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Employment, Income, Working Conditions and Vessel Safety in New Bedford

after Amendment 13 to the Multispecies Management Plan

Final Report for
Contract No. NA05NMF4721057/UNH PZ06083
Northeast Consortium

January 31, 2008

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Summary

Amendment 13 to the Multispecies Fishery Management Plan, the Interim Rule that preceded it and the Frameworks that followed it were designed to reduce fishing effort on Multispecies stocks, especially those in the Gulf of Maine. The Interim Rule of 2002 reduced days at sea (DAS) by 20% of their annual maximum from FY 1996 through FY 2000 for vessels with Multispecies permits. For vessels that had used their maximum of 88 DAS under the Fleet DAS, this meant that they were allowed to fish approximately 70 DAS per year for Multispecies stocks. Starting on May 1, 2004, Amendment 13 further reduced permitted vessel's DAS to 60% of a revised baseline (the maximum annual DAS used from FY 1996 through FY 2001), which were named Category A DAS, that could be used wherever fishing for multispecies was allowed. Fleet DAS vessels, about 1/3rd of the New Bedford offshore dragger fleet, were reduced to 53 Category A DAS per year. A few permitted vessels in New Bedford were allocated fewer that 53 Category A DAS, and the remaining 2/3rds of the New Bedford offshore groundfish fleet, who were restricted by their own history of fishing for multispecies, received an average of 73 Category A DAS.

The Environmental Impact Statement (EIS) that included an assessment of the economic effects of Amendment 13 estimated that the median gross revenue for New Bedford vessels with multispecies permits would decline about 35%, income would decline about $6 million per year in 2001 dollars in Bristol County, which contains New Bedford and the nearby smaller ports, and 220 fishermen in the offshore bottom trawl fleet in that county would lose their jobs. Using a Monte Carlo simulation with data on revenues and costs, the EIS predicted business failure rates (vessels leaving the fishery) for the New England Multispecies fishery from 18% to 27% for medium trawl vessels (between 50 ft and 70 ft) and from 31% to 43% for vessels over 70 ft long. The number of DAS necessary to meet overhead expenses and pay the crew $50,000 per year ranged from 114 days for trawlers less than 50 ft long to 143 days for vessels over 70 ft long.

The EIS assumed a constant ratio of groundfish revenue to other species revenue and constant stock sizes. These assumptions, while unrealistic, did not affect a comparison of alternative proposals for Amendment 13, which was the intention of the EIS.

This report provides evidence for these hypotheses in terms of number of vessels, employment of fishermen, and net crew share for the New Bedford offshore dragger fleet between 2002, the year the interim order went into effect, and 2005, the year after Amendment 13 went into effect. We collected data in interviews with dragger crews while they were doing gear work in two separate years, 2004 and 2006. These data include number of crew, hours of work, lay payments, and safety (2006 only). The samples of crew interviews averaged 65% of the population of New Bedford offshore draggers. We collected data from settlement houses on net crew share and fuel costs (2003 and 2005) for 2002, 2003 and 2005 by vessel for the New Bedford dragger fleet. The samples of settlement houses averaged 76% of the population of New Bedford offshore draggers. The Northeast Fishery Science Center (NEFSC) supplied vessel data on landings, vessel characteristics, allocations of DAS and DAS leased, and trips and days absent per year for 2002, 2003, 2005, and 2006.

These data show a decline in number of vessels in the New Bedford offshore dragger fleet from 83 draggers in 2002 to 70 draggers in 2005, continuing the decline since 1993, the year before DAS, when there were 113 vessels in the New Bedford dragger fleet. The decline in the number of vessels in the New Bedford from 1993 through 2005 was due, at least in part, to the accumulated effects of Amendments 5, 7, and 13 to the Multispecies FMP and the frameworks over the same period.

The decline in offshore draggers caused employment to decrease from 508 fishermen in 2002 to 490 fishermen in 2005, which also continues the decline from 1,053 fishermen on New Bedford offshore draggers in 1993. Average net crew share shrank by 6% between 2002 and 2005, even though average gross stock increased by 9% (both variables adjusted for inflation). Using the typical lay for New Bedford draggers, the increase in fuel prices, which more than doubled between 2003 and 2005, explains most of the decline in net crew share. Average income (adjusted for inflation) for fishermen on draggers declined by 17% over this period.

The decline in the number of vessels, income, and employment were less than expected in the EIS due to New Bedford draggers leasing DAS and increasing their non-multispecies trips. In 2004, New Bedford offshore dragger owners leased an average net increase of 13 DAS per vessel in 2004 and 20 DAS per vessel in 2005, recovering more than half of the DAS lost through Amendment 13. Trips not using Multispecies DAS further increased days absent per vessel from 98 days in 2002 to 116 days in 2005. The value of scallops, monkfish, and other non-multispecies (adjusted for inflation) almost doubled between 2002 and 2005, increasing to 37% of the total gross stock for New Bedford draggers in 2005.

There is evidence that the full effects of Amendment 13 and Framework 42, which followed it, did not conclude in 2005. While we don't have net income data for 2006, landings data for New Bedford indicate a drop in gross stock for New Bedford draggers, which probably led to a further decline in net crew share. The value of groundfish landed in New Bedford fell from $33 million in 2005 to $25 million in 2006, adjusted for inflation.

Crew interviews show a modest increase in watch hours on deck and a decline in watch hours off between 2004 and 2006. These interviews also report that many vessels no longer work in watches, indicating that they work steadily throughout the trip.

While we can not specifically estimate trends in accidents since the start of Amendment 13, fishing continues as a very dangerous occupation. Almost every crew reported some accident while fishing over the past 10 years, and 16 % of the sample of crewmen interviewed had survived a sinking. Twenty-seven percent of the sample said that they suffer from some chronic injury. Thirty of 45 crews responded positively to the question "Do you feel that the provisions of Amendment 13 have caused you to make decisions that reduced your safety?" On the brighter side, almost all of the crew members we interviewed in 2006 reported that they have attended safety courses within the last two years.

A word of caution is necessary in interpreting the results from this study. Changes in employment, net crew share, hours of work, and safety since Amendment 13 do not necessarily prove that Amendment 13 caused these changes. Many other variables affected employment, net crew share, working conditions, and safety over this period, especially changes in stocks of groundfish and other species that are independent of the effects of Amendment 13. Operating costs, demand for fishery products, and demand and supply conditions in New Bedford's labor markets also affected employment and income for New Bedford fishermen. The increased interest in safety courses promoted by Shore Support and other organizations in New Bedford probably also affected safety conditions on the vessels.

We did not control for these other variables in isolating Amendment 13 as the cause of changes in employment, net crew share, hours of work, and safety.

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I. Introduction

In 2000, the Conservation Law Foundation and other environmental groups filed a lawsuit in the U.S. District Court for the District of Columbia that argued that the National Marine Fisheries Service (NMFS) had not reduced overfishing sufficiently to fulfill the conditions of the Sustainable Fisheries Act of 1996. In 2001, Judge Gladys Kessler ordered NMFS to expedite development of Amendment 13 to the Multispecies Fishery Management Plan (FMP) to reduce fishing effort, and she ordered the parties to negotiate a settlement for the interim period until Amendment 13 was in place. [1] In 2002, the interim rule limited Days at Sea (DAS) per fishing year for vessels with Multispecies permits to 80% of each vessel's maximum annual DAS used for the period from fishing year (FY) 1996 to FY 2000 and placed restrictions on fishing gear, catch per trip for selected species, and other factors.[2] [3]

The final rule of Amendment 13, which began on May 1, 2004, reduced DAS that could be used in any open area (called Category A DAS in Amendment 13) to 60% of the maximum DAS per year that the vessel had landed at least 5,000 pounds or more of regulated groundfish species from FY 1996 through FY 2001.[4]

The other 40% of those days were named Category B DAS that were restricted to certain healthy stocks in certain areas, called Special Access Programs (SAPs). Use of Category B DAS in SAPs carried other restrictions, including holding Category A DAS in reserve. Catching groundfish of concern other than the targeted species, for example, required flipping from a Category B DAS to a Category A DAS, which meant that vessels had to hold Category A DAS in reserve in order to use these Category B DAS.

Amendment 13 also included other restrictions, such as, catch limitations in certain areas and gear restrictions. Amendment 13 also allowed vessels to lease (purchase for one fishing year) Category A DAS from similar vessels with multispecies permits with the price negotiated between the parties.

Economic theory predicts that the reductions and leasing of DAS would affect income, employment, and working conditions in complex ways. Due to the lay system, the regulations in Amendment 13 would affect net crew share through changes in the value of landings (called the gross stock), which in turn depends upon the quantity of the catch and the price levels. Changes in expenses would also affect net crew share. Declining revenues due to fewer DAS and rising trip costs or both combined with the incentive to sell DAS could drive marginal vessels from the fishery. This decrease in the number of vessels would cause declines in employment. Reducing the number of crew in order to maintain individual crew shares when vessel income declined would also decrease employment. Reductions in DAS would also affect working conditions, specifically hours of work per day. The fewer the DAS, the harder the crew would work to maximize the catch for those DAS due to the scarcity of DAS.

Reductions in DAS would also affect vessel safety in complex ways. At sea, fishermen handle heavy machinery on a slippery, moving deck often in rough weather throughout the day and night. The simplest mistake can cause serious injury. With limited DAS, vessel owners and

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[1] Multispecies refer to the twelve species which are usually caught by draggers: Atlantic cod, haddock, pollock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, Atlantic halibut, redfish, ocean pout, silver hake, red hake, offshore hake and white hake. Groundfish include summer flounder, or fluke, which is targeted by New Bedford draggers, but not included in the Multispecies Management Plan.

[2] U.S. District Court for the District of Columbia. 2002, Interim Rule, exhibits A & B.

[3] Fishing year for Multispecies runs from May 1 to April 30. Unless noted otherwise, year refers to calendar year.

[4] Final rule for Amendment 13 was taken from U.S. National Archives and Records Administration. 2004A.

captains may forego using these DAS in bad weather, which would reduce accidents. Decreases in DAS would likely lead to increases in the watch or in the intensity of fishing, which would increase the likelihood of injury at sea. Working more hours during fishing trips could also cause chronic injuries, such as bursitis, arthritis, and other long-term debilitating conditions.

The Economic Impact Section of Amendment 13 (EIS) estimated its potential effects on revenue and profitability, assuming a constant ratio of other species revenue to groundfish revenue, based on revenue data from 1998-2001. The analysis also assumed constant stock sizes and assumed that revenues earned on trips that do not land any groundfish would also remain constant. These assumptions, while unrealistic, did not affect a comparison of alternative proposals for Amendment 13, which was the intention of the economic impact assessment.

The EIS estimated that the median drop in gross revenue for New Bedford vessels with multispecies permits would be about 35%.[5] Using an IMPLAN model, the EIS predicted an income loss of about $6 million per year in 2001 dollars in Bristol County, which contains New Bedford and some smaller ports, and a loss of 220 fishermen jobs to the offshore bottom trawl fleet in that county.[6] Using a Monte Carlo simulation with data on revenues and costs, the economic impact analysis of Amendment 13 predicted business failure rates (vessels leaving the fishery) from 18% to 27% for medium trawl vessels (between 50 ft and 70 ft) and from 31% to 43% for vessels over 70 ft long.[7] There was no analysis of business failures by port. The number of DAS necessary to meet overhead expenses and pay the crew $50,000 per year ranged from 114 days for trawlers less than 50 ft long to 143 days for vessels over 70 ft long.[8]

This report provides evidence for these hypotheses in terms of employment of fishermen, net crew share, and hours of work on New Bedford draggers. We collected data from fishing crews and settlement houses on net crew share, fuel costs, employment, hours of work, and safety for the New Bedford dragger fleet. The Northeast Fishery Science Center (NEFSC) supplied vessel data on landings, vessel characteristics, allocations of DAS and DAS leased, and trips and days absent per year. We used these data to estimate the changes in these variables between 2002, the year the interim order went into effect and 2005.

A word of caution is necessary in interpreting the results from this study. Changes in employment, net crew share, working conditions, and safety since Amendment 13 do not necessarily prove that Amendment 13 caused these changes. Many other variables affected employment, net crew share, working conditions, and safety over this period, especially changes in stocks of groundfish and other species that are independent of the effects of Amendment 13. Operating costs, demand for fishery products, and demand and supply conditions in New Bedford's labor markets also affected employment and income for New Bedford fishermen. The increased interest in safety courses promoted by Shore Support and other organizations in New Bedford probably also affected safety conditions on the vessels. In our conclusion, we discuss some of these effects, but we did not control for these other variables in isolating Amendment 13 as the cause of changes in employment, net crew share, and hours of work.

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[5] Amendment 13, Section 5.4 Economic Impacts, p. 607-623.
[6] Amendment 13, Section 5.4.6 Short-term Impacts on Coastal Sub-Regions, p. 707-716.
[7] Amendment 13, Section 7.3.3.7.2 Regulatory Flexibility Act (RFA), p. 1039-1046.
[8] Amendment 13, Section 5.4.5 Days-at-sea Requirements for the Multispecies Fishery, p. 693-706.

II. Research Methods and Data Collection

The NEFSC supplied vessel data collected by the NMFS including vessel characteristics, annual value of landings by species types, number of trips, and days fished for vessels that listed New Bedford or Fairhaven as either principle or home port for 2002, 2003, and 2005. NEFSC also supplied data on annual DAS allocated for New Bedford vessels from 2002 through 2006 and DAS bought, sold, and carried over for 2004 through 2006.

NMFS collected landings and effort data from buyers (called weigh-out or dealer data), who recorded fish purchased and value paid per species. In 2002, and 2003, port agents recorded the data from weigh-out slips provided by dealers. In 2005, dealers reported the data directly over the internet. Starting in June 1994, NMFS also collected data from captains' logbooks (called logbook data or Vessel Trip Records (VTR)) on their estimation of the catch for the trip, days absent from port, number of crew members, and other data.

We used dealer data for landings and value for all years, because the landings reported by logbooks were an estimate of the catch and did not include the value of the catch. For all years in this study, we used logbook data for the number of trips and days absent because trips may have been counted more than once in the dealer data if a captain sold to more than one dealer at the end of a trip or sold product from the same trip on more than one date.

Until about 10 years ago in New Bedford, almost all captains sold the entire trip to a single dealer. These were the auction regulations that ruled from 1941 to the early 1990s. The display auction that started in 1994 and the on-line bidding auction that started in 2001 allowed captains to sell parts of the catch to different dealers. The increasing flexibility and complexity of the fish processing sector also encouraged dragger captains to sell monkfish, scallops, groundfish, and other species from the same trip to different dealers.

With the complexity of regulations, classifying vessels as offshore draggers, which has never been easy, became more problematic. Most large fishing vessels have many permits that allow their owners to choose among fisheries, inshore and offshore, and large draggers can switch from offshore groundfishing, their traditional fishery, to targeting other species either inshore or offshore, depending on the menu of profit expectations. Vessels also can switch between ports. In order to simplify, we categorized New Bedford offshore draggers as vessels with multispecies permits that listed New Bedford or Fairhaven as either their home port or principal port, were listed at 55 feet long or longer, landed at least some groundfish, landed at least $75,000 worth of groundfish, scallops, and monkfish combined, and took more than three trips that year. We excluded vessels that had both multispecies and limited access scallop permits (received DAS in the scallop fishery) because these vessels primarily targeted scallops with small amounts of groundfish bycatch.

This classification of offshore draggers includes some vessels that have switched from fishing offshore during long trips to fishing inshore or offshore during shorter trips for at least part of the year. Most of these vessels continued to target groundfish, but many of these vessels, in more recent years, also targeted scallops in short trips with general scallop permits, an open access fishery that allowed vessels 400 pounds of scallop meats per trip.[9] Other vessels took long or short trips targeting other species such as monkfish.

We collected income data for offshore draggers from settlement houses for 2002, 2003, and 2005. Specifically, we collected total crew income for the vessel per year taken from IRS

[9] NOAA, General Category Sea Scallop Permits.

forms 1099 paid to anyone who worked on the vessel for that year. For 2003 and 2005, we also collected data for annual fuel costs by vessel for those years. The samples for these data were 72%, 77%, and 80% of the fleet for 2002, 2003, and 2005 respectively. We assume that those vessels missing from these samples did not use New Bedford settlement houses to pay their crews. Table 1 shows the vessel characteristics for the samples and the populations for settlement house data.

Table 1.Vessel Characteristics for Settlement House Samples and Population.

	2002		2003		2005	
	Settlement	Population	Settlement	Population	Settlement	Population
Number of Vessels	60	83	59	77	56	70
Horsepower	543	530	551	539	559	553
Gross Registered Tons	130	125	132	126	131	129
Number of Trips	25	25	21	22	28	30
Days Absent	101	98	93	90	118	116
Value of Landings	$492,056	$450,369	$474,609	$430,834	$537,880	$498,209

Sources: Number of vessels, horsepower, and GRT from vessel file; Days Absent from VTR file; and Value of Landings from dealer data file. All data supplied by NMFS.

We interviewed dragger crews while they were doing gear work in two separate years, 2004 and 2006. In 2004, we interviewed 46 draggers from the fleet population of 77 vessels (60%), and in 2006, we interviewed 48 vessel crews from the fleet population of 70 vessels (69%). [10] In 2004, we asked for information on some variables prior to DAS (1993), and in 2006, we asked for information on some variables for 2003. The questionnaire was similar for both sets of interviews except that the second set of interviews included questions on vessel safety. Table 2 shows the vessel characteristics for the samples and for the populations for crew interview data.

T-tests using STATA showed no significant difference between the sample and population means for any of these variables for any year for both settlement house and crew interview data sets. [11]

For this project, we selected and recruited an Industry Advisory Panel that we used as a focus group to answer questions on data, review the data used, and review drafts of this report. We met with the entire advisory panel three times and asked questions of members of the panel throughout the project.

Amendment 13 continued the practice that began with Amendment 5 of using May 1 as the start of the fishing year for the multispecies FMP. While data on allocation and leasing of DAS follow the fishing year, other data, including landings, trip, days absent, income and fuel

[10] We compared 2004 vessel means from interviews with vessel means for the population in 2003 because we did not collect population data for 2004.

[11] STATA uses the null hypothesis that the means are different and estimates the probability of rejecting the null hypothesis. The probability for rejecting the null hypothesis was less than 5% for all variables. Test results available by request from dgeorgianna@umassd.edu.

expenses from settlement houses, and crew interview data follow the calendar year. In general, this difference between fishing year and calendar year only caused problems when identifying the annual effects of policy changes. Lags in response to changes in policies also presented difficulties in identifying effects of policy changes.

Table 2. Vessel Characteristics for Crew Interview Samples and Population.

	2004		2006	
	Interview	Population	Interview	Population
Number of Vessels	46	77	48	70
Horsepower	533	539	529	553
Gross Registered Tons	127	126	127	129
Number of Trips	26	22	34	30
Days Absent	104	90	122	116
Value of Landings	$467,958	$430,834	$524,582	$498,209

Sources: Number of vessels, horsepower, and GRT from vessel file; Days Absent from VTR file; and Value of Landings from dealer data file. All data supplied by NMFS. Note that population data was taken from 2003 and 2005.

III. Amendment 13 to the Multispecies Management Plan

DAS, as a management measure for the Multispecies FMP, began in FY 1994 with Amendment 5 that assigned maximum DAS per fishing year for targeting Multispecies stocks to permitted vessels depending on their fishing history or assigned them a common number of 190 opportunity days, which were eventually labeled Fleet DAS. The vessels that selected the latter were required to layover two days for every DAS used plus declare out of multispecies fishery for specified number of days in blocks of at least 20 days.

Amendment 5 called for a decrease of 10% per year in DAS for each vessel (but waived for Fleet DAS in year two of Amendment 5) and established a moratorium on new Multispecies permits for groundfish vessels. Amendment 5 also limited vessel upgrades through vessel replacements by placing certain restrictions on increases in vessel size and engine horsepower. Amendment 7, which began in FY 1997, further restricted DAS by reducing Individual DAS by 15% in FY 1997 and FY 1998 and limiting Fleet DAS to 139 DAS in FY 1997 and 88 DAS in subsequent years.

In 2001, U.S. District Court Judge Kessler found in favor of a suit brought by environmental groups that argued that NMFS had not met the stock restoration schedule for fish stocks that were considered overfished by the 1996 Sustainable Fisheries Act.[12] She ordered NMFS to write an amendment to the Multispecies Management Plan to fulfill the stock rebuilding schedule of the Act. In 2002, Judge Kessler adopted an interim rule, starting on May 1, 2002, that reduced each vessel's DAS by 20% of their annual maximum from FY 1996 through FY 2000 for permitted vessels (called Baseline DAS). For vessels that had used their maximum of 88 DAS under the Fleet DAS, this meant that they were allowed to fish approximately 70 DAS per year.

By basing DAS on the maximum number of days fished for Multispecies stocks over a specific time-period, Judge Kessler limited DAS for those vessels that had not fished for multispecies during the control period of FY 1996 through FY 2000 to 10 DAS per year. This measure drastically reduced the DAS that had been allocated to the fleet characterized as "latent" DAS, which had been available to vessel owners even though they had not fished for multispecies stocks.

On May 1, 2004, Amendment 13 further reduced permitted vessel's DAS to 60% of a revised baseline (the maximum annual DAS used from FY 1996 through FY 2001), called Category A DAS that could be used wherever fishing for multispecies was allowed.[13] Amendment 13 also required landing at least 5,000 pounds of groundfish in the qualifying year and eliminated the minimum of 10 DAS allocated by Judge Kessler. Permit holders who had previously used 88 DAS per year, about 1/3rd of the New Bedford offshore dragger fleet, were awarded 53 Category A DAS per year at the start of Amendment 13. A few permitted vessels in New Bedford were allocated fewer that 53 Category A DAS, and the remaining 2/3rds of the New Bedford offshore groundfish fleet, who were restricted by their own history of fishing for multispecies, received an average of 73 Category A DAS.

Unless changed through a future Council action Amendment 13 called for additional reductions in Category A DAS to 55% of the Baseline from FY 2006 through FY 2008, and 45% of the baseline starting in FY 2009.

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[12] See U.S. District Court for the District of Columbia. 2002. for details on Interim Rule.

[13] See U.S. National Archives and Records Administration. 2004A for Final Rule on Amendment 13.

Amendment 13 also allocated 40% of the Baseline DAS as Category B DAS that vessels could use as a Reserve B DAS in either Special Access Programs (SAPs) or as a Regular B DAS under certain conditions. In order to use a Category B DAS, a vessel was required to have an A DAS in reserve. If the vessel hauled back regulated species not included in the SAP, the captain contacted NMFS and "flipped" the day from a Category B DAS to a Category A DAS.

Framework 40A, enacted in November 2004, allowed permitted vessels to use Category B days, called Regular Category B DAS, in the DAS Pilot Program in which vessels could target healthy stocks of groundfish, provided that they did not land more than the applicable maximum landing limits per trip under a Category B DAS for other species.[14] Other Category B DAS, called Reserve Category B DAS, could be used in Special Access Programs in specific areas that would minimize bycatch of the overfished stocks. In order to use these days, the vessel had to install VMS (Vessel Monitoring System), which gave NMFS tracking capabilities for each vessel. Amendment 13 also created Category C DAS, which could not be used currently but may be implemented if stock recovery warranted their use.

Amendment 13 also allowed vessels with multispecies permits to lease Category A DAS to other vessels with Multispecies permits. Leased DAS could not be carried over to the next fishing year, but the vessel that bought the DAS could renew the leased DAS for the following fishing year. In other words, the leasing was a temporary transfer of DAS between vessels. Framework 40 B allowed permitted vessels to buy and sell Category A DAS either permanently or for a specific fishing year. In other words, the vessel owners could negotiate the time-period of the leased DAS. Framework 40 B also limited the purchase of Category A DAS to vessels that were within 10 % of the baseline overall length and within 20 % of the baseline horsepower of the selling vessel, the same restrictions that applied to transfers of Multispecies permits to another vessel purchased by the same permit owner.

Effective January 28, 2003, vessels with multispecies and monkfish permits could fish their full allocation of up to 40 monkfish DAS per year regardless of the amount of multispecies DAS available to the vessel. Vessels still had to use a Category A DAS to use a monkfish DAS, if the vessel had sufficient Category A DAS. Vessels without sufficient Category A DAS, could use their remaining monkfish DAS to target monkfish with 10-12 inch mesh.

On November 2, 2004, Framework 16 to the Atlantic Sea Scallop Fishery Management Plan (FMP) and Framework 39 to the Northeast Multispecies FMP, allowed all groundfish vessels with Multispecies permits to land a maximum of 400 pounds of scallops in shucked weight per trip without using DAS for that trip. The General Scallop Permit had been established in 1994 to allow draggers to retain scallops as bycatch.[15]

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[14] See U.S. National Archives and Records Administration. 2004C for details on Framework 40A

[15] See U.S. National Archives and Records Administration. 2004B for details on General Scallop Permit regulations

IV. New Bedford Landings

Figure 1 shows the pattern of revenue from scallops and all species in New Bedford following the Fishery Conservation and Management Act (FCMA) of 1976. All values and prices in this section were adjusted for inflation using 2005 as the base year.

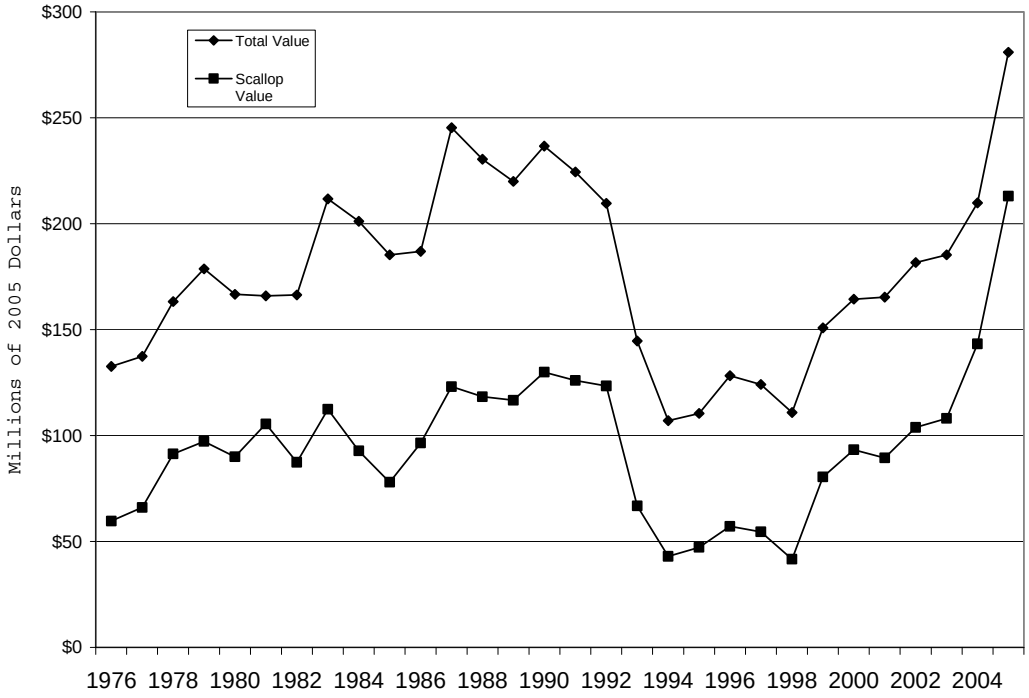

Figure 1. Value of Total and Scallop Landings in New Bedford, adjusted for inflation. (Source NMFS Landing Data.)

From 1976 to 1986, both groundfish and scallops contributed to the increases in revenue. These increases in revenue were dampened by the decline in exvessel prices when landings rose sharply in the late 1970s and early 1980s, and revenues were bolstered when exvessel prices rose as landings began to decline in the mid-1980s. Revenues fell sharply in the early 1990s, reached a low point in 1994, stayed there until 1998 before a sharp rise, reaching new peaks in 2005.

New Bedford thrived as a fishing port during the early years of the FCMA, rising from the fifth ranked port in the U.S. in terms of value in 1977 to first in the nation in 1983. New Bedford lost its position to Dutch Harbor, Alaska as the leading U.S. port in terms of value during the decline of the 1990s, returned to the top position in 2000, and has remained there since then.

Figure 2 shows quantity of landings by species for the port. When the restrictions in DAS began in 1994 with Amendment 5 to the Multispecies FMP, spawning stock biomass for groundfish stocks, especially for cod and haddock, had dropped sharply from its highs of the 1980s.[16] From 1994 through 1999, groundfish landings in the port of New Bedford remained relatively constant around 20 million pounds (landed weight), rose to almost 40 million pounds in 2001 and decreased continuously to 26 million pounds in 2005. From 2003 through 2005, most of this decline was caused by cod and flounders (other than yellowtail), which declined about 4 million pounds each. Haddock landings in New Bedford also dropped about 1 million pounds over this period.

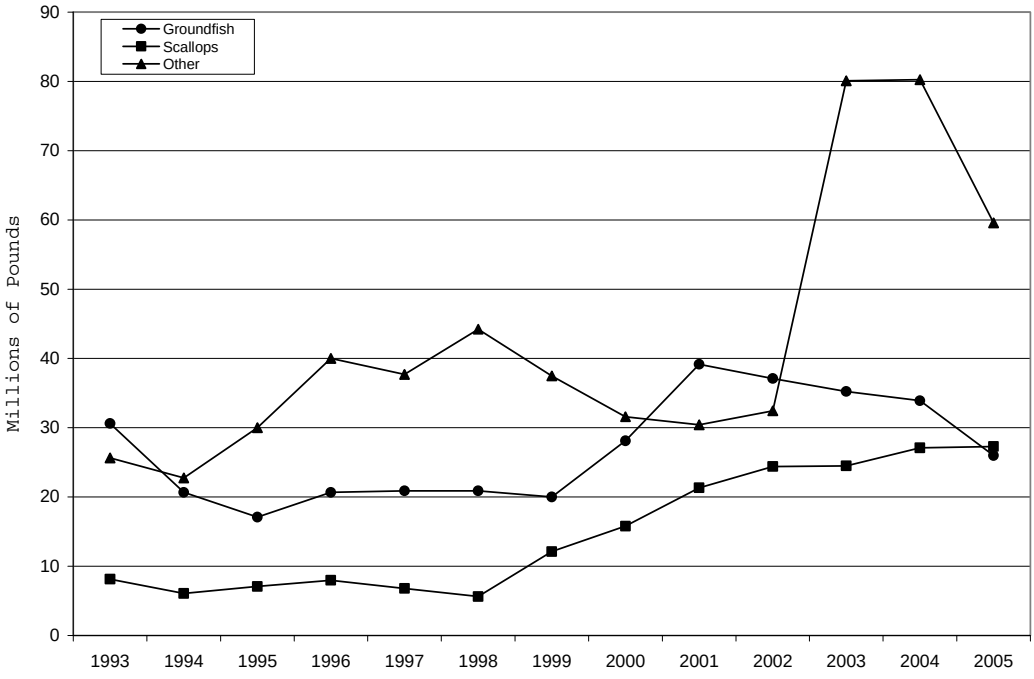

Figure 2. Quantities of Landings in New Bedford by Species.
(Source NMFS Landings Data.)

Scallop landings rose steadily starting in 1998, fueled by opening of the closed areas to scalloping in 1999, which continued on a rotational basis, and the increases in stocks in both the open and closed areas in the years following 1999. Landings of other species follow a cyclical pattern with a large increase in 2002. Between 2002 and 2004, herring, mackerel, and whiting, low prices species, accounted for most of the increase in landings of these other species.

[16] From Status of Fishery Resources off the Northeastern United States, 1998. Haddock biomass had dropped almost continually since its high of 1960.

Figure 3 shows that the recent boom in New Bedford's fishing industry was almost entirely due to the rising value of scallop landings after 1998, which increased by over 400% between 1998 and 2005. These increases in scallop values for the port were caused by the steady increase in scallop landings over the period and rising prices after 2003. See Figure 4 below for exvessel prices.

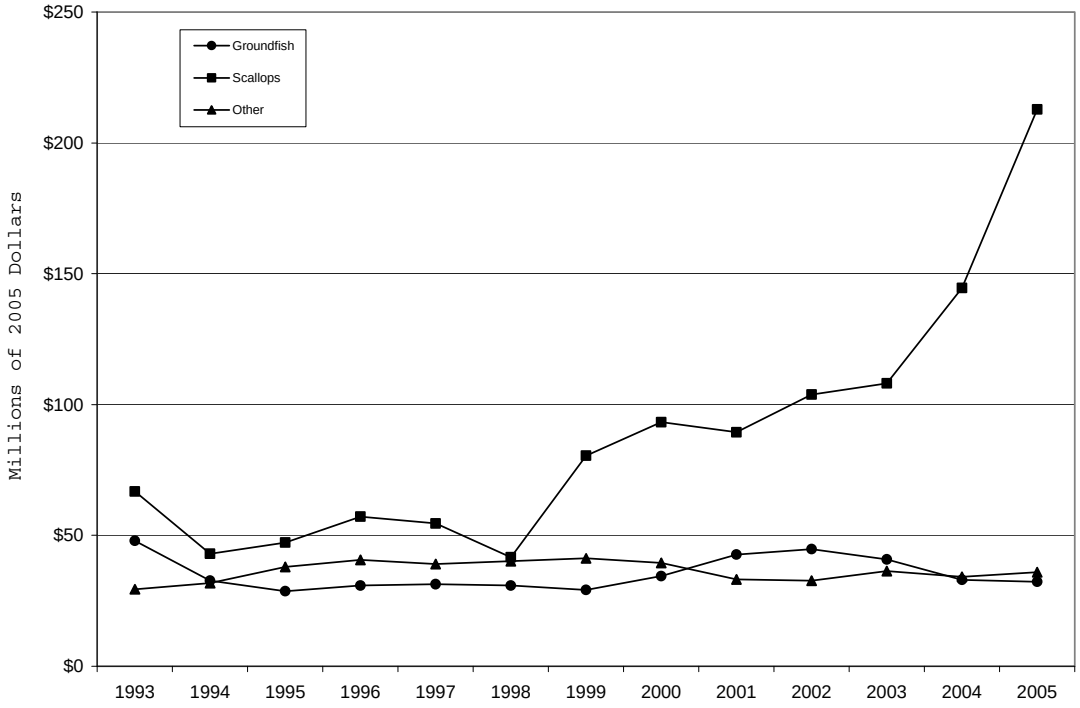

Figure 3. Value of Landings by Species in New Bedford, adjusted for inflation. (Source NMFS Landing Data.)

From 1994 through 1999, the value of groundfish landings in New Bedford remained around $30 million, rose steadily to $45 million in 2002, and then fell steadily to $32 million in 2005.

Over the period from 1993 to 2005, the real value of other species landed in the port ranged from $30 million to $40 million at 2005 prices. Since our previous report, which ended in 2002, the quantity of other species landed in New Bedford increased far more than the value of the catch, which increased from $33 million to $36 million at 2005 prices. The total value of other species landed in the port depends upon the mix of species landed.

While landed values for groundfish and other species, adjusted for inflation, remained relatively constant over the period from 1993 to 2005, they declined relative to scallop values. Groundfish especially has declined in importance to New Bedford, declining from 33% of total value of the port's landings in 1993 to 11% in 2005. The values of other species dropped from 20% of total value of the port's landings in 1993 to 13% in 2005.

Figure 4 shows that exvessel scallop prices declined at first when landings rose in 1999, stayed level from 2001 to 2003, and then rose sharply in 2004 and 2005, despite the increase in scallop landings.

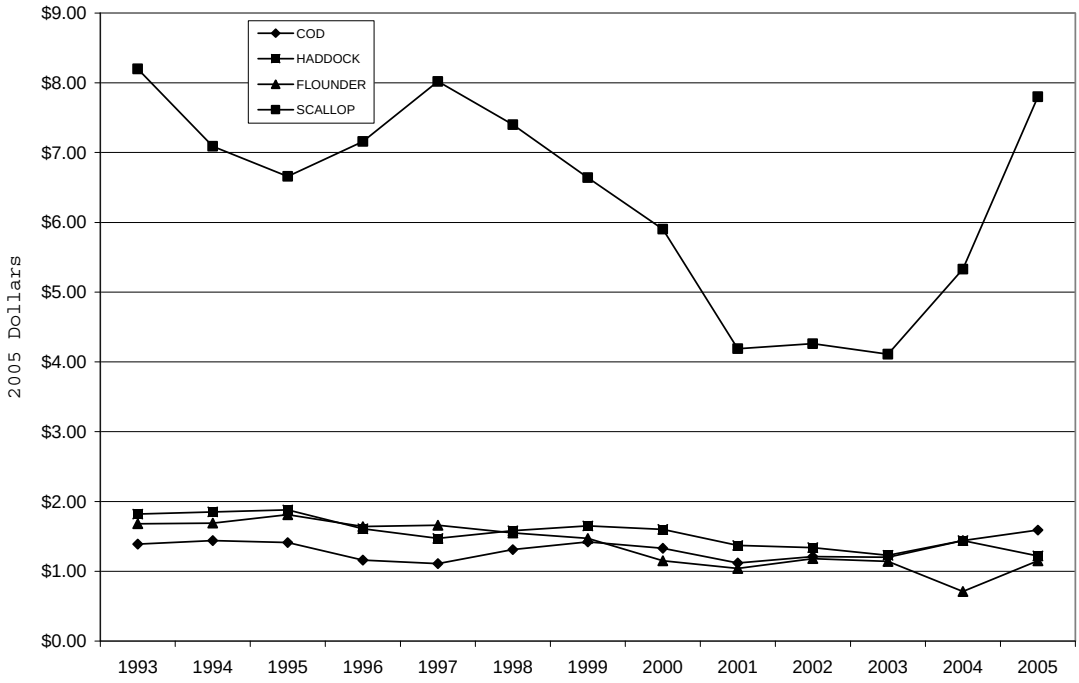

Figure 4. Exvessel Prices for Major Groundfish Species and Scallops in New Bedford, adjusted for inflation. (Source NMFS Landings Data)

At the peak of landings in 2005, scallop prices were about the same in real terms as they were in 1998, when scallop landings were at their lowest point. This combination of rising landings and sharp increases in scallop prices caused the value of scallop landings in New Bedford to double between 2003 and 2005, after adjusting for inflation. Scallops values rose from an average of about 50% of total value of the port's landings over the past 25 years to 75% in 2005.

Weighted average for groundfish exvessel prices, adjusted for inflation, dropped from about $1.50 per pound in the late 1990s to $1.22 in 2000, dropped further to $0.97 in 2004, before recovering to $1.24 in 2005. Flounder prices drive the weighted average for groundfish prices because flounder landings were about 2/3rds of total groundfish landings over this period. The size composition of the groundfish catch (larger size increases the exvessel price for most groundfish species because the yield increases and processing labor cost per pound decreases), also influenced exvessel prices.

The average value of landings by species for New Bedford draggers reflects the reduction in the share of groundfish in the port's total value. Between 2003 and 2005, the share from groundfish in the average gross stock for New Bedford offshore draggers declined while the share from scallops, monkfish, and other species increased. (See Table 3.) The average value of groundfish landed per vessel, after adjusting for inflation, declined by 11% from 2002 to 2005, while the average annual value of landings of scallops, monkfish, and other species increased by 94% over the same period. The share of scallops, monkfish, and other species increased from 21% of the average draggers gross stock in 2002 to 37% in 2005.

Table 3. Average Values by Species for New Bedford Offshore Draggers.

(2002 & 2003 values adjusted for inflation using the CPI-U with 2005 as Base).

	2002	2003	2005
Number of Vessels	83	77	70
Groundfish Value	$356,528	$328,806	$316,308
Scallop Value	$1,271	$1,396	$23,122
Monkfish Value	$37,382	$35,111	$65,973
Other Value	$55,188	$65,522	$92,806
Annual Gross Stock	$450,369	$430,834	$498,209

Sources: Vessels and values form NEFSC dealer data. Crew data for 1993 from settlement house data; crew data for 2002, 2003, and 2005 from crew interviews.

In 2005, by comparison, scallops accounted for over 98% of the gross stock for New Bedford scallopers with Limited Access Scallop Permits. Full-time scallopers had no incentive to target multispecies or other species due to abundant scallop stocks and high scallop prices.

V. Employment

Estimating employment on fishing boats is more complicated than estimating employment in other industries. Fishermen work full-time or part-time on the same vessel or on several vessels with the same owner, or they work full-time or part-time but on several vessels with different owners, often changing vessels between trips. They are employed and paid by the trip, whether they are steadily employed on one vessel or by one owner, employed part time on a single vessel, or employed part time on several vessels. The Vessel Trip Reports lists the number of crew members for every trip but does not list the crew members' names. Therefore, it is not possible to estimate part-time and full-time employment from these data. Using VTR data on crew size for New Bedford offshore draggers, we can estimate the number of sites in the New Bedford dragger fleet, but we can not estimate employment in the fishery.

The number of offshore draggers in New Bedford continued to decline. (See Table 4.) Between 2002 and 2003, eight vessels left the fishery and two offshore draggers entered the fishery for a decline of six vessels. Between 2003 and 2005, twelve vessels left the offshore ground fishery and five vessels entered for a net decline of seven vessels. Over the longer period, the New Bedford offshore dragger fleet has declined from 113 vessels in 1993 to 70 vessels in 2005. [17]

Table 4. Employment of Offshore Dragger Fishermen in New Bedford

	2002	2003	2005
Number of Vessels	83	77	70
Average Annual Crew	6.1	5.9	7.0
Average Crew Size per Trip	4.1	4.1	4.0
Total Employment	508	454	490

Sources: Average annual crew from settlement house data, and crew per trip from VTR data.

The data that we collected from settlement houses show the names of fishermen (including captains) by vessel who were paid at any time (i.e. received a 1099 IRS form) during 2002, 2003, and 2005. In order to eliminate duplicates, i.e. fishermen who worked on more than one vessel in a year, we sorted the names (last name, first name, middle initial) of all fishermen who had received payment from the settlement houses by year for the years 2002, 2003, and 2005. For 2002, 24% of fishermen had fished on more than one dragger; for 2003, 28% of fishermen had fished on more than one dragger, and for 2005, 32% of fishermen had fished on more than one dragger. These are probably underestimates of the fishermen who had fished on more than one vessel because the likelihood of matches increases as the pool of fishermen's names increases, and the pool of fishermen's names increases with the sample size. This bias is

[17] In Employment, Income and Working Conditions in New Bedford's Offshore Fisheries, we reported 117 draggers in New Bedford in 1993. Corrections in landings data reduced this number to 113.

probably small because the sample of settlement house data covered 72 %, 77 %, and 80 % of the population of New Bedford draggers in 2002, 2003, and 2005, respectively.

We estimated average annual crew per vessel by dividing the number of total unique crew (i.e. total annual crew minus duplicates) for the sample by the number of vessels in the sample. These results show that the average annual crew on offshore draggers declined from 6.1 in 2002 to 5.9 in 2003 and then increased to 7.0 in 2005. Multiplying the average annual crew per vessel by the total number of New Bedford draggers shows a total decline from 508 fishermen in 2002 to 460 fishermen in 2003 and then an increase to 490 fishermen in 2005.[18] Note that these estimates of employment include both full-time and part-time fishermen.

These estimates of employment on New Bedford draggers do not estimate total fishing employment in New Bedford because they do not include employment on scallopers and employment in other fisheries. Combining MA Department of Employment and Training (DET) data on employment with Federal data on non-employment (many fishermen are self-employed) for Bristol County show an increase in fishing employment in Bristol County, which includes the smaller ports around New Bedford, from 2,047 fishermen in 2002 to 2,164 fishermen in 2003 to 2170 fishermen in 2005. More than half of this employment was on full-time scallop vessels. [19] Once again these estimates do not separate full-time from part-time fishermen. Our previous report reported that very few fishermen work on both draggers and scallopers.[20]

VTR data report crew size per trip. The average crew size per trip for draggers (i.e. the average number of sites per vessel) remained constant at 4 crew members for 2002, 2003, and 2005. This estimate matches the averages reported by crews who we interviewed in 2004 and 2006.

In order to separate full-time from part-time fishermen in our previous report, we assumed that skippers prefer either steady full-time crewmen or transient full-time crewmen. This assumption implied that full-time fishermen make up crews with part-time transients filling in for full-time fishermen who take trips off for rest or personal reasons. We no longer have sufficient confidence in these assumptions to estimate full-time and part-time employment. For some vessels steady crewman no longer take trips off; rather the entire crew takes time off when the boat is shut down to conserve DAS or to make repairs. Other vessels change crew members depending on the targeted fishery, for example, skippers may hire different crew members to target scallops. Other vessels may depend upon transient fishermen for their crews.

The increase in total annual crew from 5.9 fishermen in 2003 to 7.0 fishermen in 2005 indicates an increase in transient part-time fishermen over this period, but we have no way to estimate the numbers of full-time and part-time fishermen from these data.

Crew interviews conducted during gear work between trips in 2004 and 2006 also provide data on fishermen's ages, years spent as fishermen, years on that vessel and their number of trips per year. Every fisherman who we interviewed responded that he was full-time. The average age for draggers in 2004 was 46 years old for the 202 fishermen who reported their ages. (See Table 9.) Four were less than 25 years old. Six were over 60 years old. These draggers had spent an average of 26 years at sea, and had worked on the current vessel for an average of seven

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[18] In Employment, Income and Working Conditions in New Bedford's Offshore Fisheries, we reported employment of 1053 for 1993 and 576 in 2002. Our current estimates are lower for 2002 due to corrections in landings, which reduced our estimate of offshore draggers in New Bedford, which in turn reduced employment.

[19] State employment data for Bristol County from Division of MA Division of Unemployment Assistance, ES-202 File. Employment for self-employed fishermen from U.S. Bureau of the Census, Non-Employer series. Employment on scallopers from Employment, Income and Working Conditions, p. 27.

[20] Employment, Income and Working Conditions, p. 28.

years. Only one had fished for less than one year. This was the first trip on that vessel for 19 crewmen, whose average age and years of experience was roughly the same as the total sample.

Table 5. Average Age and Fishing Experience in New Bedford

	2004	2006
Number of Fishermen	202	186
Age	46	49
Years at Sea	26	28
Years on Vessel	7	8
Number of trips	15.4	13.9

Sources: Crew Interviews. Number of trips refers to 2003 and 2005.

In 2006 interviews, the average age in the sample was 49. Two were less than 25 years old, and 10 were over 60 years old. In 2006, they had spent an average of 28 years at sea, and had worked on the current vessel for an average of eight years. This was the first trip fishing for three crewmen. Four had been fishing for one year or less. This was the first trip on that vessel for 18 crewmen, whose average age was 46 years old and who had fished for 22 years. Seventy four fishermen (41 % of the sample) had fished on their current vessel for two years or less.

In the 2006 interviews, we asked each fisherman the number of trips he had taken in 2003 and 2005 on any vessel. They reported an average of 15.4 trips in 2003 and 13.9 trips in 2005. As with the increase in annual crew per vessel, this decline in the average number of trips for full-time fishermen also indicates an increase in transient fishermen because the average number of trips per vessel increased over this period.

As in our previous report, these snapshots show that New Bedford crew members on offshore draggers are professional fishermen with much experience, many of whom often switch vessels. While we didn’t specifically interview the same fishermen in the two years, the results show a pattern of fishing community on the New Bedford offshore dragger fleet. About 70% of the fishermen listed on the settlement sheets for 2005, were listed on the settlement sheets for either 2002 or 2003 or for both years.

VI. Net Crew Share

Net crew share depends upon the gross stock, crew share in the lay system, and the expenses paid by the crew. Gross stock depends upon the quantity of the catch (which varies directly with days fished, intensity or productivity of the crew, and stock abundance), exvessel prices, and the mix of species caught. Amendment 13, including the interim rules that preceded it and the frameworks that followed it, probably affected most of these variables, including stock abundance. The decline in fishing employment from 1993 through 2002 probably gave more bargaining power to owners to reduce the crew share of the lay and to shift more of the expenses to the crew. [21] Crew shares and expenses are institutional arrangements, however, that change slowly over time. Factors not affected by Amendment 13, such as the prices paid by the crew for expenses, especially fuel prices, would also affect net crew share.

A. Crew Shares and Crew Expenses

In the 1950s, large draggers from New Bedford paid a "clear 40" lay. [22] Under this lay, crews (including the captain) were paid 60% of the gross stock with a few minor costs taken from the gross stock. The crew paid trip expenses, and the owner paid overhead expenses and the captain's bonus from the boat share. Smaller New Bedford draggers paid a "Broken 40" lay, which paid most trip expenses, except for food, from the gross stock before dividing the remainder between crew and owner. By the early 1990s almost all New Bedford draggers paid a "broken 45" lay that deducted trip expenses (except food), and bonuses (except for the captain's bonus) from the gross stock. The crew (including the captain) shared 55 % of the remainder with the crew paying for food and sometimes water and ice. [23] The owner paid the captains bonus of 10% of the boat share and overhead expenses from the boat share.

In the interviews conducted in 2004, crews reported a drop in average crew share from 54% before DAS (1993) to 51% in 2004. About 3/4ths of the vessels reported crew shares greater than 50% in 1993, which declined to half of the vessels reporting crew shares greater than 50% in 2004.

In the crew interviews of 2006, all but three vessel crews reported crew shares at 50% with two vessels above 50% and one vessel below 50% for an average crew share of 50%.

According to these interviews, some crews now pay additional costs, either from the gross stock or from the crew share. Some vessel crews reported that the leasing costs, which averaged $14,980 per year ($499 per trip) per vessel, were taken from the gross stock. Other crews reported that they paid leasing costs from the crew share. Some crews reported that Boatracs (a GPS system used to monitor vessels' location) costs were taken from the gross stock. At least some of the vessels that took day trips for groundfish paid according to the customary day boat rate of all expenses off the top with the net share split evenly between the owner and the crew.

Our advisory panel informed us that New Bedford draggers pay the dragger lay when fishing for multispecies and pay the scallop lay when fishing for scallops. For the same gross stock and crew share, the scallop lay probably decreased the net crew share because fuel

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[21] In Employment, Income and Working Conditions in New Bedford's Offshore Fisheries, we reported a drop in total fishing employment for offshore draggers and scallopers from 3,069 in 1993 to 2,088 in 2002, p. 27.

[22] White, 1954, The New England Fishing Industry, p. 81-83.

[23] Seafarers' International Union, 1995, and communication from Rodney Avila.

expenses and gear costs, including rings and shoes for the dredge, were paid from the crew share for the scallop lay rather than from the gross stock for the dragger lay. While we did not interview scallop crews in 2006, interviews of scallop crews in 2004 reported an average crew share of 55%, which was higher than the average dragger crew share of 51% reported by dragger crews in 2004, which probably offset some of the increases in expenses paid by the crew.

B. Number of Trips, Days Fished, and DAS

From 2002 to 2003, the number of trips and the days absent for New Bedford offshore draggers declined. (See Table 6.) This continued the decline in the number of trips and days fished that began in 1994 with reductions in DAS due to Amendments 5 and 7 and the frameworks during the period. Using data from the weigh-out reports submitted by dealers, New Bedford offshore draggers took an average of 28 trips and were absent from port for 193 days in 1993. VTR data were not available in 1993. From 1993 to 2002, days fished declined by more than trips in percentage terms. The average number of days per trip declined, therefore, from seven days per trip in 1993 to about four days per trip in 2002 and remained around four days per trip in 2003 and 2005.

Table 6. Numbers of Vessels, Trips and Days Absent.

	2002	2003	2005
Number of Vessels	83	77	70
Average Trips	25	22	30
Average Days Absent	98	91	116
Average Days per Trip	3.9	4.1	3.9

Sources: Number of vessels estimated from dealer's weight-out reports and NMFS vessel data. Trips and days absent for 2002, 2003, and 2005 from VTR data.

It is not clear why the average days per trip declined after the restrictions in DAS began in 1994. Economic theory predicts that the inclusion of steaming time in hours counted towards DAS (the rule for all DAS Multifishery regulations) would lead owners (or captains) to take longer trips in order to increase the ratio of fishing time to steaming time. An extra day of fishing is less costly in terms of DAS than returning to port and steaming back to the fishing grounds. Economic theory also predicts, however, that an increase in the cost of one factor, in this case, DAS, would lead to increasing use of the other factors, especially labor per DAS. In other words, the increasing cost of using DAS due to their reduction through regulation would lead crews to work longer hours per day.

This seems to have happened because crew interviews show an increase in the watch with many crews reporting that they work without watches, i.e. work until exhaustion and then the entire crew would sleep for a few hours. This pattern of working many hours per day would lead to a sharp loss of productivity after a few days. The downward shift in productivity would cause

shorter trips because marginal revenue from the last day or last few days of the trip would fall below the marginal cost for those days.[24]

Fishermen may also have reduced trip length to increase exvessel prices for their catch because shorter trips produced higher quality fish that have spent less time in the hold. Additionally, captains may have reduced or eliminated exploring different areas for stock abundance during a trip because limited DAS made steaming time more expensive.

Crew interviews conducted during the summer of 2006 reported an average of almost 8 days per trip. The difference between this result and the logbook data for the year in 2005 may be due to the snapshot of the trip in the summer, when dragger trips are generally longer because groundfish disperse in the summer making tows longer. The crew can rest between tows.

From 2003 through 2005, the average number of trips per vessel increased from 22 per year to 30 per year, and the average number of days fished per vessel increased from 91 days to 116 days.

These increases in days absent and the number of trips between 2003 and 2005 occurred despite the decline in allocated DAS due to Amendment 13. In FY 2004, Amendment 13 reduced Category A DAS, days that could be fished for multispecies in any open area, by about 20% of vessels' allocation under the Interim Rule. For New Bedford draggers, allocated DAS dropped from an average of 85 DAS for FY 2003 to 66 DAS for FY 2004 and FY 2005. (See Table 5.) [25]

Table 7. Average Allocated and Leased DAS per New Bedford Dragger by Fishing Year.

	2002	2003	2004	2005	2006
Allocated Category A DAS	82	85	66	66	60
Category A DAS Sold			1	3	5
Category A DAS Bought			14	23	26
Sales Price (Bought)			$935	$749	$614
DAS Carried Over	6	6	0	6	7
Net Category A DAS	88	91	79	92	88

Source: Northeast Fisheries Science Center, NMFS.

With the start of Amendment 13 in FY 2004, vessels with multispecies permits began each year with an allocated number of Category A DAS and could buy or sell Category A DAS from each other with certain restrictions based on vessel size. In FY 2004, a total of 20 New Bedford draggers bought 983 Category A DAS, and a total of four New Bedford draggers sold 98 Category A DAS. In FY 2005, a total of 35 New Bedford draggers bought 1,322 Category A DAS and three vessels sold 216 Category A DAS. In other words, the leasing program increased

[24] See Gordon, "The Economic Theory of a Common-Property Resource", p132 for the classic model that shows fishing effort determined by productivity and cost.

[25] The difference between an average 66 DAS and an average of 68 DAS that would result from a 20% drop in DAS was probably due to the mix of vessels that remained in the fishery and the change in the base year between the interim rule and Amendment 13.

the average Category A DAS per vessel by 13 DAS over their average allocated Category A DAS in 2004 and by 20 DAS over their average allocated Category A DAS in 2005. Adding the increase in net days purchased and adding the carryover from 2004 (6 DAS), average DAS per New Bedford dragger increased from 79 DAS used in 2004 to 92 DAS available for 2005.

The average purchase price as reported by the vessel owners gives some indication of the price of leased DAS. Some vessel owners, however, lease DAS between their vessels rather than transfer the DAS because there is no Conservation Tax on leased DAS. The prices reported on these transactions were probably not market prices. In a few cases, the values of the DAS purchased were listed as zero, which we did not include in the calculation of price.

The increase in Category A DAS purchased by New Bedford draggers kept average Category A DAS relatively constant between 2002 and 2005 in a regulatory environment that was reducing the allocation of Category A DAS. The increase in total days fished per vessel, however, resulted from New Bedford vessels using Category B DAS or taking trips that didn't land any of the species regulated by the Multispecies Plan. We do not have data on the number of Category B DAS used per vessel, but data on the species mix caught by New Bedford draggers are consistent with these vessels taking more non-multispecies trips. As shown in the previous section on New Bedford Landings, average value of groundfish landed by New Bedford draggers decreased between 2003 and 2005, while the average value of scallops, monkfish, and other species almost doubled from $93,841 in 2002 to $181,901 per vessel in 2005, after adjusting for inflation.

Starting in November 2004, Framework 16 to the Scallop FMP and Framework 39 to the Multispecies FMP allowed draggers up to 400 pounds of shucked scallops per trip without using a Category A DAS. The Monkfish Management Plan allowed vessels with multispecies and monkfish permits to target monkfish without giving up Category A DAS.

C. Changes in Net Crew Share and Fishermen's Income

The net effect of Amendment 13 on net crew share may be very complex. Economizing on DAS due to their scarcity may lead to more efficient patterns of fishing, such as saving DAS for better weather or higher prices, which would increase the net crew share, at least net crew share per day fished. Avoiding the use of DAS by fishing for species not covered by Amendment 13, including short trips for scallops (limited to 400 pounds of shucked weight under the General Scallop Permit), may have caused lower net crew shares for those trips, due to lower gross stocks per day or higher costs, or both, in these fisheries.

For the sample of vessels for which we have settlement data, average annual gross stock decreased by 4 % per vessel from 2002 to 2003, and increased by 13% from 2003 to 2005. (See Table 8) The changes in days absent were larger in terms of percentages than the changes in gross stock. Specifically, average days absent per vessel decreased by 8% between 2002 and 2003 while average gross stock per vessel only decreased by 4%. Average days absent per vessel increased by 27% between 2003 and 2005, while average gross stock per vessel only increased by 13%.

Assuming the usual production function in fishery economics, where gross stock is a constant proportion of days fished, other changes, such as targeting different species, stock abundances, exvessel prices, productivity, or some combination of these variables, contributed to the increase in gross stock per day between 2002 and 2003 and the decrease in gross stock per day between 2003 and 2005.

Settlement data show that average fuel cost per vessel, after adjusting for inflation, more than doubled from 2003 to 2005, from $57,350 per year to $118,386 per year. Average fuel cost per day absent increased from $616 to $989. Almost all of this increase was due to an increase in average fuel price from $1.19 per gallon in 2003 to $2.01 per gallon in 2005.[26] Using actual fuel expenditures (unadjusted for inflation), gallons used per day increased from 494 gallons in 2003 to 502 gallons in 2005. Shorter trips by some vessels targeting scallops probably caused this increase in fuel used per day.

Table 8. Average Income for Sample of New Bedford Offshore Draggers. (2002 & 2003 values adjusted for inflation using 2005 prices).

	2002	2003	2005
Sample Size	60	59	56
Annual Gross Stock	$492,056	$474,609	$537,880
Annual Net Crew Share	$219,462	$217,517	$207,299
Annual Fuel Expenditures		$57,597	$118,846
Trips	25	21	28
Days Absent	101	93	118
Gross Stock Per Day	$4,872	$5,103	$4,558
Net Crew Share per Day	$2,173	$2,339	$1,757
Annual Income per Fisherman	$35,879	$36,867	$29,614

Sources: Gross stock taken from dealer data; trips and days absent from VTR data, both from NEFSC. Crew share and fuel expenditure taken from Settlement House data.

This increase in fuel costs would reduce the net crew share for dragger trips and scallop trips, but would affect net crew share for scallop trips more because fuel expenses were paid from the crew share for scallopers, while fuel costs were paid from gross stock for dragger trips.

Given the gross stock and using the “Broken 50” lay with fuel costs taken from the top, the lay that most vessel crews reported, the increase in fuel costs (split between boat owner and crew) between 2003 and 2005 accounts for almost the entire decline in net crew share between 2003 and 2005. The decline in net crew share per day was caused by both the increase in fuel costs and the decline in gross stock per day.

Average fishermen’s income on New Bedford offshore draggers increased from 2002 to 2003 and then decreased from 2003 to 2005. The increase in income from 2002 to 2003 and decrease in the number of trips follow the pattern that our previous study showed between 1993 and 2002, where we argued that fishermen’s income increased due to the increase in gross stock per trip with relatively constant operating costs per trip over that period. In other words, efficiency increased in terms of gross stock per unit of cost. From 2003 to 2005, the pattern

[26] From observer data supplied by the Northeast Fishery Science Center.

changed. Both the number of trips and days absent increased, while net crew share declined. The decline in net crew share over this period, however, more likely resulted from an increase in fuel costs, as stated above, rather than any loss in efficiency.

These estimates of average fishermen's income are an average that covers both part-time and full-time fishermen because we cannot distinguish between them.

VII. Working Conditions

A. Hours of Work

Eight hours on and four hours off was the standard watch on draggers from the union contracts from WWII to the early 1980s. By 2002, watches on most draggers had increased to 9 hours on and 3 hours off. Interviews with crews in 2006 report that the average of watch hours on increased from 8.6 hours in 2004 to 8.8 hours in 2006. Average watch hours off decreased from 3.4 hours in 2004 to 3.2 hours in 2006. In 2006, fewer vessels reported the former union standard of eight hours on and four off and more than 3/4ths of the vessels that reported watches reported nine hours on and three hours off.

In the 2006 interviews, eighteen vessels reported no watches; none reported no watches in the 2004 interviews. It is difficult to interpret the work hours for the vessels that reported no watches. Three of these 18 vessels fished less than two days per trip in 2005, which would make watches unnecessary if the crew worked all the time that the vessel was not steaming to and from the fishing grounds. Eleven of these vessels fished an average of more than four days per trip, however. A few crews commented that they work as long as they can and then the entire crew takes a short break before retuning to work.

Hours of gear work have increased from an average 12.6 hours per trip in 2004 to 15.0 hours per trip in 2006. Hours to take out the catch declined from 5.3 hours per trip to 5.1 hours per trip.

Table 9. Average Hours of Work For New Bedford Draggers.

	2004	2006
Sample Size	46	48
Gear Work Hours	12.6	15.0
Watch		
Hours On	8.6	8.8
Hours Off	3.4	3.2
Take-Out Hours	5.3	5.1

Source: Crew Interviews.

B. Safety

Commercial fishing is one of the most dangerous occupations in the world. The loss of life is much higher than that for police or firefighters, and accidents including personal liability and loss of property cost several hundred million dollars per year in the U.S. [27] The loss of life is

[27] Jin et al, "A model of fishing vessel accident probability," p. 498.

especially troubling in a port city like New Bedford. In January, 2007, Our Lady of Grace, one of the vessels in our study, sank with all four crewmen lost.

In our crew survey of 2006, almost every crew reported some accident while fishing over the past 10 years, and 21 crewmen (16 % of the sample) had survived a sinking. Thirty of the 45 crews responded positively to the question "Do you feel that the provisions of Amendment 13 have caused you to make decisions that reduced your safety?" Their list of reasons include: neglected maintenance due to lower boat income, fatigue due to working longer watches, and taking more risks as DAS and income fell.

The most common argument, however, was that DAS caused vessels to continue fishing when weather worsened. ("Forced to stay out in bad weather" was the most common phrase.) DAS, which include steaming time, are computed in hours. This gives the financial incentive to continue fishing rather than return to port or ride out the storm in a safer area.

In newspaper interviews, fishermen pointed to DAS regulations as a cause for Our Lady of Grace sinking in an ice storm presumably while returning to port. Three weeks before, the vessel was towed back to port due to generator problems at the beginning of a trip, which cost the vessel DAS. While much of the fleet stayed ashore or returned early due to expected storms, some fishermen surmised that the captain of Our Lady of Grace stayed out because he didn't want to waste more DAS. [28]

Fishermen are covered by the Jones Act of 1850, a Federal law that makes vessel owners liable for claimants' medical bills for any accident or illness that happens on board and pays the fisherman $15 per day until he returns to work. Under the Jones Act, claimants can sue for liability. In 1850 the $15 per day represented what it would cost fishermen for accommodations for a day. While we have no direct evidence, our Advisory Board and insurance brokers told us that virtually all vessel owners have protection & indemnity insurance (P&I) that covers accidents and illnesses on board. Most of the crewmen in the sample of crew interviews in 2006 reported that insurance paid in response to the question, "How did you support your family?" but it is not clear from their responses if P&I paid or some other insurance paid. At least some insurance claims were negotiated between the underwriter, usually represented by the broker, and the claimant. If the insurer and claimant reached a settlement, P&I paid medical expenses and some percentage of the average daily rate of pay in the industry depending on the crewman's, the captain's, and the vessel's safety records and the severity of the accident. Exactly one-third of the sample that reported insurance payments specifically said that they received some percentage of a crew share from the P&I insurance while injured. Many also reported that they used savings, their wives salaries, or community services, which indicates that P&I insurance did not completely cover their lost income from fishing time lost even if P&I paid the claim.

Chronic Injuries, another hazard of fishing, are usually not reported as accidents, and more difficult to prove as a liability of the vessel owner. In our crew survey of 2006, thirty eight fishermen (27% of the sample) reported chronic injuries, mostly back, knee, and neck injuries. Twenty six crewmen (68% of the sample) who reported chronic injuries told us that they had seen a doctor for these chronic injuries. Most fishermen in the sample reported that they had no health insurance. A few had insurance from a union contract, and a few had insurance with the Fishermen's Partnership. A Massachusetts law, effective July 1, 2007, requires medical insurance for all residents with the premiums subsidized for residents earning less than 300% of

[28] "Regulations push fishermen to sea in harsh winter" Standard-Times, 1/31/2007

the federal poverty level. [29] Several insurers, including Blue Cross Blue Shield of Massachusetts offer medical insurance similar in cost to group plans.

New Bedford's fishermen's experience run counter to the intentions of Amendment 13. Safety concerns were a reason given for the choice of DAS as regulation because DAS gave vessel owners rights to fish when they wanted rather than race to fish under total allowable catch regulations. Captains, it was argued, would choose better weather to fish for safety reasons but more importantly to minimize the loss of DAS due to bad weather.

At least one statistical study using vessel data concluded that DAS regulations have not resulted in an increase in the probability of accidents throughout the Northeast region of the U.S. but may have contributed to a higher accident rate in the Gulf of Maine over the 1994-2000 study period. [30]. The study also reports that Northeast fishing vessel accident probability declined from 1981 to 2000. The authors argue that higher wind speed and winter were associated with higher accident probability, and medium-size vessels had the highest probability of an accident, while small vessels had the lowest. Accidents were more likely close to shore than offshore. Data similar to those used in this study are not available for 2004-2006, the period following Amendment 13.

Since 1991, as part of the Coast Guard Safety Act, voluntary, free, safety inspections have been offered by a Coast Guard Safety Officer that travels from port to port.

The one bright spot in our crew survey was the increased emphasis on safety training. All respondents reported that they knew where their survival suits were located, usually near their bunks. Most had tried them on recently, and almost 90 % had taken safety courses, mostly within the last two years. Almost all had attended safety courses at SMAST. [31]

After the loss of the F/V Northern Edge in December of 2004, the New Bedford fishing community brought new focus to safety for fishermen at sea. In collaboration between SMAST, NOAA, Department of Employment and Training, and the City of New Bedford, curriculum was developed to change fishermen's safety knowledge from principle to practice. Classes were offered free, and were located at SMAST where fishermen could time themselves putting on a survival suit, jumping into a pool, and then trying to hoist themselves into a waiting raft, simulating a boat sinking.

In the process of these courses, fishermen realized how much they had been ignoring safety on the vessels by leaving survival suits in locations on the vessels that made access to survival suits almost impossible if emergency had struck. These fishermen, who we have shown are an aging group with few young men, also found that many suits were either undersized for their now middle-aged physiques, and many survival suits had been stored so long that they had become dry, and porous, making them useless in the frigid North Atlantic. Development of safety curriculum continues, with the Massachusetts Fishermen's Partnership most recently added information regarding emergency first aid to the curriculum.

Fishermen were also trained to conduct safety drills. For some time, it has been required that crews review the safety drills with a conductor once a month. Documentation must be filed with the boat owners by the captain in the case of accident at sea to conform to Coast Guard Safety Regulations resulting from the Coast Guard Commercial Fishing Safety Act of 1988.

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[29] Massachusetts Trial Courts Law Library, "Mass. Laws about Health Insurance" http://www.lawlib.state.ma.us/healthinsurance.html

[30] Jin and Thunberg, "An analysis of fishing vessel accidents in fishing areas off the northeastern United States."

[31] See Hall-Arber and Mrakovcich**,** Reducing Risk to Life and Limb: for a description of the increase in safety training in New Bedford and other New England ports.

These requirements were basically ignored until the sinking of the F/V Northern Edge. After that, New Bedford Mayor Fred Kalisz, NOAA, SMAST, DET, and representatives of the fishing industry organized classes to bring new focus to these requirements.

This model is presently being used in New Bedford, Gloucester, and Point Judith, Rhode Island. There are also course instructors who travel to the smaller niche ports to offer the instruction to the boats from those ports.

During the same period following the loss of the F/V Northern Edge, the principle of Safe Harbor Provision, a framework adjustment of the Scallop Management Amendment 10, was made through NOAA and NEFMC in the Scallop Management Plan for Rotational Closed Area Trips. As a result of this framework, a boat must notify NMFS prior to leaving, but they may return to homeport or another safe harbor, due to bad weather or trouble with the vessel, without penalty.

This framework was created because many fishermen believed that the captain of the F/V Northern Edge had been influenced to stay out in unfit weather by regulations that would penalized the vessel 3,000 lbs. of scallops if the vessel left the closed area and returned later to finish the trip.

In April, 2007, the Congressional Committee on Transportation and Infrastructure held hearings with industry and Coast Guard representatives, regarding Small Fishing Vessel Safety as it applies to the Magnuson Steven Act Reauthorization. This exchange resulted in the Committee introducing a bill to the House of Representative for Reauthorization of the Magnuson Act including funding, among other things, $3,000,000 for the purposes of further Coast Guard classes and instruction, free vessel dockside inspection, and further development of safety at sea for fishermen. This bill remains under consideration.

VIII. Conclusions

This study offers evidence that supports the economic decline for New Bedford's dragger fleet that the Environmental Impact Statement (EIS) for Amendment 13 to the Multispecies Fishery Management Plan predicted would result from a 40% reduction in DAS per year. Between 2002, the first year of the Interim Rule preceding Amendment 13 and 2005, the year after Amendment 13 was implemented, the number of offshore draggers whose owners designated New Bedford (or Fairhaven) as home port declined, reducing employment of fishermen in the offshore dragger fleet. Average net crew share and average income of fishermen also declined for vessels in New Bedford's offshore dragger fleet, but crew members' average watch time on deck increased.

Leasing of DAS, initiated by Amendment 13 in 2004, and targeting species that did not require DAS reduced the potential economic losses over this period. In 2004, New Bedford offshore dragger owners leased an average net increase of 13 DAS per vessel in 2004 and 20 DAS in 2005, recovering more than half of the DAS lost through Amendment 13. Trips not using Multispecies DAS further increased days absent from dock per vessel. Average number of trips per vessel increased from 22 trips per year in 2003 to 30 trips per year in 2005, and average days absent per vessel increased from 91 days to 116 days over the same period, reversing previous trends that started with DAS in 1994. The average value of scallops, monkfish, and other non-multispecies landed per year per dragger almost doubled between 2003 and 2005, increasing to 37% of the total gross stock for New Bedford draggers in 2005.

While landings of these species increased the average gross stock per vessel, the economic decline of New Bedford's offshore dragger fleet continued. The number of vessels in the New Bedford offshore dragger fleet declined from 83 draggers in 2002 to 70 draggers in 2005, continuing the decline since 1993, the year before DAS, when there were 113 vessels in the New Bedford dragger fleet. The decline in the number of vessels in the New Bedford from 1993 through 2005 was due, at least in part, to the accumulated effects of Amendments 5, 7, and 13 to the Multispecies FMP and the frameworks over the same period.

The decline in offshore draggers caused employment to decline from 508 fishermen in 2002 to 490 fishermen in 2005, far below the estimates from our previous report of 1,053 fishermen on New Bedford offshore draggers in 1993.

From 2003 to 2005, total employment on New Bedford offshore draggers increased due to an increase in average employment per vessel. Crew size per trip remained the same, however, which implies an increase in part-time fishermen. These data, however, did not allow us to differentiate directly between full-time and part-time employment.

The data sample of vessels in the survey of settlement houses show a decline in average net crew share between 2003 and 2005, even though average gross stock increased over that period. Using the typical lay for New Bedford draggers, the increase in fuel prices, which almost doubled over the period, explains most of the decline in net crew share. The reduction in net crew share and the increase in employment caused fishermen's average real income to decline by 20% over this period.

There is evidence that the full effects of Amendment 13 did not conclude in 2005. While we don't have net income data for 2006, landings data for New Bedford indicate a drop in gross stock for New Bedford draggers, which probably led to a further decline in net crew share. The total value of groundfish landed in New Bedford dropped from $33 million in 2005 to $25 million in 2006, after adjusting for inflation.

This decline in groundfish landings probably was due, at least in part, to reductions in the use of Category A DAS through NOAA's emergency action, effective May 1, 2006, that charged 1.4 Category A DAS for each day fished for multispecies within the U.S. management area outside of the US/Canadian resource sharing area. Framework 42, implemented in November 2006, replaced this emergency rule with a rule that charged two Category A DAS for every day in a trip that landed any multispecies in the Gulf of Maine and one Category A DAS for every day in a trip that did not land multispecies in the Gulf of Maine. These restrictions in DAS probably affected New Bedford less than ports further north. Framework 42 also reduced Category A DAS by 8.3% following provisions in Amendment 13, which translated to an average decline of seven Category A DAS per year for New Bedford draggers.

Crew interviews show a modest increase in average watch hours on deck and a decline in average watch hours off between 2004 and 2006. These interviews also report that many vessels no longer work in watches, indicating that they work steadily throughout the trip.

While we can not specifically estimate trends in accidents since the start of Amendment 13, fishing continues as a very dangerous occupation. Almost every crew reported some accident while fishing over the past 10 years, and 16 % of the sample of crewmen interviewed had survived a sinking. Twenty-seven percent of the sample said that they suffer from some chronic injury. Thirty of 45 crews responded positively to the question "Do you feel that the provisions of Amendment 13 have caused you to make decisions that reduced your safety?" On the brighter side, almost all of the crew members we interviewed in 2006 reported that they have attended safety courses within the last two years.

The decline in the number of vessels and fishermen's income between 2003 and 2005 and the increase in hours of work per watch between 2004 and 2006 are consistent with economic theory regarding the reduction in DAS from Amendment 13. We cannot conclude, however, that Amendment 13 caused these changes because other factors, such as stock characteristics, operating costs, and fish prices, were not considered in the analysis.

It is important to note that virtually all fishermen that we interviewed found the regulations in Amendment 13 unpredictable, confusing, and unfair. This was due partially to the complexity of the process, the reductions in Category A DAS in Amendment 13, and disagreement with NMFS over the assessment of multispecies stocks.

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X. Appendix A. Crew Questionnaire

Vessel Name_____ Date_____ Interviewer_____
Gear Type_____

Number of Leased Days at Sea bought or sold by the vessel during 2005 and 2006

_____

CREW ON BOARD:
Name(with m.i.)_____ Age_ YAS__Time/Bt_ #trip 2003 #trip 2005

Cap_____

_____

_____

_____

_____

CREW ON BOARD LAST TRIP (If different from this trip)
Name(with m.i.)_____

_____

_____

_____

Number of full time fishermen on last trip? _____

Names?_____

Number of part time fishermen on last trip?

Names?_____

Does this crew work another boat as crew? _____Boat? _____

(If yes) How many hours of gear work does it take to switch boats:_____

WORK DURING LAST TRIP

How many days or hours of gear work before last trip_____

Length of trip (days)_____

Total steaming time (to & from grounds & between areas) _____

Watches(8&4, 9 & 3 etc.)_____

How many hours to take out and clean up once boat reaches the dock_____

Lay (crew/boat) _____ Boat Expenses? _____

Crew Expenses?_____

Do you hire lumpers? _____

How many gallons of fuel did you use last trip? _____

WORK IN 2003

Crew size_____

Watches(8/8,8/4,etc)_____

Lay (crew/boat)?_____

Has split of expenses for each trip changed since 2003?

_____

_____

Since the implementation of Amendment 13, how has annual fishing income been affected? Are you earning ½ as much as you earned in prior years, etc?

_____

_____

Has your family's standard of living changed as a result of the changes in fishing, for example, wife returning to work, cutting back on family expenses etc.?

_____

_____

_____

SAFETY

Where are your survival suits right now? _____

When was the last time you tried them on? _____

Has any crewmember survived a sinking?_____ When? What Boat?

Circumstances? _____

_____

How many of you have taken safety courses & where were they offered?

_____

_____

Have any of you been injured while fishing? _____

When? How? _____

_____

_____

How did you support your family while recovering? _____

Since Amendment 13 (2003), has anyone on board developed chronic back, knee, neck, or other conditions as a result of fishing? Describe.

_____

_____

_____

Do you see a chiropractor or doctor for this condition? _____

_____

Who on board does not have health insurance? _____

_____

Do you feel that the provisions of Amendment 13 have caused you to make decisions that reduced your safety? Explain _____

_____

_____