

**Employment, Income and Working Conditions
in New Bedford's Offshore Fisheries**



Photograph by Alan Cass

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SUMMARY

This report presents snapshots of employment, income, and working conditions in New Bedford's offshore scallop and dragger fisheries in 1993, the year directly preceding the establishment of Days at Sea (DAS) as a management instrument in both fisheries, and in 2002, ten years later. We cannot claim, however, that the changes in these variables were caused by DAS because we have not separated the effects of DAS from other causes, such as increases or decreases in stocks or other changes in management plans. We argue, however, that increases in income and watches were caused or at least are consistent with DAS.

We collected data on vessels, landings, employment, income, and working conditions. The Northeast Fisheries Science Center of NMFS supplied annual data on vessels and landings for the port of New Bedford in 1993 and 2002. Data on employment and working conditions were obtained from interviews with 69 scallop captains and crews and 50 dragger captains and crews in 2003 and 2004. Data on annual employment and income by vessel were supplied by New Bedford settlement houses (accounting firms that collect revenue and pay expenses for fishing vessels) for 37 scallopers and 65 draggers in 1993 and 60 scallopers and 59 draggers in 2002. We also interviewed a few scallop captains and a few dragger captains to verify these data and to collect information on operating costs in 1993 and 2002.

The number of offshore scallopers decreased from 112 vessels in 1993 to 108 vessels in 2002. Of these 108 scallopers in 2002, 81 also fished from the port in 1993. Thirty-one scallopers left the port, and 27 entered the port. The number of offshore draggers decreased from 117 vessels in 1993 to 96 vessels in 2002. Of these 96 draggers in 2002, 67 also fished from the port in 1993. Fifty draggers left the port, and 29 entered the port. The Federal buyback program for New England draggers caused some of the decrease in the New Bedford offshore dragger fleet in 1996. In New Bedford, 25 draggers were sold by their owners in the buyback program.

The average number of trips per year declined in both fisheries, from 20 in 1993 to 10 in 2002 for scallopers and from 28 to 16 for draggers over the same period.

Crew size remained at seven for scallopers over this period. In the years preceding 1993, average crew size had declined from the union rule of 11-man crews, due to falling catches, and in 2002, the 7-man crew was proscribed as a maximum by the Scallop Management Plan. Almost all vessels that we interviewed used the maximum crew of seven because the catch and income from the catch had risen sharply over the previous few years. Crew size on draggers averaged five in 1993 and four at the time of the interviews. The decline in average crew size was probably caused by the decline in income on draggers relative to income on scallopers.

The crew of offshore vessels is composed of steady men who take most of the trips either on a single vessel or on two or three vessels with the same owner and transients who work either full-time or part-time in fishing but frequently shift vessels. We assumed that skippers use steady men on their crews with transients filling in for crewmen who take trips off. We also assume that skippers prefer full-time transients to part-time transients. These assumptions of crew composition are necessary because the

names of the crew are reported neither to the Coast Guard nor to the National Marine Fishery Service (NMFS).

Annual data from settlement houses show the names of fishermen who worked on a vessel at any time for that year. After eliminating duplicate names to avoid double-counting of fishermen who worked on more than one vessel, the average annual crew (fishermen who had gone on at least one trip) for a scalloper declined from 18 in 1993 to 14 in 2002, and the average annual crew for draggers declined from nine in 1993 to six in 2002.

Using these data and the assumptions above, there were 784 full time fishermen working on scallopers in 1993 and 756 in 2002. Part-time employment on scallopers dropped from 1,232 in 1993 to 756 in 2002. For draggers, full-time fishermen declined from 585 in 1993 to 384 in 2002. Part-time fishermen on draggers dropped from 468 to 192.

Most of the decline in the work force (from 3,069 in 1993 to 2,088 in 2002) was made up of part-time fishermen (from 1,700 in 1993 to 948 in 2002). This seems reasonable given the decline in the number of trips in both fisheries, which made trips more valuable and discouraged full-time fishermen from taking trips off.

These results show more part-time transients in scalloping than in dragging. High earnings from a trip on a scalloper probably attracted more young men to try scalloping, but the hard work and long hours then discourage them.

Settlement house data also show few fishermen who make trips on both scallopers and draggers. Only 18 fishermen showed up on both full-time scallopers and draggers in the settlement house data for 2002. A few vessels in New Bedford own and use DAS for both scallops and multispecies. Landings data for 2002, for example, show four scallopers with more than 1/3rd of their landings value in groundfish.

According to crew surveys, New Bedford fishermen in both fisheries are professional fishermen with many years of experience. From crew interviews in 2003 and 2004, the average age for full-time fishermen was 40 on scallopers and 46 on draggers, with very few older than 60 or younger than 25. Scallopers spent an average of 19 years at sea and worked on the current vessel for an average of three years. Full-time fishermen on draggers spent an average of 26 years at sea and worked on the current vessel for an average of seven years. Very few in either fisheries worked less than one year.

Fishermen's net pay per trip depends upon the gross stock, operating expenses, crew share, and crew size. Annual income depends upon the number of trips per year.

Using landings data from NMFS and crew share data from settlement houses, average gross stock per trip increased by 175% between 1993 and 2002 on New Bedford scallopers, and net crew share (crew share after deducting operating costs) increased by 265%. Net crew share increased by more than gross stock because operating expenses, which the crew pays, stayed relatively constant per trip between 1993 and 2002. All figures were adjusted for inflation using the CPI with 2002 as the base year.

The average full time fishermen on a New Bedford scalloper took 16 trips in 1993, which paid an average of roughly \$1,800 per trip for an annual average income of \$29,000 in 2002 dollars. In 2002, they averaged over 8 trips, which paid roughly \$6,500 per trip for an annual income of \$53,000. In 1993, part-time fishermen on New Bedford scallopers averaged between two and three trips per year for an annual income of \$4,500.

In 2002, they averaged between one and two trips per year for an annual income of \$9,500.

Average income also increased on New Bedford draggers. Average gross stock per trip increased by 66%, and net crew share increased by 86%. The average fisherman on a dragger took 23 trips in 1993, which paid an average of \$1,350, for an annual income of about \$31,000 and 14 trips in 2002, which paid an average of \$3,100 per trip for an annual income of about \$43,400. Part-time fishermen on draggers averaged 7 trips in 1993 for an average income of \$9,500 per year and 5 trips in 2002 for an average income of \$15,500 for that year. Once again, all figures are in 2002 dollars.

The major change in working conditions for scallopers was the increase in work time per watch for most scallop vessels. The average hours of work per day went from 12 hours per day before DAS to 14 hours per day. More than half of the scalloper crews that we interviewed reported that their work increased by four hours per day since the start of DAS.

As with scallopers, fishermen on draggers worked more hours in 2002 than before DAS. Watches for most draggers have increased from an average of eight hours on and four off (the old union rule) to nine hours on and three hours off. Most of the dragger crews added an extra two hours of work per day. Many dragger crews reported that they no longer keep watches but work continuously.

These data support the hypothesis that DAS caused more efficient patterns of fishing, because net crew share increased by far more than gross stock per trip. Net crew share and average income increased on draggers, for example, even though average annual revenue per vessel actually declined for New Bedford draggers. The increase in work hours per day at sea, however, seems a negative effect from DAS regulations. Both of these effects are caused by the cost now assigned to a day at sea. The skipper and crew must make the most of their limited fishing time.

Two further comments temper the success of DAS as a fisheries management tool. While fishermen's income on draggers increased from 1993 to 2002, their income has probably declined since 2002, due to the reduction in DAS and the complicated restrictions on using those DAS. Income on scallopers has almost certainly increased since 2002.

Secondly, the decline in annual gross stock for draggers after adjusting for inflation suggests that the owners' annual net share has declined. While constant operating costs per trip relative to higher gross stocks increased net crew share, most of the boat owners' expenses are overhead costs that are fixed per year. Spread over fewer trips, these costs would increase per trip. More efficient fishing due to limiting DAS probably did not reduce these overhead costs.

Finally, the lack of data for crew made estimating employment and income very difficult. We made a number of assumptions that we think are reasonable to estimate full-time and part-time employment that carried over to our estimates of income, but these assumptions are a poor substitute for knowing who crew these vessels. Understanding the effects of fishery management on employment and income requires, therefore, that either the Coast Guard or NMFS record crew members for every trip.

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Employment, Income, and Working Conditions in New Bedford's Offshore Fisheries

I. INTRODUCTION

Few occupations or industries in the U.S. are regulated more than commercial fishing. States and local communities have proscribed rules for inshore fisheries since colonial times, and international agencies have regulated Northwest Atlantic offshore fisheries at least since the formation of the International Commission for the Northwest Atlantic Fisheries in 1949. Jurisdictions for these regulations are complex and in some cases overlapping. The Fishery Conservation and Management Act (FCMA), which extended U.S. territorial waters in 1976 from 12 to 200 miles offshore, established a process for regulating fish stocks in offshore waters. Inshore waters, fishing within three miles of the coastline, are regulated by states or combinations of states, and fisheries that overlap inshore and offshore are regulated by both state and federal agencies.

The FCMA, as amended since 1976, created regional councils to establish management plans in fisheries in order to “prevent overfishing, to rebuild overfished stocks, to insure conservation, to facilitate long-term protection of essential fish habitats, and to realize the full potential of the Nation's fishery resources¹.” In practice, these plans limited fishing effort and catch, including time spent fishing by trip and season, gear used, area fished, quantity of fish caught, size of fish, size of crew, and other parameters.

According to accepted public policy practices, federal and state laws, and common sense, these regulations should take into account their effects on employment, income, and working conditions within the industry and affected agencies. National Standard 8 of the FCMA states that the effect of regulations on fishing communities should influence the selection of regulations that are “consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks)².”

Fishing communities, as with most other communities centered on work, are affected by employment, income, and working conditions more than by other variables. Employment and income directly affect standard of living and indirectly affect family stability, domestic violence, and a wide range of social variables. Hours of work and other working conditions affect time at home and other variables that influence family life. All of us, in varying degrees, take our problems at work home with us. There are, however, few direct estimates of employment, individual income, and working conditions in any commercial fishery. Environmental Impact Statements, required by the FCMA, generally only include an estimate of the effect of management plans on exvessel value and occasionally estimate effects on crew shares, but rarely say anything about employment, individual or even average income, and working conditions.

The National Oceanic and Atmospheric Administration and its subsidiary agencies have made funds available for research to identify social and economic effects of regulations on fishing communities. Hard data, however, on employment, income, and

¹ Magnuson-Stevens Fishery Conservation and Management Act Public Law 94-265 As amended through October 1996.

² Ibid.

working conditions remain unavailable. New England's Fishing Communities, a recent publication by researchers from MIT and URI, funded by Marine Fisheries Initiative (MARFIN) from the National Marine Fisheries Service (NMFS), took a major step in identifying and describing fishing communities that are affected by federal and state regulation. But this report doesn't estimate income, has wide ranges of estimates for employment, and says little about working conditions.

Fishing employment and income are difficult to estimate, and few occupations provide wider variation in employment and income than does fishing. New England's Fishing Communities, for example, reports full-time employment in New Bedford, for example, between 1800 and 3000 fishermen (Hall-Arbor et al, p. 115). (Throughout this report, unless otherwise specified, New Bedford represents both New Bedford and Fairhaven, the port on the other side of the harbor from New Bedford.)

Most fishermen, (skippers and crew) are considered self-employed, and therefore are not counted in many statistics on employment. Given these limitations, the Massachusetts Division of Employment and Training (MA DET) lists 1,499 people employed full-time in fish harvesting in Massachusetts in 2001 (the most recent published data), who earned \$80,237,773³, an average of \$53,328 per fisherman for that year. This number probably underestimates full-time employment and total earnings in fish harvesting in Massachusetts.

Individual income data are far more problematic. Fishermen are paid a share of the value of the catch (called the lay), and they pay some (often most) of the operating expenses of the voyage. Captains, mates, and engineers, as crewmen, are paid from the crew share and receive additional bonuses, which are paid either as percentages or fixed dollar amounts, from the boat share or from the gross stock, i.e. the total value of the catch. Shares and bonuses vary by port and among different fisheries in the same port, among vessels in the same port, and even between trips for the same vessel. A fisherman's annual income also depends upon the number of trips that he makes. Fishermen change boats and take trips off for personal reasons, rest, and recuperation. Vessel owners and skippers also change crewmembers. Rarely, if ever, does the same vessel retain the same crew for any extended period of time.

To summarize, a fisherman's annual income depends on the value of the catch, which in turn depends upon quantity landed and the exvessel price paid at the dock, the net crew share, bonuses, the size of the crew for each trip, and the number of trips per year.

Conditions and hours of work at sea vary with the size of the catch and the size of the crew. In all fisheries, large catches or smaller crews mean harder and longer work time for the captain and crew. Work processes also vary between ports, fisheries, and vessels. Almost all vessel owners require that captains and crew work ashore when the boat is in port. Gear work, collecting supplies, and other shore-side tasks are required

³ MA DET Employment For Fishing (SIC 091) for 2001.
(<http://www.detma.org/LMIemploymentwages.htm>)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1279	1146	1281	1516	1607	1596	1576	1614	1511	1643	1573	1651
Tot Earn	Avg Emp	Avg Wage									
\$80,237,773	1,499	\$53,528									

work, but captains and crewmembers are not paid directly for these tasks, because their only payment comes from shares and bonuses from fishing trips. Gear work is a ticket to either join or remain in the crew when the boat next leaves the dock. Hourly wage, therefore, varies directly with the value of the catch, and inversely with the hours of work.

New Bedford has long specialized in two major fisheries, characterized by different gear types. Scallopers drag a dredge across the ocean floor, scooping scallops into a bag attached to the dredge, with bycatches of monkfish (sometimes targeted) and other bottom feeding fish such as flounders and lobsters. Draggers haul a net, called an otter trawl, along the bottom, which traps bottom feeding fish mainly cod, haddock, pollock, and flounders (called groundfish) and other bottom-feeding species, such as skates and dogfish. In this report, we will focus on these two fisheries. A few vessels switch gears during the year, and these we will include in the category that brings the most value, usually scallops.

Categories of species have changed in recent years, due to management regulations. Multispecies is the name given to 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 and white hake. For this report, we used the category of groundfish to describe the catch of New Bedford draggers. Groundfish include summer flounder, or fluke, which is targeted by New Bedford draggers, but not included in the Multispecies Management Plan.

Starting on March 1, 1994 for scallops and May 1 in the same year for multispecies, management plans created by the New England Fishery Management Council limited the number of days per year that vessels could fish (Days at Sea or DAS). DAS marked a sea change from earlier regulations that limited the catch or inputs to regulations based on a form of property rights that limited the DAS per year for licensed vessels. Other restrictions also applied such as mesh size, trip limits, size limits, closed and open areas and other parameters, but the focus of management changed to rights-based management for these fisheries.

This report focuses on the changes in employment, income, and working conditions in the port of New Bedford since the initiation of DAS for scallops and multispecies. Specifically, this report compares fishing employment, income and working conditions in 1993, before DAS began, with the same variables in 2002, nine years later. Other changes, however, affected these fisheries. Stock sizes increased or decreased in part due to landings, but also due to other factors, mostly environmental. Other regulations changed, especially in scalloping with closing and then opening areas to scallop fishing. The simple comparison of these variables from one period to another, therefore, cannot be attributed to the effect of DAS alone.

Sections of this report describe the research methodology and data collection, New Bedford landings, vessels, infrastructure, and management plans, and changes in employment, income and working conditions between 1993 and 2002. In our conclusion, we draw some preliminary connections between DAS and employment, income, and working conditions in New Bedford.

II. RESEARCH METHODS AND DATA COLLECTION

Estimating employment, income, and working conditions requires defining the population of vessels that makes up New Bedford's full-time fleet. While some vessels fish inshore from New Bedford and some New Bedford offshore vessels target other species, the fishing industry in this port is centered on offshore vessels that target groundfish, scallops or both. In order to estimate full-time employment and income, we eliminated inshore vessels, and offshore vessels that fish for species other than groundfish and scallops.

Defining the New Bedford offshore fleet was the next challenge because vessels dock in one port, may land in another port, and the owner may reside in a third port. For 1993 and 2002, we examined several sources of data for New Bedford vessels. After much trial and error, we decided that the best source to define the New Bedford offshore scallop and dragger fleet was the NMFS landings data for vessels whose home or principal port was New Bedford.

Using these criteria, we estimated that the number of offshore scallopers in New Bedford dropped from 112 vessels in 1993 to 108 vessels in 2002. Offshore draggers declined from 117 vessels in 1993 to 96 vessels in 2002. (See Table 1.)

TABLE 1. OFFSHORE DRAGGERS AND SCALLOPERS IN NEW BEDFORD

	1993	2002
Offshore Scallopers		
Number of Vessels in Port	112	108
Crew Interviews		69
Percentage of Total		64%
Settlement House Data	37	60
Percentage of Total	33%	56%
Offshore Dragger		
Number of Vessels in Port	117	96
Crew Interviews		50
Percentage of Total		52%
Settlement House Data	65	59
Percentage of Total	56%	61%

In order to estimate employment and working conditions, we interviewed vessel crews while they were doing gear work between trips. We designed several forms for interviews that we tested in the field, and after some trial and error, we settled on forms for interviewing crewmen, and captains.

We hired and trained seven interviewers who had connections with the fishing community, including three native Portuguese speakers. After asking permission from captains or owners, they interviewed captains and their crews while they took a break from gear work. They asked them the names of those scheduled to crew the vessel for the coming trip, their ages, years at sea, time on the vessel, and non-fishing jobs. Interviewers also asked the names of the crew for the last trip, working conditions for the

last trip, including time for gear work, steaming time, length of the trip, length of watches, time spent in taking out the catch, lay shares, and whether they hired lumpers. They also asked for information before DAS, including crew size, hours of gear work, length of watches, lay shares and changes in expenses. Finally, they asked several open-ended questions. Between 2003 and 2004, they interviewed 69 scallop crews and 50 dragger crews, which are noted in the table as 2002.

There is a lapse in time between 2002, for which we have vessel landings and financial data, and the interviews conducted from 2003 and 2004, which we use to estimate employment and working conditions. Coordination between interview data and recorded data is always difficult, because interviews almost always refer to the present and recorded data refer to the past. The long period that it took to interview sufficient sample size made coordination between these types of data more difficult.

In order to estimate income, we collected data on annual payments to fishermen from settlement houses, accounting firms that are hired by vessel owners to collect payments from buyers after every fishing trip and pay trip expenses, including fishermen's pay.

Currently there are five settlement houses in New Bedford and Fairhaven, including a vessel owner that does his own settlements and those of other vessels. Four agreed to give us names of crewmen, and the annual net crew share paid by vessels or groups of vessels for 1993 and 2002. Another settlement house owner gave us the information for some vessels. We collected these data for 37 offshore scallopers for 1993 and 60 scallopers for 2002. For offshore draggers, we collected data for 65 vessels for 1993 and 59 vessels for 2002. (See Table 2 for comparison of these samples.)

TABLE 2. VESSEL CHARACTERISTICS FOR DATA SAMPLES

	Crew Sample Average	Settlement Sample Average	Port Average
Offshore Scallopers			
Gross Registered Tons	169	171	165
Horsepower	940	967	918
Number of Trips (1993)	21	21	20
Number of Trips (2002)	10	10	10
Value of Landings (1993)	\$575,315	\$581,878	\$533,352
Value of Landings (2002)	\$941,677	\$938,437	\$879,733
Offshore Draggers			
Gross Registered Tons	127	130	125
Horsepower	533	543	530
Number of Trips (1993)	30	29	28
Number of Trips (2002)	16	16	16
Value of Landings (1993)	\$358,401	\$364,945	\$330,934
Value of Landings (2002)	\$418,521	\$405,940	\$365,615

The vessel characteristics are quite close to the port averages for these samples except for landings values for both scallopers and draggers. The value of landings for the crew interview sample and the settlement house data are about 10% higher than the port averages.

We substituted numeric codes for vessel names and crewman on all data files in order to preserve confidentiality. In this report, we show only averages.

III. LANDINGS, VALUES, AND INSTITUTIONS

New Bedford developed two major fisheries over the past 50 years: sea scallops and groundfish, especially yellowtail flounders. In 2002, New Bedford landed about one half of the U.S. total for scallops and about two-thirds of the U.S. total for yellowtail flounders. Vessels for both scallops and groundfish work offshore, with scallopers dredging for scallops during trips of eight to 12 days and groundfishing vessels dragging an otter trawl for cod, haddock and flounders during trips of five to seven days.

Landings and Values

Between 1976 when the U.S. granted exclusive rights to U.S. fishermen within 200 miles from shore and 2002, New Bedford landings increased from 65 million pounds to 109 million pounds and the value of landings increased from \$123 million to \$176 million, adjusting 1976 values for inflation using the Consumer Price Index with 2002 as the base year. (See Figure 1.)

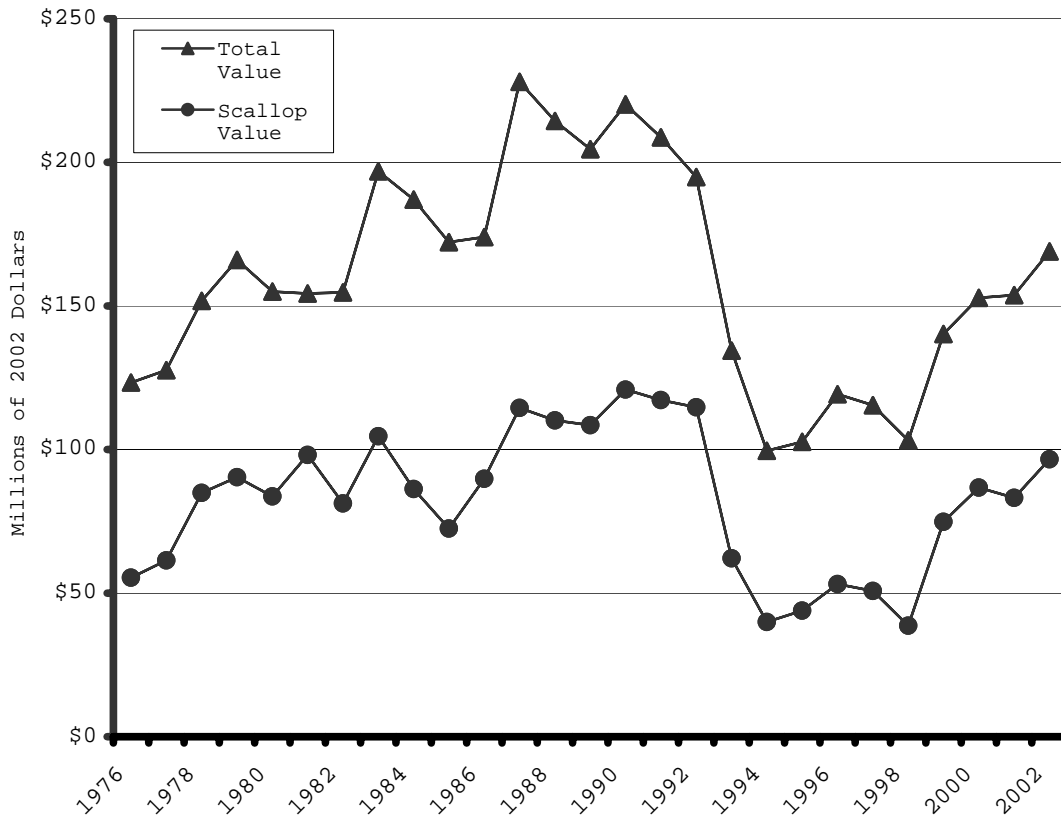


Figure 1. Annual Exvessel Value of all Landings and Scallop Landings in New Bedford, Adjusted for Inflation using the CPI with 2002 as Base Year. (Source NMFS Landing Data.)

Scallops were the major species in terms of value landed in New Bedford, averaging 50% of the value of the catch throughout this period. In 1998, at its lowest point, scallops made up only 38% of value, but increased sharply to 57% in 2002.

New Bedford, which ranked 5th among U.S. ports in value landed in 1977 climbed to first place in 1983 and remained there until 1992, except for 1988 (Fisheries of the United States, from 1976 to 1983, p. 5). From 1992 until 1999, Dutch Harbor, which has been first among the nation's ports in pounds landed from 1989 to the present with its catch of crabs, salmon, herring, halibut and pollock, landed more value than New Bedford. From 2000 through 2002, New Bedford recaptured its place as the leading U.S. port in value due to the resurgence of its scallop catch.

The rate of increase in New Bedford for both fish and scallops has been anything but smooth, and quantities and values actually declined during some of this period. For the first few years following the passage of the 200-mile limit, the number of large offshore vessels doubled to about 300 vessels in New Bedford and the number of fishermen increased to about 2,500 (Personal communication from Dennis Main, NMFS Port Agent in New Bedford). From 1976 through 1983, these vessels caught more fish and brought more value into the port. The catch declined sharply for the next few years, due to a decline in fish stocks, which caused New Bedford's fleet to stagnate. The value of landings then climbed back to their peaks in 1990 and dropped sharply again until 1994 and remained there until 1998, when values adjusted for inflation fell below where they had been before the 200-mile limit was established. It was easy to see why fishermen were complaining that the 200-mile limit with its associated management plans had failed them.

Since 1998, New Bedford's total landings and values have climbed steadily, but value of landings remains below the historic peak in 1987 mainly because exvessel prices, adjusted for inflation, have declined.

We examine more carefully the pattern of landing and values from 1993 through 2002 in Section VI, where we examine changes in fishermen's income over this period.

Lay Systems

The lay system in the NW Atlantic fishery dates back at least to the early 16th Century, when French ships paid 2/3rds of the gross stock to vessel owners and 1/3rd to the captain and crew. After 1550, the value of the catch was divided 1/3 to the owner, 1/3 to merchants who supplied the vessel, including food and gear for the trip, and 1/3 to the captain and crew. Merchants often loaned money to the crew, which they repaid from their shares at the end of the voyage. During the 17th and 18th centuries, crewmen were often paid wages rather than shares during periods of labor shortages in order to attract new sources of unskilled labor to the fishery, but some vessel owners continued to pay shares to attract skilled fishermen. The crew share in the mackerel fishery during the 19th Century approached 50%, especially during periods of competition between Canada and the US for skilled fishermen (See Innis for a full discussion of the early lay system.).

At that time, industry sources argued that shares encouraged the crew to work harder and maintain higher efficiency through pressures on crewmembers to keep up with the others. More recent analysts concluded that vessel owners preferred to share the risks associated with fishing through the lay system. This payment for risk and hard work

probably increased the lay payments over wages for similar work on shore, encouraged capital investment, and increased total employment of fishermen (Sutinen, 1979).

Both per capita income and employment vary more for fishermen than for other occupations. Variations in the quantity of the catch, exvessel prices, lay systems, and operating expenses cause variations in fishermen's income among vessels, trips, and seasons. Employment changes because the lay system makes every voyage a separate venture with fishermen essentially hired by the trip. Fishermen often shift vessels, and captains switch crewmen between vessels, but some fishermen tend to work on the same vessel or for the same owner on different vessels, because the captain or owner wants to retain them. The distribution of earnings for fishermen reflected their wide distribution of days at sea worked. In 1951, the Bureau of Labor Statistics concluded that 46% of Boston fishermen worked less than 151 days out of the 240 days that 90% of the fleet operated during that year. Their choice to work less than full-time work seemed to be voluntary (White, pp 61-64).

In the early 20th Century, lay systems for groundfish and scallop fisheries in New England varied by port, fishery, and even vessel. During the mid 20th Century, union contracts stabilized lay systems with negotiated agreements for lay shares and payment of expenses. The unions insisted that fishermen were employees rather than independent contractors with rights to benefits from the Social Security Acts, the National Labor Relations Act and unemployment compensation laws. The courts generally agreed.

Unions

In 1939, the Atlantic Fishermen's Union, a local of the Seafarers' International Union (SIU) of the American Federation of Labor organized the New Bedford fleet. In 1958, the New Bedford Fishermen's Union split to form their own local of SIU. In 1976, the Teamsters won a vote against SIU to represent New Bedford fishermen, and in 1985, SIU won back representation rights.

The shares and expenses of the lay system were the central issues in collective bargaining, but benefits, including health insurance and pension plans, and hiring and firing procedures were also negotiated. Collective bargaining also established a fish auction (see below). Both fishermen and captains were typically union members, even captains who were boat owners, because captains' pay was directly connected to the lay system. It was not unusual for captains to belong to both the fishermen's union and the boatowners' association.

From the end of WWII until the late 1970s, collective bargaining contracts for druggers and scallopers were negotiated between the fishermen's union and the Seafood Producers Association. Large druggers, small druggers, and scallopers paid different lays and expenses within the general structure of clear lay that pays almost all expenses from the shares, and broken lay that pays operating expenses from the gross stock before the division into shares (White pp. 81-83). Large druggers paid a clear 40 lay, where bonuses for the engineer, pay for lumpers, ice for summer trips and a few incidental costs were paid from the gross stock. The crews, including the captain, were paid 60% with fuel, gear oil, food, and ice for the rest of the year charged to the crew share. Owners were paid 40% with depreciation, insurance, gear and a payment of 10% to the captain charged to the owner's share.

Small draggers paid a broken lay with ice, fuel, and bonuses taken from the gross stock and the remainder divided between the crew and boat owner 60% to 40% with the crew paying for food from their share. Paying operating expenses from the gross stock rather than from the crew share increased net payments to the crew, which was probably due to proportionally lower capital costs for owners of small draggers.

Scallopers paid the cost of scallop bags and bonuses to the engineer and cook from the gross stock. The crew's share (including the captain) was 65%, with food, fuel, and ice deducted from the crew share. The owner received 35% from which they paid for depreciation, insurance, gear costs, and the captain's 10% bonus. The larger crew for scallopers probably caused the higher crew share for scallopers.

By the early 1980s, health insurance and pension payments for the crew (2.5% each) and 2% for a fisheries promotion fund were deducted from the gross stock for scallopers with the owner share increased to 36% and the crew share dropped to 64%. Draggers also paid into health insurance and pension funds from the gross stock with a split of 42% for the boat and 58% for the crew.

The union was probably at its strongest between the late 1950's and early 1970's, because fishermen, captains, and vessel owners found common ground in trying to increase the value of the catch. The fish buyers accused the fishermen's union and the vessel owners several times of negotiating rules that managed landings in order to increase price, and eventually won an antitrust decision that prohibited both parties from negotiating rules, such as maximum trip length, that reduced the catch.

During contract negotiations in 1985, boat owners proposed increasing their share in both fisheries and eliminating the deduction for the pension fund. The union refused and went on strike on December 27, 1985. Only about 1/3rd of the fleet was covered by union contracts, which had lost members since the early 1970s, but non-union vessels tied up voluntarily or wouldn't cross the picket lines. After more than one month on strike, the union offered to raise the boat share for scallopers to 40% and for draggers to 45%, while maintaining health insurance and pension fund payments off the top. By this time, the vessel owners saw little reason to pay attention to the union's offer because almost all of the fleet had returned fishing under whatever lay the vessel owner offered.

While there was little reporting on the lay for non-union boats during the strike, the Standard-Times reported in 1986 that two non-union scallopers paid crew shares of 61% and 60% with no deductions taken off the top, and health insurance paid from the boat share (Standard-Times, 1/12/86, p. 12).

Other Associations

Between the end of WWII, when the New Bedford fishing industry was growing, until the late 1980's, industry associations represented the different business sectors of the industry. The New Bedford Seafood Producers, founded in 1938, represented vessel owners, and the New Bedford Dealers Association, organized in the 1950s, represented seafood buyers and processors. The New Bedford Seafood Council, funded by a percentage of the scallop catch in an agreement between the Fishermen's Union and the Seafood Producers, promoted scallops and other New Bedford seafood products from the early 1950's until the mid 1980's. These organizations were not well equipped, however, to represent the factions of the industry after the FCMA took over the management of fish stocks, because they did not present a united front to the New England Fishery

Management Council. Most organizations declined and by the early 1990's ceased to exist except for the Fishermen's Union, which still represents a few vessels.

Other organizations took their place over the years mainly in response to the federal government's fishery management plans. The Offshore Mariner's Association, representing captains and mates, was formed to pick up the pieces after the strike in 1986 and to lobby the federal government for the industry. It disbanded in 1999 due to declining membership and lack of funds. The Offshore Mariners' Wives Association continues to organize the "Blessing of the Fleet" every year.

Shore Support was started by New Bedford fishermen and their wives in 1991 and funded in 1996 through private foundation grants to establish a voice in the regulatory process for the working rank and file fishermen. The organization informs local fishermen of the changes in regulations, refers them for retraining and human services when fishing families experience difficulties, and represents fishermen and their families in community activities. Shore Support has recently started a relief fund to help fishing families during disasters at sea and other hard times.

In the mid 1990's, some scallop vessel and settlement house owners formed the Fisheries Survival Fund, financed by levies of \$200-500 per trip for scallop vessels. Funding legal actions and using scientific surveys supplied by the School of Marine Science and Technology (SMAST) at UMass Dartmouth, the Fisheries Survival Fund was successful in pressing NMFS to open the closed areas for selective scalloping in 1999 (see Management Plans: Scallops below). Dragger owners started the Trawler Survival Fund in 2000 to fund legal representation for the draggers in multispecies management plans and associated legal actions surrounding those management plans. Both organizations still exist, although both are under stress from Amendment 13 of the Multispecies Plan, which also affects scallopers.

The New Bedford Seafood Coalition was founded in the mid 1990's by leaders of the local fishing industry, the New Bedford Chamber of Commerce and other business leaders, and the local political leadership for the purposes of uniting the port in its efforts to influence fishery management plans and help fishing families. The Seafood Coalition successfully sought funding from the federal government for the New Bedford Fishing Family Assistance Center, which still offers job search and re-training for fishermen, eligible family members, and fishing industry workers. In 2002, the Seafood Coalition was replaced by the Seafood Industry Advisory Task Force, which was formed by New Bedford Mayor Frederick Kalisz. Composed of representatives from the Mayor's office, the New England Fisheries Management Council, SMAST, and local industry leaders, the Task Force was designed to advise the Mayor on the effects of management plans and other matters.

The Massachusetts General Court created The New Bedford Harbor Development Commission (HDC) in 1957. The HDC manages New Bedford's property on the waterfront, including Homer's, Leonard's, Steamship, Coal Pocket and Fishermen's wharves and assigns docking space to fishing and other vessels. In 2002, the state's Executive Office of Environmental Affairs approved the Commission's New Bedford/Fairhaven Harbor Plan, which planned for the sharing of the multiple uses in the harbor over the short run (less than five years) and for the long run. The Plan focuses on the port as a "working port" with sub-plans for fishing, water-borne freight, shore-side marine businesses, and tourism. While moorings for pleasure craft have increased

dramatically over the past 10 years, in some cases elbowing aside commercial fishing vessels for dock space and marine services, the Plan preserves space for the fishing industry rather than replace it with tourism.

New Bedford Port Society was formed in 1830, for the “moral and religious improvement of seamen”. The society manages the Seaman’s Bethel and the Mariner’s Home, which provides overnight lodging for transient seamen.

During spring and summer 2004, members of Shore Support, the Task Force, and others connected with the fishing industry organized the Working Waterfront Festival that took place in October 2004 and is scheduled as an annual event.

Auctions

Unlike the earlier auction in Boston, the New England Fish Exchange that was controlled by the buyers, the auction in New Bedford was started by the fishermen’s union and boat owners’ association in 1941 and jointly operated by them until the strike of 1986. The rules of the auction, actually two auctions: one for scallops at 7 AM and the other for finfish at 8 AM, were negotiated between the Fishermen’s Union and the Seafood Producers’ Association (Peterson, p. 236). Buyers bid by species for an entire vessel’s trip with the beginning and end of the bidding process controlled by a clock. For the groundfish auction, the starting bell rang at 8 AM with buyers bidding on trips by species based on the hail written on a blackboard. At 8:15, the bell rang again to signify that captains who were dissatisfied with the bid could withdraw their vessel from that day’s auction. Two minutes later the bell rang again, signaling the end of the withdrawal period. The final bell rang at 8:22 that marked the end of the auction. The vessel then steamed to the plant of the buyer who had bought the catch.

Much of the activity connected with the strike of 1985/1986 centered on the auction, including picketing and other confrontation between fishermen and buyers. As a result, the buyers started another auction at a building near the South Terminal, where most of the processing plants were located, which used the same procedures as the previous auction. The original New Bedford auction never reopened. In 1994, the New Bedford Whaling City Seafood Display Auction, a privately owned company, opened in a processing plant on the waterfront, where fish were displayed before the auction, allowing purchases of lots by species rather than boatloads. In 2001, new owners bought the display auction and added on-line bidding, which continues to the present.

Other Institutions

Since whaling days, the waterfront in New Bedford harbor has been lined with businesses that serviced the marine industries. Now as then, most trip expenses are paid to businesses located within a short distance from the harbor. With some exceptions, ship supply, fuel, ice, fish processing, and transportation are located on the New Bedford side of the harbor, and marine repair and gear supply are located on the Fairhaven side. Insurance offices, settlement houses and docking space are located on both sides. As a rough rule of thumb, the value of fish landed is paid directly to fishermen, boat owners, and suppliers. Revenue from processing and retail sales generates two to three times the value of fish landed in additional income. Much of this spending cycles through the community again as household expenditures.

IV. MANAGEMENT PLANS

Many management plans affect New Bedford's fishing industry, some for individual species and others for groups of species. Almost all full-time fishermen in New Bedford, however, are regulated by either multispecies or scallop plans or both.

Multispecies

For the first few years after the passage of the FCMA in 1977, groundfish management plans focused on output controls (seasonal or three month quotas on species and minimum fish size limits for the major species) with additional input controls (maximum mesh size and spawning area closings). When seasonal quotas were consistently reached before the end of the season, trip limits were added to spread landings more evenly over the season. Trip limits proved difficult to enforce because of the lack of adequate dockside enforcement. Vessels off-loaded their catch to buyers who did not record the landings and sometimes mislabeled species, but even recorded landings regularly reached seasonal quotas before the end of the season. This open-access, derby style fishing reduced prices at the beginning of the season and raised prices when quotas were reached causing much conflict between fishermen and regulators.

In 1982 seasonal quotas were dropped and input controls were strengthened, mainly more restrictive mesh size and minimum fish size regulations. During the late 1980s and early 1990s, more species were added to the groundfish management plan and a scientific basis for management was established focused on definitions of overfishing based on stock assessment.

In 1991, The Conservation Law Foundation sued the federal government for not protecting fish stocks under the FCMA and eventually signed a consent decree with NMFS under which the New England Fishery Management Council developed a management plan that would preserve and rebuild fish stocks. In 1994, NMFS implemented the decree with Amendment 5 to the Multispecies Plan, as the groundfish plan was now known, which aimed at reducing fishing mortality by 50% over five years.

Amendment 5 of the Multispecies focused on fishing rights in the form of days per year that a vessel could fish (Individual or Fleets Days at Sea or DAS). For several years before Amendment 5, draggers needed permits to fish for groundfish, but these permits were free for the taking, and there were far more permits than vessels actually fishing for groundfish. In order to distinguish active from inactive draggers, vessel owners had to prove that they landed at least one pound of groundfish during the qualification period to qualify for DAS.

Starting on May 1, 1994, Vessel owners had the option of qualifying for individual DAS allocations based on their individual history of days spent at sea fishing for groundfish during the qualification period or an allocation of "fleet" DAS based on the average time at sea for a full-time groundfish vessel. The initial allocation of fleet DAS was 176 with required blocks of time during which vessels were required to be tied at the dock. Starting in 1994, each vessel's DAS would be reduced by 10% each year for the next five years. Amendment 5 also established a moratorium on new permits for groundfish vessels, but permits could be transferred either by selling a vessel with its permits or by transferring all of a vessel's fishing permits to another vessel that was less than 10% larger in length and GRT and less than 20% more horsepower.

Seasonal closed areas for protection of groundfish spawning were used in management since the start of the FCMA, and in 1981 the Interim Groundfish Plan closed two large areas of Georges Bank during spawning season. The Groundfish Plan, implemented in 1986, added another seasonally closed area in southern New England. These three closed areas covered approximately 6,000 square nautical miles and were closed to scallopers as well as other types of groundfish gear.

Immediately after Amendment 5 was implemented, the stock assessment performed by NMFS concluded that the total biomass of most of the 13 species in the plan continued to decline, reaching its lowest point in the summer of 1994. As a result, at the request of the Council, the Secretary of Commerce extended the seasonal closed areas to year-round closures. While a potential increase in scallop stocks due to closing these areas was specifically cited in the amendment, no one anticipated the magnitude of the increase in these stocks across the whole of the scallop resource (see below). It was well known that scallops grow very fast, but because it was initially a groundfish action, no explicit biological benefits to scallop stocks were estimated.

This emergency action was followed by Amendment 7, which was implemented in 1997, which continued the year-round closed areas and accelerated the 50% DAS reduction schedule rebuilding period from five years to three years

Under Amendment 7, DAS for New Bedford draggers with Individual DAS were reduced by about 15% per year, and those fishing under Fleet DAS were reduced to the maximum 88 DAS, however the requirement to tie up for blocks of time was dropped for vessels with fleet DAS. Without the requirement to tie up for specific time periods while in the groundfish fishery, the fleet DAS allocations became the same as individual allocations.

In 1996, the reauthorization of FCMA named the Sustainable Fisheries Act, required NMFS to include regulations that maintained and restored essential fish habitat, an additional requirement of fishery management, which once again played out in the courts. American Oceans Campaign, a coalition of environmental organizations now named Oceana, and the Conservation Law Foundation sued the federal government and in 2001 won a U.S. District Court ruling that required NMFS to consider essential fish habitats, bycatch, and other measures in formulating management plans. The Court also ruled that the Multispecies Plan had not adequately responded to overfished stocks and froze the number of DAS to the maximum level used during the period from 1996 to 2000. Judge Kessler further ordered that DAS be reduced by 20% from that level, but delayed implementation in order for NMFS to construct a plan that satisfied her conditions.

Passed early in 2004 to begin in May 2004, Amendment 13 responded to Judge Kessler's ruling. Permit holders who had used all of their available days from 1996 to 2001 (a baseline of 88 days), were awarded 52 A days that could be used to land any species subject to other restrictions. They were also awarded 17 B regular DAS not restricted by area and 17 B reserve DAS that could be used in specially authorized areas to minimize the catch of fish from "stocks of concern" such as Georges Bank cod, Southern New England yellowtail and Cape Cod yellowtail flounder. The first special access program allowing B DAS was implemented in November 2004. In order to effectively use B DAS, a boat needed an A Day in reserve. If the boat caught cod, or another species determined to be overfished, the captain contacted NMFS and "flipped"

the day to an A day, changing the requirements for landings. To participate in the special access programs (SAPs) with B reserve DAS, vessels were required to meet more detailed catch reporting requirements and to install VMS (vessels monitoring systems) that allow satellite tracking in order to ensure the boat's location during these trips.

The amendment also included provisions for a pilot program for a vessel to lease DAS from another vessel, as long as the vessel receiving the DAS did not exceed the length and horsepower of the vessel giving up DAS.

While we are not investigating the effects of Amendment 13 to the Multispecies plan, the controversies surrounding Amendment 13 and the court rulings affected the climate of our interviews. Most fishermen strongly disagreed with management plans that sharply restricted their DAS. They all believed that most groundfish stocks were at or above historic maximums. For fishermen, groundfish stocks had recovered, and they saw no reason to reduce fishing effort. Leasing DAS had also long been a sore subject with many New Bedford fishermen who feared that leased days would result in consolidation through elimination of small-scale boat owners.

From spring through summer of 2004, fishermen and their families rallied, demonstrated, and lobbied against the restrictions that resulted from Judge Kessler's rulings. We decided to add open-ended questions to the interview because any conversation with fishermen, especially draggers, led to this topic. The open-ended questions were designed to allow fishermen to tell us how the regulatory processes have affected them on a financial and personal level.

Scallops

In 1982, the first scallop management plan was implemented to regulate scallop size to 40 meats per pound of shucked scallops and a minimum shell width of 3.5 inches for scallops landed in shells. The goal of this regulation was to allow more scallops to reach maturity (between three and five years old) when they not only reach their reproductive stage but also attain their fastest rate of growth, typically quadrupling their meat weight during these two years (Status of Fishery Resources, 1992, p.118). One year later, the meat count was decreased to 35 scallop meats per pound; in order to increase the average size of scallops caught and allows more scallops to reach maturity. Bags of scallops were selected, cut open, and samples weighed. The meat count for the trip was calculated as the average of these samples.

The meat count satisfied neither fishermen nor fishery management goals. Fishermen complained bitterly about the random nature of testing for enforcement. They didn't have adequate equipment on board or sufficient time to measure the meat count more carefully for individual scallops, because shell size does not correlate very well with meat size. One fisherman commented that enforcement of the meat count regulations made all fishermen feel like criminals.

Fishery managers agreed that meat count regulations were difficult and expensive to enforce. Averaging the meat count also encouraged fishermen to concentrate on small, immature scallops, which were plentiful due to the abundant year class of 1989, and mixed tows on small scallops with tows in areas of large scallops. During this period, fishermen often cut scallops that surpassed 80 meats per pound and fished out the 1989-year class before they reached maturity. They argued furthermore, that meat count regulations encouraged fishermen to soak scallops in order to increase their weight.

As with Amendment 5 to the Multispecies Plan, Amendment 4 to the Scallop Plan, also passed in 1994, used DAS as the principal regulation in management of the scallop fishery. The regulation allocated a maximum of 204 fishing days to vessels with full-time scallop permits, which included most of the New Bedford scallop fleet. DAS were reduced to 182 days the next year, to 142 days in 1998, and in 1999, DAS were reduced further to 120 days. Each reduction in DAS was contested by scallop fishermen and environmental groups and played out in the courts, media, and the state and national political arenas against the backdrop of the Sustainable Fisheries Act of 1996 and the Judge Kessler's rulings in U.S. District Court.

A vessel moratorium was established for full-time scallopers that allowed transfer of permits to new vessels but limited increases in length, GRT, and horsepower. Mesh size on the top of the dredge and chain link size on the bottom and sides of the dredge were also reduced to allow small scallops to escape, and crew size was limited to seven, including the captain.

In addition to DAS, crew size and gear restrictions, large fishing areas were closed to scallop vessels to facilitate rebuilding of cod and other groundfish. Scallop stocks grew quickly in these closed areas at the same time that scallop stocks became depleted in open areas, due to the heavy fishing in these areas, which did not go unnoticed by scallop fishermen. Starting in 1996, several scallop vessels were seized by the Coast Guard for fishing in closed areas, which included Closed Area I and Closed Area II on Georges Bank, and the Nantucket Light Ship Area.

In 1998, Amendment 7 closed Hudson Canyon and Virginia Beach to scallop fishing in order to protect the large concentrations of small scallops in these areas.

In 1999, Kevin Stokesbury from SMAST, with vessels and crew donated by New Bedford boatowners, conducted a high-resolution video survey of sections of the three closed areas on Georges Bank. They found some of the largest sea scallops and the highest densities ever observed on Georges Bank. Later that year, portions of Closed Area 2 were opened to scallopers, and all three closed areas were opened in 2000 for brief periods. These temporary openings in the closed areas produced \$50 million in exvessel sales for New Bedford's scallopers⁴.

In 2001 and 2002, scallopers were allowed trips into the closed areas of Hudson Canyon and Virginia Beach with 10 days deducted from vessels for each trip with a 10,000-pound trip limit. Scallop stocks had improved, however, in the open areas to such an extent that even with the trip limit increased to 17,000 pounds in 2001, 18,000 pounds in 2002, and 21,000 pounds in 2003, most vessels chose to fish in the open areas rather than lose the 10 days for each trip in these closed areas.

In 2003, Amendment 10 was adopted by NMFS, which broke DAS into open area days and a rotational system for closed area trips. For 2004, each full-time scalloper was allocated 62 days in open areas and four, two, and one trip respectively in Hudson Canyon, the Nantucket Lightship area and Closed Area 1. Each closed area trip was limited to 18,000 lb of scallop meats and counted for 12 DAS. The Amendment called for more DAS in 2005 and 2006 with closed area trips in Closed Area 2 rather than in Closed Area 1 and the Nantucket Lightship area. Amendment 10 also allowed one-to-one exchanges of closed area trips between vessels.

⁴ Research and Discovery: A stronger fishing industry. University of Massachusetts.

V. EMPLOYMENT

Estimating employment of fishermen is more complicated than estimating employment for most occupations. Most fishermen are paid neither an hourly rate nor a salary, but a share of the value of the catch, according to the lay shares for their vessel. For this reason, fishermen are not considered employees by some definitions of employment. Fishermen are typically hired by the trip, although often they have informal long-term agreements that loosely tie them to a vessel. These fishermen work on board between trips repairing gear and preparing the vessel for the next trip. Fishermen, both those connected with a vessel and those looking for a berth, shift job sites more frequently than other workers. Fishermen, therefore, tend to spend much of their shore-time on the docks, in order to learn the availability of sites on vessels, recent landings, and current prices. Finally, normal distinctions between labor and management do not hold for fishing. Captains, while in charge of the vessel and its crew at sea, share the work and pay with their crews.

Prior to this study, total full-time employment has been rarely estimated with high degree of accuracy. White reports total employment for fishermen in New Bedford at 1350 during the early 1950's (White, p. 20). Hogan et al (1991) report full-time employment for fishermen in New England in 1989 at 4,000 with employment in New Bedford around 2,000. Georgianna (2000) estimated New Bedford full-time fishing employment in 1997 at about 1,000 employees. All of these figures rely on U.S. BLS data (called ES202 report) supplied by the Massachusetts Division of Employment and Training. These data are reported only at the state level and do not include fishermen who are self-employed.

Employees or Independent Contractors

Fishermen paid through the lay system can be considered as both employees and independent contractors. As employees, fishermen own neither the physical capital that they use nor the product of their labor. They also work under the direct management of the captain, who is sometimes the vessel owner. As independent contractors, fishermen contract for a service, for which they are paid a share of the product's value similar to lawyers and other professionals. This distinction was a mute point until the social reforms of the 1930's, when the classification of employee brought certain benefits such as unemployment compensation to fishermen and costs such as FICA to vessel owners.

In New Bedford, fishermen were considered employees by union contract and by the courts until 1978, when the Fishermen's Union, at a general membership meeting, voted to become self-employed while retaining their union membership in negotiating income and benefits. The vessel owners welcomed this change because it relieved them from paying their share of FICA.

Nationwide, the courts have ruled on both sides of this issue with a current ruling that fishermen are employees unless they sign individual contracts for each trip (Supreme Court of the State of Alaska). Virtually all fishermen in New Bedford consider themselves self-employed, which obligates them to pay the self-employed FICA tax, even though none sign contracts for each trip.

Full-time and Year Round Fishermen

According to the U.S. Census Bureau, Current Population Survey, Definitions and Explanations, most fishermen are neither full-time nor year-round employees. A full-time worker is one who worked 35 hours or more per week during a majority of the weeks worked during the preceding calendar year. A year-round worker is one who worked for 50 weeks or more (including vacations) during the preceding calendar year. While these definitions fit many work places, they don't apply to fishing.

Many fishermen fish on more than one vessel, and in some cases, whole crews switch between vessels with the same owner. At the same time, few if any fishermen work every trip. Most if not all take a few trips off during the year, and others leave the site either by their or the skipper's choice to take a site on another vessel. While most New Bedford vessels now take fewer trips per year than 10 years ago due to management regulations, most, if not all full-time fishermen on offshore vessels, either draggers or scallopers, work only as fishermen. Part-time fishermen work at a variety of shore-side jobs. Consequently, there are four types of fishermen employed on New Bedford offshore scallopers and draggers:

1. Full-time steady crewmen with regular sites on either a single vessel or on two or three vessels with a single owner;
2. Full-time transients who fish most of the time but on different vessels;
3. Part-time transients who fish occasionally, and
4. First time fishermen (called shackers on scallopers) who are on their first or second trip, who are training for a permanent site on the vessel.

There are probably as many mixes of steady crew and transients on vessels as there are vessels in the fleet. There are, however, three categories:

1. All steady crew with part-time transients replacing crewmen for individual trips;
2. A majority of steady crewmen with full-time transients filling in for the rest of the crew and part-time transients replacing crewmen who take time off or leave the vessel, and
3. A minority of steady crewmen with full-time and part-time transients filling most of the crew positions.

Number of Vessels

For 1993 and 2002, we collected three sets of data on New Bedford vessels: (1) vessels with Federal fishing permits from NMFS that list New Bedford as their home port (2) vessels that were listed by the New Bedford Harbor Development Commission (HDC) as having paid mooring fees in New Bedford, and (3) vessels that listed New Bedford as their home or principal port by NMFS that landed groundfish, scallops, or monkfish. We also inspected vessels at the dock in 2002 and asked industry experts to classify vessels for 1993.

The NMFS vessel files for both years include owners' names, vessel length, gross registered tons, horse power and permits for each vessel. The HDC data file for 2002 list the owners' names and addresses, and the HDC file for 1993 lists only vessel name. The

landings data for both years lists vessel name, the value of groundfish, scallops and monkfish catches, and the number of trips that the vessel made to catch those species.

After several failed attempts to classify vessels as New Bedford offshore boats using NMFS vessel data and HDC mooring data, we decide to concentrate on landings data supplied by the Northeast Fishery Science Center of NMFS that showed the number of trips for each vessel that listed New Bedford (or Fairhaven) as either their principle or home port and the value of their total landings of groundfish, scallops, and monkfish in any port. We included those vessels that landed over \$75,000 worth of groundfish, scallops, and monkfish and took more than three trips as offshore, full-time vessels in 1993. For 2002, we included those vessels that landed over \$100,000 gross stock of these species and took more than three trips as offshore full-time vessels.

Using the gross stock criterion, offshore scallopers decreased from 112 vessels in 1993 to 108 vessels in 2002. (See Table 1, p. 10.) Of these 108 scallopers, 81 also fished from the port in 1993. Thirty-one left the port, and 27 scallopers entered the port over this period. Offshore draggers decreased from 117 vessels in 1993 to 96 vessels in 2002. Of these vessels, 67 also fished from the port in 1993. Fifty draggers left the port and 29 entered the port over this period.

The Federal buyback program for New England draggers caused some of the decrease in the New Bedford offshore dragger fleet in 1996. Members of the Management Council had long argued that reducing the number of vessels in this fishery would reduce overfishing and lobbied the federal government to buy back some of these vessels. The resulting Emergency Supplemental Appropriations Act and the Interjurisdictional Fisheries Act allocated \$24.4 million to purchase 79 fishing vessels and their permits, removing 19% of the catch capacity from the New England fishery. However in 2000, a GAO report on fishing vessel buyback programs concluded that, “62 additional vessels have become active since the buyback because no steps were taken during the program to prevent previously inactive vessels from engaging in fishing.”⁵ In other words, funds obtained in the buyback may have been used to purchase vessels with permits, which were not actively fishing, and transfer these permits to new vessels. The GAO report continues, “These vessels have begun to erode the capacity reductions made by the buyback because they have replaced fishing capacity by as much as two-thirds of that purchased through the buyback.”

In New Bedford, 25 draggers were sold by their owners in the buyback program. As the GAO reported, some vessels new to the port were probably purchased with funds from the buyback program, but we cannot show any direct connections between these funds and purchases of newer vessels. Ownership of vessels and the funds used to buy them are not easily traced. Also in New Bedford, another 70 vessels sank, burned or were scrapped (Rodney Avila, personal communication). Once again, it seems likely that most of these permits and capital found their way back into the local fishery.

Another study of capacity reduction reported that the buy-back of fishing vessels in 1996 was matched by an increase of the utilization rate of the permits that remained in the fishery (NMFS, 2004b). In other words, vessel owners applied latent permits to vessels that were not previously in the fishery.

⁵ GAO, 2000, Entry of Fishermen Limits Benefits of Buyback Programs. P. 4

Crew Size

Since the start of the modern fishing era in New Bedford during the 1930's, crew size in New Bedford has depended on tradition, union rules, expectations of the catch, and management regulations.

Higher expected catch call for larger crews in order to reduce the workload per crew member. Lower expected catch and value generally lead to smaller crew size in order to maintain the payment per crew member. Union rules and customs generally proscribed larger crews. Long after the U.S. District court ruled in 1958 that limits on the crew, catch, and days at sea per trip were constraints of trade, New Bedford scallopers maintained the custom of 11 man crews, 1,000 pounds per man per trip, and eight days trips with four days in dock between trips. The 11-man crew on scallop vessels probably continued for many vessels until the fishermen's strike late in 1985.

During the early 1980's when groundfish and scallops were plentiful, crew sizes on large draggers ranged between four and seven men, including the captain (Doeringer, et al. p. 38) with six as the port standard. Scallop crews varied between nine and 13 during the same period (Ibid, p. 40). When catches fell during the early 1990's, dragger crews declined to four or five, and scallop crews fell to seven or eight.

In 1994, Amendment 4 to the Scallop Management Plan limited the crew size on full-time scallopers to seven, including the captain as part of the stock rebuilding plan. The crew size on some scallopers had probably fallen to or below this number due to stock shortages, but the Plan limited crew size to seven in order to limit the catch by limiting the ability of the crew to shuck scallops if stocks began to recover. The restriction to 7-man scallop crews continues to the present.

Interviews with 69 scallop crews reported a decline in average crew size for the scallop crews (including the captain) from 10 before DAS to seven in 2003 or 2004. These results require some interpretation, however. We took current crew size from counting the crew as listed by the crew themselves. These data are probably quite accurate. Earlier crew size was taken from the interview question that asked "crew size before DAS." This could have been interpreted in different ways, with at least some respondents looking back to the good old days, far before 1993. More intensive interviews with four captains also cast doubt on the decrease in scallop crew size between 1993 and 2003 or 2004. They reported that scallop crew sizes in 1993 had declined to a range between six and eight in an effort to maintain individual income by sharing the declining catch among fewer crewmen. The average crew sizes from settlement house data support this conclusion because they report crew size of seven for scallopers in 1993. By 2002 larger scallop catches called for larger crews but management regulations limited crew sizes to seven.

The average crew size from interviewing 50 dragger crews declined from five before DAS to four in 2003 or 2004. Settlement houses report the same decline for dragger crews. As shown in the section on income, average gross stock per vessel for draggers declined over this period after accounting for inflation. It seems most likely that dragger crews declined over this period in an attempt to maintain individual income.

Crew size on draggers was not restricted by management plans, probably because larger crew size would not increase the catch in this fishery.

Employment

No data are available either to separate steady crewmen from transients or to separate full-time from part-time fishermen. Neither NMFS nor the Coast Guard collects information on crew, either by year, vessel, or trip. A combination of data from crew members, settlement houses, skippers, and boat owners allowed us, however, to estimate full-time and part-time employment in the offshore scallop and dragger fisheries.

Interviews in 2003 and 2004 with skippers and crew while they were doing gear work show an accurate snapshot of the crew size and fishermen who made the previous trip and those who are scheduled to make the next trip. For scallopers, the average crew size was seven and for draggers, the average crew size was four. (See Table 3.) We will assume that these crew sizes did not change from 2002. For 1993, settlement house data show an average of seven crewmen for scallopers and five for draggers. In all cases, crew sizes include skippers.

TABLE 3. EMPLOYMENT OF FISHERMEN IN NEW BEDFORD

	1993	2002
Offshore Scallopers		
Number of Vessels	112	108
Average Crew Size	7	7
Full-Time Employment	784	756
Part-Time Employment	1,232	756
Total Employment	2,016	1,512
Offshore Draggers		
Number of Vessels	117	96
Average Crew Size	5	4
Full-Time Employment	585	384
Part-Time Employment	468	192
Total Employment	1,053	576
Total Full-Time Employment	1,369	1,140
Total Part-Time Employment	1,700	948
Total Employment	3,069	2,088

Settlement house data show the names of fishermen by vessel who were paid at any time during 1993 and 2002 for samples of 37 scallopers and 65 draggers for 1993 and 60 scallopers and 59 draggers for 2002. We sorted the names of all fishermen on scallopers and draggers to eliminate duplicates of those who fished on more than one vessel. For 1993, 25% of fishermen had fished on more than one scalloper and 31% of fishermen had fished on more than one dragger. For 2002, 30% of fishermen had fished on more than one scalloper and 25% of fishermen had fished on more than one dragger. Fishermen who fish on different vessels for the same owner are usually listed only once,

because owners of more than a single vessel typically combine these vessels into a single corporation for settlement purposes.

In order to estimate the average annual number of fishermen per vessel, we divided the number of fishermen's names minus duplicates by the number of vessels in the sample. This method of estimation show a decline in the average annual crew (fishermen who had gone on at least one trip) for a scalloper from 18 in 1993 to 14 in 2002 and the average annual crew for draggers declined from nine in 1993 to six in 2002. Multiplying the average annual crew per vessels by the total number of New Bedford vessels in each fishery shows a total decline from 2,016 fishermen on scallopers in 1993 to 1,512 in 2002 and a decline from 1,053 fishermen on draggers in 1993 to 576 in 2002. Note that these estimates of employment include both full-time and part-time fishermen.

Separating part-time from full-time fishermen requires some assumption about vessel crews. The simplest and most reasonable assumption is that skippers prefer either steady full-time crewmen or transient full-time crewmen. This leads to the assumption 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. Given this assumption, there were 784 full time fishermen working on scallopers in 1993 and 756 in 2002. Part-time employment on scallopers dropped from 1,232 in 1993 to 756 in 2002. For draggers, full-time fishermen declined from 585 in 1993 to 384 in 2002. Part-time fishermen on draggers dropped from 468 to 192.

In other words, most of the decline in the work force (from 3,069 in 1993 to 2,088 in 2002) was made up of part-time fishermen. This seems reasonable given the decline in the number of trips in both fisheries, which made trips more valuable and discouraged full-time fishermen from taking trips off.

These results show more part-time transients in scalloping than in dragging. While the subject of intense debate on the docks, dragging probably takes more skill in mending gear, while scalloping basically takes hard work shucking scallops for long hours. It seems reasonable that high earnings from a trip on a scalloper would lure more young men into scalloping, but the hard work and long hours would then discourage them. Very few shackers or new men last more than one trip either by their or the skipper's choice.

Settlement house data also show few fishermen who make trips on both scallopers and draggers. Only 18 fishermen showed up on both full-time scallopers and draggers in the settlement house data for 2002. A few vessels in New Bedford own and use DAS for both scallops and multispecies. Landings data for 2002, for example, show four scallopers with more than 1/3rd of their landings value in groundfish.

Crew interviews conducted during gear work between trips in 2003 and 2004 also provide data on fishermen's ages, years spent as fishermen, and years on that vessel.

The average age was 40 years old for the 428 scallopers who reported their ages. (See Table 4.) Fourteen were less than 25 years old. Three were over 60 years old. These scallopers had spent an average of 19 years at sea, and had worked on the current vessel for an average of three years. This was the first trip fishing for three crewmen. Five had been fishing for one year or less. This was the first trip on that vessel for 41 crewmen, whose average age was 38 years old and who had fished for 17 years.

**TABLE 4. AVERAGE AGE AND FISHING EXPERIENCE IN NEW BEDFORD
(2003-2004)**

	Offshore Scallopers	Offshore Draggers
Sample Size	428	202
Age	40	46
Years at Sea	19	26
Years on Vessel	3	7

This snapshot shows that New Bedford scallopers are professional fishermen in their prime years of experience, with few young and few old. Very few vessels hire shackers. Length of time on the boat gives an indication that most of these men consider themselves steady on the vessel, and only a small number were transients. The snap shot doesn't tell us who took the trip off.

The average age for draggers was 46 years old for the 202 who reported their ages. Four were less than 25 years old. Six were over 60 years old. These dragger men had spent an average of 26 years at sea, and had worked on the current vessel for an average of seven 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.

As with scallopers, this snapshot shows dragger crewmen as professional fishermen with many years of experience. On average, fishermen on draggers are older than those on scallopers, with very few young and a few over 60 years old. As with scallopers, few were transient, who rarely do gear work.

VI. INCOME

Annual fishermen's income depends upon the quantities of fish and scallops landed per trip, exvessel prices, the lay or share of the catch that goes to the crew, crew size, and the number of trips per year. As shown in the previous section, crew size has probably stayed at seven for scallopers and declined from five to four for draggers, but number of trips per year has declined substantially in both fisheries since DAS began in 1994.

Total Landings and Value

Between 1993 and 2002, the total quantity of landings increased in New Bedford with most of the increase coming after 1998. (See Figure 2.) In 1998, scallop landings dropped to their lowest point since the establishment of the 200-mile limit in 1976. Between 1998 and 2002, scallop landings quadrupled, mostly due to the opening of the closed areas and the growth of stocks outside the closed areas. Groundfish landings dropped sharply until 1995, rose modestly until 1999, and then nearly doubled between 1999 and 2002 with the largest increases in cod, yellowtail flounder, and haddock.

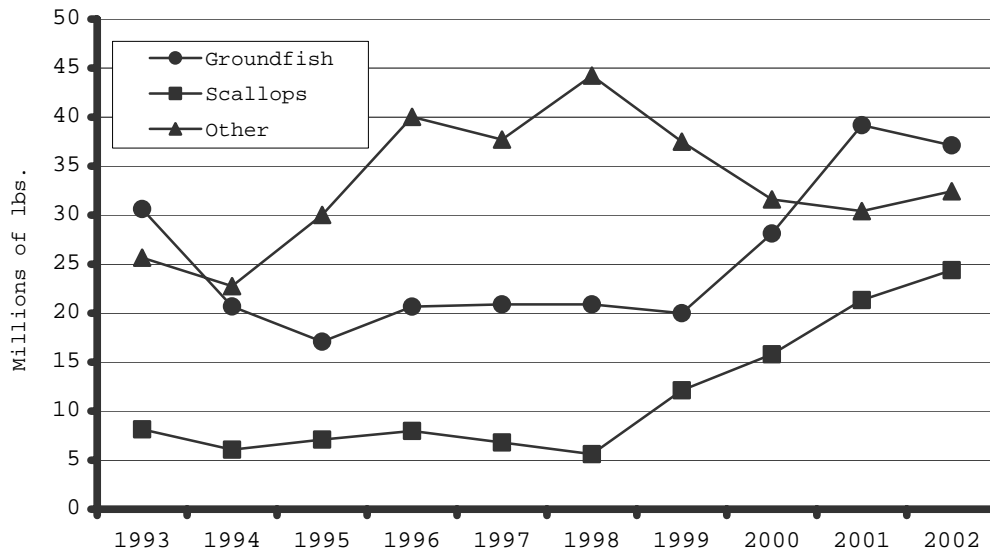


Figure 2. Annual Quantity of Landings in New Bedford.
(Source NMFS Landings Data.)

Landings of other species⁶ rose until 1998 and then dropped steadily until 2002. Many different species contributed to these changes. Monkfish and skates stayed relatively constant around an average of seven million and five million pounds per year respectively. Dogfish dropped from eight million pounds per year in 1993 to almost no

⁶ Monkfish, lobster, red crab, dogfish, mackerel, herring, whiting, ocean quahog, skates, squid, swordfish, and other species.

landings from 2000 through 2002. Landings of lobster, red crab, whiting, herring, and mackerel increased over the period. Lobster landings increased steadily to over one million pounds in 2002. Red crab jumped from no landings through 1999 to an average of two million pounds per year from 2000 through 2002. Whiting jumped from almost no landings from 1994 through 1999 to one million pounds in 2000, two million pounds in 2001 and 2002 respectively.

The values of landings in New Bedford, adjusted for inflation, also increased over the period but far less than the increase in landings. (See Figure 3.) In 2002, scallops were the major earner at \$97 million with cod, haddock, yellowtail flounders, and winter flounders earning about \$10 million each. The share of scallops in total value increased from 40% in 1994 to almost 60% in 2002 with all the gains between 1999 and 2002. Only in 1981 was the scallop share in total exvessel value higher than it was in 2002. The average of scallop's share in the value of landings in the port since 1976 was 50%

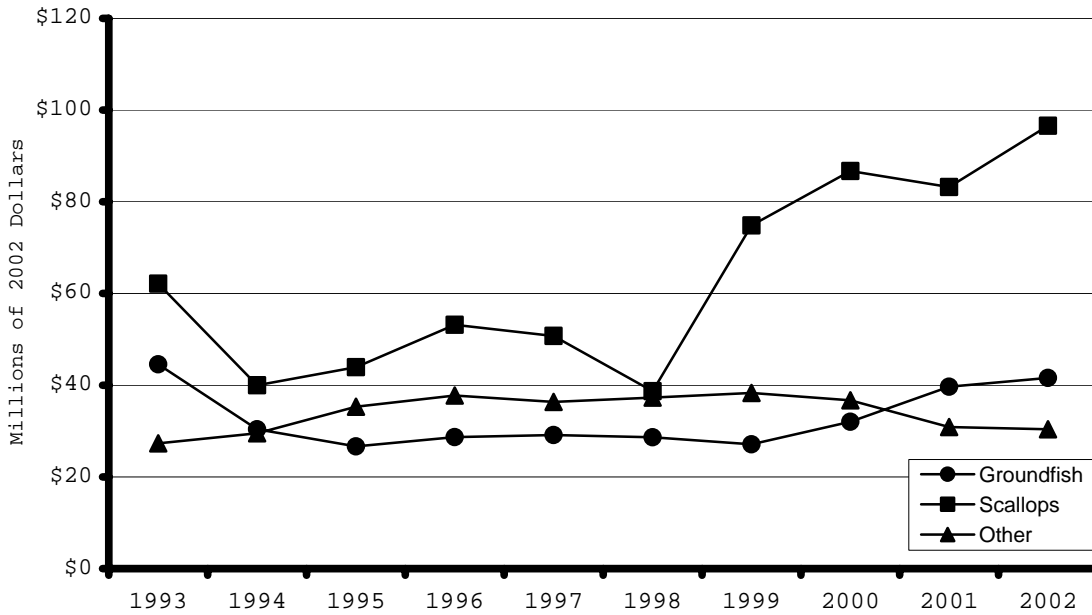


Figure 3. Value of Landings in New Bedford, Adjusted for Inflation using the CPI with 2002 as Base Year. (Source NMFS Landing Data.)

Exvessel Prices

Between 1993 and 2002, exvessel prices, adjusted for inflation, declined for scallops and most groundfish species. Average exvessel scallop prices, adjusted for inflation, declined almost 50%, from \$7.62 in 1993 to \$3.96 in 2002 dollars. Haddock prices declined from \$1.69 to \$1.23 per pound over the same 10-year period, and the weighted average of flounder prices declined from \$1.56 to \$1.09. Cod also declined from \$1.30 per pound in 1993 to \$1.12 per pound in 2002. All of these prices are in 2002 dollars.

While a careful analysis of the causes of these changes in prices is beyond the scope of this study, we feel secure in some simple observations. The sharp increase in landings of scallops and haddock certainly contributed to the decline in prices for these

species. The results for cod and flounders are murkier. Cod landings decreased sharply, but prices adjusted for inflation also declined, although less than the decline in other species. Flounder landings increased slightly, while exvessel prices adjusted for inflation dropped sharply. Cod, haddock and flounders are probably substitutes in both consumption and production. Adding groundfish landings together and averaging their exvessel prices, the total quantity of landings for groundfish increased about 20%, while average exvessel prices adjusted for inflation for these species decreased about 20%

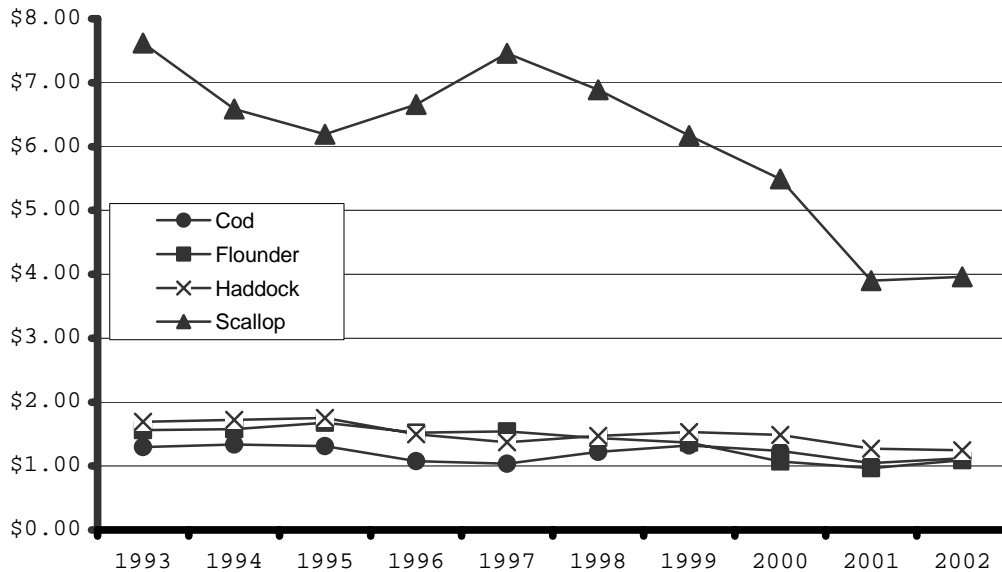


Figure 4. Exvessel Prices for Major Groundfish Species and Scallops in New Bedford, Adjusted for Inflation using the CPI with 2002 as Base Year. (Source NMFS Landings Data)

Lay System

After the 1986 fishermen’s strike, vessel owners paid different lays centered on an average in each fishery. We have little information on draggers before this study, but a survey of vessel owners to estimate the costs of scalloping in New Bedford for 1997 included questions on the lay system (Georgianna et al, 1999). This study reported an average split of 59% for the crew and 41% for the owner with most vessels at 60/40. Most paid a captain’s bonus of 5% to 10% from the gross stock or from the owner’s share with fuel, food, ice, oil, grease, and filters paid from the crew share. Boat owners paid for repairs, liability and accident insurance, and the mortgage for the vessel.

For the 69 scallop vessels whose crews we interviewed in the present study, crew share dropped from 59% (the same result as the survey of Scallop costs in 1997) in 1993 to 55% in 2002. The date 1993 may not be significant because we asked the question about lay shares before DAS, which may or may not correspond to 1993 for fishermen. A few crews reported that they paid for shovels from their share. Others reported that the cost of Boatrac transponders, a new expense since 1994 also was paid from the gross stock. Others reported that captains’ bonuses (10% of the boat share) were paid from the owner’s share before DAS and are now paid from the gross stock, which would reduce

the crew share. Some crews reported that payments to the Fisheries Survival Fund (\$500 per trip) are now paid from the gross stock rather than from the owners share.

The crew share for draggers also dropped between 1993 and 2002. According to our interviews with 50 offshore dragger crews, the average crew share declined from 54% to 51%. On roughly half of the vessels, the crew share declined from 1993 to 2002. More than half of the draggers now pay 50/50 split, the lowest crew share that any vessel reported. Before DAS, only about 1/4 of the draggers paid 50/50. Once again, 1994 is not a fixed point for the start of DAS in the minds of most dragger fishermen because most draggers were not severely restricted by DAS until Amendment 13 in 2004.

Almost no expenses are paid from the gross stock for draggers, which still basically pay a clear lay in New Bedford. As with scallopers, payments for food, fuel and ice are taken from the crew share on draggers.

Fishermen's Income

Fishermen's income depend upon the earnings of the vessel they fish from, as well as the number in the crew, the lay assigned to the crew, and the expenses paid either from the gross stock or the crew share. Changes in fishermen's income since DAS depend mainly, however, upon whether they fished from a scalloper or from a dragger.

The average annual value of scallops, groundfish, and monkfish (the most valuable bycatch in scalloping) landed by New Bedford scallopers in all ports increased from \$533,352 to \$879,733 per vessel between 1993 and 2002⁷. Adjusting these figures for inflation shows an increase from \$666,690 to \$879,733 over this period. (See Table 5.) The gross stock per trip in 2002 dollars shows a larger increase over the period, from \$34,034 average gross stock per trip in 1993 to \$86,139 in 2002, as the average number of trips per year fell in half from 20 trips per year to 10 trips per year.

**TABLE 5. AVERAGE GROSS STOCK FOR NEW BEDFORD OFFSHORE VESSELS.
(1993 VALUES ADJUSTED FOR INFLATION USING THE CPI)**

	1993	2002
Offshore Scallopers		
Number of Vessels	112	108
Annual Gross Stock per Vessel	\$666,690	\$879,733
Number of Trips per Year	20	10
Gross Stock Per Trip	\$34,034	\$86,139
Offshore Draggers		
Number of Vessels	117	96
Annual Gross Stock per Vessel	\$413,668	\$365,615
Number of Trips per Year	29	16
Gross Stock Per Trip	\$14,666	\$23,244

⁷ From value of scallops, multispecies, and monkfish landed by vessels in 1993 and 2002, whose principle or home port was listed as New Bedford or Fairhaven. Supplied by the Northeast Fisheries Science Center of NMFS.

The annual gross stock for offshore New Bedford draggers, adjusted for inflation, decreased between 1993 and 2002, from an average of \$413,668 per vessel in 1993 to \$365,615 per vessel in 2002, a decrease of 12%. As with scallopers, these figures include landings by New Bedford draggers at all ports and include groundfish, scallops, which are a small bycatch, and monkfish, a larger bycatch for draggers. The average gross stock per trip increased, however, from \$14,666 per trip in 1993 to \$23,244 in 2002, once again, because the average number of trips per year declined from 29 trips per vessel in 1993 to 16 trips per vessel in 2002. This increase in gross stock per trip could have been caused either by larger fish stocks or more efficient fishing effort due to the reduction of DAS.

Data from New Bedford settlement houses show larger increase in net crew share than in gross stock per trip for both scallopers and draggers.

For the sample of 37 scallopers in 1993 and 60 scallopers in 2002, for which we have data from settlement houses, average gross stock was higher than the port average, but the pattern is the same. Annual gross stock increased by 35%, and gross stock per trip increased by 175%. Net crew share (crew share after deducting operating costs) increased by 265%, an increase from \$12,484 per trip in 1993 to \$45,416 per trip in 2002. (See Table 6.) Larger new vessels did not cause this increase in net crew share because the sample of 32 scallopers that fished in both 1993 and 2002 shows a similar increase. All estimates of crew share include captains' and other bonuses.

**TABLE 6. AVERAGE INCOME FOR SAMPLE OF NEW BEDFORD VESSELS.
(1993 VALUES ADJUSTED FOR INFLATION USING THE CPI).**

	1993	2002
Offshore Scallopers		
Number of Vessels	37	61
Annual Gross Stock per Vessel	\$727,348	\$932,857
Trips per Year	21	10
Gross Stock Per Trip	\$35,410	\$97,439
Net Crew Share per Trip	\$12,484	\$45,416
Annual Income Full-time Fisherman	\$29,000	\$53,000
Annual Income Part Time Fisherman	\$4,500	\$9,500
Offshore Draggers		
Number of Vessels	65	59
Annual Gross Stock per Vessel	\$440,532	\$409,826
Trips per Year	29	16
Gross Stock Per Trip	\$15,256	\$25,324
Net Crew Share per Trip	\$6,808	\$12,674
Annual Income Full-time Fisherman	\$31,000	\$43,400
Annual Income Part Time Fisherman	\$9,500	\$15,500

The increase in net crew share for draggers was more dramatic because annual gross stock per vessel had actually decreased in real terms. As with scallopers, the sample of 65 draggers in 1993 and 59 draggers in 2002, for which we have data from settlement houses, show gross stock about 10% higher than the part average, but the pattern is the same. Annual gross stock decreased by 7%, gross stock per trip increased by 66% and net crew share (crew share after deducting operating costs) increased by 86%, increasing from \$6,808 per trip in 1993 to \$12,674 per trip in 2002. (See Table 6.) As with scallopers, larger new vessels did not cause this increase in net crew share because the sample of 41 draggers that fished in both 1993 and 2002 shows a similar increase.

We believe that the increase in percentage terms was larger in net crew share than in gross share per trip because operating costs stayed relatively constant over the period while gross stock increased. Interviews with scalloper skippers reported that average operating costs for their vessels stayed roughly constant between 1993 and 2002, probably increasing by no more than 10%. Fuel costs, the largest operating expense, probably declined from about \$8,000 per trip to about \$7,000 per trip, mostly due to less steaming time searching for scallops in 2002, because they tended to fish in one area per trip. Food costs increased from about \$1,000 per trip to about \$1,500 per trip, and ice also increased from about \$1,000 per trip to about \$1,200 per trip. These estimates for 1993 are roughly consistent with average operating costs estimated by Georgianna et al (1999) from surveys completed by 56 vessel owners in 1997, (\$6,872 for fuel and oil, \$774 for ice, and \$1,513 for food and water). A small increase in operating costs per trip with a much larger increase in gross stock per trip would cause the increase in net crew share to exceed the increase in gross stock.

In short, net crew shares per trip increased in both fisheries (with larger increases in scalloping than in dragging) because gross stock per trip increased while operating costs stayed constant.

Estimating the increase in individual fishermen's income per trip (adjusted for inflation) is quite straight forward. With the seven man crew in scalloping, an average fishermen's share increased from \$1,783 in 1993 to \$6,488 in 2002. The increase for fishermen on draggers was less, from \$1,362 in 1993 to \$3,168 in 2002, which includes the decline in dragger crew size from five to four over the period. All calculations are in 2002 dollars.

Estimating annual income is more difficult because the annual net crew share is split between full-time fishermen and part-time fishermen.

As with employment, we assume that vessel crews are filled by full-time fishermen, either steady men or full-time transients, with part-time fishermen filling in for fishermen taking trips off. A small sample of skippers told us that full-time fishermen took 80% of the trips in 1993 and 85% of the trips in 2002. Full-time fishermen probably took a higher percentage of trips in 2002 because limited DAS made trips more valuable.

In short, the average full time fishermen on a New Bedford scalloper took 16 trips in 1993, which paid an average of roughly \$1,800 per trip for an annual average income of \$29,000 in 2002 dollars. In 2002, they averaged over 8 trips, which paid roughly \$6,500 per trip for an annual income of \$53,000. (See Table 6.) In 1993, part-time fishermen on New Bedford scallopers averaged between two and three trips per year for

an annual income of \$4,500. In 2002, they averaged between one and two trips per year for an annual income of \$9,500.

The average fisherman on a dragger took 23 trips in 1993, which paid an average of about \$1,350, for an annual income of about \$31,000 and 14 trips in 2002, which paid an average of \$3,100 per trip for an annual income of about \$43,400. Part-time fishermen on draggers averaged 7 trips in 1993 for an average income of \$9,500 per year and 5 trips in 2002 for an average income of \$15,500 for that year. Once again, all figures are in 2002 dollars.

Note that these estimations imply that fishermen on draggers earned more than scallopers in 1993 but less than scallopers in 2002. This model also implies that part-time transients on draggers earn more than their counterparts on scallopers because they take more trips. Both of these observations conform to observation on the docks.

VII. WORKING CONDITIONS

Fishing is extremely difficult and dangerous work. Basically, fishermen handle heavy machinery on a slippery, moving deck often in rough weather throughout the day and night. The simplest mistake can mean injury or death.

Fishermen work on shore and offshore. On shore, they unload the catch from the previous trip, repair and clean nets and other gear (commonly called gear work), clean and paint the vessel, buy supplies, and load gear, ice, and supplies for the next trip. Fishermen are not usually paid for this work or more correctly stated, their pay for this work is included in their share of the catch. Performing gear work ensures or improves fishermen rights to a site during the trip. Offshore they navigate the vessel, maintain the boat, engine, and gear, prepare meals, set out and retrieve the gear, process the catch, and load the catch into the hold.

Catching and processing scallops entails operating the winch to retrieve the dredge, dumping the contents on deck, sorting the scallops from fish and debris into baskets (called picking the pile), shoveling debris over the side, shucking the scallops, packing scallops into cloth bags, icing and storing the bag below decks, and washing the deck. Occasionally, scallops, in their shells, are loaded on deck from one tow or more and shucked during steaming home or steaming to another fishing ground. As with groundfish, the dredge is mechanically set out and retrieved by the captain or mate operating the winch, while deckhands collect and shuck the scallops. The captain or mate also shuck scallops from the wheelhouse or just outside the wheelhouse.

Catching and processing groundfish entails operating the winch to retrieve the net, dropping the contents of the net on deck, separating the catch by species and size, shoveling debris, unwanted fish, and other marine life over the side, gutting and sometimes gilling the fish, placing the cleaned fish into totes, icing the catch, storing the catch below decks, and washing the deck for the next tow. The trawl is set out and retrieved by the captain or mate operating the winch, while deckhands process the catch.

Hours of work are inversely related to the crew size because the work is shared and fishing gear is set out continuously on the fishing grounds except in the worst weather. Smaller crews translate into longer hours of work because at least two or three crewman (in addition to the captain or mate operating the vessel and winches) are needed to handle the gear and process the catch. If the crew size declined due to declining catch, the hours of work may increase but the intensity of work decrease. This was most evident just before DAS, when catches were low and tows long for both draggers and scallopers.

In the late 1940's, union contracts required four days ashore between trips for scallopers and three days on shore between trips for draggers (White, p. 85). Maximum length of trip was fixed by contract at six days for draggers and eight days for scallopers. Crew size was limited to six for draggers and 11 for scallopers. The catch for scallopers was limited to 1,000 pounds per crewman for scallopers. The watches were set at eight hours on and four hours off for draggers and eight hours on and eight hours off for scallopers. A series of constraint of trade rulings during the 1950s and 1960s eliminated these conditions (except for hours of work) from union contracts, but much of the New Bedford fleet continued these work rules as tradition, although they weakened over the years until the 1986 strike effectively eliminated the union's effect on working conditions.

Hours of Work

We asked the 69 scallop crews that we interviewed in 2003 and 2004 about working conditions for their last trip. (See Table 7.) They averaged 6 hours of gear work before their last trip and 8 hours of gear work before DAS. They averaged 35 hours steaming to and from fishing grounds, with almost all vessels steaming the same time out and back. In other words, most fished in the same general area for the entire trip. We did not ask about steaming time before DAS.

**TABLE 7. AVERAGE WORKING CONDITIONS FOR NEW BEDFORD VESSELS.
(2003-2004)**

	Offshore Scallopers	Offshore Draggers
Sample Size	69	50
Gear Work Hours	6	13
Steaming Time	35	36
Total Hours		
Days Fishing	10	6
Watch		
Hours On	8	9
Hours Off	6	3
Take-Out Hours	5	5
Fishing Hours	139	104
Working Hours	171	147

Scallopers averaged 10 days fishing with average watches of eight hours on and six hours off. Ten crews reported current watches of six on and six off and twenty reported eight on and eight off. All others reported more work hours per watch than rest hours. Twelve reported 10 hours on and six hours off. Eight crews reported eight on and four off. Five crews reported nine on and seven off. Three crews reported 7 on and 5 off, and the remaining six crews reported watches of 14 and 6, 10 and 7, 12 and 4 or 7 and 6. Almost all crews reported equal hours on and off (either six on and six off or eight and 8) before DAS. In other words, the average hours of work per day increased from 12 hours per day before DAS to 14 hours per day. More than half of the scalloper crews that we interviewed reported that their work increased by four hours per day.

The average time spent taking out and cleaning the vessel after the most recent trip was five hours. Over two-thirds of the crews reported that they hired lumpers to unload the catch. We did not ask about take-out time and lumpers before DAS.

We calculated fishing time by adding the work watches for the days that they fished. The average fishing time was 139 hours for the last trip. Adding fishing time to gear work, take out and cleaning and 60% of steaming time gave an average of 171 hours of work during the trip.

The 50 dragger crews that we interviewed averaged 13 hours of gear work before their last trip, the same as before DAS. Dragger crews do more gear work than scallop crews because they repair and build nets between trips, tying knots for many hours. Their

average steaming time was 18 hours each way. Five crews reported that they steamed longer coming in, implying that they fished in more than one area.

They averaged six days fishing. Watches have increased from an average of eight on and four off (the old union rule) before DAS to nine hours on and three hours off for the trip before the interview. About 25% of the crews have retained the old watch of eight and four. In other words, most of the dragger crews added an extra two hours of work per day.

The average time spent taking out and cleaning the vessel after their most recent trip was five hours, the same time as scallop crews. Only four of the crews reported that they did not hire lumpers to unload the catch. We did not ask about take-out time and lumpers before DAS.

As with scallopers, we calculated fishing time by adding the work watches for days that they fished during their last trip. The average fishing time was 104 hours for the last trip. Adding fishing time to gear work, take out and cleaning and 60% of steaming time gave an average of 147 hours of work during the trip.

VIII. CONCLUSIONS

Using landings and vessel data from the Northeast Fisheries Science Center, data from interviews with vessel skippers and crews, and payment data from settlement houses, we estimated employment, income, and working conditions for New Bedford's offshore scallop and dragger fisheries for 1993 and 2002.

Full-time employment in New Bedford's offshore scallop and dragger fisheries fell from 1,369 in 1993 to 1,140 in 2002, with most of the decline in dragging. Part-time employment fell more over the same period, from 1,700 to 948, once again with most of the decline in dragging. Total employment fell from 3,069 to 2,088. Part-time employment fell by more than full-time employment because full-time fishermen probably took less time off because fewer trips were available.

Crew surveys showed that New Bedford fishermen in both fisheries are professional fishermen with many years of experience. From crew interviews in 2003 and 2004, the average age for full-time fishermen was 40 on scallopers and 46 on draggers, with very few older than 60 or younger than 25. Scallopers spent an average of 19 years at sea, and worked on the current vessel for an average of three years. Full-time fishermen on draggers spent an average of 26 years at sea, and worked on the current vessel for an average of seven years. Very few in either fisheries fished less than one year.

Fishermen's income rose more in scalloping than in dragging. Average gross stock per trip for scallopers rose from \$34,034 in 1993 to \$86,139 in 2002, but the average number of trips per year fell in half from 20 trips per year to 10 trips per year. All 1993 values are reported in 2002 dollars. As operating expenses per trip stayed relatively constant over the period, average net crew share increased from \$12,484 per trip in 1993 to \$45,416 per trip in 2002, which is a larger percentage increase than gross stock. All estimates of crew share include captains' and other bonuses.

Income for draggers increased but was far less than the increase for scallopers. The annual gross stock for offshore New Bedford draggers actually decreased in 2002 dollars between 1993 and 2002, from \$413,668 per vessel in 1993 to \$365,615 per vessel in 2002. The average gross stock per trip increased, however, from \$14,666 per trip in 1993 to \$23,244 in 2002, as the average number of trips per year declined from 29 trips per vessel in 1993 to 16 trips per vessel in 2002. Average crew share after deducting operating costs increased from \$6,808 per trip in 1993 to \$12,674 per trip in 2002.

The average full-time scalloper in 1993 took 16 trips in 1993, which paid an average of roughly \$1,800 per trip for an annual average income of \$29,000 in 2002 dollars. In 2002, full-time fishermen on scallopers averaged over 8 trips, which paid roughly \$6,500 per trip for an annual income of \$53,000. In 1993, part-time scallopers averaged between two and three trips per year for an annual income of \$4,500. In 2002, they averaged between one and two trips per year for an annual income of \$9,500.

The average full-time fisherman on a dragger took 23 trips in 1993, which paid an average of \$1,350 per trip, for an annual income of about \$31,000 and 14 trips in 2002, which paid an average of \$3,100 per trip for an annual income of about \$43,400. Part-time fishermen on draggers averaged 7 trips in 1993 for an average income of \$9,500 per year and 5 trips in 2002 for an average income of \$15,500 for that year.

The major change in working conditions was an increase in hours of work during watches. Before DAS, most scallopers worked watches of either eight hours on and eight hours off or six on and six off. When we interviewed crews in 2003 and 2004, most scallopers had increased work time to eight on and four off or 10 on and six off. The average hours of work per day went from 12 hours per day before DAS to 14 hours per day. More than half of the scalloper crews that we interviewed reported that their work increased by four hours per day since the start of DAS.

As with scallopers, fishermen on draggers worked more hours during their last trip before we interviewed them in 2003 and 2004 than before DAS. Watches for most draggers have increased from an average of eight hours on and four hours off (the old union rule) to nine on and three off. About 25% of the crews have retained the old watch of eight and four. In other words, most of the dragger crews added an extra two hours of work per day. Some dragger crews reported that they no longer keep watches but work continuously, taking short naps when exhausted.

It is beyond the scope of this report to estimate the effect of DAS on employment, income, and working conditions, because analyzing the pure effect of DAS would require separating the effects of DAS from other changes in regulations and from changes in stock sizes. Scalping, especially, was affected by allowing fishing in the closed areas and the general increase in stocks throughout both the closed and open areas.

These data support, however, the hypothesis that DAS caused more efficient patterns of fishing and longer watches.

After adjusting for inflation, the annual gross stock increased by 35% for the average scallop vessel, but gross stock per trip increased by 175% and net crew share (crew share after deducting operating costs) increased by 265%. For draggers, the average annual gross stock actually decreased by 7% after accounting for inflation, while gross stock per trip increased by 66% and net crew share increased by 86%.

The increase in work hours seems a negative effect from DAS regulations. Once again, it is beyond the scope of this report to separate the effects of DAS from the effects of other changes. It seems reasonable, however, and the data supports that limiting crew size in scalping and maximizing fishermen's income under limited DAS in dragging contributed to the increase in hours of work. Crews we spoke with talked about the importance of making DAS as productive as possible since they felt that their futures were so uncertain.

Two further comments temper the success of DAS as a fisheries management tool. While fishermen's income on draggers increased from 1993 to 2002, their income has probably declined since 2002. Amendment 13 reduced DAS for offshore draggers from 88 to 86, but complicated restrictions and requirements that led to unexpected outcomes that reduced the economic value of DAS, especially for B DAS. For example, vessels could target yellowtail flounder using B SAP DAS in the US/Canadian Transboundary Area. The total catch of these yellowtail was limited, however, encouraging vessel owners to take this allocation as quickly as possible. As a consequence, the price of yellowtail dropped sharply, reducing the economic benefit from this allocation of DAS.

Secondly, the decline in annual gross stock for draggers after adjusting for inflation suggests that the owners' net share has declined. While, on average, constant

operating costs per trip relative to increased gross stock increased net crew share, most of the boat owners' expenses are overhead costs, which would increase per trip as the number of trips decreased. More efficient fishing due to limiting DAS probably did not reduce these overhead costs.

Finally, the lack of data for crew made estimating employment and income very difficult. We made a number of assumptions that we think reasonable to estimate full-time and part-time employment, which carried over to our estimates of income, but these assumptions are a poor substitute for knowing who crew these vessels. Understanding the effects of fishery management on employment and income require, therefore, that either the Coast Guard or NMFS record crew members for every trip.

There is another reason to record crew members before vessels leave port. During the recent tragedy of the loss of the Northern Edge, many family members, and friends did not know if their loved ones were on the boat. This intolerable hardship should be corrected.

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