel owners had the ability to pay this membership fee in increments of $2,500 per year (over a four year period). In addition to the membership fee, most sectors charged a fee per pound of landed groundfish during FY2010. These fees were used to cover the cost of operating the individual sector and the services provided by NESSN. This fee was variable, based on the volume of groundfish landings within each sector. Based on the interviews with NESSN sector members, the fee in FY2010 ranged from $0.04 - $0.10 per pound. Vessels in sectors with lower groundfish landings are required to pay more per pound as the costs for managing sectors were relatively similar across sectors.

In order to capture the variable effect of sector fees on different individuals and sectors a simplifying assumption was made. Specifically, an average fee of $0.04 was applied to landed pounds of groundfish for each vessel in a sector. In this manner, the sector costs differed for each vessel depending on the total landed pounds of allocated groundfish even though the average per pound fee was held constant. The sector membership fee was treated as an additional overhead cost. The fee was assumed to be paid out over four years and was set at $2,500 for all vessels.

Note that the sector fee on a per pound basis does not necessarily have the same proportional effect on all vessels. This is illustrated by applying the per pound fee to average groundfish landings and then dividing groundfish revenue by the resulting product to calculate the sector fees as a share of groundfish revenue (Table 2.6.1). This shows that the per-pound fee has different impacts on vessels depending on the composition of groundfish revenues. That is, the sector fee is lower as a share of groundfish revenue for vessels that, on average, land higher valued species and vice versa for vessels that land lower value groundfish species.

2.9 Leasing Costs and Revenues

Sectors were only required to report trades between sectors; transactions that occurred within a sector were not reported. The reported price of quota varied greatly; some transactions involved a transfer of money, others were swaps of species, or barters for trade services. In addition, some species, for which an excess of quota were available, were often exchanged at no cost. Due to the complexity of the leasing market and lack of data the cost and revenue associated with the exchange of quota has not been included in the break-even analysis. However, the cost and revenue from leasing may be substantial for many vessels. Lease prices for some stocks exceeded the price vessels would get at auction, because the benefit of acquiring quota in a stock in the portfolio of stocks necessary to fish could increase the catch of other species. See The Effects of Leasing in the Discussion for more information.

2.10 Ground-Truthing

We were concerned about the quality of the fixed cost data due to low return rates during the most recent years the survey was conducted, and because there was no information from FY2009 or FY2010. Preliminary work done by the NEFSC suggests that the fixed cost data collected is not always representative of the fleet segments, particularly for the larger vessels. Statistical tests showed the returned surveys were not representative of the population in terms of vessel length for some vessel categories. Note we partially address this issue by selecting data collected from vessels consistent with the size classes used in the break-even analysis. Nevertheless, the larger vessels are underrepresented in the NEFSC data.

Due to these concerns, a ground-truthing exercise was conducted. The fixed cost data provided by NMFS was utilized as a starting point for the ground-truthing. Data on fuel consumption was also provided to vessel owners for feedback. Each vessel owner interviewed was provided a sheet with the average fixed costs by category, such as insurance, maintenance and safety equipment (see Appendix B). The averages provided were intended to be representative of a range of vessel sizes for each gear type (the interviewed owners were shown the information that should be representative of their vessel). The vessel categories used throughout this analysis were followed.

In addition to interviews summary data was compiled from a parallel study conducted with the South Shore (MA) groundfishermen, specifically Sector 10. Twenty-six surveys were collected from this sector. Each survey included a section on fixed costs; the information provided in this section was used in the ground-truthing exercise. Individual survey responses and interview records will not be presented in this document to maintain confidentiality. However, the range of cost estimates collected in the interviews is provided in Appendix B. When only one estimate or no information was collected we noted N/A. Zero indicates that some vessels do not incur the cost.

During interviews most participants cited that the costs appeared to be underestimated for 'Improvements and Investments', 'Vessel Insurance', and 'Repair and Maintenance' categories. This was particularly true for the large otter trawl vessels (>75ft)[6]. In the final report the NEFSC data have been utilized, but adjusted to reflect 2009 and 2010 prices, this has improved the correspondence between the ground-truthing responses and NEFSC data. Now the overhead costs utilized in the analysis fall within the range of values provided in the interviews.

There is a significant amount of variability in some of the overhead cost categories for both the ground-truthing results and the information collected by NOAA. There are a variety of ways to explain this variability, and it is likely a combination of all sources of variation. The first source of variability is that the questions and categories are not clear. We encountered this problem in the ground-truthing exercise particularly between improvements, investments, and repair and between maintenance and haul out. The second source of annual variation is that vessel owners

[6] The vessel sizes for the ground-truthing do not correspond to the vessel categories used in the report, because at the time it was done we did not anticipate using another size definition and it is not possible to reconstitute the sample in the way that can be done with the other data sets used in the BE analysis.

may choose to defer some of these costs due to their financial constraints, e.g. low revenues or inaccessible credit. The third source may be that some costs only apply to certain vessels, e.g. not all vessel owners belong to associations; not all vessel owners incur non-crew labor services etc. Other categories such as communication, permit fees, and safety (not included as a specific item in NEFSC survey) have much less variability probably because they are necessary expenses (due to regulations, or practicality).

In addition to the overhead costs discussed above, vessel owners interviewed were asked to list any additional overhead costs they incurred that were not included on the list. Prior to conducting the interviews we added safety equipment as a line item as previous feedback suggested that this was a significant cost that should be included. In addition to safety equipment interviews revealed that shore-side power, and crew benefits as two line items that should be included in the future. From these interviews it seems that future surveys may benefit from the addition of a section on shore side costs (similar to trip costs) as many vessels now pay for maintenance on the vessel when it is not fishing, and VMS requirements make it necessary to keep power on the boat at all times. The amount paid for these costs was not obtained from these interviews, but it is clear that this component is critical to understanding the costs of owning and operating a fishing vessel. It should be noted that some of these costs may already be imbedded in the analysis in line items such as mooring and dockage fees, or in the 'other' category.

III. Results

Table 3.1 reports the numbers and percentages of all vessels included in the break-even analysis in each vessel category that at least broke even with and without sector costs in FY2009 and FY2010 using the mean of the values from the Monte Carlo simulation. For Numbers of Vessels, the values shown in parentheses denote the upper (+) and lower (-) bound estimate of number of vessels based on a 90% confidence interval constructed as the average difference between the mean and the number of vessels above break-even at the 10^{th} and 90^{th} percentiles of the simulation distribution. Constructed in this manner, the confidence interval is a measure of uncertainty around the mean estimate. Percentages of vessels above break-even were evaluated at the mean. For these percentages the numbers in parentheses denote that upper and lower bound on the percentage of vessels above break-even evaluated at the 10^{th} and 90^{th} percentiles.

The mean values show higher percentages of vessels in most vessel categories breaking even in 2010 than in 2009. On a fleet-wide basis 49% (227 of 468) of vessels were above break-even during 2009 as compared to 55% (196 of 357) of vessels above break-even during 2010 after accounting for sector costs. Among the different vessel categories mean percentages of vessels above break-even were lower during 2010 as compared to 2009 for larger gillnet vessels (≥ 40 feet) and for otter trawl vessels less than 50 feet. In other vessel categories the percentage of vessels above break-even after accounting for sector costs was higher during 2010 as compared to 2009. However, all of these should be interpreted with caution, because the uncertainty in any of these results is quite high. For example, in 2009, 51% (44 vessels) of the 85 trawl vessels less than 50 feet, were above break-even, yet it could have been as low as11% or as high as 80% based on a 90% confidence interval. In 2010, once sector costs are taken into account 50% (29 vessels) of the 58 small trawl vessels were above break–even, but it could have been as low as 12% or as high as 84%. For gillnet vessels < 40' the number of vessels that at least broke even

ranges from 18 vessels to 46 vessels in 2009 with corresponding percentages ranging from 37% to 86%. For 2010 including sector costs, the number of gillnet vessels < 40 ranged from 12 vessels to 38 vessels, with corresponding percentages ranging from 31% to 90%.

At a fleet-wide level this level of uncertainty means that while the average percentage of all vessels above break-even during 2009 was 49%, the percentage could have been as low as 35% or as high as 62%. Similarly, the fleet-wide average above break-even could have been as low as 39% or as high as 69%. Since the upper and lower bound estimates for 2009 and 2010 including sector costs for the fleet-wide average as well as all other vessel categories overlap one another, it is difficult to distinguish differences in performance between the two fishing years with or without sector costs. This level of uncertainty is primarily due to the inability to reliably match vessel categories with overhead costs caused by the high variability and the low number of observations from the fixed cost survey.

Table 3.1. Simulation Mean Number of Vessels Above Break-Even By Vessel Category and Fishing Year (Number in Parentheses Denotes 90% Confidence Interval

	Fishing Year 2009			Fishing Year 2010				
Vessel Category	Total Vessels	Number of Vessels Above Break-Even	Percent Vessels Above Break-Even	Total Vessels	Number of Vessels Above Break-Even Excluding Sector Costs	Percent Vessels Above Break-Even Excluding Sector Costs	Number of Vessels Above Break-Even Including Sector Costs	Percent Vessels Above Break-Even Including Sector Costs
Gillnet < 40 feet	58	32 (±14)	55% (37-86%)	42	26 (±12)	62% (36-90%)	25 (±13)	59% (31-90%)
Gillnet >= 40 feet	83	49 (±35)	59% (11-95%)	66	39 (±26)	59% (12-90%)	37 (±25)	56% (12-86%)
Longline < 40 feet	10	4 (±2)	36% (10-50%)	8	4 (±2)	48% (25-75%)	4 (±2)	43% (25-75%)
Longline >= 40 feet	11	6 (±4)	55% (27-91%)	9	6 (±3)	62% (33-89%)	6 (±3)	61% (22-89%)
Trawl < 50 feet	85	44 (±29)	51% (11-80%)	58	30 (±22)	52% (12-88%)	29 (±21)	50% (12-84%)
Trawl >= 50 and <= 65 feet	80	37 (±30)	46% (9-85%)	63	35 (±24)	55% (16-92%)	34 (±24)	54% (14-90%)
Trawl > 65 feet	141	55 (±38)	40% (13-67%)	111	65 (±35)	59% (21-84%)	63 (±35)	56% (21-84%)
Totals	468	227 (±62)	49% (35-62%)	357	204 (±55)	57% (41-72%)	196 (±54)	55% (39-69%)

In terms of numbers of total vessels on average, more vessels were above break-even during FY2009 (227) as compared to FY2010 (196) including sector costs. It may also be said that fewer vessels were below break-even during 2010 (153) than was the case during 2009 (241). This is, of course, an artifact of having different numbers of vessels in each year of the break-even analysis. Percentages tend to remove the effect of different baselines and may provide a more consistent indicator of change in break-even. The number of vessels above break-even during 2009 tended to be larger than in 2010 for nearly all vessel categories except for longline vessels and trawl vessels greater than 65 feet. For longline vessels the mean number of vessels above break-even was the same in both 2009 and 2010 while the mean number of large trawl vessels above break-even increased from 55 vessels during 2009 to 63 vessels in 2010 including sector costs. However, as was the case for comparisons among vessel categories, the uncertainty in our estimates is large and the upper and lower bound estimates for vessel totals overlap. For example, the number of large trawl vessels (above 65 feet) above break-even during 2009 may have been as many as 93 or as low as 17 vessels. The uncertainty in the number of large trawl vessels breaking even ranges from 28 to 98 vessels.

At least part of the difference between 2009 and 2010 is due to the differences in numbers of vessels that met our criterion, but is also due to reduced numbers of vessels participating in the groundfish fishery. Specifically, of the vessels included in our study data, 111 fewer vessels fished for groundfish in FY2010 than in FY2009. A total of 331 vessels fished for groundfish in both years. Twenty-eight vessels fished for groundfish in FY2010, but not in FY2009, and 137 vessels fished for groundfish in FY2009 but not in FY2010. Of these 137 vessels, 80 fished during FY2010, but did not land any groundfish while 57 of the vessels that did fish during 2009 did not fish at all during FY2010.

The 111 vessels that left the groundfish fishery in 2010 were included in the break-even analysis for 2009, but were not included in the 2010 analysis because these vessels targeted a wide assortment of other fisheries, which would have made sample size for observer data on trip costs and overhead costs from these vessels too small when spread out across different fisheries. These data and break-even analysis also does not indicate the cause for these vessels leaving the groundfishery in 2010 nor do we know the reasons why the 57 vessels that did fish for groundfish during 2009 did not fish at all during 2010.

Table 3.2 reports the numbers and percentages of all the study vessels in sectors and in the common pool that caught groundfish that at least broke even with and without sector costs in FY2009 and FY2010 using the mean of the values from the Monte Carlo simulation. Note that the 90% confidence intervals are also high relative to the mean for both common pool vessels and sector vessels.

Table 3.2 Simulation Mean Number of Vessels Above Break-Even for Common Pool and Sector Members for Fishing Years 2009 and 2010 (Number in Parentheses Denotes 90% Confidence Interval

	Fishing 2009			Fishing Year 2010				
	Total Vessels	Number of Vessels Above Break-Even	Percent Vessels Above Break-Even	Total Vessels	Number of Vessels Above Break-Even Excluding Sector Costs	Percent Vessels Above Break-Even Excluding Sector Costs	Number of Vessels Above Break-Even Including Sector Costs	Percent Vessels Above Break-Even Including Sector Costs
Common Pool	94	34 (±13)	36% (22-50%)	68	30 (±11)	45% (29-60%)	N/A	N/A
Sector Members	374	194 (±51)	52% (38-66%)	289	174 (±45)	60% (44-75%)	167 (±46)	58% (42-73%)

IV. Discussion

4.1 Break-even Analysis

While Table 3.2 suggests that a greater percentage of both common pool vessels and sector vessels broke even in FY2010 relative to FY2009, the uncertainty in the break-even results make definitive conclusions regarding financial performance difficult to support with or without including sector costs. Available data on overhead costs in particular hamper our ability to reliably ascertain the financial condition of the vessels included in the break-even analysis. Nevertheless, even though we cannot be certain of the reasons, it is clear that fewer vessels participated in the groundfish fishery during FY2010 than did so during 2009. It is also clear that under any circumstances the results show large numbers and percentages of vessels not breaking even in either FY2009 or FY2010. This raises the question of how vessel owners could keep their vessels fishing over two years and perhaps more without covering their costs, especially when credit is often difficult for vessel owners to obtain. There are several possible answers to this question.

It may take more than a year or two for vessels to leave the fishery. Vessel owners may draw on personal resources to cover costs, for example. If some overhead costs have to be paid if the vessel fishes or not, e.g. a mortgage on the vessel, then vessel owners will continue to fish their vessels if revenues cover trip costs and those overhead costs that are required for fishing. Other possibilities may be that large overhead costs, such as vessel maintenance may be delayed or vessel owners may reduce crew share or shift costs to crew share. Vessel owners who skipper their vessels could reduce the share that they receive or apply their crew share to vessel costs. Some owners may own multiple vessels or own other vessels engaged in other more profitable fisheries and use these profits to subsidize less profitable vessels. These and any number of other strategies may explain how vessels that may otherwise be expected, given limited available data or a purely economic calculus, to go out of business.

We also made several assumptions about trip costs that would affect break-even. We assumed that trip costs per day for non-groundfish trips were the same as trip costs per day for groundfish trips. For vessels that use the same gear for all trips this assumption is reasonable. For vessels that use different gears for non-groundfish trips, costs would be overestimated for gears that may be less costly and underestimated for gears that are more costly. We held trip costs constant across trip types because we chose to aggregate data for the entire fishing year rather than do a trip-level analysis that would have required developing estimates of trip costs for multiple gear types.

Break-even analysis and any other financial analysis require accurate cost data; the low scores for accuracy from these results show clearly the importance of accurate data. The financial condition of the multi-species fishery cannot be estimated with even modest accuracy without more complete data collection. If reliable annual estimates of the financial condition of the groundfish fishery are of interest to the NEFMC or other interested management bodies then greater attention will need to be paid to cost data collection, and overhead costs in particular. There are efforts underway to collect more accurate cost data. The NEFSC is reviewing methods to collect overhead data, and also investigating more refined statistical methods to estimate trip costs. These models would provide a more accurate estimate of trip costs that would account for differences across vessels. Sector reports that we used for the following section on leasing also offer promising methods to collect cost data.

4.2 Effects of Leasing Costs

With the transition to ACLs and accompanying formation of 17 sectors under Amendment 16, leasing of ACE within and between sectors was allowed to enable sectors and their members to reconcile initial allocations with desired fishing strategies by buying and selling ACE. Leasing between sectors was regulated and recorded. Leasing within sectors was neither regulated nor recorded in order to give vessel owners within sectors flexibility in their business plans.

While there are gains from trade for both parties, the value of the leasing transaction is neutral in terms of accounting; sellers receive the same amount as buyers pay, excluding transaction costs. However, buying ACE has implications for the financial position of any given fishing business depending on a number of factors including initial ACE allocations, lease prices, planned fishing, and access to capital. To provide a reliable estimate of these effects on break-even position for FY2010 we would need to know both in-flows and out-flows of leased ACE by vessel, whether these trades were monetary or swaps of one species for another, the price paid and received, and whether leased-in ACE costs were treated as trip costs and, therefore, partially paid by crew. Data at this level of detail are simply not available at this time. For this reason, we cannot provide a formal analysis of leasing impacts on break-even. Nevertheless, we do have sufficient data to estimate the in-flow of ACE that would have been required for the vessels included in the break-even analysis. This estimate was obtained for each vessel by summing catches during FY2010 and subtracting the initial ACE by stock for each vessel. A positive value means that FY2010 catch was greater than the vessels initial ACE. Some vessel owners may have access to ACE through ownership of multiple vessels or multiple companies either in their own right or in affiliation with other owners. Ignoring the ability to access ACE through intra-company transfers may overestimate leasing requirements. For this reason the trading requirement was determined

by summing the combined ACE for all vessels (whether they fished or not) that were part of a common ownership group where ownership groups were determined by matching affiliated businesses with affiliated people (business owners) in the NERO permit application data.

During 2010, the 357 vessels included in the FY2010 break-even data caught (landings plus discards) a combined 13.5 million pounds over their initial allocations of ACE (See Appendix A, Table A9). The 13.5 million pounds represented 23% of total catch by our sample vessels would have had to been acquired either through monetary or in-kind trade. Gulf of Maine cod represented the largest need for all gillnetters, small longline, and for small otter trawl vessels. Georges Bank cod represented 84% of the ACE need for larger longline vessels. For mid-size and large otter trawl vessels the stocks with the largest trading needs were GB cod, GOM cod, GB winter flounder, white hake, and pollock.

Since not all vessels had an estimated overage during FY2010 for any given stock, or for any stock the average need was calculated as the total need divided by the number of vessels included in each category (See Appendix A, bottom half of Table A9). The average need to cover the gap between FY2010 ACE and catches ranged from 1,456 pounds of all stocks combined for longline vessels 40 feet and above to 207,586 pounds for large otter trawl vessels. The vehicle through which these needs may have been met is uncertain, as is the cost that may have been incurred.

Sectors submitted their phase 2 reports on September 2, 2011. The data contained in these reports offers some insight as to how vessels secured needed quota but less revealing about the price paid for quota. That is, the sector reports contain information on the type of compensation received (monetary, swapping fish for fish, gift without compensation, for example) for both inter- and intra-sector trades. These designations suggest that about 64% of all pounds in intra-sector transactions involved a monetary transaction whereas 81% of all pounds in inter-sector transactions were for monetary compensation (see Appendix A, Table A10). These data indicate that the majority of any ACE overage would most likely have involved a monetary transaction. Although, the sector reports do include some data on the value of some transactions there are a large number of transactions for which no lease price was reported or the transaction involved a block of stocks. In these cases the value of the entire trade may be reported which makes it difficult to ascertain how much any given stock may have been worth.

4.3 Effects of Subsidized Costs

The break-even analysis for FY2010 did not include costs of managing sectors not paid by vessel owners or crew. Some costs associated with the start-up and operation of sectors were subsidized by NOAA for FY2010. Each sector was given $18,824 for costs incurred from October 1, 2009 through December 31, 2010. This could be used for expenses such as manager salaries, office supplies, computers, printers, furniture, workers compensation, internet and phone services, and FishTrax maintenance. In addition, each sector received a grant for $46,305 for costs incurred from May 1, 2010 through June 30, 2011. This grant could also be used for the sector's operation costs. At-sea-monitoring was paid for by NMFS and dockside monitoring was also reimbursable up to $75,204. It is likely, in the near future, that these costs will be the responsibility of sectors, and their member vessels.

Interviews with sector managers indicated that the annual overhead costs to run one sector are expected to be $80,000 to $100,000. This amount covers items such as the sector manager's salary, insurance, workers compensation, office lease, internet, telephone, dockside monitoring, and other miscellaneous costs.

The cost of sector membership per vessel will vary depending on the composition of their sector, specifically how many vessels is the cost distributed among, and how much groundfish they catch. Currently the unsubsidized sector costs are paid as a per pound fee, members in sectors that have more boats and higher landings will pay less per pound and in total, less per year.

In addition to sector costs, vessels may be expected after FY2011 to pay for at-sea monitoring (ASM), which is a significant cost. The effect on specific individuals and sectors will likely vary. The potential cost of at-sea monitoring depends on the number of trips and trip duration. In FY2010 the target coverage rate for ASM was 30%. The combined ASM and Northeast Fisheries Observed Program (NEFOP) coverage rate was 38% (combined common pool and sector vessels). The realized rate for 2010 was 35% of trips and 35.9% of sea days. The coverage rate for trips varied by sector, ranging from 19.7% for the common pool to 45.2% for the Northeast Fishery Sector XII (NMFS, 2011). Approximately 76% of the overall coverage was provided by ASM which translates to an estimated 26.6% coverage rate for ASM alone. The target ASM coverage rate for FY2011 was the same as that for 2010, but the coverage rate over and above the 8% coverage planned by the NEFOP for 2012 (the year in which ASM costs would no longer be subsidized) was recently set at 17%.

In order to gauge the potential effect of observer costs on the fishery we estimated the average annual cost, which would have been paid by the vessels included in the break-even study in 2010, for ASM observers, if they had not been subsidized. The estimated cost for the at-sea monitors was based on the actual number of trips and trip duration by each of the vessels included in the break-even study that were covered by an ASM observer. It is probable that the number and duration of sector trips would have been different had the cost of at-sea monitors not been subsidized. Factoring these costs into trip planning may be anticipated to alter the expected net return from a sector groundfish trip as compared to a non-groundfish trip and may affect trip duration particularly as the cost of an ASM observer was based on a calendar day or any portion of a day. This means that using 2010 data as a measure of ASM costs may not be a predictor of what ASM costs may be once these costs become internalized to fishing trip economics.

Total sea days where an ASM observer may have been assigned to a trip was estimated by summing the number of groundfish day trips and the product of average trip duration rounded up to the nearest whole day for multi-day groundfish trips and the number of groundfish multi-day trips (see Appendix A, Table A11). This resulted in an estimate of 21,929 sea days taken by the vessels in the break-even analysis on 7,492 day trips and a total of 2,880 multi-day trips.

Given the estimated ASM coverage rate of 26.6% the estimated ASM costs during FY2010 was calculated as the product of the ASM coverage rate, the average cost per sea day ($630), and the total sea days. This calculation resulted in an estimate of $3.67 million which represents 4% of total groundfish revenue, 4% of total groundfish trip revenue, and 2% of total fishing revenue from all species including groundfish and non-groundfish trips (see Table 4.3.1). The impact of

having to pay for ASM may not have equal impacts on all segments of the groundfish fleet. Based on FY2010 activity, the ASM costs would have a greater impact on gillnet gear and small otter trawl vessels ranging from 7 to 10 percent of groundfish revenue. As a percentage of total fishing revenue, vessels in either small or large gillnet category would still be the most affected (5% of total revenue) since these vessels exhibit a high percentage of groundfish trip revenue of total revenue. This was not necessarily the case for small trawlers as the ASM costs were estimated to be 3% of gross revenue; as compared to 2% for both medium and large trawl vessels.

Table 4.3.1. Estimated ASM Costs as a Percent of Revenues for Vessels Included in the Break-Even Analysis

Vessel Category	Estimated ASM Cost	ASM Cost as % of Groundfish Revenue	ASM Cost as % of Groundfish Trip Revenue	ASM Cost as % of Total Revenue
Gillnet < 40 Feet	$356,443	10%	8%	5%
Gillnet >= 40 Feet	$723,778	8%	6%	5%
Longline < 40 feet	$39,381	5%	5%	3%
Longline >= 40 Feet	$39,549	5%	5%	2%
Trawl < 50 Feet	$259,749	7%	6%	3%
Trawl >= 50 and <= 65 Feet	$439,730	4%	3%	2%
Trawl > 65 Feet	$1,816,232	3%	3%	2%
Totals	$3,674,862	4%	4%	2%

Compared to the estimated costs for FY2010, the required 17% coverage rate for ASM would result in lower overall monitoring costs. At FY2010 activity levels for the vessels included in the break-even analysis the 17% coverage rate would have cost $2.35 million. This level would represent approximately 3% of FY2010 groundfish revenue and 1.4% of total fishing revenue.

Appendix A. Tables and Figures

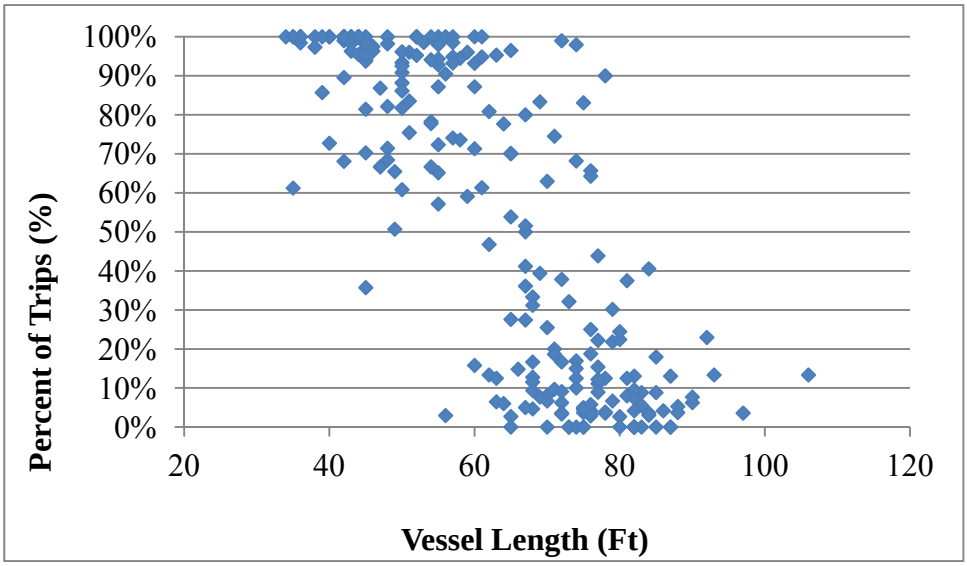

Figure A1. Percent of groundfish trips (on otter trawl vessels) that are day trips plotted as a function of vessel length. Day trips are categorized as those trips that last less than 24 hours.

Table A1. Average Effort for Vessels Included in the Break-Even Analysis by Vessel Category and Fishing Year

Vessel Category	Average Total Trips	Average Total Days Absent	Average Total Groundfish Trips	Average Total Days Absent on Groundfish Trips	Average Total Non-Groundfish Trips	Average Total Days Absent on Non-Groundfish Trips
			Fishing Year 2009			
Gillnet < 40 ft	112.4	53.5	86.1	38.9	26.3	14.6
Gillnet >= 40 ft	111.0	66.9	81.9	48.7	29.1	18.2
Longline < 40 ft	64.5	40.4	40.5	27.2	24.0	13.2
Longline >= 40 ft	68.6	51.3	24.5	25.8	44.2	25.4
Trawl < 50 ft	97.4	52.8	54.0	31.0	43.4	21.8
Trawl >= 50 and <= 65 ft	94.6	84.6	36.2	39.8	58.3	44.8
Trawl > 65 ft	42.3	134.8	20.2	85.7	22.1	49.1
			Fishing Year 2010			
Gillnet < 40 ft	82.0	40.2	48.8	22.9	33.2	17.4
Gillnet >= 40 ft	80.8	54.2	50.8	35.2	30.0	19.0
Longline < 40 ft	102.8	50.8	23.6	18.4	79.1	32.4
Longline >= 40 ft	94.4	52.8	16.7	20.2	77.8	32.6
Trawl < 50 ft	72.4	41.0	20.8	15.0	51.6	25.9
Trawl >= 50 and <= 65 ft	87.7	79.8	21.3	31.4	66.3	48.4
Trawl > 65 ft	40.8	146.8	18.7	91.4	22.1	55.4

Table A2. Average Revenue for Vessels Included in the Break-Even Analysis by Vessel Category and Fishing Year

Vessel Category	Total Revenue	Total Groundfish Trip Revenue	% Groundfish Trip revenue of Total Revenue	Total Groundfish Revenue on Groundfish Trips	% Groundfish Revenue on Groundfish Trips	Total Non-Groundfish Revenue on Groundfish Trips	Total Non-Groundfish Revenue on Non-Groundfish Trips
				Fishing Year 2009			
Gillnet < 40 Ft	$166,148	$129,715	78%	$108,128	83%	$21,587	$36,433
Gillnet >= 40 Ft	$248,829	$187,418	75%	$150,044	80%	$37,374	$61,411
Longline < 40 Ft	$126,702	$106,339	84%	$102,119	96%	$4,220	$20,363
Longline >= 40 Ft	$185,796	$111,726	60%	$105,471	94%	$6,255	$74,070
Trawl < 50 Ft	$160,306	$100,207	63%	$87,797	88%	$12,410	$60,099
Trawl >= 50 and <= 65 Ft	$320,914	$165,991	52%	$128,731	78%	$37,260	$154,923
Trawl > 65 Ft	$651,917	$438,525	67%	$319,589	73%	$118,936	$213,401
				Fishing Year 2010			
Gillnet < 40 Ft	$171,628	$107,362	63%	$87,176	81%	$20,186	$64,266
Gillnet >= 40 Ft	$243,556	$174,279	72%	$141,216	81%	$33,063	$69,278
Longline < 40 Ft	$183,894	$105,039	57%	$102,768	98%	$2,272	$78,854
Longline >= 40 Ft	$231,898	$97,051	42%	$95,250	98%	$1,800	$134,847
Trawl < 50 Ft	$160,876	$77,329	48%	$68,693	89%	$8,635	$83,548
Trawl >= 50 and <= 65 Ft	$414,567	$199,838	48%	$159,090	80%	$40,748	$214,729
Trawl > 65 Ft	$903,211	$584,720	65%	$481,741	82%	$102,979	$318,491

Table A3. Average Total Cost for Fuel, Ice, Water, Oil, Supplies, and Bait on Day Trips

Vessel Category	Sample Size	Mean	Standard Deviation	25th percentile	Median	75th Percentile	Coefficient of Variation
2009							
Gillnet < 40	696	137.4	100.2	81.2	115.8	166.9	0.73
Gillnet >= 40	1088	190.3	306.6	130.6	167.0	215.6	1.61
Longline < 40	93	475.2	450.1	152.7	287.6	512.4	0.95
Longline >= 40	25	510.9	564.2	189.6	239.9	609.5	1.10
Trawl < 50	448	253.8	139.5	156.1	226.1	326.5	0.55
Trawl >= 50 and <= 65	367	317.8	163.3	221.6	283.5	373.7	0.51
Trawl > 65	84	366.9	216.3	202.6	306.9	469.3	0.59
2010							
Gillnet < 40	696	140.0	102.1	82.7	118.0	170.0	0.73
Gillnet >= 40	1088	193.9	312.4	133.0	170.1	219.6	1.61
Longline < 40	93	484.1	458.5	155.6	293.0	522.0	0.95
Longline >= 40	25	520.5	574.8	193.2	244.4	620.9	1.10
Trawl < 50	448	258.6	142.1	159.0	230.3	332.6	0.55
Trawl >= 50 and <= 65	367	323.8	166.3	225.8	288.8	380.7	0.51
Trawl > 65	84	373.8	220.3	206.4	312.7	478.1	0.59

Table A4. Average Cost of Food per Crew on Day Trips

Vessel Category	Sample Size	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Coefficient of Variation
2009							
Gillnet < 40	326	7.4	5.8	2.5	7.3	10.0	0.79
Gillnet >= 40	487	6.7	5.2	2.5	6.6	10.0	0.77
Longline < 40	54	9.2	7.7	4.8	7.9	14.7	0.83
Longline >= 40	19	8.4	6.1	3.3	9.8	14.7	0.72
Trawl < 50	233	7.6	7.4	0.0	7.5	10.0	0.98
Trawl >= 50 and <= 65	206	7.0	8.5	0.0	5.0	10.0	1.22
Trawl > 65	69	6.2	6.7	0.0	5.0	10.0	1.09
2010							
Gillnet < 40	326	7.5	5.9	2.5	7.4	10.2	0.79
Gillnet >= 40	487	6.8	5.3	2.5	6.8	10.2	0.77
Longline < 40	13	2.7	3.5	0.0	1.6	4.9	1.28
Longline >= 40	54	9.4	7.8	4.9	8.1	15.0	0.83
Trawl < 50	19	8.6	6.2	3.4	10.0	15.0	0.72
Trawl >= 50 and <= 65	206	7.1	8.7	0.0	5.1	10.2	1.22
Trawl > 65	69	6.3	6.8	0.0	5.1	10.2	1.09

Table A5. Average Cost per day for Fuel, Ice, Oil, Water, Supplies and Bait on Multi-Day trips							
Vessel Category	Sample Size	Mean	Standard Deviation	25th percentile	Median	75th Percentile	Coefficient of Variation
2009							
Gillnet < 40	27	144.7	98.0	77.2	142.0	172.8	0.68
Gillnet >= 40	124	245.1	81.6	187.4	238.1	298.3	0.33
Longline < 40	63	794.9	415.9	443.0	827.0	1135.0	0.52
Longline >= 40	90	662.0	348.2	423.7	563.9	892.6	0.53
Trawl < 50	123	291.7	234.7	103.5	187.0	427.0	0.80
Trawl >= 50 and <= 65	218	845.9	592.8	452.2	753.1	1185.0	0.70
Trawl > 65	1123	1361.3	574.6	976.7	1287.0	1682.9	0.42
2010							
Gillnet < 40	27	147.4	99.8	78.6	144.7	176.0	0.68
Gillnet >= 40	124	249.7	83.1	190.9	242.6	303.9	0.33
Longline < 40	63	809.9	423.7	451.3	842.5	1156.3	0.52
Longline >= 40	90	674.4	354.7	431.6	574.5	909.3	0.53
Trawl < 50	123	297.1	239.1	105.4	190.5	435.0	0.80
Trawl >= 50 and <= 65	218	861.7	604.0	460.7	767.2	1207.2	0.70
Trawl > 65	1123	1386.9	585.3	995.0	1311.2	1714.5	0.42

Table A6. Total Pounds Sold Through Auctions and Landed in Boston or New Bedford During FY2010 by Vessel Category

Gear/Size Category	Total Landed Pounds	Total Pounds Sold Through Auction	Total Pounds Landed in Boston or New Bedford	Proportion Subject to Auction Fee	Proportion Subject to Trucking Fee
			Fishing Year 2009		
Gillnet < 40 Ft	9,169,136	3,581,408	252,311	39%	97%
Gillnet >= 40 Ft	19,992,156	6,907,113	1,046,294	35%	95%
Longline < 40 Ft	679,346	438,356	34,000	65%	95%
Longline >= 40 Ft	1,384,293	2,385	295,394	0%	79%
Trawl < 50 Ft	9,675,385	2,514,914	184,057	26%	98%
Trawl >= 50 and <= 65 Ft	27,039,224	3,166,692	1,357,168	12%	95%
Trawl > 65 Ft	81,512,381	25,216,756	33,975,501	31%	58%
			Fishing Year 2010		
Gillnet < 40 Ft	6,060,580	1,341,240	261,495	22%	96%
Gillnet >= 40 Ft	14,021,447	4,049,060	936,807	29%	93%
Longline < 40 Ft	852,175	283,476	63,405	33%	93%
Longline >= 40 Ft	977,837	3,965	1,360	0%	100%
Trawl < 50 Ft	7,159,384	1,381,660	169,600	19%	98%
Trawl >= 50 and <= 65 Ft	26,026,031	1,192,113	3,159,269	5%	88%
Trawl > 65 Ft	84,796,909	27,736,068	33,437,907	33%	61%

Table A7. Estimated Sector Fees as a Share of Groundfish Revenue

Vessel Category	Average Total Groundfish Revenue on Groundfish Trips	Average Total Pounds Groundfish Landed	Sector Fees @ $0.04 per Pound	Sector Fees as a % of Groundfish Revenue
Gillnet < 40 Ft	$87,176	46,350	$1,854	2.1%
Gillnet >= 40 Ft	$141,216	95,840	$3,834	2.7%
Longline < 40 Ft	$102,768	51,838	$2,074	2.0%
Longline >= 40 Ft	$95,250	63,163	$2,527	2.7%
Trawl < 50 Ft	$68,693	34,709	$1,388	2.0%
Trawl >= 50 and <= 65 Ft	$159,090	105,676	$4,227	2.7%
Trawl > 65 Ft	$481,741	358,233	$14,329	3.0%

Table A8. Average Overhead Cost

Vessel Category	Sample Size	Mean	Standard Deviation	Median	Coefficient of Variation
				2009	
Gillnet < 40	15	55,174	29,224	49,697	0.53
Gillnet >= 40	37	80,316	45,793	71,762	0.57
Longline < 40	7	45,109	40,218	29,684	0.89
Longline >= 40	4	68,849	17,064	61,935	0.25
Trawl < 50	37	59,838	39,686	54,650	0.66
Trawl >= 50 and <= 65	30	137,722	146,829	85,804	1.07
Trawl > 65	63	220,493	133,320	161,503	0.60
				2010	
Gillnet < 40	15	56,051	29,697	50,512	0.53
Gillnet >= 40	37	81,609	46,518	72,940	0.57
Longline < 40	7	45,845	40,879	30,171	0.89
Longline >= 40	4	69,907	17,202	62,951	0.25
Trawl < 50	37	60,788	40,325	55,462	0.66
Trawl >= 50 and <= 65	30	139,952	149,240	87,177	1.07
Trawl > 65	63	223,941	135,515	163,661	0.61

Table A9. Summary of Total and Average Pounds of Allocated Groundfish Needed to Cover Initial ACE Overages for All Permitted Vessels in Break-Even Analysis

Stock	Gillnet < 40	Gillnet >= 40	Longline < 40	Longline >= 40	Trawl < 50	Trawl >=50 and <= 65	Trawl > 65	Total
Total Pounds Needed								
GB Cod	13,652	117,860	0	11,085	42,049	353,897	815,585	1,354,128
GOM Cod	420,627	585,827	108,273	7	237,926	508,002	313,171	2,173,833
GB Haddock	13	6,586	77,010	0	1,082	2,541	281,343	368,576
GOM Haddock	10,785	20,889	40,076	219	28,423	39,363	78,171	217,926
GB Winter	0	49	57	520	990	15,222	637,916	654,753
GOM Winter	2,827	17,722	3	0	24,283	46,990	4,996	96,821
Witch	2,056	3,466	0	0	62,905	104,176	192,553	365,157
CCGOM YT	31,202	73,051	1	0	121,821	117,992	70,382	414,450
GB YT	0	0	25	52	1,991	21,269	328,765	352,101
SNEMA YT	45	53	0	49	6,160	98,083	37,832	142,222
Plaice	2,885	871	51	17	32,313	137,944	357,977	532,058
White Hake	65,264	157,868	3,057	1,153	6,190	282,623	474,099	990,253
Redfish	1,031	10,927	916	0	295	160,005	182,651	355,825
Pollock	140,400	431,842	2	0	12,175	166,749	453,494	1,204,662
Total	690,787	1,427,010	229,471	13,102	578,605	2,054,855	4,228,933	9,222,763
Average Pounds Needed								
GB Cod	390	2,455	0	1,232	779	6,677	10,731	22,264
GOM Cod	12,746	12,205	13,534	1	4,489	9,407	4,121	56,503
GB Haddock	0	137	9,626	0	20	47	3,702	13,533
GOM Haddock	327	435	5,009	24	536	729	1,029	8,090
GB Winter	0	1	7	58	18	282	8,394	8,760
GOM Winter	86	369	0	0	458	870	66	1,849
Witch	62	72	0	0	1,187	1,966	2,534	5,821
CCGOM YT	946	1,522	0	0	2,299	2,185	926	7,877
GB YT	0	0	3	6	37	394	4,326	4,765
SNEMA YT	1	1	0	5	114	1,851	498	2,470
Plaice	85	18	6	2	610	2,555	4,710	7,986
White Hake	1,978	3,289	382	128	117	5,234	6,238	17,365
Redfish	29	228	115	0	5	2,963	2,403	5,743
Pollock	4,255	8,997	0	0	230	3,088	5,967	22,536
Total	20,905	29,729	28,684	1,456	10,899	38,247	55,644	185,564

Table A10. Percentage of Pounds Traded by Stock for Inter- and Intra-Sector Trades by Method of Compensation

Stock	Fish for Fish Trade	Monetary Trade	No Compensation	Unknown Compensation
		Intra-Sector Trades		
GB Cod	28.23%	61.42%	0.86%	9.49%
GOM Cod	10.69%	66.78%	6.87%	15.65%
GB Haddock	1.61%	67.51%	0.01%	30.87%
GOM Haddock	14.20%	53.91%	5.29%	26.60%
GB Winter	3.01%	93.57%	0.03%	3.40%
GOM Winter	16.01%	69.42%	4.89%	9.67%
Witch	11.69%	46.57%	4.25%	37.49%
CCGOM Yellowtail	18.43%	66.38%	2.33%	12.85%
GB Yellowtail	21.55%	68.61%	0.06%	9.77%
SNEMA Yellowtail	26.02%	59.23%	0.25%	14.50%
Plaice	5.67%	45.69%	5.75%	42.90%
White Hake	13.11%	48.47%	10.35%	28.07%
Redfish	0.03%	49.36%	5.34%	45.27%
Pollock	2.88%	61.53%	11.98%	23.60%
Totals	6.73%	63.95%	3.40%	25.93%
		Inter-Sector Trades		
GB Cod	9.84%	84.45%	5.71%	0.00%
GOM Cod	17.32%	73.38%	9.30%	0.00%
GB Haddock	0.28%	77.54%	19.65%	2.53%
GOM Haddock	40.77%	54.30%	4.94%	0.00%
GB Winter	1.34%	87.42%	11.23%	0.00%
GOM Winter	2.40%	80.94%	16.66%	0.00%
Witch	27.33%	65.42%	7.21%	0.03%
CCGOM Yellowtail	13.88%	66.41%	18.15%	1.57%
GB Yellowtail	6.29%	82.31%	11.40%	0.00%
SNEMA Yellowtail	21.32%	74.53%	4.15%	0.00%
Plaice	14.05%	73.27%	12.62%	0.06%
White Hake	11.55%	83.68%	4.77%	0.00%
Redfish	0.03%	93.37%	5.17%	1.43%
Pollock	7.03%	88.26%	4.61%	0.10%
Totals	9.71%	80.64%	9.07%	0.59%

Table A11. Estimated FY2010 Sea Days on Groundfish Trips for Vessels Included in Break-Even Analysis

Vessel Category	Total Groundfish Day Trips	Total Groundfish Multi-Day Trips	Days Absent on Groundfish Multi-Day Trips	Average Trip Duration on Multi-Day Groundfish Trips	Total Estimated Sea Days
Gillnet < 40 Feet	1,973	77	131	2.0	2,127
Gillnet >= 40 Feet	3,031	322	1,017	4.0	4,319
Longline < 40 feet	143	46	68	2.0	235
Longline >= 40 Feet	64	86	143	2.0	236
Trawl < 50 Feet	1,037	171	374	3.0	1,550
Trawl >= 50 and <=65 Feet	924	425	1,518	4.0	2,624
Trawl > 65 Feet	320	1753	9,979	6.0	10,838
Totals	7,492	2,880	13,229	5.0	21,929

Appendix B. Ground-Truthing Results for Overhead Costs

Table B1. Gillnet Fixed Cost Estimates (Interview Results)	
Fixed Costs	Gillnet < 40 ft Range of Values
Improvements/Investments	0 – 15,000
Non-Crew labor services	0
Association fees	0 – 100
Hull/Vessel Insurance	2,500 – 8,000
Interest Payments on Business Loans	1,000 – 13,000
Mooring/Dockage fees	650 – 4,320
Permit/Licensing fees	500
Professional fees	800 – 4,700
Repair and Maintenance	9,212 – 10,000
Business Taxes	N/A
Business travel	N/A
Business vehicle	5,400 – 6,720
Communication (cell phone/VMS)	1,000 – 1,440
Haul Out Cost	1,137 – 3,000
Safety Equipment	0 – 3,200

Table B2. Trawl Fixed Cost Estimates (Interview Results)			
Fixed Costs	Trawl < 50 ft Range of Values USD, $	Trawl > 50 ft and < 75 ft Range of Values USD, $	Trawl > 75 ft Range of Values USD, $
Improvements/Investments	4,900 – 15,000	700 – 25,000	18,000 – 100,000
Non-Crew labor services	0	0 – 9,150	0 – 20,000
Association fees	0 – 300	0 – 3,000	0 – 2,400
Hull/Vessel Insurance	0 – 10,000	5,000 – 14,365	40,000 – 87,000
Interest Payments on Business Loans	0 – 790	2,500 – 14,760.35	0 - 124,176
Mooring/Dockage fees	2,000 – 13,500	1,000 – 7,000	1,500 – 17,000
Permit/Licensing fees	410 – 750	450 – 500	500 – 2,000
Professional fees	900 – 8,500	700 – 3,600	5,000 – 11,500
Repair and Maintenance	2,000 – 3,500	400 – 33,656	16,000 – 50,000
Business Taxes	0 – 7,500	344.13 – 12,753	500 – 1,100
Business travel	0 – 500	0 – 1,500	1,500 – 14,000
Business vehicle	3,600 – 4,000	0 – 7,800	0 – 4,000
Communication (cell phone/VMS)	1,400 – 1,750	1,964.83 – 4,241	1,500 – 6,000
Safety Equipment	600 – 3,600	336.45 – 1,800	500 - 2,000
Haul Out Cost	3,600 – 6,000	2,500 – 22,929	2,500 – 10,000

Table B3. Longline Fixed Cost Estimates (Interview Results)	
Fixed Costs	Longline Range of Values USD, $
Improvements/Investments	0 – 500
Non-Crew labor services	0
Association fees	250 - 940
Hull/Vessel Insurance	3,000 – 3,900
Interest Payments on Business Loans	0
Mooring/Dockage fees	450 – 1,370
Permit/Licensing fees	700 - 740
Professional fees	0 - 700
Repair and Maintenance	500 – 8,250
Business Taxes	0 - 410
Business travel	0 - 200
Business vehicle	1,800 – 3,800
Communication (cell phone/VMS)	1,470 – 1,700
Safety Equipment	1,000 – 1,420
Haul Out Cost	1,274 – 3,000

Appendix C. Glossary of Terms

Acceptable Biological Catch (ABC): a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and should be specified based on the ABC control rule.

Accountability Measures (AMs): management controls that prevent ACLs or sector ACLs from being exceeded (in-season AMs), where possible, and correct or mitigate overages if the occur.

Annual Catch Limit (ACL): the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures.

Annual Catch Target (ACT): an amount of annual catch of a stock or stock complex that is the management target of the fishery. A stock or stock complex's ACT should usually be less than its ACL and results from the application of the ACT control rule. If sector ACL's have been established each one should have a sector ACT.

Fishing Year (FY): in the multispecies fishery the fishing year starts on May 1st and ends April 31st.

Optimum Yield (OY): The term "optimum", with respect to the yield from a fishery, means the amount of fish which -

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and

(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

"Overfishing" and "Overfished": a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

Overfishing Limit (OFL): the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers of weight of fish.