Profitability of the U.S. Northeast Fisheries, 1976-1986

Patricia A. Kurkul and Stanley D. H. Wang

Analytical Services Branch
Northeast Region
National Marine Fisheries Service
Gloucester, MA 01930

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I. Introduction

Northeast fisheries represent an important component of U.S. fisheries and have experienced many changes in recent history. Significant changes have occurred in management, regulations, fishing participation, and in abundance of fish stocks. These changes affect the performance of these fisheries, particularly the changes in management and regulations, e.g., International Commission for the Northwest Atlantic Fisheries (ICNAF), Magnusen Fisheries Conservation and Management Act of 1976 (MFCMA), and the 1984 USA - Canada boundry settlement of the Gulf of Maine. Therefore, it is important to review the performance of the Northeast fleets in view of these changes, and from a historical perspective, to assist in understanding these fisheries. For this purpose, a review of profitability and a discussion of some important factors affecting profitability are presented.

In this paper, the methodology used to generate profit data and a discussion of profit trends are presented in Section II. Some important factors are discussed in relation to profit trends in Section III. A tentative conclusion is finally drawn in the last section.

II. Profitability

A. Methodology

The information to follow on net vessel income and crew earnings was generated through the use of a computer based financial system developed at the National Marine Fisheries Service (NMFS). This model, originally developed in 1980-1982 and updated on an annual basis since, generates information on costs and earnings in the New England otter trawl and New Bedford scallop fleets.

Briefly, the development of this model involved first a compilation of data on vessel factor costs and effort, vessel characteristics, mortgages and on secondary price/cost data (i.e. fuel prices, etc.). From this, cost equations were estimated for the following; fuel, food, ice/water, insurance, gear, repair, supplies, and maintenance. These equations were supplemented with data on vessel operations, landings, revenue and vessel settlement systems. Finally, the information was combined in a computer model to generate estimates of costs, vessel income and crew earnings. The detailed methodology is presented in a document by Kurkul (1987).

In this study, net vessel income and net crew earnings are used as indicators of the profitability of these fisheries. Net vessel income, net income and vessel income are used interchangeably.

B. Net Vessel Income

Immediately following enactment of the MFCMA, in 1976-1978, net income per vessel in the New England otter trawl fishery increased in all vessel size classes in both nominal and deflated dollars. Thereafter, vessel income declined steadily for all vessel classes until 1985. There was some improvement in earnings in 1986 (Table 1), however, earnings were still significantly below those in 1976 and in the 1978 peak year. In real terms for example, 1986 earnings, were down by 78%, 75%, and 24% from 1976 in each of these three vessel classes, respectively.

Trends in net vessel income in the scallop fishery are similar to those evidenced by the otter trawl fishery (Table 1), however, declines in net income were even more pronounced for scallop dredge vessels than for otter trawl vessels. Between 1976 and 1986 scallop vessel income in real terms dropped by approximately 80% in each of the two tonnage classes.

C. Crew Earnings

Fluctuations in crew earnings follow a trend similar to vessel income (Table 2) since crew earnings, to a great degree, are tied to the gross earnings of the vessel (Table 2). However, the fluctuation in crew earnings in relation to vessel income has not been as dramatic and percentage declines in crew earnings were much smaller.

TABLE 1

NET INCOME BY GEAR AND TONNAGE CLASS (1)

OTTER TRAWLS - NEW ENGLAND

	CLASS I		CLASS II		CLASS III	
YEAR	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars
1976	21991	20785	31381	29661	36713	34700
1977	30120	26726	45897	40725	56020	49707
1978	41102	33885	55606	45842	81456	67153
1979	29703	22002	47632	35283	71522	52979
1980	22246	14511	17664	11523	45540	29706
1981	22902	13535	23348	13799	66140	39090
1982	17144	9551	36474	20320	62136	34616
1983	18050	9741	27993	15107	57943	31270
1984	8517	4408	13871	7180	39107	20242
1985	8494	4245	-2063	-1031	22032	11010
1986	9502	4658	15379	7539	54000	26471

SCALLOP DREDGE - NEW BEDFORD

	CLASS I		CLASS II		CLASS III	
YEAR	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars
1976	N.A.	N.A.	158150	149480	146581	138545
1977	N.A.	N.A.	126682	112406	111051	98537
1978	N.A.	N.A.	163879	135102	160912	132656
1979	N.A.	N.A.	153154	113447	159018	117791
1980	N.A.	N.A.	106032	69166	104787	68354
1981	N.A.	N.A.	106537	62965	118336	69939
1982	N.A.	N.A.	92396	51474	92864	51735
1983	N.A.	N.A.	79941	43141	109963	59343
1984	N.A.	N.A.	40329	20874	48959	25341
1985	N.A.	N.A.	20565	10277	3833	1916
1986	N.A.	N.A.	49084	24061	47838	23450

(1) Net income before depreciation, taxes, and miscellaneous costs.

N.A. = Not available.

CPI, 1975=100

Class I = 5 - 10 GRT
Class II = 51 - 150 GRT
Class III = 151+ GRT

Source: Chart and Statistical Book of the Northeast Fisheries, Analytical Services Branch, NMFS, Gloucester, MA (Research Document No. NER 88.1).

TABLE 2

AVERAGE NET CREW SHARE BY GEAR AND TONNAGE CLASS (1)

OTTER TRAWL - NEW ENGLAND

	CLASS I		CLASS II		CLASS III	
YEAR	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars
1976	13,552	12,809	18,028	17,040	16,240	15,350
1977	16,710	14,827	22,192	19,691	20,417	18,116
1978	24,898	20,526	25,027	20,632	27,269	22,481
1979	20,028	14,836	26,220	19,422	27,604	20,447
1980	17,317	11,296	20,560	13,412	23,518	15,341
1981	20,234	11,959	21,774	12,869	27,417	16,204
1982	17,672	9,845	25,988	14,478	28,326	15,780
1983	18,020	9,725	25,962	14,011	28,397	15,325
1984	17,258	8,933	24,506	12,684	30,272	15,669
1985	17,322	8,657	22,161	11,075	30,471	15,228
1986	18,265	8,953	25,933	12,712	35,908	17,602

SCALLOP DREDGE - NEW BEDFORD

	CLASS I		CLASS II		CLASS III	
YEAR	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars	Nominal Dollars	Real Dollars
1976	N.A.	N.A.	36,290	34,301	33,843	31,988
1977	N.A.	N.A.	32,441	28,785	26,451	23,470
1978	N.A.	N.A.	41,029	33,824	41,241	33,999
1979	N.A.	N.A.	40,791	30,216	38,509	28,525
1980	N.A.	N.A.	27,345	17,838	24,948	16,274
1981	N.A.	N.A.	25,349	14,982	26,655	15,754
1982	N.A.	N.A.	21,203	11,812	21,840	12,167
1983	N.A.	N.A.	24,193	13,056	29,799	16,081
1984	N.A.	N.A.	19,919	10,310	20,787	10,759
1985	N.A.	N.A.	16,810	8,401	16,255	8,123
1986	N.A.	N.A.	26,095	12,792	30,937	15,165

(1) The "crew" in net individual crew share does not include the captain.

N.A. Not available.

CPI, 1975=100.

Class I = 5 - 50 GRT
Class II = 51 - 150 GRT
Class III = 151 + GRT

Source: Chart and Statistical Book of the Northeast Fisheries, Analytical Services Branch, NMFS, Gloucester, MA (Research Document No. NER 88.1).

Decreases in crew earnings were much more dramatic in the scallop fleet than in the otter trawl fleet (Table 2). Between 1976 and 1986, otter trawl crew members on class II vessels, for example, experienced a decrease of only 25% from $17,040 to $12,712, whereas crew members on scallop vessels in the same class faced a loss in real earnings of almost 63% from $34,301 to $12,792.

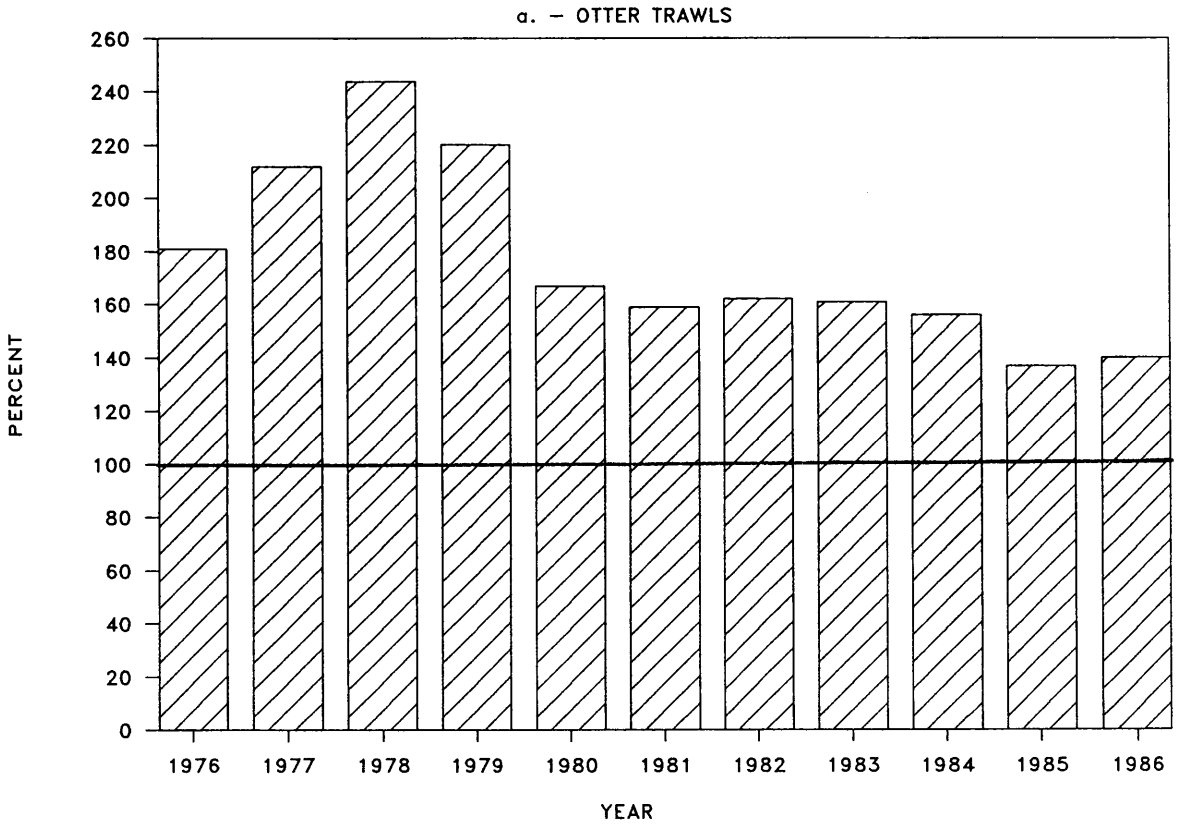
It is interesting to note that because earning in the scallop fishery were initially so much higher than in the otter trawl fishery, these large relative decreases left scallop crew members with earnings very close to those of the otter trawl vessels by 1986. For example, crew members on class II vessels earned $12,712 in the sea scallop fishery versus $12,792 in the otter trawl fishery in 1986.

A comparison of crew earnings with that of New England manufacturing workers' earnings reveals that, on average, otter trawl crew members earned more than manufacturing workers during this time period, ranging from 40% more in 1985 to 144% more in 1978 (Figure 1.a). Scallop vessel crew members earned from 10% less in 1985 to 281% more in 1978 (Figure 1.b).

III. Factors Impacting on Profitability

Net revenue is gross revenue minus cost, and gross revenue is a function of landings and prices. Therefore, the three major areas that should be examined when analyzing trends in profitability are: landings (productivity of inputs), price (of

CREW VS. MANUFACTURING WORKER EARNINGS



outputs), and cost (price of inputs). This section examines each of these areas and identifies the variables which may impact upon profitability.

A. Landings

1. Otter Trawl Fishery

Table 3 summarizes information on landings and effort in the otter trawl fishery. Briefly, the number of vessels increased steadily until 1984 but decreased in 1985 and again in 1986. At its 1984 peak, there were 397 more vessels fishing than in 1976, representing an increase of 67%. Interestingly, 1984 was a year when vessels suffered major decreases in real net earnings, especially the smaller tonnage vessels (Table 1). This appears to have impacted on the number of vessels in the fleet and by 1986 there was a net decrease from 1984 of 122 vessels.

Total New England landings steadily increased from 244 million pounds in 1976 to 372 million in 1982 then declined thereafter. By 1986, landings were 261 million pounds, the second lowest during this period (Table 3). As a result of incompatible growth in the otter trawl fleet,landings per vessel declined steadily from 1978 through 1986 (Table 3). This pattern of landings per vessel is highly correlated with that of net income as shown in Table 1, indicating numbers of vessels and landings are major factors responsible for the net income trend.

TABLE 3

NEW ENGLAND OTTER TRAWLS

YEAR	NUMBER VESSELS	LANDINGS (MILL)	POUNDS/ VESSEL (000's)
1976	590	243.8	413.3
1977	594	281.8	474.5
1978	625	302.4	483.8
1979	757	316.8	418.5
1980	846	339.5	401.3
1981	890	330.8	371.7
1982	975	373.6	383.2
1983	984	366.2	372.2
1984	987	333.4	337.8
1985	938	295.7	315.3
1986	865	261.4	302.1

Source: New England Otter Trawl and Scallop Industry Trends, ASB, NMFS, NER, 1986.

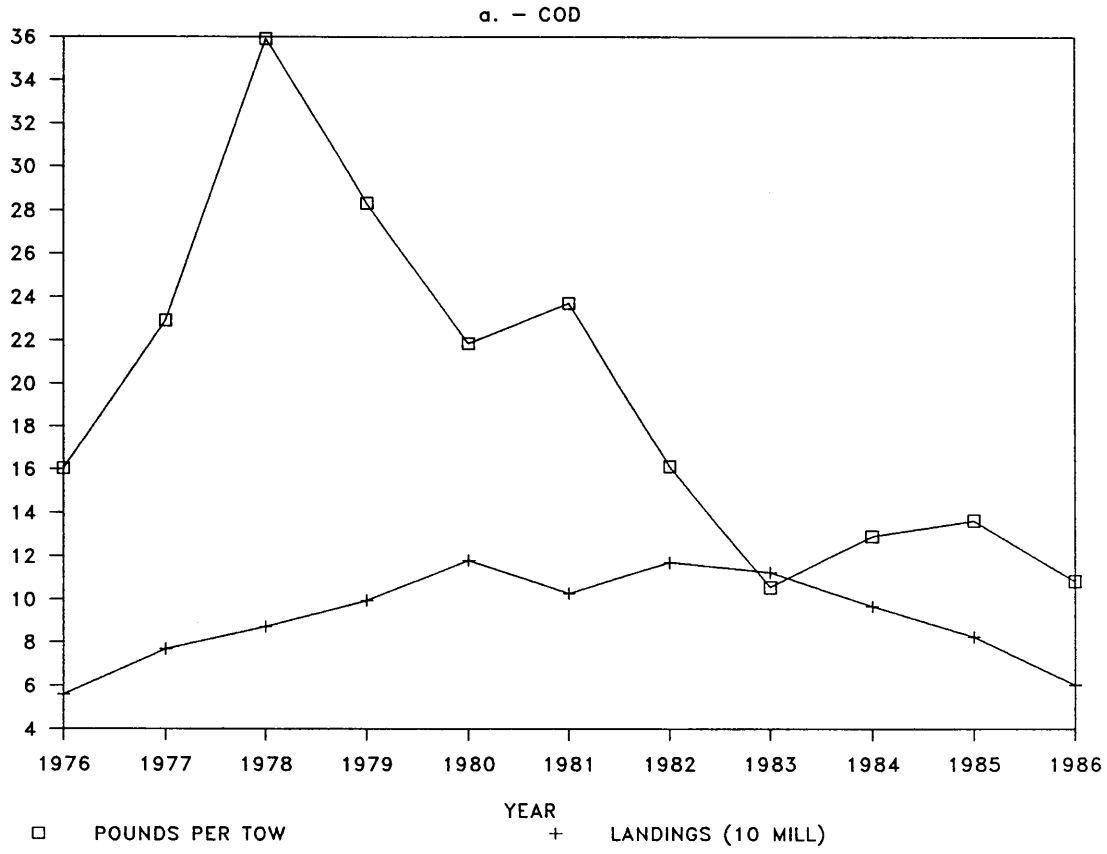
Further, the boundry settlement in October 1984 may be responsible for further declines in landings during 1985-1986. The boundry settlement resulted in transfering the Northeast Peak, one of Georges Bank's richest portions, to Canada. The U.S. loss in landings due to the settlement was estimated to be approximately 8% of total landings to the major New England ports (Wang et al 1985).

To add an additional piece to the puzzle on landing, information is presented comparing abundance of three major species making up the groundfish complex; cod, haddock, and yellowtail flounder (Figures 2a-c). There was a generally increasing trend in abundance and landings of these species during the earlier post-MFCMA period. After that, landings begin to gradually decline with abundance dropping off sharply. While landings continue to decline, abundance of these fish stocks seem to have stabilized somewhat since 1983-1984. These notable fluctuations in abundance and landings and fleet sizes go far toward explaining the fluctuations in landings per vessel over this time period.

2. Scallop Fishery

The number of vessels fishing for scallops in New England more than tripled between 1976 and 1980 (Table 4). In this same period, real net vessel income in the two vessel tonnage classes decreased by about 50% (Table 1), and average landings per vessel decreased by about 40% (Table 4). Unlike net income, however,

FIGURE 2
TRAWL SURVEY ESTIMATES AND LANDINGS



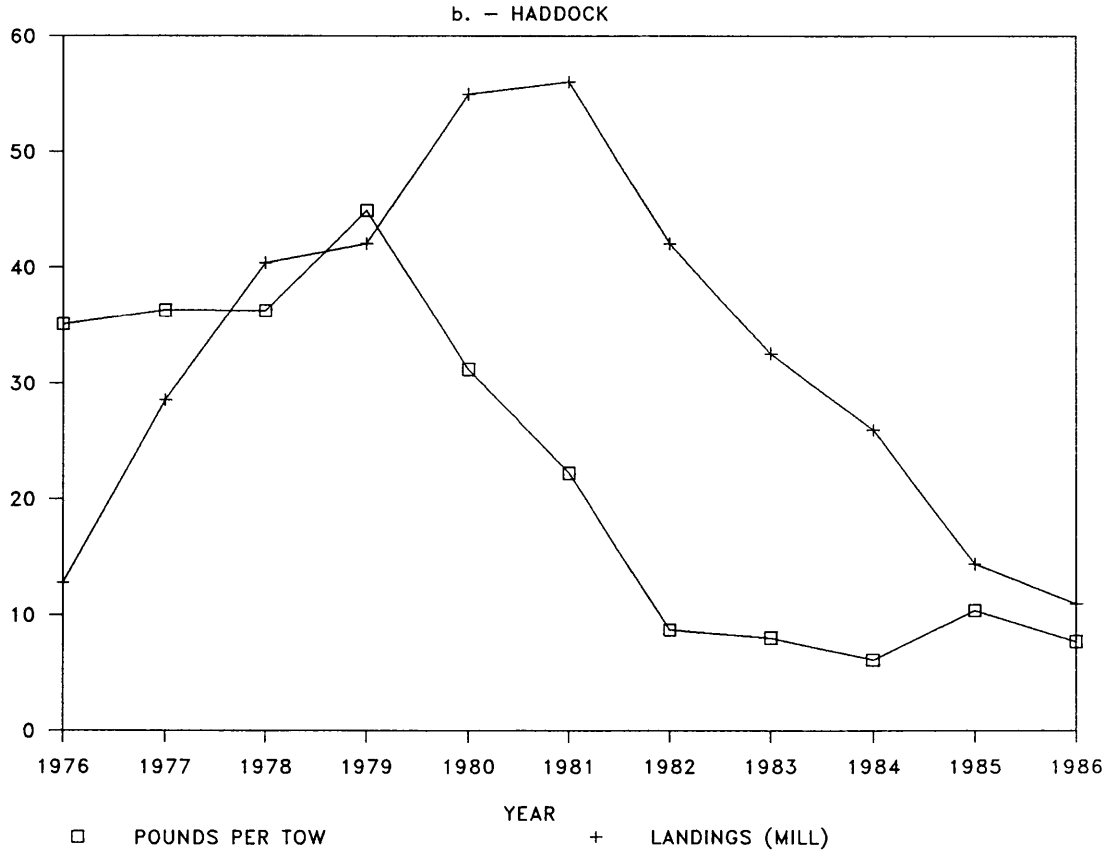


FIGURE 2
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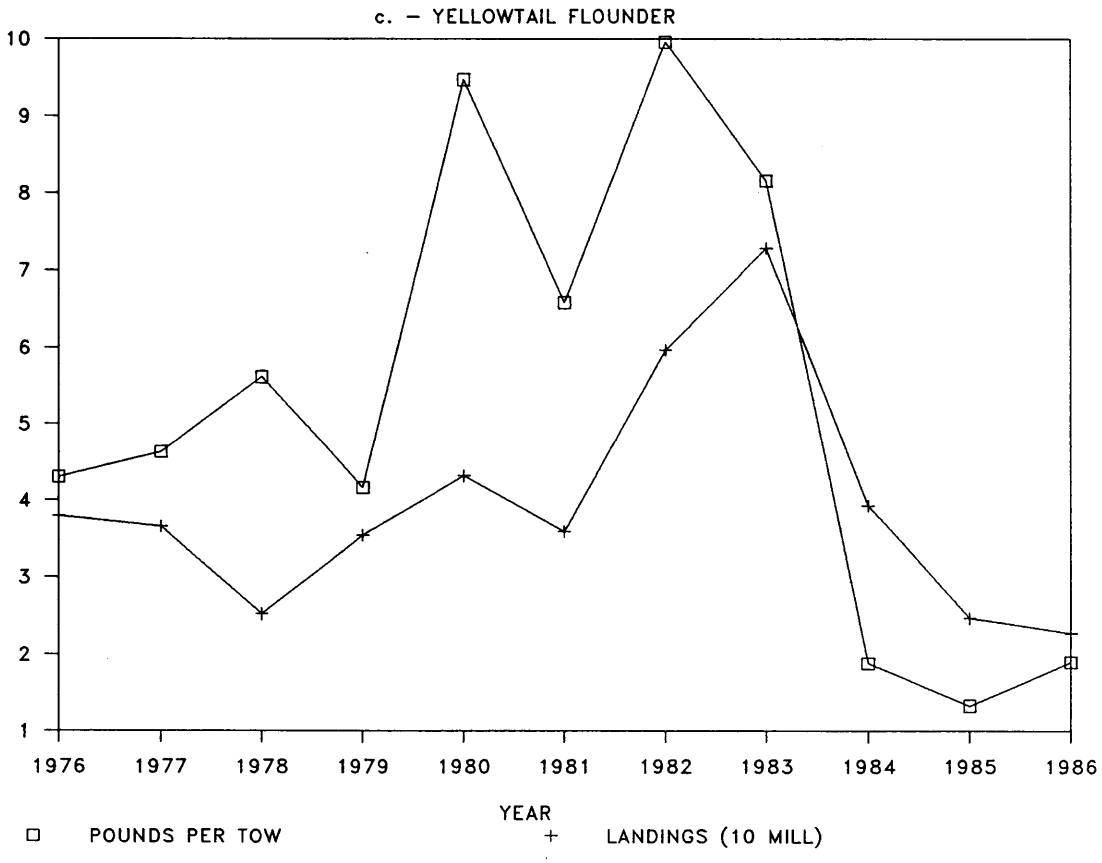


TABLE 4

NEW ENGLAND SCALLOPERS

YEAR	NUMBER VESSELS	LANDINGS (MILL)	POUNDS/ VESSEL
1976	84	10.4	124379
1977	154	15.8	102827
1978	133	16.5	123927
1979	199	17.1	85752
1980	266	18.7	70163
1981	259	19.5	75411
1982	172	15.8	91982
1983	190	14.5	76099
1984	177	10.6	59706
1985	142	10.1	71130
1986	115	12.9	111888

Source: New England Otter Trawl and Scallop Industry Trends, ASB, NMFS, NER, 1986.

the trend in landings per vessel began to stabilize to some extent in the 1981-1985 period although landings per day absent continues downward. On average these vessels were fishing 45 more days in 1985 to land less than half what they landed in 1976. Declining productivity means higher cost per unit of effort. This and widely fluctuating changes in prices, have played a major role in the profitability of this fishery. These will be discussed in more detail in a later section.

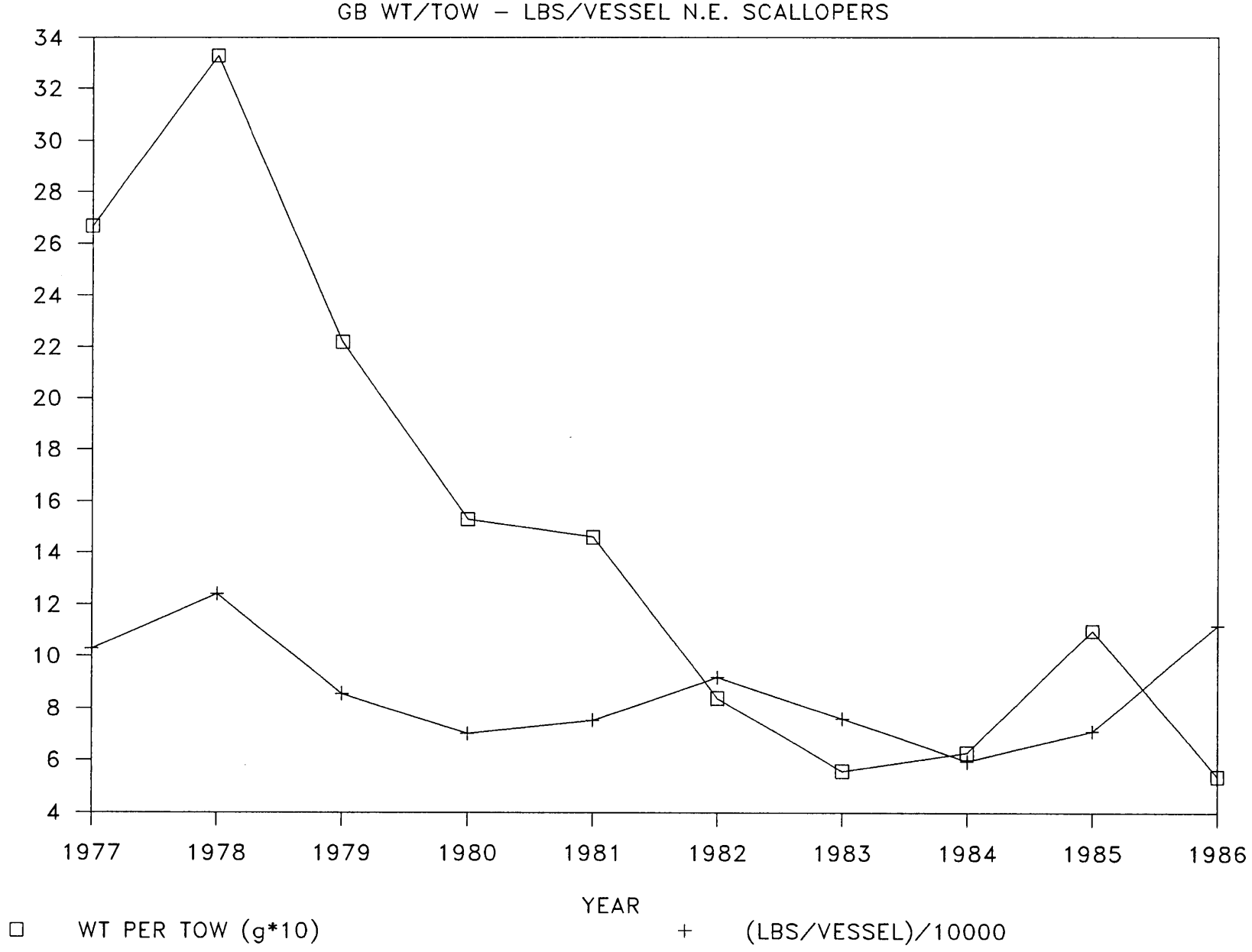
In 1986, there was substantial improvement in these vessels landings, productivity, and as shown, resulting net vessel income. The number of vessels in this fishery was down to 1976-1977 levels and correspondingly, landings per vessel were up to those of the same time period.

Abundance had also played a large role in this decline in landings per vessel. Abundance (mean wt per tow) peaked in 1978 and declined steadily until 1983 (Figure 3) (Serchuk and Wigley, 1986). Pounds per vessel also peaking in 1978 and was at its lowest in 1984. Again, like abundance, it began to increase in 1985. This reversal of the trend also coincides with the decrease in the number of vessels in the fleet in 1984-1986, and by 1986 landings per vessel had begun to increase despite a drop in abundance in that year.

C. Prices

1. Ex-vessel Prices of the Otter Trawl Fishery

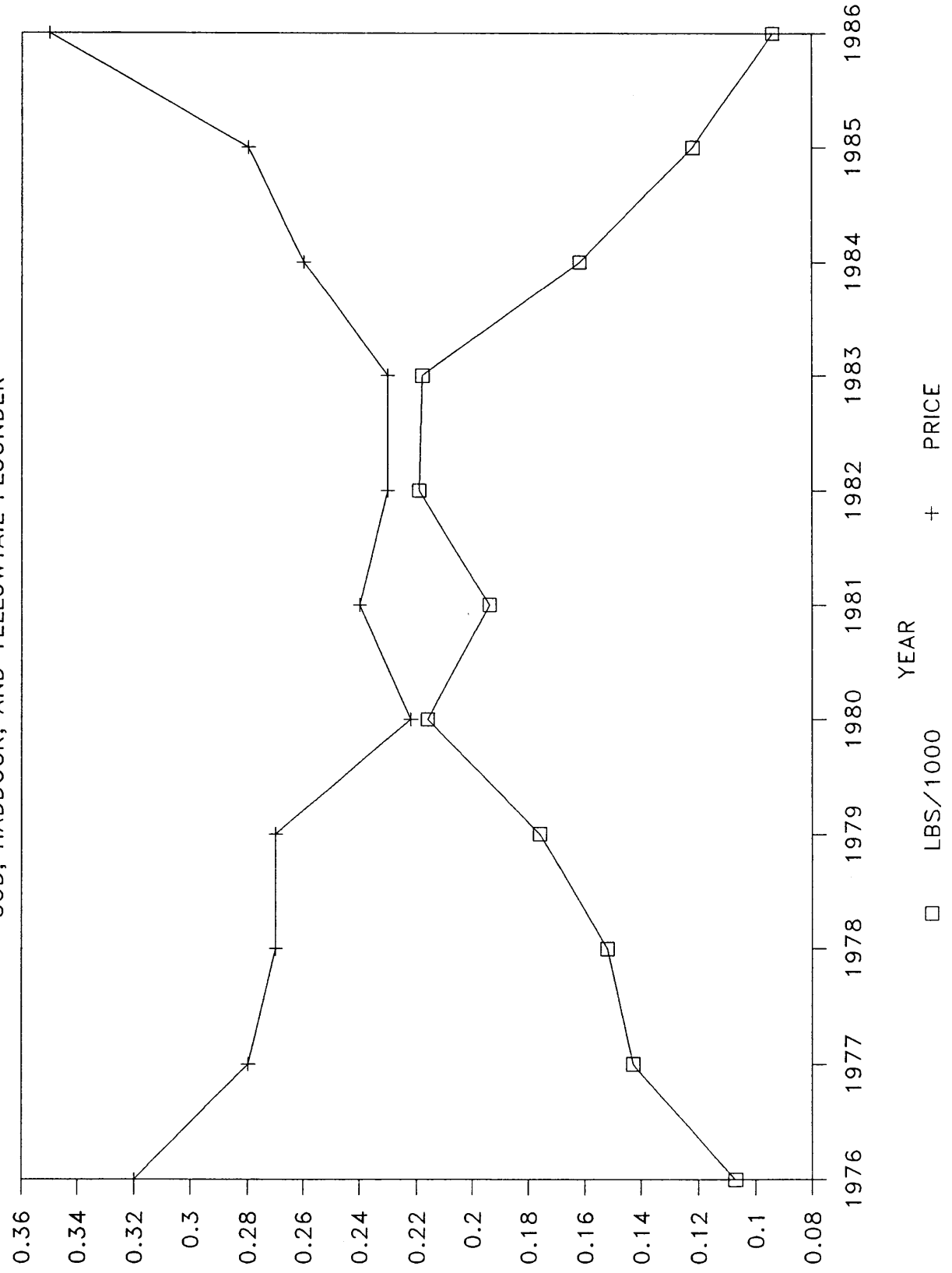
FIGURE 3: MEAN WT/TOW - LANDINGS/VESSEL



Several empirical studies of the U.S. groundfish market found that U.S. landings, imports, income and other factors are important in determining the ex-vessel prices of species caught by the otter trawl fleet (Crutchfield 1985, Felixson et al 1987, Wang 1984, Wang and Chou 1986). For example, ex-vessel price flexibilities of cod, haddock and yellowtail flounder were approximately -0.50 with respect to landings of these species; -0.10 to -0.50 with respect to other landings of groundfish; -0.01 to -0.10 with respect to fresh fish imports; and +0.30 with respect to income. (Wang 1984, and Wang and Chou 1986). Therefore, variation in landings can explain only part of the price variation. Fluctuations of imports and income, and changes in consumer attitudes most likely also explain part of the price variation. However, the relationship between landings and prices for cod, haddock and yellowtail flounder indicate that the price variation is almost totally explained by the variation in landings (Figure 4). This suggests that other factors play no role in the price determination which is inconsistance with the empirical findings.

U.S. income and population have steadily increased over time and these alone should have generated a higher demand and an upward price trend. Further, the Omega III excitement in the early 1980's should have reinforced the income and population effects on the upward price trend. Nevertheless, an upward price trend net of the price effect of landings is not observed, and may have been offset by other factors.

FIGURE 4:TOTAL LANDINGS - AVERAGE PRICE



Our investigation of trends in imports of fresh groundfish reveals that a drastic increase in imports during the period could have offset an upward trend. For example, U.S. imports of fresh whole groundfish increased by 610% from 13 million pounds in 1976 to approximately 96 million pounds in 1986. Imports of fresh groundfish fillets increased by 350% from 7.5 million to 34 million pounds. Therefore, these increases in imports may be part of the reason for depressed prices and revenues and low profits in the otter trawl fisheries.

2. Ex-vessel Price of Sea Scallops

According to Edwards (1981) and Wang et al (1986), landings, imports, income and prices of substitute goods, among others, are major factors in determining the ex-vessel price of sea scallops. For example, findings show that a 1% increase in landing would lead to a 0.36% decrease in prices; that each 100,000 pounds of imports from Canada depressed the price $0.03 per pound; and that a 1% increase in income or the price of king crab would force the price up by 0.80% and 0.37%, respectively.

During the period from 1976 to 1986, the ex-vessel price in real terms generally rises, despite price decreases in 1981-1982 and 1984-1986 (Table 5). The upward price trend is reflective of increases in income and the price of king crab and should benefit the profitability of the sea scallop fleet. However, the more recent downward trend in prices in 1984-1986 would not have a

TABLE 5

SEA SCALLOP EX-VESSEL PRICES, LANDINGS AND IMPORTS

YEAR	EX-VESSEL PRICE/LB REAL $	LANDINGS MILLIONS POUNDS	IMPORTS (1) MILLIONS POUNDS
1976	1.69	18.48	25.25
1977	1.45	25.17	29.79
1978	2.05	30.18	28.37
1979	2.45	29.65	25.16
1980	2.52	27.3	20.89
1981	2.41	25.83	26.23
1982	2.08	19.94	20.86
1983	3.04	19.21	34.28
1984	2.86	17.02	27.27
1985	2.41	14.94	42.04
1986	2.44	18.06	47.92

(1) Fresh and Frozen.

CPI, 1975=100.

positive effect on profits. This downward trend is clearly attributable to a big jump in scallop imports to 30-40 million pounds from 20-30 million pounds.

U.S. landings peaked at 30 million pounds in 1978 and steadily declined by half to 15 million pounds by 1985 and then recovered slightly to 18 million in 1986. This landings trend predominated the revenue trend and the trends in net vessel income and crew earnings. This indicates that the upward price trend discussed above was not high enough to offset the landings trend and reverse the downward trend in revenues and profits. Therefore, it is our conclusion that the poor profitability of the sea scallop fleet in recent years is, in part, attributable to both low landings and high imports. It should also be pointed out that landings are a function of numbers of vessels and abundance, as discussed in the preceeding section.

D. Costs

Table 6 presents information on selected indices of expenses, nominal and real. Real total costs have actually decreased since 1976 by 17% for the otter trawl vessels and by 35% for the scallop fleet. Recent increases in vessel insurance costs seem to have been offset by decreases in vessel fuel costs (Kurkul and Terrill, 1986). Fuel expenses peaked around 1981-1982 and have been declining ever since. Conversely, insurance costs increased in the 1984-1986 period. Fuel, however, has historically

TABLE 6

INDICIES OF SELECTED COST PER VESSEL

NEW ENGLAND OTTER TRAWLS

	FUEL & OIL		INSURANCE		TOTAL COSTS	
YEAR	NOMINAL	REAL	NOMINAL	REAL	NOMINAL	REAL
1976	100	100	100	100	100	100
1977	123	116	102	96	114	107
1978	131	114	105	91	124	108
1979	178	139	103	81	136	107
1980	268	185	106	73	160	111
1981	347	217	107	67	188	118
1982	332	195	106	63	188	111
1983	296	169	109	62	184	105
1984	270	148	167	91	187	102
1985	235	124	213	113	178	94
1986	158	82	191	99	160	83

NEW BEDFORD SCALLOPERS

	FUEL & OIL		INSURANCE		TOTAL COSTS	
YEAR	NOMINAL	REAL	NOMINAL	REAL	NOMINAL	REAL
1976	100	100	100	100	100	100
1977	102	96	107	100	93	87
1978	111	97	121	106	115	101
1979	168	132	139	109	127	99
1980	235	163	148	102	125	86
1981	302	189	156	98	143	90
1982	310	182	170	100	143	84
1983	271	155	177	101	144	82
1984	240	132	284	156	134	73
1985	230	121	405	214	136	72
1986	169	88	216	112	126	65

CPI, 1975=100.

Source: Chart and Statistical Book of the Northeast Fisheries, Analytical Services Branch, NMFS, Gloucester, MA, (Research Document No. NER 88.1).

commanded a larger share of total expenses. As a result, decreases in fuel prices have been a large factor in offsetting increases in other vessel expenses.

These trends in expenses undoubtedly contributed to the erosion of net income in the 1980-1983 period, but perhaps more importantly, do not seem to be a strong contributing factor to the recent financial condition of these fleets.

IV. Conclusion

The U.S. Northeast fisheries have experienced many changes in recent history. It is therefore important to review the performance of these fisheries, in view of historical changes, to assist in understanding these fisheries. A review of the financial performance of the New England otter trawl and scallop fleets is presented in this paper.

Immediately following enactment of the MFCMA, in 1976-1978, the New England otter trawl and scallop fleets enjoyed some prosperity. However, the prosperity was short-lived. Vessel income and crew earnings increased during 1976-1978, declined steadily thereafter until 1985, and then improved slightly in 1986. Even though there was an improvement in 1986, both the income and the earnings were signifantly below the levels experienced by the fleets in the 1976 base year and in the 1978 peak year.

Two factors which were found to be responsible for the short-lived prosperity in 1976-1978, were: (1) a general increase in abundance of fish stocks, and (2) the withdrawal of most foreign fishing on Georges Bank under the MFCMA. Factors possibly responsible for declines in income and earnings during 1978-1985 include: (1) increases in numbers of vessels in the fisheries, (2) decreases in abundance of fish stocks during the period, (3) loss of the Northeast Peak of Georges Bank to Canada in the boundary decision by the World Court in 1984, and (4) substantial increases in fish imports.

While most of these negative factors continue to work against the financial performance beyond the 1978-1985 period, a decreasing trend in numbers of vessels in the fisheries and a slight leveling off in the trend in abundance were two factors accountable for the 1986 improvement. It must be noted also that positive factors such as increases in both real income and population, and the Omega III excitement in early 1980's, were working during the entire period. Nevertheless, positive factors have been outweighed by negative factors since 1978. As a result, the prosperity of these fleets failed to last beyond 1978. Finally, cost factors may have been accountable for part of the poor financial performance during the early period but did not play a big role in the later period beginning around 1984.

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