Woods Hole Oceanographic Institution

THE NEW ENGLAND FISHING INDUSTRY:
A BASIS FOR MANAGEMENT

by

Leah J. Smith
and
Susan B. Peterson

August 1977

TECHNICAL REPORT

Prepared with funds from the Pew Memorial Trust and by the Department of Commerce, NOAA Office of Sea Grant under Grants 04-5-158-8 and 04-6-158-44106, and the Institution's Marine Policy and Ocean Management Program.

WOODS HOLE, MASSACHUSETTS 02543

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Approved for Distribution Robert W. Morse

Dr. Robert W. Morse
Associate Director and Dean of
Graduate Studies

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PREFACE

This research was supported by the Marine Policy and Ocean Management Program at the Woods Hole Oceanographic Institution and funded by Sea Grant, National Oceanic and Atmospheric Administration, Department of Commerce, Grant No. 04-6-158-44016 and 04-6-158-44106. We are grateful to Ann Martin for all of her help in preparing this manuscript, and to Kaleroy Hatzikon and Lynda Davis for typing it. Spencer Apollonio, Joel Dirlam, Courtland Smith, Michael Orbach, Richard Hennemuth, Robert Edwards and Lauriston King offered criticism and support, both of which were appreciated. We are grateful to all of the fishing industry members with whom we spoke, but attribute none of our follies to their information. We hope this effort will contribute to successful fishery management in New England.

CHAPTER I - INTRODUCTION

Fish and fishermen appear to be in a serious decline in New England. The haddock are overfished, inshore herring stocks are depleted, yellowtail flounder and lobster are scarce. The popular image is of grizzled fishermen, their boats chipped, scarred, old-fashioned hulks of wood tied up two and three abreast along the rotting wharves and piers of New England's depressed port towns. In this research project we wanted to determine the state of the New England fishing industry and to propose acceptable methods for the management of the fishery.

During our early discussions with fishing industry people we mentioned that we were interested in limited effort programs as they might be applied to New England fishermen. We carefully, and probably tediously, explained the "theory of limited effort" and we were generally thought to be daft. We were told we had things backwards--that the fishing industry needed more fish, more men, more boats - and that the way to accomplish this was to get a 200-mile fishing limit and kick the foreigners out.

One of these wishes has come true - in the spring of 1976, P.L. 94-265 established a 200-mile fishing zone off the United States, with regional management councils to make management plans and allocate the resources first to United States fishermen, with surpluses to foreign fishermen.

To consider methods of distributing scarce resources among a large number of fishermen spread out along New England's coast, we decided to concentrate on the possibility of limited effort programs. We began by studying the fisheries management methods of Japan, South Africa, Norway, Great Britain, British Columbia, Alaska, Washington, and other places, programs briefly discussed in Chapter IV. At the same time we collected the information available about the New England "industry". "Hard data" is as scarce as haddock in the early 70's.* The New England information we compiled and collected is found in Chapters II and III. A profile of vessel characteristics by port is in Table I.1.

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* A number of studies aimed at specific parts of the fishery have provided some hard data, but it is usually not in a form which makes possible comparisons and generalizations within New England. See: J.M. Acheson, 1972. Territories of the Lobstermen. Natural History 81:60-69; J.M. Acheson, 1975. The Lobster Feifs: Economics and the Ecological Effects of Territoriality. Human Ecology 3 (3); F.P. Bowles, 1973. Natural Regulation of an Island Fishing Community. Unpublished Ph.D. dissertation, Harvard University; R.J. Marshall Jr., 1973. Emotive Commitment to Fishing: A Sociological Exploration of Three New England Fishing Communities. Unpublished thesis, University of Rhode Island; National Marine Fisheries Service, Fishery Statistics of the U.S., various years; V. Norton and M.M. Miller, 1966. An Economic Study of the Boston Large-Trawler Labor Force, Bureau of Commercial Fisheries Circular 248, U.S. Department of the Interior, Fish and Wildlife Service; J.J. Poggie Jr. and C. Gersuny, 1974. Fishermen of Galilee, Sea Grant Marine Bulletin 17, University of Rhode Island; J.J. Poggie Jr. and C. Gersuny, 1972. Risk and Ritual: An Interpretation of Fishermen's Folklore in a New England Community. Journal of American Folklore 85: 66-72; J. Wilson, 1977. The Effects of Tariffs on Imported Fishing Gear and Equipment, Unpublished manuscript, University of Maine.

Table I.1

OFFSHORE FISHING VESSELS IN NEW ENGLAND-1976

PORT	NUMBER OF VESSELS	AV. LENGTH	AV. HP	AV. YR BUILT	AV. NO. CREW
Massachusetts					
Boston	29	80 (24)	477 (337)	1960 (11)	7 (3)
Cape Cod	129	49 (20)	207 (126)	1945 (21)	3 (2)
Gloucester	134	60 (21)	277 (160)	1948 (16)	4 (2)
Menemsha	16	50 (12)	219 (137)	1950 (16)	3 (2)
New Bedford	156	64 (25)	368 (224)	1953 (20)	5 (3)
Rhode Island					
Newport	74	57 (26)	262 (149)	1949 (23)	3 (2)
Point Judith	69	52 (20)	234 (135)	1951 (20)	3 (2)
Maine					
Portland	56	62 (36)	272 (197)	1951 (16)	3 (2)
Rockland	27	57 (34)	314 (269)	1951 (26)	2 (2)

Figures in parentheses denote Standard Deviation

Note: The statistic on average year built does not reflect the addition of many steel vessels that came to New England from the Gulf and South Atlantic fisheries in 1976 and 1977. Vessels are listed according to the port in which they land most fish even though they may also land fish in other ports.

Source: NMFS statistics

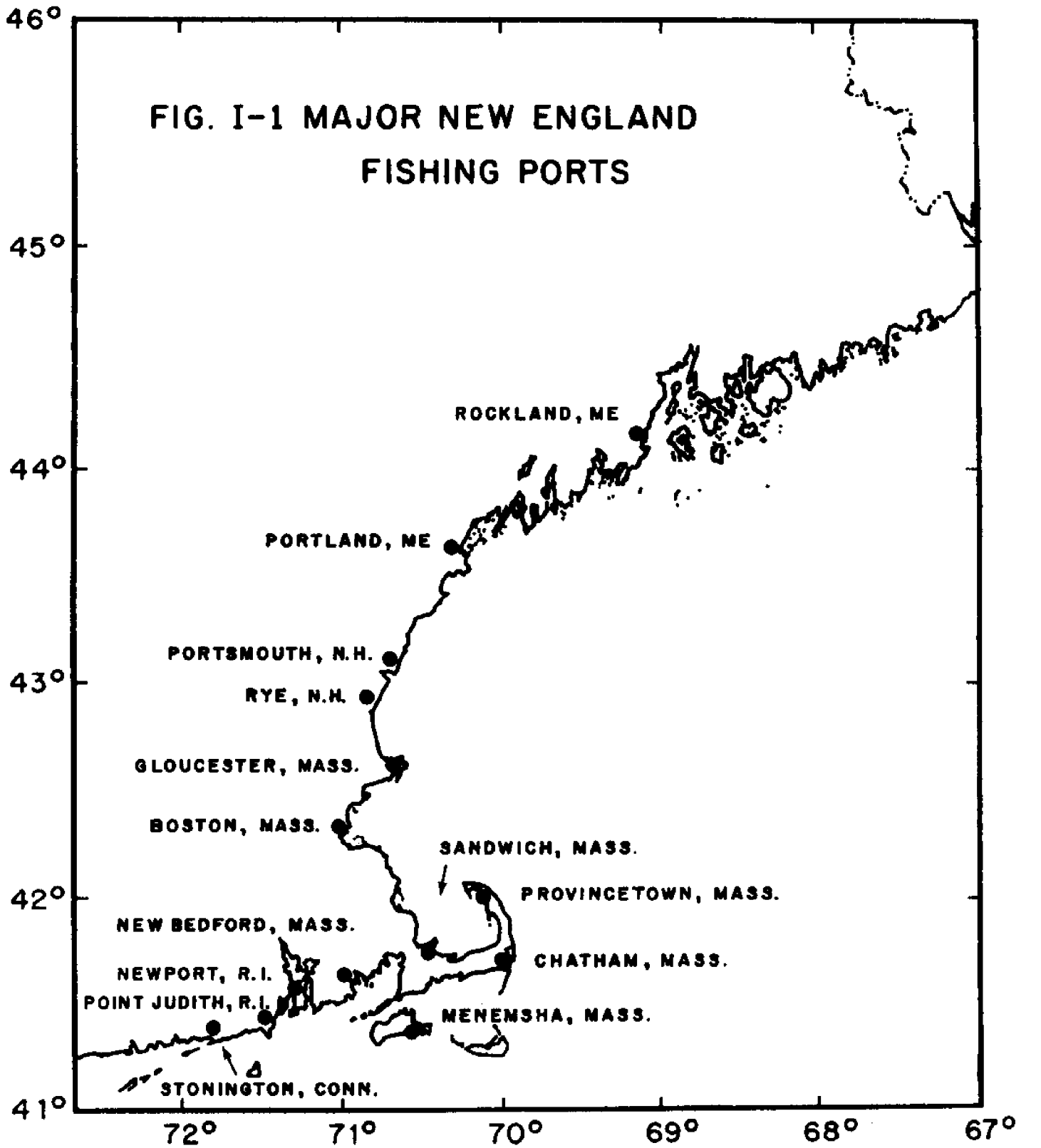


FIG. I-1 MAJOR NEW ENGLAND FISHING PORTS
46°
45°
44°
43°
42°
41°
72°
71°
70°
69°
68°
67°
ROCKLAND, ME
PORTLAND, ME
PORTSMOUTH, N.H.
RYE, N.H.
GLOUCESTER, MASS.
BOSTON, MASS.
SANDWICH, MASS.
PROVINCETOWN, MASS.
NEW BEDFORD, MASS.
CHATHAM, MASS.
NEWPORT, R.I.
POINT JUDITH, R.I.
MENEMSHA, MASS.
STONINGTON, CONN.

Chapters II and III are organized by port. (See Figure I.1) The major ports considered are: Gloucester, Boston and New Bedford, Massachusetts. A special interest in the social and economic systems in New Bedford started the research for this project on all New England's major ports, so more information is given for New Bedford than for any of the other ports. There are many interesting aspects of the New Bedford fleet which illustrate management problems for all of New England. Despite its large value of landings, Point Judith differs from the major ports in several ways and so is grouped with the smaller ports. Other ports which land a smaller volume of offshore fish are Rockland and Portland, Maine; Rye, New Hampshire; Provincetown, Chatham, and Menemsha, Mass.; Newport, Rhode Island; Stonington, Connecticut. Table I.2 shows volume and value of landing for these areas.

Chapter IV summarizes limited entry and limited effort management plans, and Chapter V discusses them as they might be applied to New England. We conclude that most existing limited entry plans require far more information than we have about cultural, social and economic characteristics of the fishing industry. Furthermore, the diversity among New England fishermen would make regulation of their behavior along uniform lines socially unacceptable and expensive to administer. We have not recommended any type of limited entry for New England because we feel that a necessary first step is to begin to collect adequate data. Therefore we recommend that a uniform licensing system be established for all of New England which would require reporting

Table I.2

NEW ENGLAND PORTS: COMMERCIAL LANDINGS

1975

PORT	POUNDS (1000)	DOLLARS (1000)
Massachusetts	269,952	78,470
Boston	24,468	6,262
Gloucester	126,419	14,504
New Bedford	68,640	31,283
Rhode Island	79,337	18,788
Newport	16,925	7,654
Pt. Judith	54,310	6,482
Maine	138,359	48,493
Portland	30,184	n.a.
Rockland	11,360*	n.a.
Connecticut	7,238	2,635
New Hampshire	2,597	1,306

*Ground fish and redfish only

Source: NMFS Yearbook of Fishery Statistics

information on effort, gear, location as well as investment, income attributable to fishing, and some other economic and social characteristics.

Of course, by suggesting that limited entry not be considered until more data is available, we can be criticized for being short-sighted. The demand for limited entry from the industry is growing in those fisheries heavily overfished, such as yellowtail, haddock and lobster; but in those fisheries limiting entry would affect individual fishermen now in the fishery. Some would have to leave the fishery, and those forced to leave would have fair grounds for complaint since we lack the data to write a good limited entry plan. However, it may be worth while to plan for the future, building limited entry plans for fisheries not yet overfished, setting up regulations which shape the expansion of the fishery. Management plans established now with conservation, social and economic goals to mold future expansion might help overcome the immediate objections from parts of the industry to limited entry. The diversity within New England remains a problem not easily solved; greater homogeneity in the industry may not be a reasonable goal. The following description illustrates the general problems more specifically discussed in later chapters.

Despite the recent decline in popular species, the New England fishing industry remains substantial and diverse. It encompasses a range of vessels from small, one-man lobster boats to 140-foot trawlers with crews of 13 men. Thousands of boats fish within three miles off shore, but that area is state controlled under the 1953 Submerged Lands Act. These inshore and nearshore fisheries are important to the economies of the coastal states, and these fishing efforts have measurable effects on the fish population, but a study of their efforts with an eye to management would have to take many problems into account. First, these inshore and nearshore fishermen frequently fish seasonally, and change fisheries or remove themselves entirely from fishing at short notice. They fish out of rather small boats which have greater mobility, speed and more diverse uses than their offshore counterparts. The volumes of fish caught are small enough to be trucked or hauled from one potential buyer to the next by the fishermen themselves. Finally, there are thousands of them, working independent of one another, and they are hard to find. To plan any stringent management scheme we would have to know more about these fishermen.

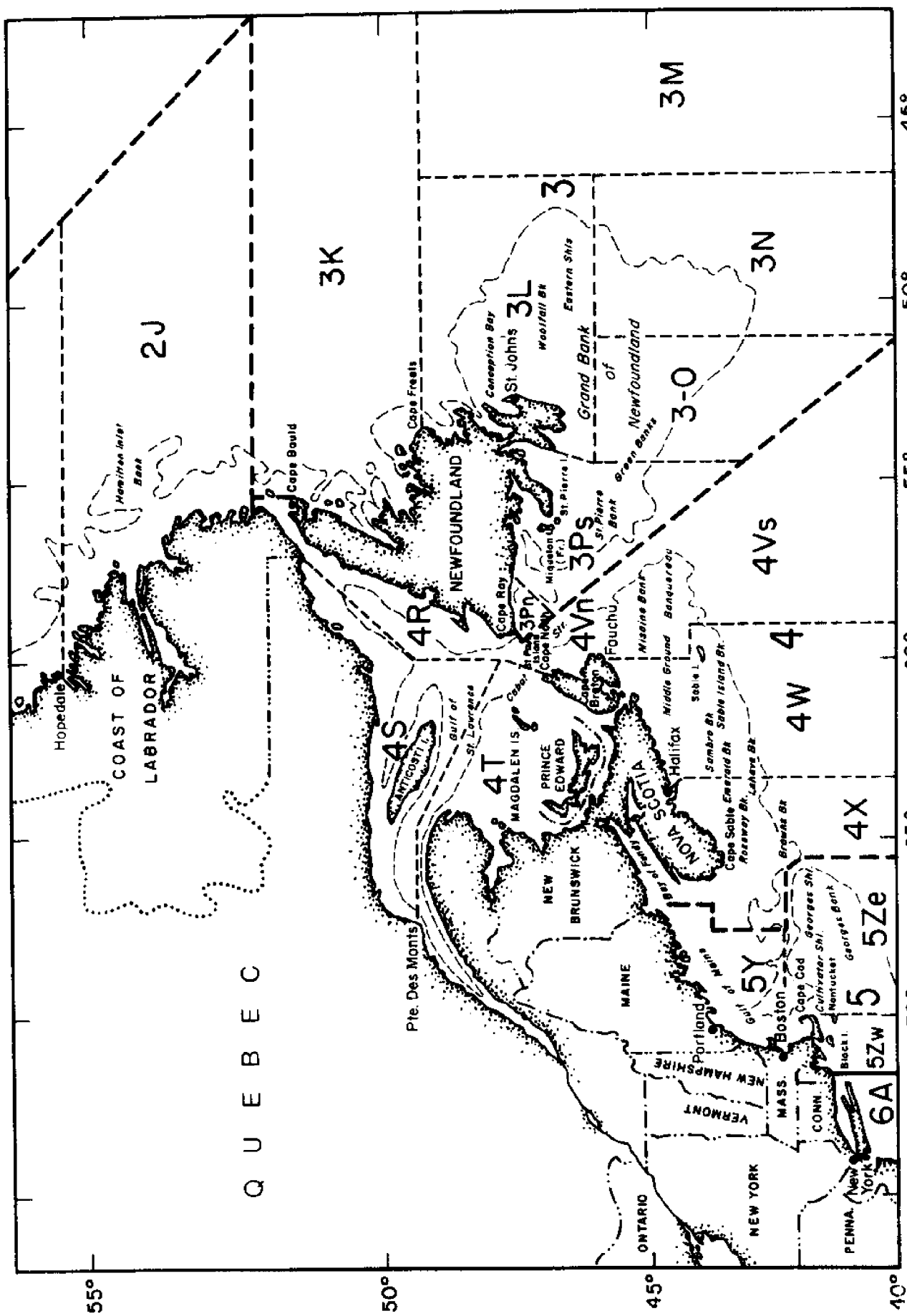
In this report we have limited ourselves to the offshore fishermen, who fish predominantly outside the 12-mile contiguous fishing zone. These fishermen use vessels large enough to survive the waters of the Northwest Atlantic - usually boats more than 50 feet long and 40 gross tons. These boats fish in

30 to 40 meters of water and employ such gear as otter trawls, purse seines, long lines and dredges. Offshore lobster fishing also takes place in this area; however, only fin fishing and scalloping are discussed here. For the most part, we limited our interviews to owners/skippers who had ground fish certificates to fish in the ICNAF (International Commission for the Northwest Atlantic Fisheries) areas. (See Figure I.2) Boats fishing nearshore (from approximately three to 20 miles from the coast) are included when they land fish in the major ports.

Descriptions of the New England fishing fleet in the last several years have varied according to the purpose of the speaker or writer. The fleet has been downgraded in order to attract financial support from government, upgraded to get lower interest and insurance rates from industry, romanticized as the "First Industry" for Bicentennial purposes, praised for the independence of spirit and action it embodies for America's young men, and mourned for its precipitous decline. The New England fishing industry, however, does not lend itself to such generalizations.

Until recently fishing vessels built for New England fishing were wooden side-trawlers of a design used all over the Northern Atlantic. Variations in the vessels were in rigging, location and size of engine and winch, design of the working space, living space and fish hold. But even in these areas, the variation was minimal. Until stern trawlers were introduced in the late 60's, vessel design did not make any

FIG. I-2 FISHING AREAS FOR THE INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES



gross difference in fishing methods off the New England coast. Even the differences which did exist were not as important as changes brought about by the electronic gear introduced after World War II. Loran navigation systems and fish scopes enabled the fishermen to locate and return to prime fishing grounds to explore new areas with more confidence.

The greatest variations have been in the men themselves: their motivation for fishing, past experiences with gear and fishing grounds, and the alternatives they perceived for catching and selling fish. While the vessel provides the basic tool of this trade, the capabilities of the men can differ so much that three to four times the volume of fish landed by one skipper can be landed by another using a similar boat and gear. The communities from which these men come, local support for the industry, and its special dependence on weather and season are important to an understanding of the way the industry functions. Almost all fishermen operate as independent business men or women, with loans from local banks based on available collateral and their skill and success at fishing. Although most of the people to whom we spoke were captains and/or owners of vessels, the crew members also make a difference - their age, relationship to or with the captain/owner, past experience, and the fact that they are paid on a share system rather than a flat rate or fixed salary. (See Table I.3).

Finally, we consider the fish processing part of the

Table I.3

NEW ENGLAND PORTS: LABOR FORCE CHARACTERISTICS FOR OFFSHORE FISHERMEN

PORTS	NUMBER OF FULL-TIME FISHERMEN	UNION, COOP. NONE	APPROX. AV. AGE	MAJOR ETHNIC GROUPS
MASS.				
Boston	100	Union & Nonunion	55	Yankee, Portuguese
Chatham	60-80	Coop.	45	Yankee
Gloucester	500	Union & Nonunion	45	Italian, Yankee
Menemsha	30	None	40	Yankee
New Bedford	400	Union	43	Yankee, Norwegian Canadian, Portuguese
Provincetown	150-200	Coop & Nonunion	40	Yankee
RHODE ISLAND				
Newport	80	Union & Nonunion	45	Yankee, Portuguese Italian
Pt. Judith	120	Coop.	40	Yankee, Norwegian
MAINE				
Portland	150	None	40	Yankee
Rockland	80	None	40	Yankee
CONNECTICUT				
Stonington	45	None	50	Yankee
NEW HAMPSHIRE				
Rye	20	None	40	Yankee

Source: Interviews

industry. Because fishermen bring in only those kinds of fish they are able to sell, the immediate buyers, who often also process the fish, have a great influence on the fishing industry. They affect the species sought, handling and storing procedures and length of trip. There are basically two groups of processors in New England: those who process fresh fish brought in by the region's fishermen, and those who process imported frozen blocks of fish fillets. Only the former are discussed here, although the existence of frozen block-processed products and imported fresh fish exerts a constant competitive force on the New England market. The fresh fish processors obtain fish through auctions, through direct sale from the vessel owne and crew, through sales mediated by fisheries cooperatives, and through wholesalers who buy on consignment.

Until 1963, New England fishermen had little competition from foreign fleets in the waters off the United States. Canadian fishermen caught a small amount of groundfish on Georges Bank and participated in the scallop fishery, and the Spanish and Portuguese had fished off Georges as long ago as 1685, but these efforts did not constitute significant competition for the United States fleet. In 1961, the arrival of the Russians, fishing for herring and hake, heralded a new era in foreign competition for the New England fisheries. The Russians were soon joined by fishermen from Poland, Rumania, France, Japan, German Democratic Republic, Federal Republic of Germany, Italy, Norway, Denmark, Iceland, United Kingdom, Bulgaria

and, more recently, Cuba. The expansion of foreign fishing is graphically traced by the ICNAF sightings of foreign vessels (see Table I.4). The ICNAF regulation of foreign and American fishing in the area has effectively limited the volume of fish caught since 1974. The quota system began in October 1973, but enforcement did not become effective until 1975. Table I.5 shows the total United States and foreign catch from 1961-1976.

The foreign fleets have influenced the operation of the New England fleets primarily by reducing stocks of many popular species. Although recent quotas have eliminated directed foreign catch of the most overfished species (haddock and yellowtail flounder), foreign fleets had taken vast quantities of these species in the late 1960's and continue to catch them as a by-catch of other directed fisheries. Particularly destructive to certain stocks was the "pulse fishing" technique in which a fleet concentrated fishing effort on a single species, fishing it intensively until the search for that species became unprofitable. Recovery of stocks in areas subjected to pulse fishing has been estimated to require five to 15 years. However, recovery time varies from one species to the next, so it is still difficult to summarize the effects of pulse fishing on many stocks of fish. Many of the stocks are interdependent, and the results of pulse fishing on related stocks has yet to be fully determined.

Table I.4 Metric Tons of Fish Landed by Individual Countries Fishing in the Northwest Atlantic (ICNAF Sub-Area 5) between 1961 & 1976

COUNTRY / YEAR	BULGARIA	CANADA	CUBA	DENMARK	FRANCE	FRG W.GERMANY	GDR E.GERMANY	ICELAND	ITALY	JAPAN	NORWAY	POLAND	ROMANIA	SPAIN	USSR	UK	USA	TOTAL
1961	--	39206	--	--	--	--	--	--	--	--	140	--	--	--	68521	--	381291	489158
1962	--	54975	--	--	--	--	--	--	--	--	--	535	--	--	209370	--	427769	692649
1963	--	70206	--	--	--	--	--	--	--	--	--	--	--	--	230832	--	412555	713593
1964	--	75178	--	--	--	--	--	--	--	--	299	723	--	22	335930	1050	342520	755722
1965	--	68046	--	--	--	--	--	--	--	--	--	4543	--	69	500686	--	313494	886838
1966	--	84496	--	--	--	--	--	--	--	--	--	16103	--	9531	456358	111	294326	860925
1967	--	80619	--	--	--	28288	--	--	--	--	--	41264	1766	16250	267924	24	273980	710115
1968	--	99674	--	--	53	71097	--	292	--	--	--	80025	2892	18016	281954	--	280991	834994
1969	--	60493	--	--	5	73833	--	12786	--	--	1224	56408	621	15526	380196	--	262570	863662
1970	--	47353	--	--	--	92441	--	--	--	10723	--	101740	2720	8163	166201	--	257680	687021
1971	--	69789	--	--	--	58340	--	--	--	15340	--	123689	5026	9403	292754	--	246107	820448
1972	20525	52141	1557	260	506	32449	79449	--	--	12539	29	113850	2798	13918	407352	--	201157	938530
1973	29327	52097	--	--	3206	35650	126725	--	--	10718	--	170299	1196	17376	390180	--	226022	1062796
1974	7909	62060	--	--	3832	26760	43944	--	1339	13885	--	89491	3701	15480	299078	666	238269	806414
1975	15854	75786	4056	60	2978	25202	58129	--	565	7055	1	70799	1803	7331	268087	--	253688	791394
1976	531	88209	10555	17	1222	14224	11787	--	67	10451	--	50521	2204	5719	159781	--	290221	645509

Source: ICNAF Statistical Bulletin

TABLE I.5

FISH CATCH FROM GEORGES BANK 1961 - 76

IN THOUSAND OF METRIC TONS

	TOTAL	U.S.	OTHER COUNTRIES
1961	343	274	69
1962	534	317	217
1963	586	329	257
1964	759	370	389
1965	919	348	571
1966	935	274	661
1967	723	260	463
1968	841	183	658
1969	943	163	780
1970	785	158	627
1971	1058	149	909
1972	939	202	737
1973	1063	191	872
1974	924	195	729
1975	850	220	630
1976	750	230	520

(From ICNAF Redbook 1973 Part I p. 10 and 1974 pp. 94,95)

The foreign fleet employs gear similar to that of the United States fishing industry, but on a much larger scale; trawlers are often more than 400 feet long. Large foreign fishing vessels have 2000 to 5000 horsepower engines while typical United States vessels have about 500 horsepower. The large engines move the giant foreign vessels rapidly over long distances and allow them to fish with very large nets. Trawl doors on foreign vessels may weigh as much as 10,000 pounds, five times the weight of typical United States gear.

The effects of this influx of foreign effort on the New England fishermen were dramatic. New England fishermen objected to the presence of foreign fleets off their coast because they depleted the stocks of fish, and caught those fish most valuable to American fishermen, although in many cases the catches of haddock and yellowtail flounder were incidental to the directed foreign fisheries. Foreign fleets often operate in groups, totally occupying a single rich area so that the United States fishermen are effectively excluded from that part of the ocean. Although ICNAF commissioners determined both direct and incidental catch of each species when setting allowable catch figures for foreign fleets, many Americans felt the incidental catch, or by-catch, was larger than it should be for many species, especially since the by-catch was made up of fish highly valued by Americans. Thus, the United States fishermen felt that foreign fishermen were catching "their fish" - those popular, high-priced species - despite the new ICNAF quotas intended to restrict these catches.

The voices of those fishermen were heard by the press, the public and by Congress, and the resulting "200 mile bill" does effectively limit the foreign fishermen spatially and by species. However, the legislation also allows for more strigent restrictions of American fisherman than ever before.

CHAPTER II. MAJOR NEW ENGLAND PORTS

II.1 CHARACTERISTICS OF MAJOR PORTS

Three Massachusetts cities - Boston, New Bedford and Gloucester - are important ports in the Northeastern United States. The catch for these three ports is 44 percent of the New England volume, and many people are employed in fishing and processing; also, prices determined in these ports affect the prices of fresh fish throughout the region.

A unique factor distinguishes many of the fishermen in these ports; they are represented by organized labor, unlike the fishermen in smaller ports throughout the region. The Atlantic Fishermen's Union and the New Bedford Fishermen's Union, locals of the Seafarer's International Union of North America, Atlantic,Gulf, Lakes and Inland Waters District, AFL-CIO, represent about a thousand men. The records kept by the unions are probably the best source of information on the range of earnings for each man and each vessel. Fluctuations in earnings, illnesses (type and duration), changing costs for fuel, food, materials, all are found in their records, as are basic social indicators for the members. Of course, these records are confidential; any summary information would have to be volunteered by the union officers. This information would be useful to the New England Regional Fisheries Management Council as it plans management programs for the fishing industry, especially if the council wishes to include social factors in its decisions.

The number of fishermen in the unions has declined since the mid-1950's, but so have the over-all number of fishermen and the volume of fish. The unions represent the captain, cook and deck hands in all negotiations with boat owners. The contracts state conditions under which the men will work, duties, benefits and method of pay.

There are several share systems commonly used throughout New England to allocate a share of the proceeds to each man. A thorough discussion of the share system or lay system can be found in Holmsen (1972), and the economic theory underpinning the system is explained in Sutinen (1977). These share systems are formally written in the contracts for the unionized fishermen but similar share systems are used throughout the region.* The system used on vessels without union contracts is usually not written down - it is understood by the men and put into operation by the bookkeepers or settlement houses which handle the distribution of earnings. In smaller ports without these professional financial aides, the owner/captain's payments are in cash. The share system states what costs come out of the gross revenues, subtracts them, and then divides the remainder between the boat (meaning owner or owners) and the crew. From the total crew share, a number of expenses are then subtracted before it is divided among crew members. A

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* See for example Master Contract between the New Bedford Fishermen's Union and the Seafood Producer's Association, June 17, 1967.

50/50 lay would mean 50 percent to the boat, 50 percent to the crew, while 40/60 would give 40 percent to the boat and 60 percent to the crew. Identifying which expenses are to be subtracted from the total and which from the crew share depends on the convention in each port.

The fact that fishermen are paid by share rather than a fixed salary or hourly wage has several implications for the industry as a whole. For example, crew may be resistant to change in fishing gear or fishing grounds because the cost of learning is absorbed by all of them rather than by the captain or owner interested in instituting a change. Also since fewer men on a vessel receive a larger share of the total income, any plan to increase employment in the industry would have to consider individual losses of income. Plans to limit effort by requiring archaic gear and therefore more men is also to the disadvantage of the crew. Share systems usually are advantageous to the owner because he assumes men will not be careless with gear or time for which they pay.

The discussion below describes the fishing industry in the three major ports of Massachusetts, comparing and contrasting the fishermen, vessels, methods, processing capability and technology. The next chapter contains descriptions of other New England ports which make a substantial contribution to the volume of fish landed in New England. This data was collected from interviews by Susan Peterson during 1974-76 and by Leah Smith in 1975-76. Fishermen, processors, gear

suppliers, dry-dock operators, etc. were interviewed. Data collected from published sources is referenced accordingly. There was no vigorous sampling design for interviewing fishermen, but all fresh fish processors were approached with a request for an interview. A small portion declined.

II.2 BOSTON

Boston Fishermen

Although at one time Boston was an important port because of its fishing boats and fishermen, the emphasis here has now shifted to wholesale fish businesses. Although the offshore fishing boats using Boston harbor are for the most part modern, efficient, steel stern trawlers built as bottom trawlers for cod and haddock, there are now less than fifteen boats which regularly land fish in Boston from offshore, in contrast to the more than one hundred offshore boats which fished out of this harbor thirty years ago. Former Boston boats now fish out of Portland, New Bedford and Stonington. We do not know what happened to the men who fished on them. Figures II.1 and II.2 and Table II.1 describe the present Boston fleet. Several of these are Gloucester boats - boats which return to Gloucester after unloading their catches. Although the new steel vessels have space for thirteen to fifteen crew, most of them are now fishing with nine or fewer men on board. Most of the men are older - in their fifties and sixties according to union officials - with only a few younger men

Figure II.1 Distribution of Boston Vessels by Length

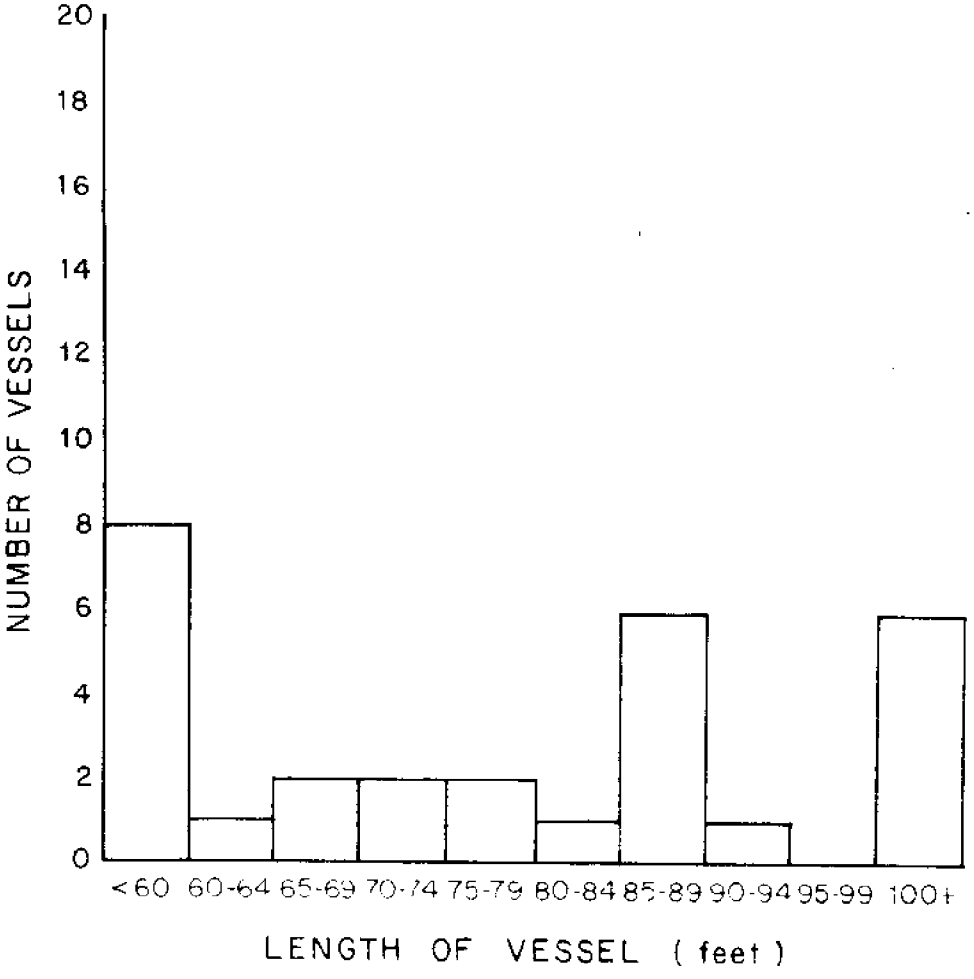

Figure II.2 Distribution of Boston Vessels by Age

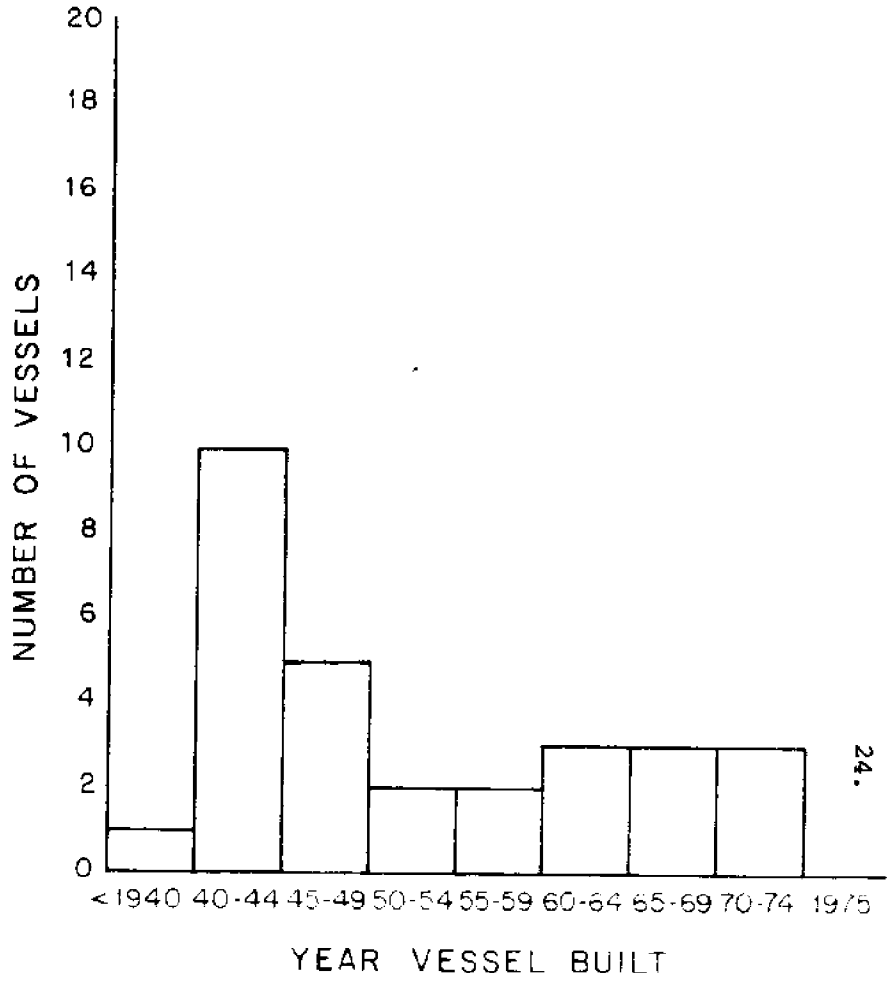

Table II.1
Fishing Vessels Operating Out of Boston in 1976
Year Built and Hull Type

Steel	1					2	2	3	
Wood		10	5	2	2	1	1		
Year Built	1935 - 1939	1940 - 1944	1945 - 1949	1950 - 1954	1955 - 1959	1960 - 1969	1965 - 1969	1970 - 1974	1975 - 1976

working as deck hands. No generalization about ethnic groups can be made; there seemed to be a little of everything. In contrast to the other New England ports, several of these Boston vessels are owned by corporations - groups of investors who took advantage of the federal boat building subsidies available ten years ago. These vessels make trips lasting seven to ten days, and occasionally fifteen days, looking mainly for cod, haddock and pollock. None of them fish near shore. All fish on Georges Bank, Browns Bank, and sometimes on the Grand Banks; all are capable of fishing beyond the U.S. 200-mile economic zone. (See Figure I.2) Several smaller, older draggers fish the nearshore areas around Boston harbor and land fish in Boston. They occasionally fish offshore when weather permits and when the price of fish is high enough to justify the additional travel time.

Several reasons for the decline in the Boston fishing fleet have been discussed over the years. Some attribute the decline in the number of boats to the poor condition of

the harbor, the piers and the unloading facilities. Others hypothesize that the demands of fishermen's unions for more benefits and shorter hours forced many boat owners to move to other ports where the unions were not well-established. (Boston fishermen belong to the Atlantic Fishermen's Union or the New Bedford Fishermen's Union). Many fishermen left Boston to go to other ports because they objected to the Boston auction system; they felt it denied them the best prices and caused inconvenience in unloading fish and getting paid after the weighout. Finally, it has been suggested that the men who fished out of Boston did not introduce their sons and nephews to the occupation in the same way their counterparts have in Gloucester, perhaps because Boston offered more diverse jobs than Gloucester. Thus as the men grew older and retired there was no one to take their places. As it is, many of the "sites" - positions - on Boston boats are filled with men from all over New England who come to Boston because they can't get sites in their own ports. In other New England ports there is much competition among men who do not want to leave their home port.

As the number of vessels landing fish declined in Boston, there was a dramatic rise in the proportion of fish processed and brokered by Boston wholesalers which they bought from ports outside Boston and outside Massachusetts. The change in processors' sources has decreased the demand for fresh fish landed in Boston itself. The history of the Boston fishing

fleet is discussed in several works (Norton and Miller, 1966; Boeri and Gibson, 1976).

It is difficult to imagine the development of a public policy that could limit the fishing effort from Boston area fishermen any more effectively than have the combined forces of physical deterioration of the port, high costs and wages and scarcity of fish over the last twenty years. The questions that should be raised for the Boston fishing industry are: What directions should the port take? Should it be a re-distribution center for fishery products, or a landing port for large volumes of fresh and/or frozen fish? How can re-cruitment of able men and vessels be assured? At this time it would be easier to administer a management plan for Boston than for other ports because there are so few fishermen and vessels, they make long trips, and they land their catch at the Fish Pier.

Boston's Auction System

The fresh fish brought into Boston in fishing boats is sold at auction in the Fish Exchange, built in 1920, at the end of the Commercial Fish Pier. The auction is held five days per week from 7:00 to 7:15 A.M. The names of the vessels and their contents, listed by species, size-range within the species, and weight for each category, are listed on a large blackboard to one side of the auction room. The auctioneers stand on a raised platform in the center of the room and sell the items - 2,000 lbs of market size cod, 1,600 lbs of pollock,

23,500 lbs of scrod cod, etc., item by item to the highest bidder. Although quality affects price, scarcity is the more important consideration. The buyers own fish houses along the fish pier or at the nearby New England Seafood Center. When all of the fish is sold, vessels are unloaded by lumpers, who pile the fish into large hand trucks, each holding four to five hundred pounds, and cart it to the facility of the man who bought it. All work is done by hand with the exception of the boat's winch, which is used to bring the fish out of the hold in canvas buckets, eighty to a hundred pounds of fish and ice at a time. The fish is packed into wooden crates and stored in the cold room or put directly on the cutting line. Some buyers do little if any processing, so their fish is either resold to buyers on the fish pier for cutting, or boxed and shipped to New York or New Bedford. This cuts down their labor expenses, and, in several instances, the need to maintain modern facilities. Once the boats are emptied of fish, they are washed and refueled. The captain then goes to settle - to collect the money earned from that fishing trip for himself and his crew. Boston fishermen are paid the same day their fish is unloaded. Payments are made under a variety of share systems. (See Holmsen, 1972).

Boston Processors

The phenomenon of growing processing industry, despite declining fresh fish landings, depends on importation of fish from other sources. Some Boston wholesalers take fresh fish

from Boston, other New England ports and Canada to cut and clean for the fresh market. Others import frozen blocks of fish or fish packed in brine from foreign countries. The latter group of wholesalers will not be analyzed in this report.

The eighteen Boston wholesalers of fresh fish are located on the old Commercial Fish Pier and in the New England Seafood Center on Atlantic Avenue.* Many of these companies are over a hundred years old and have weathered drastic changes in the fortunes of the port and the fish business in general. Those that survive have had to make many adjustments in their products and methods of operation as the years have passed. Of course, many companies have had changes in ownership and/or management. The youngest Boston fish processing firm is twelve years old; all the firms now operating have experienced dramatic declines in domestic catch volume that followed the build-up of foreign fleets on Georges Bank in the late 1960's. The average (mean) age of these firms is fifty-one years. The median age is thirty years.

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* This data was collected by personal interviews during 1975-6. The processors in Boston are: Abramo Fish Co. Inc., Avenue Fish Co. Inc., Blue Sea Fish Co., Channel Fish Co., D & F Fish Corp., F.E. Harding Co., Globe Fish Co., Great Atlantic Fish Corp., G.P. Hale Co., John Nagle & Co., New England Fillet Co. Inc., Pier Fish Co. Inc., A.F. Rich & Co., Rite Foods Inc., Sea Frost Fish Co. Inc., Seaside Fisheries Inc., Super Snooty Sea Foods Corp., Bart Tribuna Inc. We would like to thank all those interviewed for their cooperation.

The economic characteristics, management strategies, sources of fish supply, and the distribution of the final products are described for these firms. One reason for the change in the sources of fish supply over the past twenty years is illustrated in Table II.2 which shows the annual volume of fish landed in Boston from 1950 to 1976.

The processing industry is resilient; although Boston employment in fish harvesting dropped by half between 1970 and 1974, in the same period processing employment declined by only 17 percent. Local economic performance over the same period was better; total Boston employment (covered by the Division of Employment Security) increased 13 percent. Fishing-related employment is less than 1 percent of the total Boston industrial employment, so it is not a large factor in the local employment picture.

The fresh fish wholesalers of Boston employ from six to thirty-five people each, and have an annual production ranging from approximately 750 thousand to 15 million pounds. The averages for all seventeen companies are 16 employees and 3.8 million pounds per year. The Boston firms are much smaller than those in New Bedford (See Section II.3). Some firms have substantial seasonal variations in employment, but most run at about the same level year round. In terms of pounds processed per employee per year, there is some evidence of economies of scale; firms with more employees process more pounds of fish per employee per year (See Figure II.3:

Table II.2
Boston - Fish and Shellfish Landings

	Pounds	Dollars
1950	172,033,356	13,556,525
1951	171,022,954	14,310,547
1952	173,173,955	14,343,776
1953	152,226,097	12,102,390
1954	151,378,432	10,787,725
1955	136,691,447	9,225,815
1956	147,401,771	10,544,663
1957	135,071,634	11,176,824
1958	123,764,194	12,633,889
1959	113,257,023	11,250,520
1960	110,384,347	9,627,143
1961	117,028,913	9,555,037
1962	117,592,482	10,490,807
1963	107,154,660	10,809,494
1964	107,535,793	10,290,970
1965	103,630,336	11,643,936
1966	89,695,364	10,746,121
1967	77,925,766	9,616,066
1968	59,986,148	7,963,452
1969	46,128,081	6,968,478
1970	31,879,807	5,793,785
1971	31,438,939	5,925,470
1972	23,505,261	5,022,182
1973	26,473,718	5,625,590
1974	28,073,398	5,885,529
1975	24,463,038	6,256,272
1976	23,320,000	6,753,000

Source: Massachusetts Landings. Current Fisheries Statistics. NOAA/NMFS. Various years.

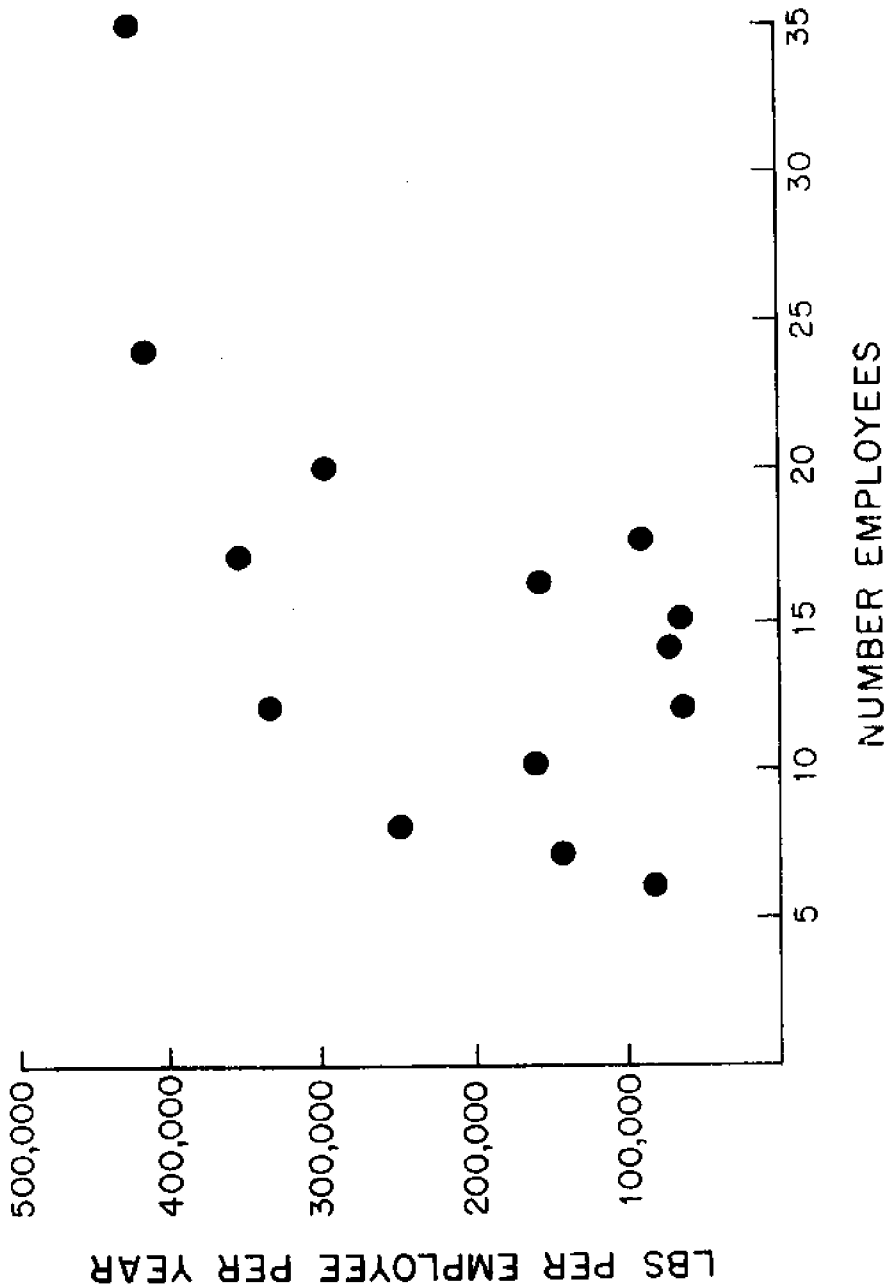

Figure II.3 Boston Processors: Economies of Scale

Spearmen rank correlation = .52,significant at .05 level). This measure is not very reliable, however, since the companies have different types of operations and markets. A firm that specializes in filleting a few popular species of fish and sells to other wholesalers and retailers is likely to have higher productivity than one that cuts custom ordered portions from a wide variety of fish for restaurants and institutions.

There is substantial variation in degree of specialization among these firms. Although cod and haddock have been the traditionally preferred species in Boston, recent declines in these stocks have forced all processors into some diversity in what they handle. About one-third handle just about anything, buying frozen products to supply customer needs or importing fillets from Canada, salmon from the West Coast when needed; the other two-thirds handle primarily the popular species of finfish - cod, haddock, flounder, swordfish, tuna, pollock, perch, halibut, mackerel - and only occasionally deal in shellfish or other species.

Part of the fish supply for the Boston processors comes from Boston through the auction and some directly from boats, but much of the fish comes from other ports in New England - New Bedford, Provincetown, Gloucester, Chatham and all of rural Maine. Canada is another important source of fresh fish, especially in the winter. The Canadian fish was not an important part of the supply until the big decline in New England

catch in the late 1960's. In fact, several buyers said they would have gone out of business had it not been for the Canadian fish that kept them going. The amount of fish trucked from Canada by the individual firms varies from zero to 50 percent in winter, less in summer. As a year-round average, firms derive about twenty-five percent of their fish from Canada.

Distribution of the product is very wide. Most companies ship fish all over the country - not only to the East Coast, but to the Midwest, California, Texas and Arizona. The local and regional distribution is by truck; more distant market orders are shipped by air. About one-third of the processors have mainly local markets.

Most of the wholesalers will sell retail at the plant if someone comes to them, but the majority of their fish goes to other wholesalers and retailers. Many sell to chain stores; only four firms sell most of their products to restaurants and institutions.

None of the firms maintains a separate retail market, although one closed such an outlet recently. In fact, the only evidence of any vertical integration is that a few companies own trucks for local delivery. Some firms do perform multiple functions as processors, wholesalers, brokers and retailers, but these activities are carried out in a single plant facility.

Expectations about future expansion of fresh-fish processing in Boston are generally cautious. Owners are concerned about

the fate of the facilities on the fish pier. The Massport Authority is considering renovating the pier area or moving the processing facilities altogether. Most processors doubt that the 200-mile limit will have an immediate impact, although many feel it will eventually increase the supply of fresh fish landed in New England.

Although the average firm is operating at about 85 percent of desired capacity in terms of number of employees, almost none have immediate plans for an expansion to handle more local fish. Most of them are waiting to see a larger steady supply of fish before they will expand operations. Few have interest in diversifying operations, but some feel more frozen products might be a possibility.

Family ties are important in this business generally, and the Boston firms are no exception. About half the owner/managers either inherited the business from a father or father-in-law and/or hope to have a son take over the business when they retire. Virtually all the firms' employees are unionized (Seafood Workers' Union, ILA, AFL-CIO), so wage rates are standardized throughout the port.

II.3 NEW BEDFORD

New Bedford Fishermen and Auction*

Every weekday morning at 7 A.M. the New Bedford Fishermen's

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* Part of the analysis of New Bedford fishing boats appears in "Fishing Boat Income, Capital and Labor: A Distributional Study of a New England Port" by Leah J. Smith in Economic Impacts of Extended Jurisdiction ed. Lee G. Anderson, Ann Arbor Science Publishers Inc., Ann Arbor. 1977.

Union representatives hold an auction for fresh scallops landed in that port. At 8 A.M. the day's catch of fresh fish is auctioned, but, unlike the Boston auction, in New Bedford buyers must bid for a boat's entire trip - not a selection of species from each boat. It is a matter of logistics. In Boston all boats filled with fish tie up at a single pier and unload their catches. The fish are taken to the buyers on hand trucks, so it is fairly easy to separate each boat's catch by species and take it to the appropriate buyer. In New Bedford there is ordinarily no buyer of a single species; fishing vessels unload using canvas buckets to haul the fish out of the hold and into the chute directly into the shore-side plants which purchased their fish. Fish are then distributed by species and size by the wholesalers.

There are not many different species to sort. Most of the fishing out of New Bedford is for yellowtail flounder, and that fish alone explains the port's high earnings in the past several years (See Table II.3); since the volume has dropped, the price per pound has risen. Now a scarcity of yellowtail is threatening the fishermen, and they are landing a larger percentage of other species than in the early 1970's. These include cod, pollock, haddock, sand dabs, black back, greysole and fluke, fish valued more than those landed in ports to the north. New Bedford is home to about a hundred offshore draggers and fifteen to eighteen full-time sea scallop dredge boats, although that number has grown dramatically

Table II.3
New Bedford Fish and Shellfish Landings

	Pounds	Dollars
1950	116,911,424	11,342,854
1951	79,317,757	11,921,366
1952	75,177,458	13,136,554
1953	75,000,690	11,784,514
1954	71,560,858	10,280,899
1955	83,040,997	11,947,932
1956	87,964,927	12,291,485
1957	104,334,421	13,059,410
1958	111,668,533	13,750,592
1959	107,960,784	15,745,665
1960	85,118,650	13,164,150
1961	100,465,094	14,813,051
1962	119,765,555	16,504,348
1963	135,148,620	16,804,673
1964	135,722,564	16,748,014
1965	147,315,816	19,805,302
1966	133,497,454	18,688,586
1967	117,842,010	15,422,709
1968	126,098,504	18,908,882
1969	108,214,570	17,402,237
1970	111,282,310	19,574,846
1971	73,693,916	16,396,381
1972	60,844,397	18,331,244
1973	63,086,894	17,357,179
1974	67,557,352	21,388,767
1975	68,640,222	31,283,504
1976	64,886,000	39,197,000

Source: NMFS Statistics

since the discovery of large scallop beds from Cape Cod to South Carolina in the fall of 1976. This is an unusual year class, and the volume harvested for this is not expected to continue (Arthur Posgay, personal communication). Most boats make trips of five to eight days, and twenty to thirty-five of these per year. The offshore draggers include older, wooden side trawlers and the most modern steel stern trawlers.

New Bedford vessels which appear to be similar in design, gear, and other physical characteristics produce a surprisingly wide range of incomes. In an attempt to find an explanation for this variation, we studied a representative sample of economic and social data for thirty-one offshore vessels and their crew with gross incomes over $100,000. Because any management system must be based on generalizations about the fishing vessels, we feel it is most important to illustrate graphically the wide variations within the fishing fleet itself.

These variations of income may be expressed in terms of gross-stock - the total annual revenue for a vessel, figured by the weight of the catch times the price per pound. Figure II.4 shows the distribution of gross stock for New Bedford fishing vessels, both total population and the sample, which was based on interviews done from 1974 and 1976. The distribution in the sample stresses high gross stock vessels, although most boats have incomes near the mean. The Lorenz curve in Figure II.5 gives a better idea of unequal gross stock distribution. If all vessels had equal incomes, the

Figure II. 4 Distribution of Gross Stock - New Bedford Vessels

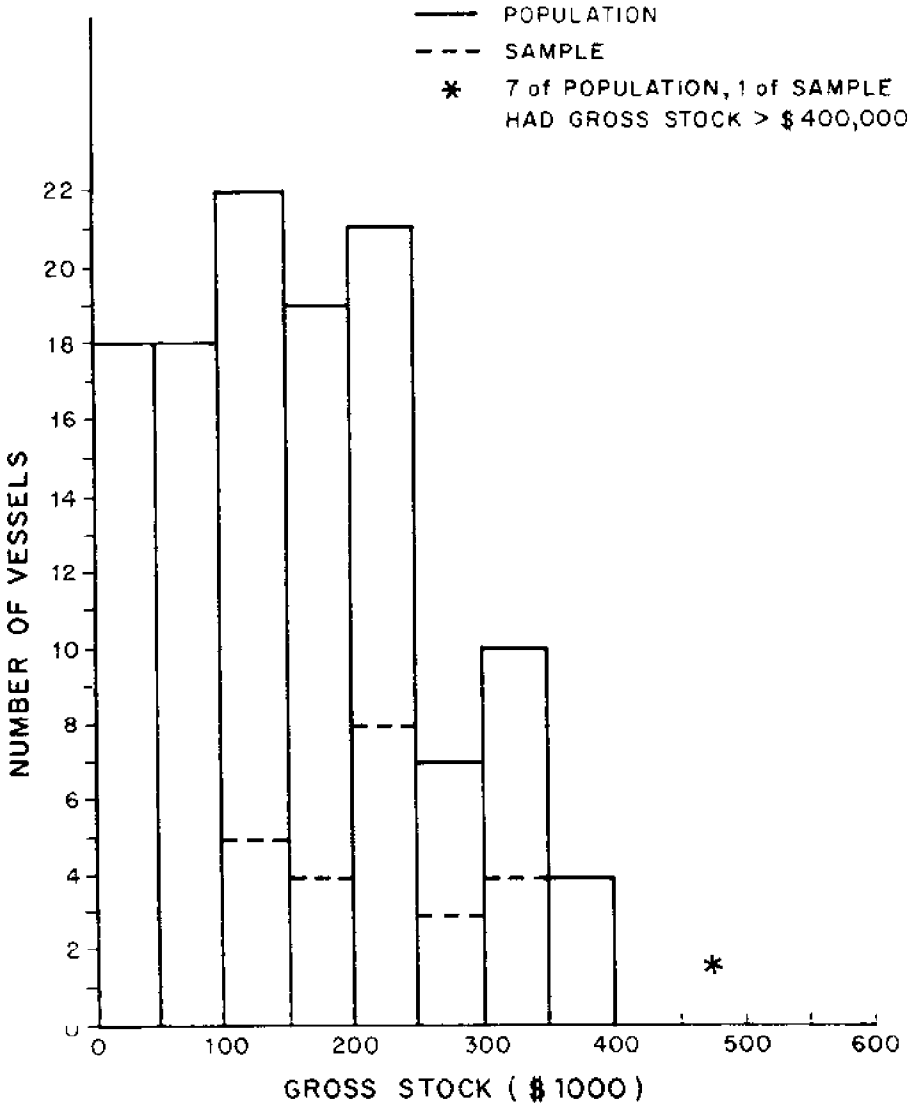
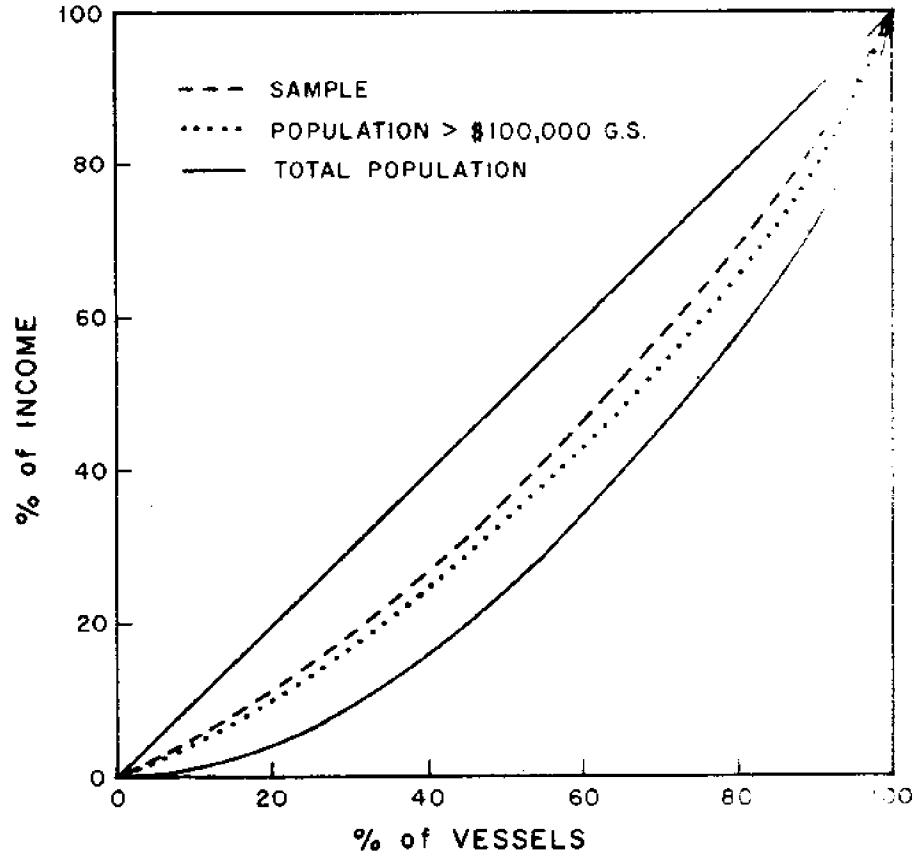


Figure II. 5 Lorenz Curves for Gross Stock - New Bedford Vessels



distribution would be the straight diagonal line. The Lorenz curve shows very similar distributions for the sample vessels and for the total population of vessels with over $100,000 gross stock. The group of vessels with gross stock of over $100,000 are vessels which operate primarily in the offshore fishery.

We explored three categories to explain the variation in earnings from one vessel to another: capital stock and technology, labor, and social variables. The sample data is summarized in Table II.4.

The length, age of a vessel, gear, and hull material, were all included in capital stock and technology. The overall length of a fishing vessel is one indicator of earning ability, but many of the largest vessels in the fleet have below average gross stocks. The present size of the offshore fleet and our sample (Figure II.6) concentrates at a size around 70 to 74 feet, while vessels built in the last ten years average 78 feet. Experienced fishermen indicate that most of them prefer a vessel of less than 80 feet for reasons of maneuverability/ flexibility, and for economy in purchase and operation. The age of a boat is another important variable; the newer boats catch a greater value of fish. Figure II.7 shows the age distribution of New Bedford vessels. Major additions to the fleet took place in late 1940's and late 1960's; the average-age boat in the fishery would have been built in 1955. Mean gross stocks by gear (side trawl or stern trawl) and hull type

Table II.4

Summary of Sample Data from 31

New Bedford Offshore Groundfish Trawlers

Variable	Mean	Standard Deviation
Gross Stock ($)	229,000	90,701
Capital and Technology		
Length of Vessel (feet)	79	15
Horsepower of Engine	445	186
Age of Vessel (years)	20	14
Gear Type	*	
Vessel Hull	*	
Labor		
Number of Crew	6	1.2
Age of Crew	43	7
Age of Skipper	45	10
Days at Sea	223	46
Social		
Kin	*	
Owner-operator	*	
Ethnicity of skipper	*	

*These variable have zero-one values.

Gear type shows whether vessel was a side or stern trawler: 12% of the sample were stern trawlers, 88% side.

Vessel hull is either wood or steel: 36% were steel, 64% were wood.

Kin reflects presence of related individuals on the crew: 36% of the vessels had kin on board.

Owner-operator: 60% of the skippers also owned their vessels.

Ethnicity of skipper reflects the ethnic group with which the skipper classifies himself. The sample included the following:

U.S. (Yankee)	48%
Norwegian	20%
Canadian	8%
Portuguese	8%
Other	16%

Figure II.6 Distribution of New Bedford Vessels by Length

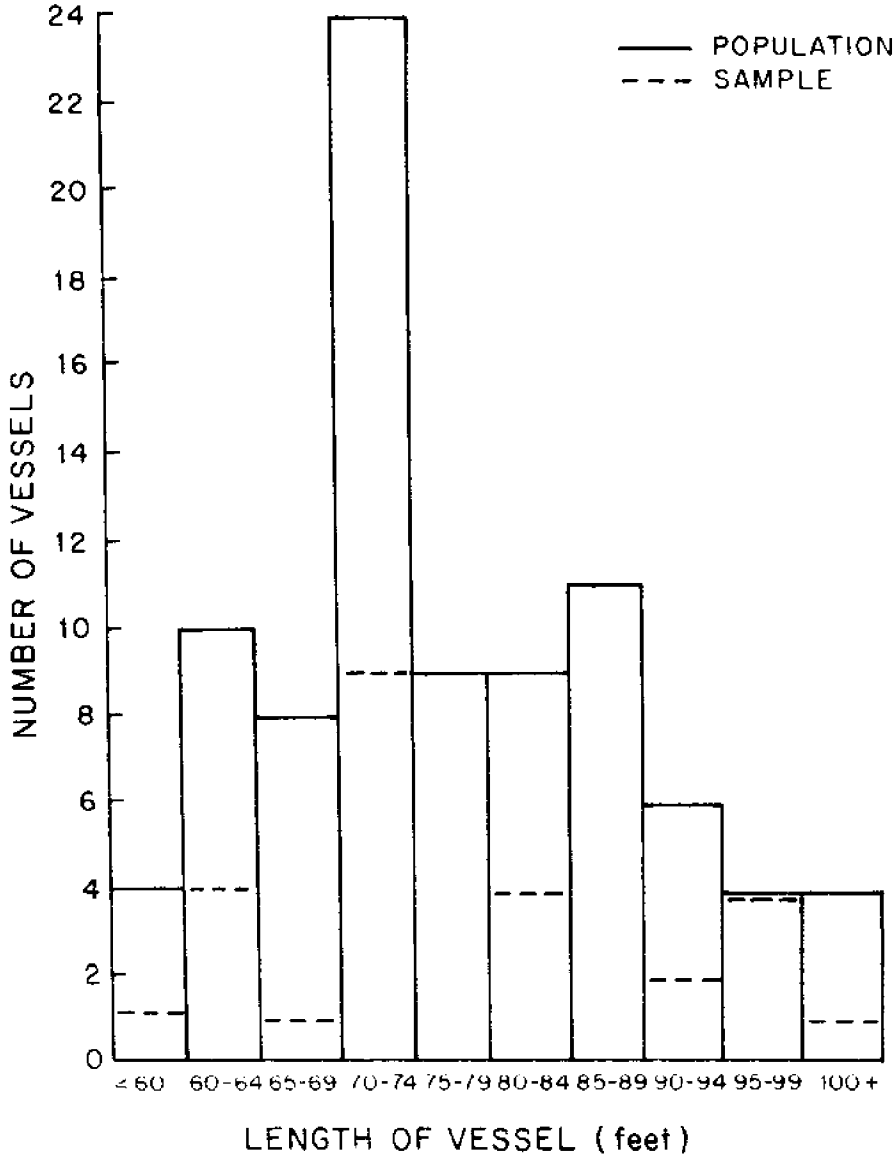


Figure II.7 Distribution of New Bedford Vessels by Age

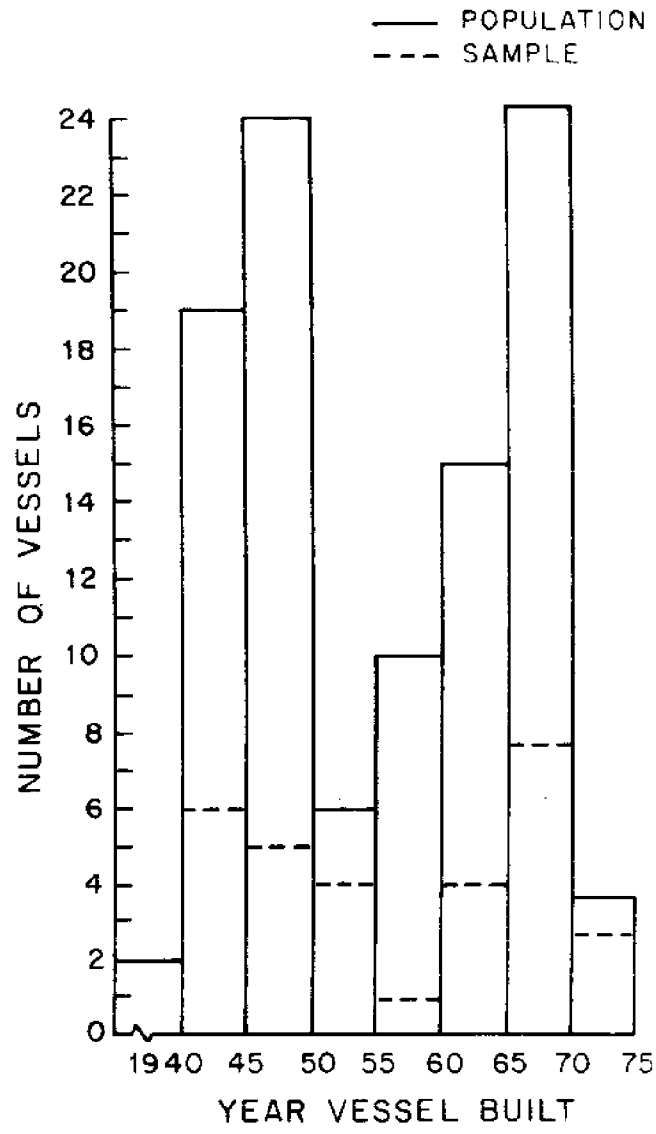


Table II.5

Mean Value of Gross Stock by Gear Type
and Hull for New Bedford Vessels

Gear and Hull Type	Mean Gross Stock ($1,000)	Standard Deviation
All Boats	229	91
Side Trawlers	212*	65
Wood Hull	208	58
Steel Hull	221	92
Stern Trawlers**		
Steel Hull	354*	165

* The difference between these means is significant at the .01 level.

** There were no wood stern trawlers in the sample, although there are some in the New Bedford fleet.

(wood or steel) are shown in Table II.5. Whether a vessel is equipped with stern trawling equipment or not seems to be extremely important in determining the size of gross stock. The hull construction appears to be insignificant. Most of the fishermen agree; they say they would build a stern trawler if they were building a new boat today, but they see little difference between the efficiency of steel and wood hulls. Some differences in maintenance time and cost may appear as the hulls grow older. All five of the new trawlers added to the fleet in 1975 are steel stern trawlers, and all new offshore vessels added to the fleet since 1968 have been steel. (Table II.6). To summarize, the capital/technology

Table II.6
Fishing Vessels Operating Out of New Bedford
in 1975
Year Built and Hull Type

Steel		2	6	1	1	5	17	5	5
Wood	4	22	19	3	11	13	17	0	0
Year Built	1925 - 1939	1940 - 1944	1945 - 1949	1950 - 1954	1955 - 1959	1960 - 1964	1965 - 1969	1970 - 1974	1975 - 1976

variables which are important in explaining variation in gross stock (revenue) are gear type, age of boat and length of boat.

We had expected to find that the age of the skipper and the age of the crew would reflect experience and skill in fishing and a higher quality of labor. We were wrong; there is little

correlation between ages and the size of gross stock. The other labor variables, the number of crew members and the number of days spent at sea per year, were more important. Number of crew members varied between three and nine in the boats sampled - 79 percent had six. It appears that the more men there are on board, the more total income, in general. The number of days out at sea per year is also important in terms of gross stock.

Our third category of social variables included ethnic group identification of the skipper, whether or not the skipper also owned his boat, and the presence of kin ties among members of the crew, including the skipper. There was no significant difference between mean gross stocks for boats skippered by their owners and boats with hired skippers, but most New Bedford boats are in fact owned by individuals or small groups of individuals. The picture might be different for ports which have some boats owned by processing plants and others owned by individual skippers. Presence of kin within crews was also insignificant in explaining income variation in New Bedford. The ethnicity of the skipper was identified by the skipper's self-classification and includes some second or even third generation ties. The number of individuals in each ethnic group of our sample is small, and may not be representative of the entire population. However, in the sample ethnicity was very significant (see Table II.7). In New Bedford the "high-liners" - a local term for most successful

Table II.7
Mean Value of Gross Stock and Days at Sea by Ethnicity of Skipper in New Bedford

Ethnicity of Skipper*	Mean Gross Stock ($1,000)**	Standard Deviation	Mean Days at Sea	Standard Deviation
U.S. (Yankee)	195	55	220	58
Norwegian	351	107	243	46
Portuguese	196	48	239	44
Canadian	172	66	207	46
Other	224	70	208	9
All skippers	229	91	223	46

* The distribution of ethnicity among skippers and the number of skippers sampled is given in Table II.4

** The difference in mean gross stock among groups is significant at the .01 level.

fishermen - are Norwegian skippers; there is less difference among U.S., Portuguese and Canadian skippers' gross stock. Mean number of days at sea was also calculated for each group. Although the Norwegian skippers spent slightly more days at sea, this did not significantly correlate with their productivity.

This information from a sample of New Bedford fishing boats shows that a vessel's economic success or failure depends on the age and length of the boat, gear used, the number of crew, days spent at sea, and the ethnic group of the captain. New Bedford is a port in which most fishermen seek a few popular, high-priced species, primarily yellowtail; here the gross stock, which reflects both price and pounds of fish caught, is useful as an indicator of fishing success exclusive of pounds caught.

The criteria used in this study of gross stock may be usefully applied to other individual ports, with the possible exception of ethnicity. Indeed, that information may be relevant only to such an ethnically mixed port as New Bedford. In Gloucester where most of the fishermen are Italian, and in Point Judith where they are mostly Yankees, the role of ethnicity would be nearly impossible to determine. The "good-captain" influence on the productivity of a boat and crew has been recognized elsewhere (Comitini and Huang, 1967) but may not be so strongly associated with ethnicity as in New Bedford.

New Bedford Processors

New Bedford has twelve processing companies, which together process more domestically caught fish than any other port in New England except Gloucester. Some facts about the processors* are shown in Table II.8. Six of the twelve are primary buyers in the daily fish auction; they buy fish by the trip, unload the fish at their harborside facilities, and pack it into wooden crates holding 125 lbs of fish and 20 to 25 lbs of ice. Although several of the six secondary buyers have the facilities to unload fish from the harbor directly into their processing plants, they choose to buy their fish from the primary buyers at three cents to four cents per pound more than auction price. There are several reasons for this besides tradition. The secondary buyers in general are quite specialized, handling a specific quality and size fish to produce a fillet that is similar from day to day.

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* These data were collected by personal interviews during 1974. Since that time, the New Bedford Fishermen's Cooperative purchased the processing facility and freezer of E11 Vee Dee Inc. The cooperative's fish house has now been leased by a new entrant into New Bedford processing. The other processors in New Bedford are: Aiello Brothers Inc., Coastal Fisheries, Acushnet Fish Corp., D-Fillet Inc., New Bedford Seafood Cooperative, Pilgrim Corp., New Bedford Fillet Inc., Jay Bee Fillet Co., Inc., Quality Fillets Inc., Seaview Fillet Co., Inc., Tichon's Fish and Fillet Corp. We would like to thank all those interviewed for their cooperation.

Table II.8

New Bedford Fish Processors

Age of Company	Age of* Plant	Buying Primary	Buying Secondary	Functions	Number of Employees	Fish Mix
10 years of less						
	new		X	CF	40	YT,DAB,COD,GS
	new	X		RCFB	80	YT(75%),COD(15%)DAB, LS,GS,HAD
	new		X	C	45	YT(95%)
	old		X	C	25	YT(80%),COD,GS,DABS
15 years						
	new		X	C	30	YT,COD,DABS,RED,GS
	old	X		CF	88	YT,GRND FISH
	med.		X	CF	48	YT,(50%),COD(50%)
	med.		X	RCFB	75	Flounder (90%)
20 years or more						
	med.	X		CF	50	YT(85%),COD,HAD,POL
	med	X		RCF	111	YT,COD
	new	X	X	RCFB	120	YT,POL,SQD,WHIT,HAKE MIXED GROUND
	old	X	X	RCF	45	YT,MIXED GROUND

R = sells in round
C = cut
F = freeze
B = bread

*New = built in 1970's
Med = built between 1945-1969
Old = built before 1945

They handle 45 to 95 percent yellowtail flounder*, with only one of the six buying 50 percent yellowtail and 50 percent cod to fillet. If they were to buy a "trip" they would have to deal with some haddock, some cod, some pollock, and other species they do not choose to process. By purchasing fish from a primary buyer, they can buy quantities, sizes and species they particularly need to fill orders. At the same time, by observing the auction rather than participating in it, secondary buyers diminish the number of potential buyers for a boatload of fish, possibly keeping the price lower than it might be with more competitors. However, in recent years, there have almost always been more primary buyers at the morning auction than there were boats.

The fish not processed by the primary buyers themselves or sold to secondary buyers in New Bedford is sent by the primary buyers to Boston or New York, with smaller amounts to Baltimore, Philadelphia, Chicago, Seattle and local outlets. At the same time that fish is being landed, boxed and shipped out of New Bedford, other fish is being brought in from Newport, Sandwich, Point Judith, to sell to several of the New Bedford buyers.** This fish is used to supplement both primary and

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* During 1975 this dependence on yellowtail changed as sand dabs (Lopaopseta maculata) began to be caught, processed and sold through the same channels as yellowtail.

** Research is currently being done under a NOAA contract to attach numbers to these transactions.

secondary buyers' demand for a specific volume to be processed. The primary buyers make money distributing unprocessed fish as well as processed fish, while the secondary buyers make money only from selling the processed product.

The twelve processors employ about 600 to 750 people (compared to 7897 for all New England in 1973) in a variety of jobs: chute men who sort, ice and pack the fish; handlers who take it to waiting trucks, cold storage, or the fillet room; cutters who take the fillet off the frame before sending it down the line to be skinned, washed, checked for bones and finally packed.* Three plants also buy scallops which they market fresh,freeze or process.

Most of the fish fillets are packed in 20-lb metal or plastic tubs which are crated with ice to be shipped. Crates are marked with the species, weight, other descriptive information, and the name of the producer. Although the quality of packed fish varies from plant to plant depending on freshness, amount of skin and bone inadvertently included, the buyer can distinguish among the 20-lb containers only by the producer's name on the outside of the crate. Product identification has become a serious problem for the New Bedford dealers, since

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* The New Bedford workers are represented by Local 1572-61LA, AFL-CIO. Other unions associated with the fishing industry are the New Bedford Fishermen's Union, which is affiliated with the Seafarers International Union of North America, AFL-CIO, and Local 1749 of the International Longshoremen's Association, Fish Lumpers.

most of their product is ultimately sold in large markets where the fish fillets are displayed on beds of ice labeled by species but not by producer. Some plants provide fish packed for military contracts, school lunch programs, or other institutional uses. The military requires frequent inspections; institutions often require uniform weight of fillets.

Each of the twelve fish processing plants in New Bedford employs between 25 and 120 people who work an average of 32 to 44 hours a week; however, during the winter there are often weeks when few employees are called in to work because of the low volume of fish. Minimum daily hours are set by union contracts. Once employees are called in to work they are guaranteed a minimum number of hours for which they will be paid. Most of the plants are owned and managed by members of the families who established the businesses. Annual volume per plant ranges from 2.5 to 40 million pounds; New Bedford produced about 128 million pounds of processed fish in 1974. The average plant processes about 11 million pounds a year with 62 employees. Most have substantial underutilized capacity. On the average they would like to have 16 more employees, reflecting a 78 percent capacity utilization. In terms of daily volume, producers operate at about 74 percent of their desired level, although this average does not reflect the fact that some companies are using nearly all their capacity while others are operating at less than half their optimal rate. The

plants with a larger number of employees process a greater than proportionate volume of fish, so economies might become more pronounced if plants could operate at capacity, although we have no precise data. (See Figure II.8) There is no systematic bias of plant size in relation to capacity utilization.

Most firms agreed that raw materials (fish) account for 60 to 80 percent of their total costs (average: 65 percent), and labor for about 20 percent. Labor costs ranged from $140,000 to over $1 million per year for individual plants.* Data on value added were not readily available, but fish processing industry statistics from the 1972 census show that value added was about 35 percent of the value of shipments in New Bedford, 26 percent for the nation.

The gross sales for New Bedford processors in 1974 were $21.2 million (67.7 million pounds) exclusive of scallops; figures on profits could not be obtained for most plants, but one plant had profits of about 18 percent on sales.** New

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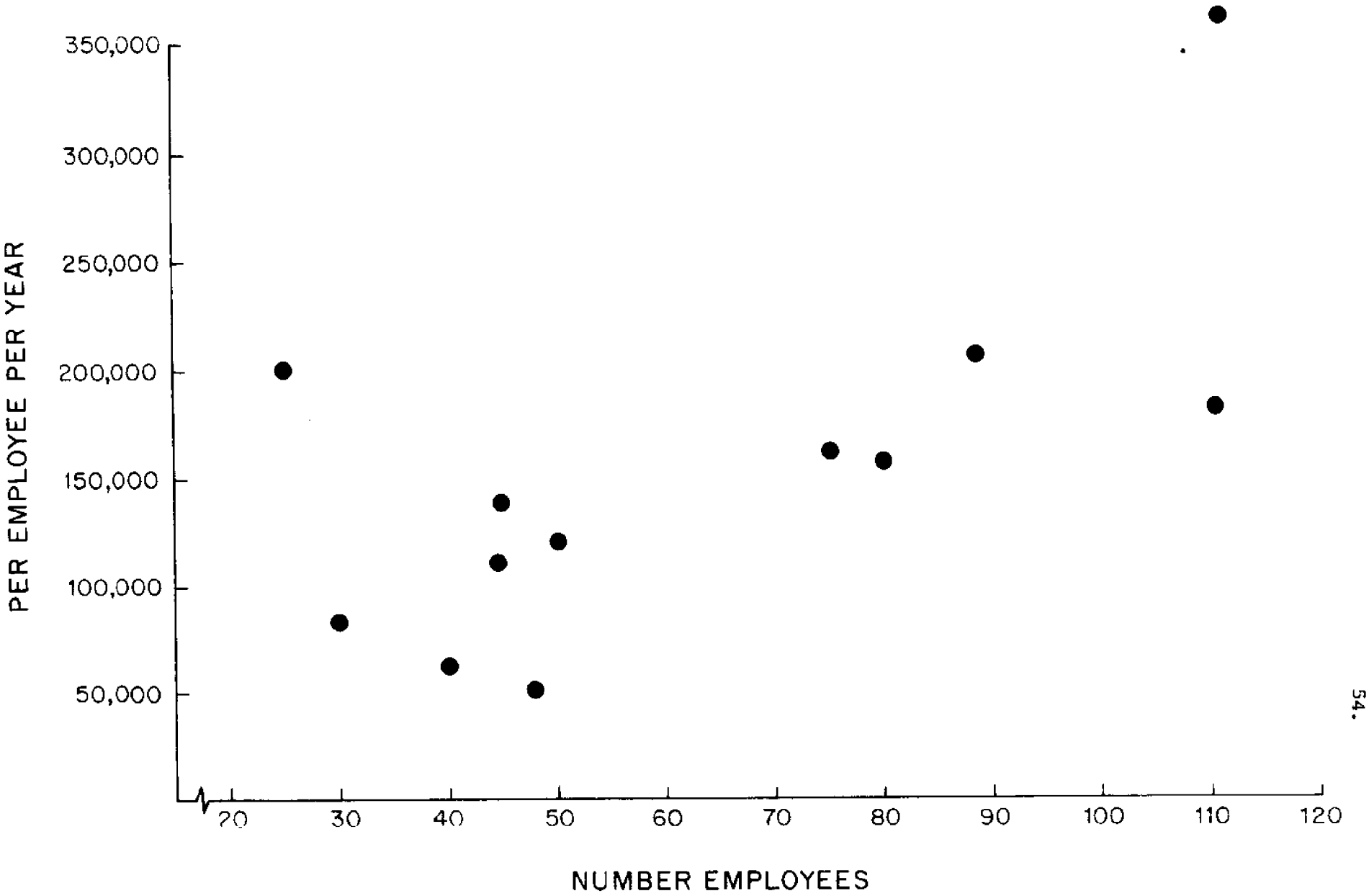
* Nationally, the 1972 census of manufacturers showed that for SIC 2092 (fresh or frozen packaged fish) cost of materials was 74% of value of production, materials plus payroll 86%.

** Markup per pound of yellowtail is generally 35 cents to 40 cents per pound. Processors use a formula to determine their selling price: (cost of raw material/lb x percent of fillet obtained from whole fish) + .35 or .40/lb = wholesale price/lb.

Figure II.8 New Bedford Processors: Economies of Scale



Bedford fish is sold along the East Coast - New York, Boston, Philadelphia, Baltimore, with smaller markets in Connecticut and Rhode Island. Several of the processors also ship to the Midwest and California. Local markets absorb some fish, especially during the summer tourist season. The buyers are usually wholesalers, with some direct sales to retailers, chain stores, restaurants or the military. Nine of the twelve processors felt that a high-quality product would bring a higher price or other advantages, such as greater volume or more regular customers. Customers appear to be fairly careful about the quality of the product and apparently have sufficient information to distinguish among sellers.

With only six processors acting as primary buyers in the daily auction pricing of yellowtail, they could, presumably, hold fish prices at an artificially low level. In fact, the largest four companies account for 67 percent of total volume. Several factors guarantee competition: ease of judging the product's quality, and a large number of buyers and sellers in major cities at the wholesale level. One other point about competition among fish processors: not only are there many processors scattered among the port towns of New England, but the product must compete at the retail level with fresh fish imported from Canada, imported frozen fish and domestically processed fish products made from imported fish. Competitive forces on the selling side are considerable for New Bedford

fish processors, as they are for other U.S. processors. Nonetheless, New England fishermen and processors feel that their fresh fish product is far superior to imported products. While the processors have a number of alternative sources for fresh fish and scallops - other New England ports and Canada - most of the fishing vessels do not have flexibility in their choice of port to land their fish. The size of the New Bedford vessels keeps them out of the smaller ports, and the inconvenience of travel over great distances to spend shore time with their families keeps most fishermen out of distant ports. Also, many fishermen do not go to different ports because they do not know the "rules" there; they have no way of judging whether or not they will get a fair price and good treatment.

In discussions about the future, the processors of New Bedford seem content to continue processing the same species they have always handled, and show little interest in expanding into new types of operations. Three of the twelve processors own or have an interest in fishing boats, one has a retail store, and one operates a restaurant. Eight have no facilities besides the processing plant. Half of the processors did not plan to expand the species mix they process, only considering expansion of traditional species processing. Four others would expand into other species: squid, monk fish, pout, cod, swordfish. Only three showed interest in expansion beyond their present type of operation: producing pan-ready or frozen

fish, opening a retail market, processing the scraps and waste into pet food, selling ice to fishing boats. The general prognosis for the local industry is that hard times are ahead unless (a) the volume of traditionally caught species expands or (b) the market for other species expands. The 200-mile economic zone is regarded as one way of expanding the volume of fresh fish landed in U.S. ports, but even with extended jurisdiction volumes of traditional species will increase only gradually. Government agencies and private organizations have so far not produced changes in the processing industry's willingness to work with unfamiliar species of fish. However, the New England Fisheries Program has begun to experiment with underutilized species, and the processors themselves have introduced sand dabs, previously considered a trash fish by the fishermen. Although these changes are small, limited success in such programs should encourage further experimentation.

II.4 GLOUCESTER

The Gloucester fishing fleet has little in common with the Boston and New Bedford fleets except vessel design. The older wooden side trawlers used there easily mark this as a New England port. Fishermen from Gloucester catch and market greater varieties of fish than their counterparts in other Massachusetts ports. In addition to some cod, haddock and a small amount of flat fish, they catch squid, hake, redfish,

Table II. 9
Gloucester-Fish and Shellfish Landings
NMFS Statistics

	Pounds	Dollars
1950	195,931,338	9,060,805
1951	259,669,856	12,694,422
1952	222,433,621	9,610,905
1953	186,424,657	6,963,934
1954	232,387,196	8,256,166
1955	253,544,676	7,930,587
1956	252,038,268	7,441,842
1957	248,927,661	7,024,162
1958	230,218,202	7,973,333
1959	228,722,506	7,117,936
1960	192,406,289	6,329,994
1961	163,058,745	5,955,820
1962	167,219,107	6,422,382
1963	139,475,812	6,611,086
1964	124,201,801	6,088,927
1965	121,365,199	7,039,289
1966	116,484,075	7,728,705
1967	83,342,372	5,285,080
1968	98,035,197	5,730,843
1969	69,544,173	6,880,680
1970	92,374,441	8,366,387
1971	111,179,148	7,853,094
1972	112,389,086	9,644,925
1973	130,116,501	12,206,500
1974	119,512,736	11,408,978
1975	126,419,464	14,503,977
1976	144,228,000	16,464,000

shrimp, herring, menhaden, monk fish, pollock, cusk. Table II.9 shows the volume of catch for Gloucester 1950-1976. About twenty-five of the approximately one hundred Gloucester vessels fish for groundfish offshore on three to five day fishing trips. The remaining vessels, many of which are capable of longer trips, make day trips. The vessels are wooden side trawlers designed for bottom trawling, but many are used for longlining and gill netting. Several steel stern trawlers started fishing out of Gloucester in 1976, but new vessels have been added at a slower rate than at New Bedford. Table II.10 and Figures II.9 and II.10 describe the present Gloucester fleet.

Table II.10
Fishing Vessels Operating Out of Gloucester in 1976
Year Built and Hull Type

Steel				1		1	1	6	2	4
Wood	22	5	21	24	14	10	5	8	3	
Year Built	<1935	1935 – 1939	1940 – 1944	1945 – 1949	1950 – 1954	1955 – 1959	1960 – 1964	1965 – 1969	1970 – 1974	1975 – 1976

Gloucester Fishermen

The fishermen range from 18 to 70 years of age. A growing number of young men own their own vessels, and many of the crew are in their twenties and thirties. Kinship ties seem to play

Figure II.9 Distribution of Gloucester Vessels by Length

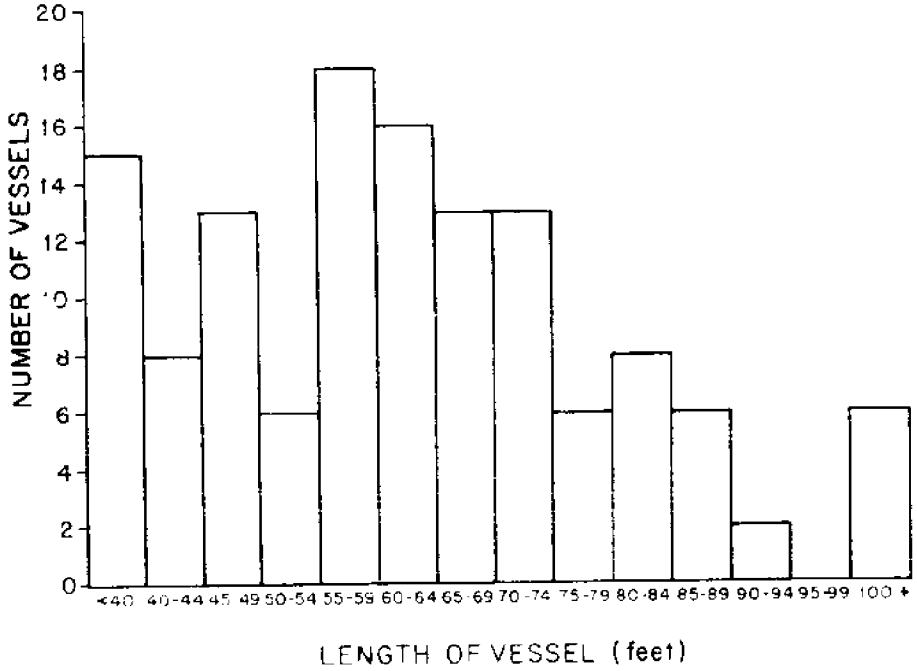
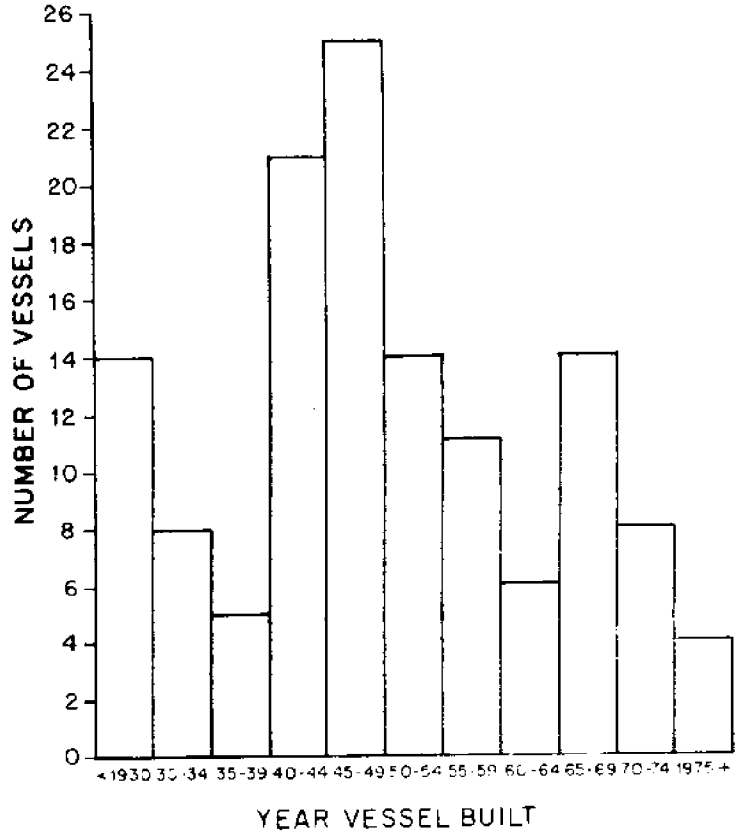


Figure II.10 Distribution of Gloucester Vessels by Age



an important role in this port. Many captains have relatives working for them as well as brothers, uncles and cousins working on other vessels in the harbor. Many of the younger captains of fishing trawlers work for their fathers or uncles who are the "shore captains". This does not work very well; the man on shore always has a different idea about how to fish for what, where, when and with what gear than does the active captain. A few have long-term arrangements of this type, but most such arrangements collapse. Most of the vessels have three to five men abroad, a few have as many as ten men. For day trips, most vessels can operate with three or four men unless fish are particularly abundant. Then they may bring along an extra man to help with sorting and putting fish below. The composition of most crews is stable, with the same men working on a boat for a number of years. Many of the men in their fifties and sixties had worked on only four or five different vessels. The men are paid on a share system which varies more from boat to boat than it does in New Bedford, perhaps because fewer Gloucester vessels are crewed by union members and therefore there are no contracts to dictate share systems. The Atlantic Fishermen's Union has about 250 members in Gloucester, most of them over forty years old, and the influence of the union seems to be declining. Perhaps the union is less strong here because so many of the men work on family owned and operated vessels. Also, the union's strength

seems to be eroding as more of the vessels day-fish rather than trip-fish. Under day fishing, many of the negotiated conditions for trip fishing are not so important.

Since World War II, this port has become much more diversified in both fishing and fish processing. After nearly going broke a number of times because of dependence on a single species - first the redfish and then the whiting - many fishermen have learned to catch a variety of species throughout the year, reducing dependence on a single species and increasing their skills in fishing for higher valued species. Because of this adaptability, an association between vessel and crew characteristics and gross stock is not apparent in Gloucester as it was in New Bedford. Instead, the ability of the captain and crew to select high priced species or to fish for a high volume of low priced fish needs to be considered, and this ability is difficult to measure. The Gloucester fishermen change fishing gear, location fished and species sought throughout the year as fish become more readily available or as prices for particular species rise. The costs of these changes have yet to be determined. In any case, we could not run the same correlations as in New Bedford because information on gross stock is much more difficult to obtain in Gloucester. In New Bedford, the captain or owner would gladly tell how much he grossed for how many trips during the year, and would rank himself among the other boats. If the captain's gross stock

had declined or gone up from previous years, he would have a good idea why. Sometimes it was attributed to good luck or bad luck, but most of the time the men knew it was because of time lost from bad weather, necessary repairs or family crises. Rarely did they attribute fortunes or misfortunes to the fish or the market. In contrast, Gloucester fishermen were not very specific about their earnings, did not seem to compete among one another for standing determined by earnings, and attributed almost all radical change to luck.

In Gloucester the trip boats unload fish in the early mornings at any one of seven or eight fish houses with whom the captain has established a sales agreement. Usually boats go to the same fish house for a long time - until a disagreement over quality, quantity, money, space or equipment makes the captain decide he can get better treatment elsewhere. Day fishermen take out (unload) in the evening, usually before dark. The fish prices depend on a variety of factors. If the species they caught are common to Boston or New Bedford, then they receive some variation on that day's auction price. Redfish prices are the same as those in Maine; ultimately the Portland-caught redfish and the bulk of the Gloucester redfish are handled by the same company. Prices for whiting (silver hake) and herring are established by individual buyers who take into account the volume that can be processed per day, the prices for the same fish in Point Judith or New York, and

the condition of the fish. Since there is no central location for buying and selling fish in Gloucester, many transactions are difficult to track down because they are done over the telephone, and because the fishermen are secretive about the price they actually received for the fish. Incomes are much lower in Gloucester than in New Bedford because the fish they catch sells for lower prices, although volume is higher than in New Bedford.

Most fishermen take out the fish from their vessels without hiring extra help. Some of the trip boats do hire lumpers, but most lumpers are occupied with the imported frozen fish block shipments. There are about eighty lumpers, and they are represented by Local 15 of the Amalgamated Meatcutters. Most lumpers have other jobs in afternoon and evenings.

Gloucester Processors

The city of Gloucester has evolved into an important fish processing center on the U.S. East Coast. However, much of the fish processed there is imported frozen blocks. Of the fresh fish processed there in 1976, the greatest volume was in herring, whiting, and mackerel. Eight buyers handled most of the fresh fish brought to Gloucester, and several of these did no processing at all.* They provided waterfront space, ice,

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* These data were collected by personal interviews during 1975-6. The processors in Gloucester are: API Inc., Captain Joe's, Empire Fish Co. Inc., Frontiero Brothers Inc., Kennebec Fish Co., Oceanside Fisheries Inc., Star Fisheries Inc., John B. Wright Co. We would like to thank all those interviewed for their cooperation.

boxes and unloading facilities as well as a marketing service to the boats. There are a few lumpers in Gloucester, but most of the work is done by the fishermen on the vessels and the fish house employees on the dock. Two of them have experimented with buying fish on consignment, but most of them pay a price agreed upon at the time the fish is taken out, a price based upon Boston prices for the same species. The latter system is tricky, for the buyer usually cannot transport the fish to Boston that day. If he resells in the Boston market the next day, he is dealing with a product for which he paid yesterday's price. If prices do not fluctuate radically, he is all right, but a major change in price can mean large profits or losses within a short time.

All of the fresh fish buyers would like to expand their facilities, and many of them need more cold storage and freezer space to deal with large catches of whiting or herring. Space is scarce because the waterfront is used for so many purposes: shipping, petroleum product storage, frozen fish processing, fresh fish processing, restaurants, yacht facilities, etc. This is in contrast to the large amounts of space that are available for fresh fish handling in Boston and New Bedford harbors.

The number of fresh fish buyers and their employees fluctuates from season to season. For those few companies which pack whole fish but do no processing, the number of

employees varies from four to sixteen, while for the companies which cut and pack fish, the numbers of employees vary seasonally. Plants may work with a fixed labor force of four to ten people, calling in as many as seventy or eighty to work on processing lines when fish is plentiful. Then fish is cut twenty-four hours a day, with some plants running three shifts, and others running a mixture of two shifts plus overtime workers. In contrast to Boston and New Bedford, most of the people who work on the processing lines are women, and few of the workers in fresh fish belong to unions. Several indicated a strong preference for seasonal, part-time labor, and did not dislike the unpredictable hours or weeks of work. Of course, they can collect unemployment benefits for part of the year, thus bolstering their incomes. Total employment for fresh fish processing varies between 70 and 500.

Processors are enthusiastic about increasing the volume of fresh fish in Gloucester, and the labor force is already capable of handling volumes of fish. Presumably as Gloucester expands in the volume and variety of fish handled, the processors and fishermen will become less dependent upon the vagaries of the Boston and New Bedford markets. However, competition with other activities in the port may create conflicts over use of space.

CHAPTER III. CHARACTERISTICS OF OTHER NEW ENGLAND PORTS

Boston, New Bedford and Gloucester account for less than half - about 45 percent - of the fresh fish landed in New England, but have been described as the marketing centers for New England. Much of the balance of fish is brought in to Point Judith and Newport, Rhode Island; Rockland and Portland, Maine; Rye, New Hampshire; Provincetown, Chatham and Menemsha, Massachusetts; and Stonington, Connecticut; and some of this is sold through Boston, New Bedford and Gloucester. These are ports where fish are landed from offshore vessels; many other ports support large numbers of near shore vessels, but they are not included in this sample, although collectively they may catch 20 to 25 percent of New England's fresh fish. This figure is questionable because of poor reporting methods; the fish caught by near shore and inshore fishermen may comprise a greater proportion of fresh fish landings than these percentages.

Although many of the ports discussed in this chapter have some processing capacity, they channel much of the fish through the larger New England ports or New York City. A few of the smaller ports report a major species or two as being a backbone of business, but most fishermen bring a wide variety of species to these ports; the small size of the ports does not necessarily impair flexibility in terms of species caught. The labor force in each port is small, with little alternative employment, and

often the vessels are several years older than the average in larger ports.

Point Judith, R.I., is the largest of the small ports, with about ten percent of New England's fresh fish landed there. Although the size of the landings might rank Point Judith with the previous three ports, we include it with the smaller ports because of similarities in social structure. At Point Judith there is really only one buyer - the cooperative, one of three discussed in this chapter. The cooperatives in Chatham, Provincetown and Point Judith were founded under the 1934 Fishery Cooperative Marketing Act, based upon the Cooper-Volstead Act of 1922. The cooperative in Point Judith, founded in 1947, has been used as a model for other cooperatives in New England, and the managers of the Coop have contributed their talents to newer Coops. The role of cooperatives in the New England fishing industry has been discussed in Marcus,Townley, Brown and Lee (1974) and MacKenzie (1973).

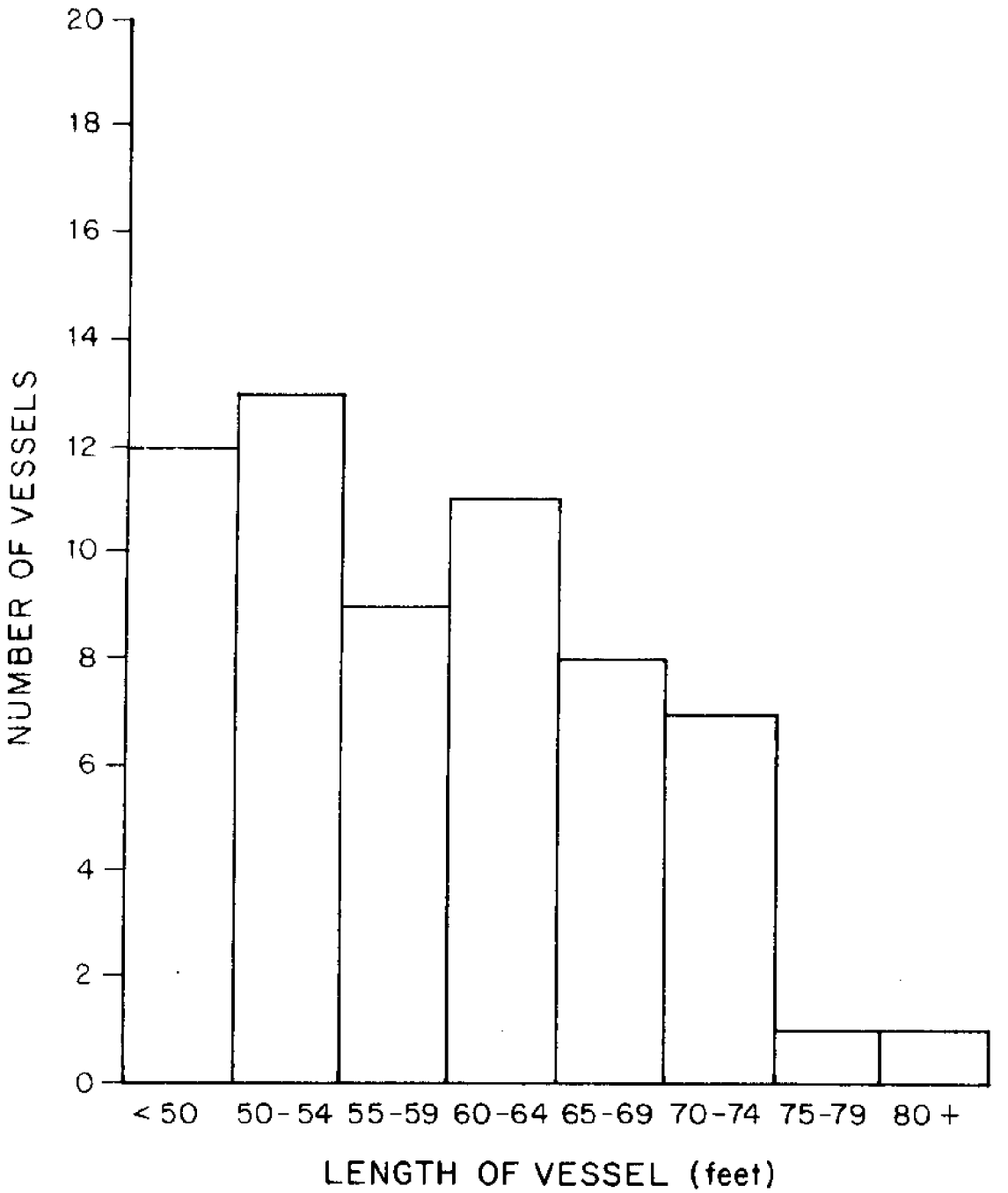
The particular characteristics of each small port are discussed below. With the exception of Point Judith, the arrangement is geographical, from north to south. The effects various management plans would have on these ports is discussed in Chapter V.

III.1 POINT JUDITH, RHODE ISLAND

In October of 1947 the Point Judith Fishermen's Co-operative started business in the harbor at Galilee, R.I. For many years there were about a hundred members, but in recent years membership has grown to about a hundred and fifty. Most of the fishing vessels are less than 80 feet (see Figure III.1). Few boats are larger because maneuverability in the dredged parts of this harbor is difficult. Most of the fishermen make day trips, or trips of three to five days.

Many of the men who joined the Coop at the beginning are still actively fishing, and several of them now have sons and nephews fishing with them or on their own boats. "Ethnic group" was impossible to determine for most of them - Yankee is the most accurate description, and ethnicity cannot be used as a predictor of gross stock as it was in New Bedford. Poggie and Gersuny (1974:54) describe their sample of Point Judith fishermen as essentially "Yankee" - with all of them born in the United States, two-thirds of them in Rhode Island. Nevertheless, kinship is a factor in this port; several sets of brothers fish, and have sons and nephews in the industry, and a whole series of collateral relations are involved in the fishing business. Many of the younger men studied at the University of Rhode Island's school for commercial fisheries, a school that has been actively encouraged by Coop fishermen. During

Figure III.1 Distribution of Point Judith Vessels by Length



the summers many students in that program have their first fishing experience on Point Judith vessels. The University of Rhode Island, in part through their Sea Grant Cooperative Extension Service, has also worked with the fishermen of Point Judith on problems of gear, especially net design, processing and marketing.

The fishermen in this port have been the subject of a number of sociological studies (MacKenzie, 1973, Marshall, 1973, Poggie and Gersuny, 1972), but none of them explores the relationship between the fishermen and the Cooperative. The Cooperative is a collective of fishermen with appointed officers and employed managerial staff, so that the management strategies used in the Coop both reflect and form the actions of the fishermen. Several years ago when yellowtail flounder were available in large quantities, the Coop processed much of their fish into fillets. However, with the decline in yellowtail, the fishermen began to catch greater varieties of fish. Their activity now centers around packing and shipping 17 to 18 million lbs of a variety of whole fish, with very little filleting. The Coop can handle a maximum of approximately 250,000 lbs/day, if the catch is fish which can be pumped or bailed out of the hold. For fish that must be taken out in baskets, 100,000 lbs/day is considered tops, and then only if the boats' arrival times are spread out over the day. The Coop has established regulations to ensure a more

even flow of fish. For example, all trip boats are to be in port by 1 P.M., and all day boats are to be in before 6 P.M.

Because the Coop's salesmen work for the fishermen, their philosophy when selling fish is quite different from the views of most wholesalers. They want their fishermen to get as high a price as possible, and they try to spread the fish out among buyers rather than selling it to only a few people. This way they can give the illusion that fish is scarce and can maintain a higher price than if large volumes were sold to a few buyers. Most fish buyers throughout New England pay as little as possible for the fish and sell for as much as they can get, absorbing the profits rather than distributing them among fishermen. They often make high profits by selling a large volume of a few species with a modest markup. This strategy discourages the introduction of new species of fish into the market. In the Coop, fishermen are willing to catch anything because they can expect the Coop to sell the fish. In fact, the Coop cannot refuse the fish unless it is poor quality. In ports without Coops, fishermen get as little as the dealer thinks he can offer, and dealers who don't want to be bothered with miscellaneous amounts of random species are not compelled to buy. The fishermen don't catch what they cannot sell easily.

The Coop can also control fishing effort on some species. If a species has a very limited market, then the fishermen

should not catch too much of it in any day or week. For some species, two boats could easily catch all the Coop could sell at a good price, so the Coop managers discuss how to allocate that catch. If only two boats are interested, then they catch it all, but if there is wider interest, then the stock is allocated among the boats. They may decide to limit boats to 2000 lbs/trip of some species. If that can all be sold at a price high enough to pay for the effort involved, the Coop can increase the limit until the price level indicates they are putting too much into the market. Considering the complexities of the market, it is noteworthy that the Coop members can move flexibly from one species to the next, seeking a mixed fishery to provide the Coop with various species at appropriate volumes and prices. Total Rhode Island catch for 1954 through 1975 appears in Table III.1. Separate figures for individual ports in Rhode Island are not available.

The Coop employs about eighty people on land, and runs a 50 to 80 hour work-week, depending upon the number of boats, volume and time of arrival. The fish is sold at local Rhode Island and southeastern Massachusetts markets, as well as to Boston, New York, Baltimore, Philadelphia and Virginia.

Many Coop members would like to make some changes in the physical setup at the Coop because of the limited amount of space for taking out fish. Only four boats can be accommodated at one time. Members of the Coop have experimented to improve

Table III.1
Rhode Island Fish and Shellfish Landings

	Pounds	Dollars
1954	103,060,615	4,124,854
1955	114,852,393	4,654,850
1956	140,439,490	4,644,930
1957	142,080,200	4,604,744
1958	113,367,697	4,015,477
1959	117,793,200	4,284,644
1960	69,317,599	3,846,324
1961	84,045,889	3,317,452
1962	76,839,100	3,527,617
1963	69,311,800	4,149,072
1964	36,393,778	3,641,558
1965	48,705,800	4,624,453
1966	68,088,300	5,323,422
1967	76,347,300	5,764,142
1968	71,024,400	6,262,093
1969	88,513,700	8,373,567
1970	77,918,991	9,603,551
1971	79,384,390	12,176,244
1972	81,137,759	12,461,836
1973	96,618,761	14,717,624
1974	95,923,332	15,866,577
1975	79,325,377	18,770,100

Source: NMFS Statistics

the speed of taking out fish, and they continue to look for better and faster ways to handle the boats in port.

III.2 MAINE

Maine has more fishermen and fishing boats than other New England states, but they are spread out along the coastline in many small harbors and ports. Many of the men fish for lobster or herring, but they are turning to ground fishing as lobster and herring stocks decline. In most coastal towns, fishing and tourism are responsible for maintaining the local economy. If management techniques such as limited entry are used in the Maine fishery to reduce the number of fishermen, concentrate the industry in a few ports and develop an efficient marketing system, much of the social and economic structure of rural Maine will be changed.

Because the Maine fishermen are difficult to find and even more difficult to pin down on specifics, very few generalizations can be made about these men. We do not know their gross income from fishing, what their costs are, how many days and hours each year they spend at sea, how many people are employed part-time or full-time, what kind of gear/bait equipment they use - nor how effective they are at harvesting fish. The only Maine fisheries for which information is available as a basis for management are the herring and redfish industries, which are fished and processed in a company

structure, and the ground fishery out of Rockland and Portland, where wer have a good estimate of how many men are catching how many fish of each kind. Overall Maine catch volume and value are in Table III.2

Rockland, Maine

In Rockland, Maine, there are five company-owned fishing vessels, a rarity in New England where most vessels are owned by a family or individuals. All five of these vessels now catch redfish, and the company,* is the largest processor of fresh redfish in New England. The port is also home to a number of lobster boats, a few gill netters, and several draggers which fish within twenty or thirty miles of the coastline. Until 1974, six other company-owned vessels also fished for redfish; however, that company decided to close down its fresh fish processing lines in favor of frozen imported fish blocks. For several years they had been unable to get consistent supplies of fish, adequate crew or reasonable insurance rates for the men and the vessels. These six vessels are 131 feet long, built of steel between 1931 and 1941, rigged for mid-water trawling and they are still for sale.

The captains and crew members of the present redfish vessels are long-time employees of the company; several men have fathers or uncles who were or are captains or crew members of family-owned vessels. Crew members range in age from twenty to sixty,

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*F.J. O'Hara and Sons and National Sea Products were interviewed.

Table III. 2
Maine Fish and Shellfish Landings

	Pounds	Dollars
1950	353,279,886	14,688,742
1951	220,922,749	15,606,047
1952	295,783,594	17,896,980
1953	241,558,713	16,754,164
1954	283,905,931	16,855,620
1955	255,431,299	16,083,227
1956	278,360,631	16,988,405
1957	292,242,113	16,769,175
1958	316,954,664	19,024,410
1959	265,958,925	19,571,778
1960	294,640,643	20,071,496
1961	197,969,532	19,029,469
1962	294,323,215	20,364,943
1963	285,635,900	21,215,671
1964	192,574,588	21,958,241
1965	204,846,473	21,922,010
1966	200,391,318	24,329,156
1967	197,437,735	22,973,039
1968	218,730,096	25,613,569
1969	191,313,898	27,533,007
1970	158,805,062	30,672,028
1971	142,684,463	31,068,899
1972	149,270,329	34,819,236
1973	143,318,052	43,060,715
1974	147,822,392	41,410,167
1975	138,359,242	48,498,843

Source: NMFS Statistics

with most men in their thirties and forties. Although the vessels have space for more men, these vessels are now fishing with a crew of five each. Incomes have improved in the last several years, and crew members now make approximately $800/ trip. However, because the boats average less than two trips per month (10 to 14 days per trip), annual crew incomes range from $10,000 to $15,000 (1975). Several of the crew feel that they could do better financially fishing out of southern New England ports, although none of them seriously considers moving out of Maine. None of the men interviewed had sought any other type of work, nor had any of them been trained in other work, with the exception of military service.

The redfish vessels are all steel-hulled vessels, built in the late 1960's, in part with loans from the NMFS vessel loan guarantee program. Several of the 120 foot vessels are rigged for mid-water trawling, bottom trawling and purse seining. Although they can hold up to 250,000 pounds of iced fish, a catch for a ten to fourteen day trip of half that amount of redfish is considered quite good.

The price of redfish is never very high anyway and is less subject to rapid fluctuation than the prices of groundfish landed elsewhere in New England. The Rockland fishermen usually know the current price for redfish within one-half cent, and can predict their earnings fairly accurately even before they return from a trip by judging the volume of fish they have on

board. All other species caught incidentally are sold to the company at prices three to five cents per pound less than the price set at the Boston fish auction, sold to local markets, or taken home for supper.

Although redfish is the specialty of this harbor, hake, grey sole, haddock, cod, pollock and dabs are also handled. More than 11 million lbs of fresh fish were processed there in 1975, with thirty or more people working full time and nearly a hundred individuals in seasonal employment. Seasonal peaks of activity occur in the spring after spawning, and in fall. The Rockland processing facilities are used at 70 to 75 percent capacity (1976).

Most redfish is sold by the processors as frozen fish, directly to chain stores, although the last and freshest fish caught on a trip are prepared as fresh fish for the New York market. Most of the ground fish also goes to New York. Although some redfish is processed in Portland, the major competition to the Rockland fishermen and processors is by Canada which sends both fresh and frozen products to U.S. markets.

Portland, Maine

The harbor in Portland provides an interesting contrast between traditional and modern uses of waterfront area. Much of the harbor is devoted to storage facilities and anchorages

for the vessels which bring petroleum products to Maine. The fishing piers are old and dilapidated, and there seem to be no plans to renovate the harbor to assure the continued activity of the fishing industry. On the contrary, the city seems anxious to remodel piers and wharves to accomodate recreational speed boats and sailboats rather than work boats.

Many of the fishing vessels now working out of Portland were built in Maine boat yards twenty, thirty, forty and fifty years ago to fish in southern New England waters - out of New Bedford or Point Judith. As they were replaced with more modern vessels, the Maine-built boats were bought by Maine fishermen. Although intended as trip boats to fish on Georges Bank, most of these vessels now fish day trips, and few of them fish year round. Although there are a good number of vessels here (see Table III.3), this port is more like the smaller New England ports. The men fish for a variety of species

III.3 MAINE VESSELS:

NUMBER, AGE AND LENGTH BY PORT

	Number of Vessels	Mean Year Built	Mean Length (Feet)
PORTLAND	56	1951	61.6
ROCKLAND	27	1951	56.7
BOOTHBAY	20	1949	39.7
YORK COUNTY	19	1953	34.8
SAGADAHOC COUNTY	11	1943	43.9

Source: NMFS Statistics

with seasonal variations. Many young men have begun fishing in the last five to ten years. Because most of them bought older vessels, original investment levels were markedly lower than in southern New England - in the range of $20,000 to $50,000, rather than $100,000 or more. Many of them seem to have little or no background in the fishing industry; they wanted to live and work in Maine. Although their original investments were low, earnings are also low because prices paid for landed fish are substantially lower than those offered in Boston and New England. There are several buyers of fish in Portland, but some of the fish is trucked to Boston on consignment, and almost all the Portland-landed fish actually goes through Boston before being redistributed.

III.3 RYE, NEW HAMPSHIRE

Almost all fishing out of New Hampshire ports takes place within 12 miles. Three or four 42 to 50-foot gill netters from Rye fish for pollock, cod and haddock, as do boats from similar ports such as Biddeford Pool to the east of Rye in Maine. A major groundfish industry is unlikely to develop in New Hampshire, but some fishermen who work outside of three miles will come under federal jurisdiction with the 200-mile limit.

Most fish from Rye is packed in ice before being trucked and sold to dealers in Boston, but some is sold locally. The

fishermen consider themselves inshore fishermen, and most have used a variety of gear (fish traps, lobster traps) before settling on gill netting as a profitable way to fish.

III.4 PROVINCETOWN, MASSACHUSETTS

Of the approximately thirty-five fishing vessels using Provincetown harbor, twenty-two are draggers in the range of forty-five to sixty feet, made of wood - only three were steel-hulled vessels in 1975 - and rigged as side trawlers fishing a variation on the standard Yankee trawl. Other vessels in the port are sword fishing boats (both longliners and harpooners), trap boats, scalloping and lobster boats and several line trawlers. Engine sizes range from 180 to 360 hsp, and although most captains knew of fairly sophisticated gear, depth sounders were used more consistently than loran or radar systems. Because of the port's location on the tip of Cape Cod, most fishing is done in the surrounding waters, with few vessels fishing further than two or three hours steaming from the port. Because the vessels are relatively small, most make day trips, leaving early in the morning - about 3 A.M. in the summer - and returning to port between 4 and 7 P.M.; larger vessels in other New England ports make trips of 7 to 15 days. Crew size averages four men. The boats have the capacity to hold 10,000 to 80,000 lbs of iced fish; day trips rarely exceed 2,000 lbs. (Of course, catches of

whiting, which generally amount to 10,000 or more pounds, are an exception to this). There is a growing tendency for the men in the port to buy smaller boats with reduced fuel and maintenance costs.

The yellowtail flounder, grey sole, whiting, pollock, cod and haddock which represent the major species landed in the port are sold to either the Provincetown cooperative or to an independent buyer in the port - the Seafood Packers. Any given boat always sells to one buyer, although no boats are actually owned by the buyers. Small amounts of the fish are distributed to markets on the Cape; most is trucked to New York, Boston or New Bedford. Provincetown fishermen receive prices 10 to 30 percent lower than the prices set at the Boston or New Bedford auction, partly because the Provincetown fish are culled differently than are New Bedford fish, and partly because of the cost of transporting fish off the Cape.

The estimates of the number of full-time fishermen vary from 150 to 350 men. Some men fish seasonally although they are wholly dependent upon fishing for their incomes. "I fish when the fishing is good" stated one man as an explanation for what appeared to be erratic fishing. Some captains drive themselves to fish 220 to 250 days or more of the year ignoring all but the worst storms and poor markets; many fishermen feel that a better strategy is to fish on the good days and spend

the other days working on their boats, gear, or taking care of shore-side business such as dentist, doctor appointments, repairs on homes, cars, and other activities.

Most of the fishing vessels are operated by the man who owns the boat or by a close relative. Distribution of the vessel's earnings is by a share system, most commonly a 50/50 split where the boat gets 50 percent of the earnings, and the crew get 50 percent of the earnings. This division is made after running costs such as fuel, food and ice have been subtracted from the gross stock. A few vessels have a 45/55 split, and others have the older 40/50 split, with the smaller portion going to the vessels.

Most crew members are fairly stable in their jobs, staying with the same vessels for several seasons, but there is evidence that over the years the fishermen have spent time fishing on a number of boats in the port. Crew members seek sites on other vessels when they become dissatisfied with the captain, type of fishing, or low earnings, unlike the Gloucester fleet, where crew seem less likely to look for other sites. Both ports have a high proportion of kin involved in the fishing industry, and there is social pressure for a captain to choose among his kindred in need of work before hiring an outsider. In the last few years, captains have frequently had to choose among less experienced or inexperienced men. Since this involves some risk for the entire crew, the captain usually

consults them. Both captain and regular crew feel they need to be selective about hiring a "green" deckhand. They need someone who learns quickly, knows how to handle equipment, stays out of the way when he can't be of any use, and can spend hours on his knees sorting fish, often in disagreeable weather. Because of Provincetown's appeal to tourists, this port seems to attract wide-eyed romantics who want to go fishing, and escape from modern society. To the surprise of the old-timers, some of these young men succeed as fishermen.

The Provincetown Seafood Cooperative, founded in 1970, packs fish which are landed in Provincetown by its 25 member vessels and occasional other vessels, and it handles a wide variety of fish: yellowtail, cod, blackback flounder, cusk, hake, halibut, scallops, whiting and so forth, with additional species from trap fishermen. A recent decline in volume to well below the desired 100,000 pounds per week has made operations less profitable.

The ten to twelve employees pack fish to send to wholesalers in New York, New Bedford and Boston. In addition, the Coop acts as a wholesaler, supplying fresh and frozen domestic fish and frozen imported fish to restaurants and markets on the Cape. The Coop also has a retail outlet operated separately from the wholesale business.

The Provincetown Coop is willing to diversify into new species and other processes only if buyers can develop adequate

markets; the Coop will sell anything that pays seven cents per pound to fishermen. Since the Coop has recently (1976) added a charge of seven cents per pound of fish handled, this means a dockside price of at least fourteen cents per pound. The company expanded and diversified its operations in 1974; further expansion will depend on increasing volume of fish landed and of market demand for non-traditional species. One continuing problem is the difficulty of marketing fish landed at this port that is a large distance from major marketing centers.

III.5 CHATHAM, MASSACHUSETTS

Chatham looks different from all of the other ports in New England. Nestled into a hillside in an expensive Cape Cod community, the fish pier and harbor areas neither look nor smell like their counterparts in Point Judith, Provincetown or Rockland. The fishing boats are under 50 feet, western rigged (pilot house forward) boats of wood and fiberglass unlike the eastern rigged wooden vessels that dominate the other ports discussed here. The method of fishing is also different. The thirty to forty boats with one or two men aboard make day trips long lining for cod, haddock, yellowtail and black back flounder, fluke, halibut, pollock. They pack and ice the fish in shipping containers as they take it off the line, and when they return to port, these containers are placed on refrigerated trucks and sent to New

York in time to arrive for the early morning fish sales. The fishermen are Yankees, long-time residents of Chatham and surrounding towns, who have developed a very specialized fishery. They catch low volumes of high-quality fish within thirty to forty miles of their home ports, exploiting fishing grounds too rough for the men who tow nets, or too specialized for the men who depend on large volumes of fish.

The Chatham Seafood Coop, founded in 1966, is the major primary buyer in Chatham. It unloads and packs all the fish landed in Chatham; it charged a handling fee to the other fish wholesaler who buys there. The 93 regular and 63 associate members bring almost all fish (but not all shellfish and lobster) to the Coop. Profits are then shared on a yearly basis with the stockholders.

The Coop has an average of 20 employees (37 in the summer). It handles a wide variety of species, including cod, cusk, haddock, hake, halibut, pollock, bass, scup and squid. Most of the processing consists simply of cutting, but squid and scup are frozen. Annual volume in 1973 was 5.7 million pounds; distribution is mainly to New York and Boston.

The Coop runs two retail markets in Brewster and Chatham, and the Brewster market was closed in 1976 because of problems leasing space. These retail markets are managed separately from the wholesale business. The company would be willing to diversify into smoked fish or other prepared fish dishes.

During periods of high unemployment on the Cape, many local residents turn to fishing to supplement their incomes. This increases the amount of fish on the market, decreases the amount caught per man, damages the port's reputation for high-quality fish because the newcomers do not maintain standards, and overwhelms the Coop with paper work. Because of their specializaions, the men and Coop cannot adjust to drastic changes and continue making a good living. Fortunately the Coop members seem to be very flexible, willing to sit out short-term problems with the industry. But because of their vulnerability to change in the population of men or fish, management techniques used in New England should be introduced over a period of five to ten years to allow the fishermen from smaller ports time to adjust before they go broke. Provincetown seems to be less vulnerable than Chatham, because it does not rely so much on top quality and low volume catch, and because the vessels have the potential for fishing further offshore than the Chatham boats.

III.6 MENEMSHA, MASSACHUSETTS

About twenty boats land fish regularly in Menemsha in the summer. Half of those have other home ports for most of the year. The year-round boats are draggers of about 45 feet. Most of the local boats make day trips, but some summer boats go for longer trips. Crew size on these boats is usually two or three. One 75 foot boat is rigged to longline swordfish in summer and fishes off the New York canyons in winter. Several other small boats also fish out of Menemsha: lobster boats, scallopers and one trap-fishing boat.

The major buyer of fish takes all species and pays the going rate in Boston or New Bedford for popular species. He pays enough for the less desirable species to keep the fishermen landing there. Tonnage of fish handled is greatest in summer for swordfish, fluke, bluefish, stripped bass, codfish. Shellfish predominate at other times of the year. Most fish is sold fresh, either filleted or whole, but some is processed into frozen fillets and a variety of prepared foods. The distribution by value is about 5 percent prepared foods, 18 percent frozen fillets and 77 percent fresh.

In the summer about 25 percent of the fish is sold on Martha's Vineyard, but in the winter almost all is sold off-island. Markets include New York, Philadelphia, and many other areas including Florida and Colorado. Some products have been

exported to Italy. The products basically go to luxury markets, including restaurants, retail stores, and New York wholesalers. The number of employees varies between four and twenty, depending on the season.

Besides the plant which processes fish into prepared foods, the company operates three retail outlets, two of them seasonal, and owns five trucks to handle local distribution.

The small size of the Menemsha company gives some advantages of flexibility. The willingness of the owner to buy all species supports local fishermen, but a greater volume of fish could be handled with the present labor force. The owner would like to increase his line of prepared foods, but expanding in a luxury food market is expensive and difficult.

A couple of other large-volume buyers operate on Martha's Vineyard at least seasonally. One has larger operations in New Bedford and handles processing there.

III.7 NEWPORT, RHODE ISLAND

The fishing industry considers Newport a suburb of New Bedford. This relationship characterizes the offshore draggers which land in that Rhode Island port, but two groups of Newport's fishermen are independent of their Massachusetts neighbor. One is the offshore lobster fishery; Newport is the lobster center for all of New England. The other major Newport group which

makes an important contribution to total landings is trap fishermen, who work in near shore and inshore waters. We are particularly concerned with the offshore draggers.

The characteristics of Newport's offshore draggers and the fishermen who work them are virtually the same as for New Bedford. Many fishermen belong to the New Bedford union, making trips which last nine or ten days (seven or eight days in summer). The fishing grounds and species caught are similar to those for New Bedford. Many of the boats in fact make some landings in New Bedford, and most of the yellowtail landed in Newport is trucked to New Bedford.

Despite the similarities of vessels and fishermen between Newport and New Bedford, on land the industry structures have some important differences. Instead of using an auction system for selling the catch, Newport fishermen sell their landings by prior arrangement to one of the three major buyers. Some of the draggers are owned by these buyer-processors. In addition to the year-round boats from Newport and New Bedford, boats from Shinnecock, Stonington and other New England ports sometimes land fish. In the summer about half a dozen "Johnny Rebs" - boats from South Carolina - also land in Newport. Of course, as the center of the offshore lobster industry, Newport attracts boats from all over New England.

When the catch is landed, fish prices are based on the

going price in New Bedford for yellowtail and in Boston for cod and haddock. A wide variety of species are handled, but yellowtail, other flatfish, cod, haddock are the most important. The boats pull up to their usual buyer, all located at the ends of piers, and unload the fish in baskets, as in New Bedford.

Trap boats are generally owned by these same processor-buyers; they bring in a wide variety of species--scup, squid, butterfish, etc., all very fresh and of highest quality. They are unloaded on conveyer belts which run from the deck of the boat directly into the plant for sorting, cutting, packing in ice. Of the three major processor-buyers, one handles only trap fish, the other two handle traps, draggers and/or lobsters. The peak catch from traps is in May; the peak for draggers is June through September.

The processing companies in Newport engage in many levels of business in the fishing industry. These companies own traps and trap boats and/or draggers; they do packing and some cutting of fish; they own trucks for wholesale distribution; one runs a large retail market. Altogether the processors handle about 16 million pounds of finfish per year, shipping them to local stores and restaurants, and to distant wholesalers in New York, Philadelphia, Baltimore, Boston. None of the companies has any immediate plans for expansion, but they are

all happy with the present level of business. They are able to sell all they handle now, and already have a fairly diverse catch. All three companies are owned and managed by families with other financial interests, especially real estate. The companies are from ten to forty-five years old.

As for all fish processors, the major business cost is the raw material fish--about 90 percent of total costs. Since much of the fish is simply packed and sent elsewhere, labor is a smaller cost per pound of fish handled than in firms where all fish is cut. Each packing/processing plant employs between eleven and twenty-five workers, more during seasonal peaks. These employees are not unionized.

The processing arm of the industry is characterized by strong family ties and by a vertical integration more pronounced than in other New England ports. Perhaps the most striking characteristic of the Newport fishing industry is its division into the three distinct segments of the industry: trap fishing and offshore lobstering centered in Newport, and offshore trawling that is shaped by the close relationship to the New Bedford offshore trawl industry.

III.8 STONINGTON, CONNECTICUT

About twelve day-trip draggers land fish in Stonington. Another twelve or fourteen consider Stonington their home port

but haul out in Newport, Point Judith or on Long Island. Most of the vessels are wooden side trawlers, but there are some boats from the Gulf built in the last five years which are stern rigged, steel or wood hulls. All of the boats have engines under 400 hp. Fish of many species are caught, including whiting, flounder, yellowtail, fluke, pollock, cod, scup, butterfish.

Most of the crew on draggers are in their forties and fifties. Usually two or three men fish on a boat. Many fishermen take shore jobs in the winter. A number of younger men fish for inshore lobster, except during the winter.

There is only one major fish buyer, who leases the building at the end of the town pier. The fish is not processed, but is simply boxed and shipped for sale elsewhere.

The port is used heavily for pleasure boats, especially in the summer. Tourism is an important local summer industry, but the fishermen perceive little conflict with the recreational uses of the harbor.

CHAPTER IV. FISHERIES MANAGEMENT: LIMITED ENTRY PROGRAMS

Attempts to manage fisheries are as old as the problem of overfishing. During the 17th Century, the alewife catch in Cape Cod towns was regulated by a warden who set fishing days and allowed only town residents to fish.[1] Attempts to assess fish stocks on a national scale began in the United States with the establishment of the Bureau of Commercial Fisheries in 1871. Fisheries management goals have evolved from biological assessment and research through more comprehensive goals, including preservation of fish stocks, to consideration of the economic and social problems of fishermen. The methods used to implement these goals range from regulation of net size to restriction of the number of fishermen who have access to the resource.

Biological assessment and research continue to be an important aspect of fisheries management, particularly in systems which depend upon quotas to limit the catch. Increasingly, the idea of maintaining a fish stock so that it may produce indefinitely has guided the formation of fisheries regulating bodies. Usually the depletion of stocks through excessive fishing has stimulated action to regulate fishing. One management strategy to build up depleted stocks calls for maintenance of an annual catch below the present sustainable yield.[2]

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1. John Hay, 1959. The Run (New York: Ballentine Books), p.25.
2. Maximum sustainable yield is the largest harvest which a fish stock can support year after year. A successful attempt to build up stocks to a level to support MSY is discussed in W.F. Thompson, 1950. The Effect of Fishing on Stocks of Halibut in the Pacific, (Seattle: University of Washington Press.)

A persistent problem in controlling fish mortality by regulations is the factor of natural variations - fish populations fluctuate in response to a wide variety of natural phenomena, including water temperature, currents and winds. Recently fisheries biologists have tried to consider interactions among species, hoping this would produce a more realistic picture of dynamic changes in the total biomass. However, any management plan primarily oriented toward a conservation goal, such as harvesting at MSY or an adequate spawning stock of some species, may ignore the roles of the fishermen, boatowners and processors who make the fish available to the consumer. Often when fish are conserved by a management scheme which ignores social and economic factors, returns to fishermen and boatowners are inadequate;[3] the capital and labor used in fishery could be more productive in some other function.

The economic problems of the fishing industry have been compounded by the fact that fish are a common property resource. That is, no individual has exclusive rights to the stock of fish from which he harvests, although he assumes the right to fish as a part of the traditional freedom of ocean exploitation.

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3. For example, the Pacific salmon fishery. See James A. Crutchfiled and Giulio Pontecorvo, 1969. The Pacific Salmon Fisheries: A Study of International Conservation. (Baltimore: The Johns Hopkins Press for Resources for the Future)

Other fishermen also have access to the fishing grounds he exploits; a fish he does not catch today may be caught by someone else tomorrow.[4]

With the 200-mile limit zone, further United States entry into fisheries may be encouraged because investors will expect a more plentiful resource for United States fishermen when stricter federal regulations of foreign fishing are enforced to reduce those foreign catches of fish. If entry into the fishery remains free, the profit level for individual fishermen and boat owners may be driven down rapidly. High investment costs, coupled with fluctuations in the number of fishermen, fish, and demand for fish, can force the individual investor or fisherman out of business as earnings decline, even under a regulatory system which achieves conservation objectives. If fishermen could be assured of a given share of a well-managed fishery resource, the fluctuation in catch and consequent economic risk would be ameliorated. Processors face similar risks; many fisheries have become overcapitalized on shore, as well as at sea, as yields have declined and operating costs increased. Even if yields rise, the entry of boats and gear into a fishery can keep returns low to the individual. Technological improvements under these conditions

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4. Many of the economic problems of the fishery arise because a fishery is a common property resource. This aspect of fisheries has been discussed by the following, among others: H.S. Gordon, 1954. The Economic Theory of a Common Property Resource: The Fishery, Journal of Political Economy 42(2): 124-142; V.L. Smith, 1968. Economics of Production from Natural Resources, American Economic Review 58(3) 409-431; F.T. Christy, Jr., 1971. Fisheries: Common Property, Open Access and the Common Heritage, in Pacem in Maribus, II. (The Royal University of Malta Press)

generally mean increased cost because of the extra investment in new technology, but if the technological improvement is widespread among the fleet's vessels, there may be no comparable increase in the share of the resource. A technological innovation can improve a fisherman's relative share only if he is the first to introduce it, or if others are unable to adopt the innovation because of cost or skill constraints.

Methods of Fisheries Regulation

The rationale of past fisheries regulation has been aimed at conservation of stocks of fish, basically a biological objective with some social and economic implications; most regulatory methods have been based on the physical characteristics of the species sought. For example, regulation of salmon fishing began with the prohibition of weirs on rivers in order to increase the percentage of salmon able to complete the trip upriver to spawning grounds. Mesh size limitation has been used in the northwest Atlantic and elsewhere to prevent the taking of small fish of various species. Other methods of regulation have included closed areas, especially spawning grounds, such as yellowtail and haddock spawning grounds in the northwest Atlantic; closed seasons, such as those established by the International Pacific Halibut Commission; size limitations, such as minimum sizes for lobsters and crabs; gear restrictions, such as the limitation of some Chesapeake Bay oystermen to sail craft and tongs; and catch quotas.

Most fisheries regulation techniques can be effective in protecting fish stocks from overexploitation if properly

administered. However, some have proved inadequate because uncontrolled variables can override the restrictions. Closed seasons are ineffective in maintaining stocks if the number of fishermen and boats expands substantially during the open season. A major drawback of regulation by gear restriction is the discouragement of technological innovation. If only certain gear is allowed in a fishery, the efficiency of fish-catching techniques will rarely improve. If existing gear can be made more efficient, innovative fishermen will be able to increase their catch in a way which may circumvent the intent of management. Catch quotas can ensure a limit to the quantity of fish caught, but the number of fishermen and boats may increase to the point at which much labor and captial is unnecessarily expended.

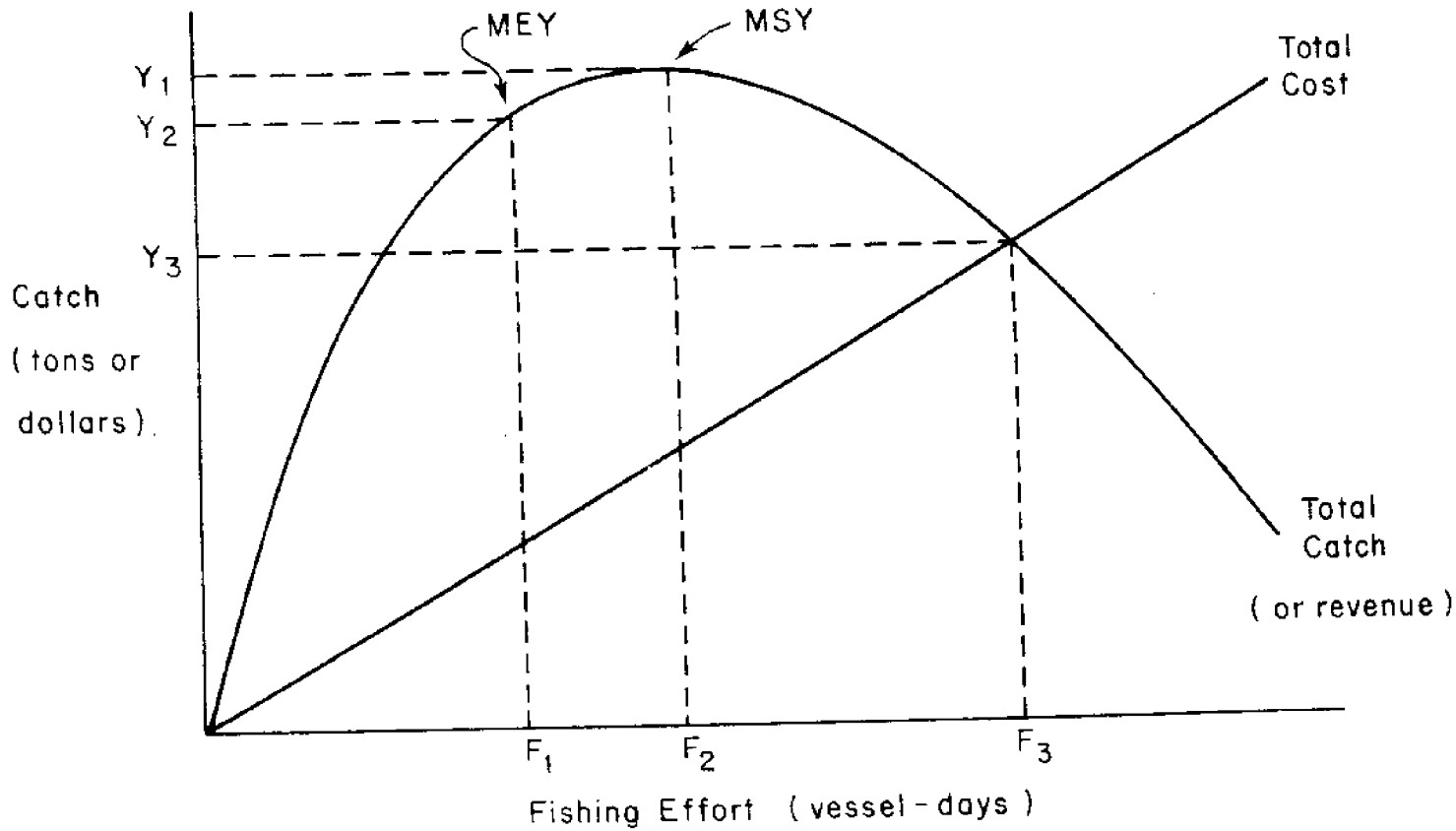
Regulation by Limiting Effort

Restriction of entry into the fishing industry is an additional technique of regulation. Unlike other methods, it focuses on fishermen and their effort expended to catch fish, rather than on the characteristics of the fish. In contrast to the biological characteristics of the fishery, which are usually central to regulation by closed season or closed area, labor and capital inputs into the fishing activity are of primary importance in a licensing program designed to limit entry. A licensing program has the advantage of simultaneously controlling the size of fish catch, a conservation goal, and the amount

of effort expended in terms of labor and capital, economic goals. In addition, provision of special licenses for certain ethnic or social groups may allow preservation of traditional ways of life, a social goal. The British Columbia salmon licensing program includes a special, inexpensive license restricted to Indians, a group which has maintained a social and economic life based on the salmon fishery for centuries.

A licensing program can allow an annual catch equal to the maximum sustainable yield while providing for reasonable returns to labor and capital. The maximum economic yield (MEY) is the physical yield which produces greatest total profits in the fishery (total revenue minus total cost). Since costs are lower, the price to the consumer should also be lower, so consumers as well as fishermen should benefit. Usually, MSY is larger than MEY, and the relative importance of aiming to increase physical yield or economic gain is a basic management decision (see Figure IV.1). Although MEY has desirable characteristics as a management goal, it has never been adopted as a sole objective in an actual fishery. The British Columbia salmon program probably comes closest among existing systems. In most programs to limit effort, social goals are considered along with conservation and economic goals. Society has multiple objectives in managing any fishery, so it is difficult to make simple statements

Figure IV.I Typical Relationship between Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY)



Y_1 is the catch at maximum sustainable yield (MSY); F_2 is the fishing effort required to catch that amount.

Y_2 is the catch at maximum economic yield (MEY), where the difference between total revenue and total cost is greatest (maximum profits); F_1 is the corresponding level of fishing effort.

Y_3 is the catch level eventually reached with open access to the fishery; F_3 is the corresponding level of fishing effort.

about theoretical "profit-maximizing" goals, although keeping incomes to fishermen at a moderate level may be an objective. The Fisheries Conservation and Management Act of 1976 calls for managing for "optimal yield," based on the biological MSY with adjustments for social, economic and ecological factors. Precise definition of optimal yield is elusive, but one of the regulatory methods to achieve it is limited entry.

Once a catch goal has been set, a program limiting effort must consider the number of boats, fishing capability of individual boats, and the amount of time spent fishing. These elements of effort may be controlled by a system of fees, taxes or licenses. The design and administration of programs using these methods have been discussed elsewhere.[5] Such programs

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5. See the following selection as an indication of papers in the field:
J.A. Crutchfield, 1961. An Economic Evaluation of Alternative Methods of Fishery Regulation, Journal of Law and Economy 4 (3): 131-143; R. Turvey, 1964. Optimization and Suboptimization in Fishery Regulation, American Economic Review 54(2):64-76; P.T. Christy and A. Scott, 1965. The Common Wealth in Ocean Fisheries. (Baltimore: The Johns Hopkins Press for Resources for the Future); James A. Crutchfield, ed., 1965. The Fisheries: Problems in Resource Management. (Seattle: University of Washington Press); F.T. Christy, 1973. Alternative Arrangements for Maine Fisheries: An Overview. (Washington,D.C.: Resources for the Future); F.T. Christy, 1973. Fisherman Quotas: A Tentative Suggestion for Domestic Management, Occasional Paper No. 19, Law of the Sea Institute, University of Rhode Island.

generally begin with permission for all existing fishermen and/or boats to continue to fish. Then effort is reduced to the desired level through gradual attrition and/or a government program to buy some vessels. The result of this type of program, with a slow approach to the desired level of effort, is in direct contrast to more common regulations such as closed seasons and areas which, despite a strong immediate effect in reducing catch, are ultimately ineffective because fishing effort intensifies in the open seasons or areas to push up total catch. In practice, regulation of a fishery might rely on a combination of several methods to reach multiple conservation, economic and social goals.

Examples of Limited Entry Programs

Fisheries regulated through entry limitation rely primarily on licensing arrangements. Several national and regional fisheries are currently regulated with limited entry programs of various types. We summarize some of these programs, including species and areas covered, method of limitation, criteria for issuing licenses, administrative agency, special provisions, and biological, economic and social implications.[6] Programs

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6. The programs summarized do not include all such programs now in existance. Others are operating in Australia, Maritime Provinces of Canada (lobster), New Zealand, Mexico (abalone), California (herring and herring roe), Ohio and Michigan. These limited entry programs are summarized in "Management Approaches for Marine Fisheries: The Case of the California Abalone" by B. Cicin-Sain, J.E. Moore and A.J. Wyner; University of California Sea Grant College Program, IMR Ref. 77-101. January 1977.

are grouped by region and include well-established programs in operation for more than twenty years as well as newly introduced programs in the process of becoming effective. Much of the experience elsewhere is relevant to New England's potential reaction to various kinds of limited entry programs.

South Africa. South Africa's license limitation scheme is relatively simple. Since 1953, the national government of South Africa has licensed a restricted number of fishing vessels in the pilchard (Sardinops ocellata pappe), maasbanker (Trachurus trachurus) and mackerel (Scomber japonicus) fishery to preserve stocks of these species.[7] The vessel licensing system, established by the Sea Fisheries Act, was combined with special licensing regulation of reduction plants (beginning 1949) and canneries (1964). For five years (1965-1970) two factory ships were also licensed in the fishery, but they were found to be too efficient in reducing stocks and too much competition for conventional vessels. The fleet has improved in size and in sophistication of equipment since the licensing scheme has been in effect, and the shore-based enterprises have become more vertically integrated by purchasing their own vessels, building stickwater plants to extract nutrients from waste water produced by fish meal processing, or devising processes to more fully utilize tonnage of raw fish. South Africa's relatively simple plan has been

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7. Gertenbach, L.P.D., 1973. License Limitation Regulations: The South African System. FAO Technical Conference on Fishery Management and Development, Vancouver, British Columbia, Feb. 13-23.

effective in controlling the fishery it was designed to protect and in improving average vessel income levels, but it also resulted in vertical integration and increased capitalization.

Japan. Japan has an extremely complex regulatory system dating back to 1901.[8] Three basic categories of fisheries currently are administered - the fishing-rights fisheries, license fisheries, and other fisheries. Fishing-rights fisheries are coastal fisheries; monopolistic and exclusive rights are granted for fishing certain areas of public waters.[9] These special fishing rights, granted by prefectural governors, are regarded as property rights, providing some vested interest in the resources for those who hold licenses. Although licensed fishermen are protected from competition through the granting of monopoly rights and new entry is greatly discouraged, there has apparently been enough competition to encourage technological advancement. The second classification of the Japanese fishing industry, "license fisheries," applies mostly to offshore and deep-sea areas. Such licenses constitute exceptions to general restrictions forbidding or regulating these fisheries; they are issued by the Minister of Agriculture and Forestry. The

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8. Asada, Y., 1973. License Limitation Regulations: The Japanese System. FAO Technical Conference on Fishery Management and Development, Vancouver, British Columbia, Feb. 13-23.

9. Matsuda, Yoshiaki, 1972. Extension Approach to the Development of Rural Fishing Villages on Hokkaido, Japan. Unpublished thesis, University of Georgia, Athens.

third group, "other fisheries", regulates fishing, usually through the Minister of Agriculture and Forestry, as required for species not covered above and for compliance with international agreements. Despite these domestic controls, certain distant water fleets, such as those fishing for Bristol Bay salmon, have not participated in the international commissions designed to conserve specific resources.

One interesting aspect of the Japanese system is that when the number of vessels in given fishery is reduced, the vessels forced out may either be transferred to another fishery or the vessel owners be compensated by those remaining in the fishery. The long history of the Japanese limited-effort program has created fairly complete public acceptance of the management program, but in recent years opposition by fishermen has prevented the government from charging fees for licenses and fishing rights. The Japanese system covers both exclusively domestic fisheries and fisheries affected by bilateral and international agreements. The complexity of the regulations can be taken as an indication of the varied requirements of a national fisheries plan in a country such as the United States.

British Columbia - Salmon. The British Columbia Salmon Vessel License Control Program, administered by the Fisheries Service under the Canadian Department of the Interior, was established in 1968. Its purpose was to ensure adequate spawning escapement and thus continued maintenance of stocks, with

some consideration of the economic and social needs of fishermen and the fishing industry.[10] The method of limitation is the issuance of licenses by vessel - with "A" and "B" license categories based on salmon production in the base years 1967 and 1968. Vessels under construction at the time the program was announced were also allowed licenses. Category A vessels can be retired or replaced (on a ton-by-ton basis since 1970), and the government has begun a "buy-back" program to reduce the number of "A" licenses. A special "A" category was established in 1970, with a token $10 fee, for native Indians who owned or were purchasing their own vessels. These could be resold only to another Indian. The "B" category vessels, which have a history of low production, can be reconstructed but not replaced and are expected to be eliminated gradually by attrition. Both "A" and "B" license fees are substantial. Once a fisherman holds a license he has some incentive to improve his efficiency in order to increase his catch and revenues, since gear and boat improvements do not require a new license. However, capital investment has increased faster than revenue, and the intended improvement in economic conditions has not completely materialized. Some further restrictions or controls will probably be necessary to protect those who are in the fishery, perhaps by requiring purchase of another license to improve a vessel's fishing capacity. The special license category for Indians was designed to protect a unique social-economic system. The disruption caused by limiting fishing would be substantial

10. B.A. Campbell, 1972. Limited Entry in the Salmon Fishery: The British Columbia Experience. Pacific Sea Grant Advisory Program No.6, Centre for Continuing Education, University of British Columbia.

in the rather isolated rural communities of the Indians which offer few alternative labor opportunities.

Washington State - Salmon. In 1974 the state of Washington established a plan to limit the number of vessel licenses in order to improve control of the salmon fishery for economic and biological reasons. The Department of Fisheries initially issued commercial gear fishing licenses or vessel delivery permits only to fishermen who held such permits in past years or already had boats under construction. Since the beginning of 1975 no new licenses have been sold to "non-qualifying" fishermen. The salmon season is short, so most of the fishermen hold other jobs as well. Regulation of the salmon fishery is made more complex by the special rights of certain Indian tribes to the production of the fishery and by conflicts between commercial and recreational fishing interests.

Oregon has a very similar licensing program which is administered in a cooperative manner. The number of licenses issued in Oregon has not been restricted at all except by general economic and social conditions. Traditional restrictions on seasons, gear and so forth, remain the most important management techniques.

Alaska. In 1974 the State of Alaska Commercial Fisheries Entry Commission began to limit entry into the salmon fishery, with an option to limit entry at a later date to other species such as bottomfish, crab, herring, shrimp, halibut and black

cod.[11] The goals of the program were to achieve maximum sustainable yield and to provide fair returns to the fisherman. Licenses were issued to fishermen for $50 and can be resold at whatever price the market supports. Licenses are issued for specific fisheries by geographical area on the basis of a point system which accounts for past participation, economic dependence on the fishery and whether the residence of the fishermen is rural or urban. Fishermen receive extra points if they live in rural areas, where presumably alternative jobs are scarce. Special laws were passed in the state legislature to allow limitation of entry into the fishery; these laws were challenged in court on the grounds that Federal Constitutional rights had been abridged by Alaska's Commercial Entry beyond three miles, the states over stocks within three miles. Generally the federal authority leaves administration of limited entry programs to the states. The Federal Government has generally supported limited entry fisheries of only local interest.

Others. Norway, Iceland, Mexico, Australia, New Zealand and some other countries have some limitation on entry into their fisheries. Of course, centrally planned economies have control over the number of vessels and men engaged in fishing, but this sort of limitation falls into a different category than programs instituted in basically free-enterprise economies.

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11. Alaska Commercial Fisheries Entry Commission, 1973. Limited Entry: Report to the Fishermen of Alaska, July 15, 1974; Alaska Commercial Fisheries Entry Commission, 1974. Costs and Earnings of Alaskan Fishing Vessels-An Economic Survey, Sept. 10; Laws of Alaska, SCS/CSHB 126amS, Chapter No. 79. An Act Relating to the Regulation of Entry into Alaska Commercial Fisheries; and Providing for an Effective Date.

V. GOALS AND METHODS OF REGULATION FOR THE NEW ENGLAND FISHERY

LIMITED EFFORT VS LIMITED ENTRY

The examples of limited effort and limited entry in the previous chapter have one characteristic in common - the management plans were specifically tailored for the political system of the country or region. To adapt any one of those limited entry plans to New England would require more information about the New England fleet and fishermen than has been collected previously; it is questionable whether even an adapted plan would be realistic - all the plans inherently demand a level of social control over individuals in the fishery that has been unacceptable to New Englanders. In addition, the limited entry plans discussed previously do not include information about industry variability such as we have described for New England. These plans imply a greater cultural homogeneity of population and industry in Japan, South Africa and Norway than exists in New England. They also reflect a long tradition of federal control over the fisheries and centralization of fisheries management and development. Until the passage of PL 94-265, giving the Federal Government management authority within the 200-mile zone, the only bases for restrictions in New England were state regulations and international agreements. Most of

these restrictions affected fishermen uniformly; quotas were established for Americans, not for the individuals within the fleet, mesh regulations were uniform, as were closed seasons and areas. Strong feelings of individualism exist throughout New England, and the fishermen seem to represent freedom and independence of thought and action for the entire society. Although management plans need to consider the biological, economic and social data, they also must take into account the history of social control in New England communities and the role of government as it affects individual behavior.

Parallel to the broad issues of social control associated with limited entry are economic considerations. Some individual fishermen feel that if they could put up with the social control, they might earn more money under a stringent management program where entry into profitable fisheries would be restricted or closed. They argue that under the present system of open entry a man who makes a good living from a fishery is an example for other men, who then enter the industry, so that profits for each decline as they are shared by an increasing number. Many fishermen see open access as a disincentive to the introduction of new species, market development, gear research and so forth. On the other hand, the advantages of limited entry may not be worth the social costs, such as perceived loss of opportunity; few fishermen are convinced

it would be.

While limited entry does not seem socially or politically acceptable at this time, many forms of limited effort are more attractive. Table V.1 is a summary of limited effort methods, many of them discussed in Chapter IV. Some of these forms of limitation are acceptable while others are not. Limitations on technology in general seem to be acceptable methods of reducing catch, perhaps because they seem equitable; all fishermen are bound by the same restrictions. The ability to profit under technological restrictions depends upon the same individual skills which reap success in an unregulated fishery. Although many fishermen have grumbled about closed areas, closed seasons, mesh regulations and gear restrictions, they recognize conservation as a legitimate goal and cooperate. Several regulations have seemed less sensible and less fair. For example, many fin fishermen would prefer strong mesh regulations to minimum size requirements. Most of the fish caught by draggers is dead when it comes aboard. A minimum size restriction requires fishermen to discard all fish of less than minimum size, a waste of important protein as well as a loss of income for the boat. Despite adjustments to minimum size regulations to reduce waste by allowing fishermen to possess fish less than minimum size if these fish constitute less than 10% of the catch, this is not a wholly acceptable method to reduce catch. Minimum size regulations may be useful for shellfish, which can be returned to the sea alive. Minimum

mesh size does have some technical drawbacks; recent studies suggest that minimum mesh size should be much larger than the sizes commonly used now. The nets have a herding effect which traps many small fish which should theoretically escape.

TABLE V.1

Methods for Regulating Fishing Effort

Biological Management

- quotas
- closed areas
- closed seasons
- minimum or maximum size limits of fish

Equipment Management

- vessel size
- vessel power
- gear restrictions: net size, technique

Entry Management

- require licenses
- restrict number of licenses based on:
  - lbs. of fish landed in the previous year
  - minimum income from fishing, % of income from fishing
  - number of years in the fishery
  - license auction
  - lottery
  - inheritance
  - state reclaims license to sell by methods above

Regulations which have generated a great deal of opposition in the past are the results of quotas established under ICNAF. While most U.S. quotas were set high enough so that Americans could fish unrestricted, the haddock and yellowtail flounder quotas were low because the stocks were low. The zero quota on haddock was not so troublesome in 1973 as it was in 1976. In 1973, stocks were so low that it was unlikely that a vessel would catch more than the allotted 10 percent of his total, but by 1976 haddock were recovering, easier to catch, and seemed to be plentiful even though stocks were perhaps only one-tenth of their size in the mid-1960's. Fishermen with catches including more than 10 percent haddock were cited by fishery enforcement personnel and fined by the courts. Fisheries managers argued that the zero quota was necessary to prohibit a directed fishery on haddock; fishermen argued that the fish were unavoidably caught in a directed fishery for cod and pollock and should not be wasted. Because the price of haddock is so high, few fishermen could rationalize a trip that did not have 10 percent haddock in it; after all, everyone else caught 10 percent. Even with a change which allowed annual or quarterly computation of 10 percent haddock rather than the 10 percent per trip determination, many fishermen felt that the regulation was unfair. Although many fishermen say they favor conservation, they disagree with specific regulations designed to achieve that end.

While this quota resulted in what the fishermen perceived to be waste, a restriction on yellowtail flounder established by the Commonwealth of Massachusetts seemed to the fishermen to be inequitable. Because yellowtail is the major fishery for the New Bedford fleet, and because the quota was lower than the New Bedford vessels would catch during the year, Massachusetts passed a law which restricted the catch of yellowtail to 5000 lbs per man per trip. Although on the surface this regulation appears fair, it discriminated in favor of those boats which had larger crews and fished short trips. A six-man boat was allowed 30,000 lbs of yellowtail each trip. That was enough, when supplemented with small catches of other flounder and cod, to ensure a good income to all. Vessels with the ability to catch the same amount, but rigged to fish with four men, found their incomes considerably limited since the restriction allowed only 20,000 lbs of yellowtail per trip. These disadvantages were not perceived when the restriction was established, perhaps because most New Bedford vessels have six men as is required by the Fishermen's Union.

A management plan to limit entry fairly and equitably calls for much more information than the number of men per vessel and the length of trips. Even with more information, no management plan can be fair and equitable to all fishermen, all of the time. The problems associated with eligibility for licenses have driven the Alaska Limited Entry Commission to distraction. Table V.1 lists several methods by which licenses could be issued. There do not seem to be simple, straightforward

ways to reduce the number of men in a fishery.* All licensing systems have seemed unfair to those individuals who have been eliminated from a fishery or whose gear has been restricted. In order to make limited entry equitable, social scientists have begun to ask for more detailed information about the individuals, hoping to find a small number of social characteristics which can be used to define a fisherman, and to license fishermen based on this definition. As we have illustrated in Chapters II and III there is enormous variation within a port, and few generalizations can be made among ports. If fishermen were more homogeneous, and if fishery planning were centralized, then it might be possible to regulate by limited entry and quota allocation to individual fishermen because the effects of regulation would be predictable throughout the industry. But fishermen are not alike, and this is not a centrally planned economy; regulations which may be fair to New Bedford fishermen might be grossly unfair to men in Gloucester or Point Judith and vice versa.

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*Susan B. Peterson and James M. Friedman, 1977, The Massachusetts Lobster Fishery: Model Legislation and Management Plans. Technical Report, WHOI Reference No. 77-5, Woods Hole Oceanographic Institution, Woods Hole, Mass.

LIMITED EFFORT: EFFECTS ON INDIVIDUAL PORTS

A discussion of the potential effects of limited effort plans on several ports must consider the diversity within the New England fishery. The impact of any plan on fishermen, fishing vessels, species sought and fishing techniques cannot be predicted simply for "The New England Fishing Industry." Some of the major ports are examined one at a time to explore briefly the difficulties of applying a limited effort program in each.

Boston

A limited effort program, and indeed most management techniques, could probably be applied more easily in Boston than in the other large ports. The offshore trawlers are large, make long (ten to 14 day) trips, seek a limited array of species, land fish at the Fish Pier, and sell fish at a public auction. Control of the number of vessels landing fish of either specific varieties or mixed species would be relatively simple. Reported catch could be checked when the boats land their fish, and the limited number of vessels would simplify administration. The concentration of fish landing, processing and wholesaling in one physically small area would keep marketing information and catch data easily available if any alterations in effort were needed.

In terms of the need to limit effort, or the kind of effort which should be controlled, Boston presents an interesting case. The number of vessels in Boston seems unlikely to increase

unless the variety of species that are caught changes to accommodate market promotion programs by the processors and wholesalers. The large volume and extensive markets of Boston's processors make this sort of expansion attractive, at least in theory. In fact, the processors have regular suppliers from Canada and other U.S. ports, and most of them are reluctant to expand operations to include more Boston-landed fish unless they are certain of a stable supply. Any limitation or increase in the number of vessels in Boston cannot be considered independent of local buyers and their markets.

In terms of the number of fishermen, existing vessel capacity could employ approximately fifty percent more crew than at present. The number of crew is less than that for which the vessels were designed because the boats generally are not filled in the ten to 14 day trips, and longer trips are impractical - both socially and for the quality of fish landed. Also, fewer men in the crew implies a greater share of the sales (gross stock) for each fisherman, and since most owners are also captains, this is to their advantage as well. Both low catch rates under the limited trip time (necessary if fish is to be sold fresh) and desire for high income levels mitigate against increasing crew size; crew size is unlikely to increase unless stocks of popular fish and/or prices of underutilized fish rise significantly.

At present the natural economic forces in the industry seem quite sufficient to limit entry into the Boston fleet.

If conditions improve in the future and entry into the fishery threatens to reverse a favorable trend in profits, a limited entry program could be administered fairly easily in Boston.

Gloucester

Despite its physical proximity to Boston, Gloucester's fishing industry is a marked contrast to Boston's. Gloucester is home port to more vessels than Boston, and these boats seek a diverse group of species and employ a wider variety of gear and styles of fishing. Instead of a single fish pier with a central auction, in Gloucester there are many piers, and boats land their fish directly at a buyer's plant, generally by prior arrangement. Data collection and enforcement of any limited effort scheme would be a much more complex task than in Boston.

Fish catch has been expanding in Gloucester since the late 1960's, although it is still only about half the volume of the 1950's. There is, therefore, some optimism in the port that opportunities in the industry are better now than they have been in fifteen years. This optimism is reflected in the experimentation with pair trawls and other new techniques by some boats in the fleet, and by the introduction of several new steel stern trawlers.

Despite the larger volume handled by processors of imported frozen blocks of fillets, fresh fish processors in Gloucester handle a wide variety of fish and are enthusiastic about expanding. Gloucester seems a better prospect for processing and

marketing under-utilized species than most New England ports. The frozen fillet processors have a different, more capital intensive production process which potentially could be used to produce U.S.-caught fish products. The experience of processors and fishermen since World War II has bred a willingness to experiment which should be very helpful in expanding the fishery. The major difficulty in managing the Gloucester fishing industry would be in differentiating the effects any management plan will have on the two discrete parts of the fleet: the modern innovative trawlers, often with relatively young crew, and the older wooden side trawlers with older crew. The two groups do overlap to some extent, particularly when a young man buys or operates an older vessel until he can afford a newer one. He may be willing to try new styles of fishing or seek new species of fish, but his initial vessel may limit his ability to do so. The social implications of a limited effort program would need careful analysis in Gloucester.

New Bedford

In terms of administrative setting for a limited effort program, New Bedford falls somewhere between Boston and Gloucester. The fishing fleet includes a wide variety of offshore vessels in terms of age and size, but most use standard side or stern trawl gear, and fish for a small selection of popular species. Although the fishermen include a wide range of ages and ethnic groups, most are committed to traditional

fishing methods. Most fish is sold at public auction; some is sold directly to processors.

Any limitation on the number of fishermen or vessels would probably provoke strong opposition. The New Bedford fishermen feel they are doing quite well, even with reduced stocks of yellowtail and other popular species. They want to catch more fish, but most are not yet willing to seek unfamiliar species. Much of this reluctance to expand the fishery can be attributed to the New Bedford processors who were badly scared by the rapid decline in volume during the late 60's and early 70's.

Stricter quotas on yellowtail, cod and haddock might drive some fishermen out of business, but a limited entry program would probably eliminate even more of them. The transition to new species will not be easy; past experience in New Bedford with red crab, dogfish and squid has been mixed. The processors are a critical link in introducing new species for the fishermen and cannot be ignored in setting up a management program to alter fishing patterns.

Point Judith

Point Judith is a relatively small port, but the diversity of species landed and of fishing techniques give it a special place in the New England fishery. Point Judith fishermen, through the Coop, have developed a highly successful strategy of catching a wide variety of fish and a limited volume of any one species. The Coop has established marketing channels which bring in high prices to the fishermen. It has provided a

cushion of support to allow individuals to experiment with new gear and techniques.

Applying a limited effort program to Point Judith would appear unnecessary; the Coop's self-interest dictates careful restriction and allocation of catch. Annual species quotas could probably be handled more easily in Point Judith than in most New England ports, as the Coop could coordinate effort. However, since most Point Judith boats are smaller and carry fewer crew than New Bedford boats, quotas in terms of pounds per man per trip would put Point Judith at a disadvantage. Limiting gear or fishing techniques to control effort would be particularly detrimental to Point Judith's activities. If a limited effort program were formulated to discourage catching popular species, Point Judith could readily shift to a higher proportion of under-utilized species. Certainly the transition would be easier in Point Judith than in other New England ports. The combination of a flexible fishing fleet and a strong and varied marketing system through the Coop would be desirable under any management system, but particularly for a limited effort program.

Rockland

Rockland's mainstay as a fishery, the offshore redfish catch, would be particularly simple to manage (and probably less necessary) under a limited effort program. The fishing vessels are owned by the processing plant which buys and

processes their entire catch. The desired fishing effort could be prescribed, and major decisions about number of boats and crew could be left to the owner company which already makes those decisions anyway. This would be effective as long as only one company is active in the fishery. If expansion is desired, new entrants could be admitted as necessary - either independent or processor-owned boats. Present fishing effort does not appear to be excessive, but if the overall health of the New England fishery required reduced redfish catch, arranging a limited entry program would not be difficult. One problem in Rockland would be that the entire burden of reducing the fleet would fall on one company and might destroy its economic viability.

FUTURE OF FISHERY MANAGEMENT

Developing limited entry programs for the large New England ports is a challenge; developing management plans for all New England fishermen may be impossible because of the lack of information about the men, their vessels, markets, gear and other variables. Because many fishermen fish out of small ports from Maine to Rhode Island which are not part of the NMFS survey of fish landings, and because they fish seasonally, for a variety of species in areas which change with the weather and markets, they are difficult to find, interview or find again. Although these inshore and nearshore fishermen were not considered in this report, the difficulties associated with

collecting data on them are the same difficulties one would encounter if trying to develop a limited entry program for all New England fishermen. A fishery management program which ignores these people might be a reasonable solution, as long as it did not put them out of work or cause a shift in fishing effort toward bigger landings by fishermen from the small ports. It may be that management will be planned in terms of the large New England ports only, using a percentage of catch to estimate all activity of other fishermen for which we have no information. However, a limited entry plan for New England would surely be legally challenged if 20 percent or 30 percent of the fish were caught by men not affected by the regulations. In order to provide a limited entry plan which might be equitable, data would be needed from a reasonable sample of all fishermen in a given fishery, a requirement both expensive and time-consuming.

Now that the 200-mile fishing limit has been established, the New England Fisheries Management Council has the task of setting goals and priorities for management of the New England fishery. Allocation and future industry structure emerge as the major considerations which the regional council must face. Most of the day-to-day problems in fisheries management reflect one or both of these issues. For example, the discussion of yellowtail flounder quota allocation among American fishermen illustrates the likelihood that problems will be serious within the next few years because quota systems devised thus far are not value free. There is a potential for substantial increase

in the size of the New England fleet and catch, but a rational plan for this growth is needed to guide expansion, provide support for declining segments of the industry, and discourage rigidity in management techniques which would impair the long-run viability of the industry.

Despite the appealing management characteristics of a limited entry program, such a program does not seem appropriate for the present political and economic structure of the New England fishery industry. However, any attempt at fisheries management would benefit from adoption of licensing programs which have been used as the basis for allocation under limited entry programs. A licensing system would provide the council with a framework for data collection. Systematic knowledge of the fishing industry gives the council a rational basis for making decisions. The basic problems of allocation and industry structure must be faced by any management method. If at some future time limited entry or some other innovative management technique should become attractive, the council will have the background information necessary to respond to changes in the fishery.

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15. Supplementary Notes

16. Abstracts

Fish and fishermen appear to be in a serious decline in New England. The haddock are overfished, inshore herring stocks are depleted, yellowtail flounder and lobster are scarce. The popular image is of grizzled fishermen, their boats chipped, scarred, old-fashioned hulks of wood tied up two and three abreast along the rotting wharves and piers of New England's depressed port towns. In this research project, we wanted to determine the state of the New England fishing industry and to propose acceptable methods for the management of the fishery.

During our early discussions with the fishing industry people, we mentioned that we were interested in limited effort programs as they might be applied to New England fishermen. We carefully, and probably tediously, explained the "theory of limited effort" and we were generally thought to be daft. (Cont.) *

17. Key Words and Document Analysis. 17a. Descriptors

1. Fisheries
2. New England
3. Management

*We were told we had things backwards--that the fishing industry needed more fish, more men, more boats - and that the way to accomplish this was to get a 200-mile fishing limit and kick the foreigners out.

One of these wishes has come true - in the spring of 1976, P.L. 94-265 established a 200-mile fishing zone off the United States, with regional management councils **

17b. Identifiers/Open-Ended Terms

**to make management plans and allocate the resources first to United States fishermen, with surpluses to foreign fishermen.

17c. COSATI Field/Group

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by Leah J. Smith and Susan B. Peterson. 130 pages. August 1977. Prepared with funds from the Pew Memorial Trust and by the Department of Commerce, NOAA Office of Sea Grant under Grants 04-5-158-8 and 04-6-158-44106, and the Institution's Marine Policy and Ocean Management Program.

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