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Essays on Social and Cultural Aspects of New England Fisheries: Implications for Management, 1980 Final Report, Volume II

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FINAL REPORT TO THE NATIONAL SCIENCE FOUNDATION

VOLUME II

ESSAYS ON
SOCIAL AND CULTURAL ASPECTS OF NEW ENGLAND FISHERIES
IMPLICATIONS FOR MANAGEMENT

UNIVERSITY OF RHODE ISLAND, UNIVERSITY OF MAINE STUDY OF SOCIAL
AND CULTURAL ASPECTS OF FISHERIES MANAGEMENT IN NEW ENGLAND
UNDER EXTENDED JURISDICTION

JAMES M. ACHESON, PRINCIPAL INVESTIGATOR

Any opinions, findings, conclusions
or recommendations expressed in this
publication are those of the author(s)
and do not necessarily reflect the views
of the National Science Foundation.

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TABLE OF CONTENTS

Preface	iii
 <u>Section I: Key Values and Social Units in New England Fishing Ports</u>	
Adaptation to Uncertainty and Small Numbers Exchange: The New England Fresh Fish Market by James A. Wilson	1
"Boats Don't Fish, People Do": Some Ethnographic Notes on the Federal Management of Fisheries in Gloucester by Marcos L. Miller and John Van Maanen	27
Getting into Fishing: Social Identities Among Traditional and Non-Traditional Fishermen by Marcos L. Miller and John Van Maanen	53
Fishermen's Wives: Coping with an Extraordinary Occupation by Fran Danowski	115
Sociocultural Variables Related to Variance in Perceptions of Alternative Fishing Types in Southern New England by Richard B. Pollnac and John J. Poggie, Jr.	191
Factors Influencing Preferred Fishing Type Among Fishermen in Southern New England by Richard B. Pollnac and John J. Poggie, Jr.	211
Social Desirability of Work and Management Among Fishermen in Two New England Ports by John J. Poggie, Jr. and Richard B. Pollnac	230
The Structure of Job Satisfaction Among New England Fishermen by Richard B. Pollnac and John J. Poggie, Jr.	256
Pruning the Family Tree: Kinship and Community in Coastal Maine by Toby Lazarowitz and James M. Acheson	295
Using the Family Jewels: The Family Estate in Coastal Maine by James M. Acheson and Toby Lazarowitz	337
The Fishermen's Wives Association by James M. Acheson and Jayne Lello	374

Section II: Studies of Innovation and Impact of Extended Jurisdiction

Metal Traps: A Key Innovation in the Maine Lobster Industry by James M. Acheson	401
Patterns of Gear Changes in the Northern New England Fishing Industry by James M. Acheson	451
Technological Innovations and Organizational Implications: The Case of Pair Trawling in New England's Fishing Industry by John R. Bort	500
Technical Innovation in the New England Fin-Fishing Industry: An Examination of the Downs and Mohr Hypothesis by James M. Acheson and Robert Reidman	515
New Boats and New Gear: Federal Regulation and Investment in the New England Groundfishery by James M. Acheson	560

Section III: Current Fisheries Management Issues

A Model to Analyze the Effects of Changing the Maine Minimum Legal Lobster Size from 3 3/16 Inches to 3 1/2 Inches by James M. Acheson and Robert Reidman	589
Cultural and Technical Factors Influencing Fishing Effectiveness in the Maine Lobster Industry: An Assessment by Fishermen and Biologists by James M. Acheson	643
Factors Influencing Production of Metal and Wooden Lobster Traps: A Technical Report by James M. Acheson	716
Attitudes Towards Limited Entry Legislation Among Fin-Fishermen in Northern New England by James M. Acheson	771

Section IV: Summary

The Tragedy of the Commons: An Uncommon View by James M. Acheson, John Poggie, Richard B. Pollnac, and James Wilson	803
Social and Cultural Factors Influencing Fishing Effort by James M. Acheson and Ann W. Acheson	823

PREFACE

This volume is the second in a three volume series of reports submitted to the National Science Foundation for a project entitled "University of Rhode Island, University of Maine Study of Social and Cultural Aspects of Fisheries Management in New England Under Extended Jurisdiction" (N.S.F. Grant Number AER77-06018). This project was funded through the RANN Directorate of N.S.F. (Research Applied to National Needs), and was designed to provide data on social, cultural, and economic aspects of the New England fishing scene which would be of value to those in industry and government concerned with managing the marine fisheries of the northeastern part of the United States, particularly those concerned with management under PL 94-265, the Fisheries Conservation and Management Act of 1976. It is important to note that PL 94-265 calls for the management of U.S. fisheries for Optimum Sustainable Yield. This means, in essence, that the U.S. fisheries would be managed not only for biological ends, but with economic and social factors in mind as well. The Congress clearly recognized that the management of marine fisheries affects both the fish resources and the economy and culture of coastal communities. The data in each of the three academic areas most directly involved in fisheries management are very uneven. There is a great deal of information about the biological aspects of U.S. fisheries; less on the economic sphere; and virtually no social and cultural information on fishermen and fishing communities in New England. This current project was initiated with a view toward correcting that imbalance.

All told, there were 13 people who worked on the project: five from the University of Rhode Island and eight from the University of Maine.

The entire University of Rhode Island crew were anthropologists. Five of the University of Maine group were anthropologists; two others were economists. The people who authored sections of this volume, along with their institutional affiliation on the project, academic discipline, and project role are listed below:¹

<u>Name</u>	<u>Project Role</u>	<u>Academic Field</u>	<u>Institution</u>
Dr. James M. Acheson	Principal Investigator	Anthropology	University of Maine
Dr. Ann W. Acheson	Research Assistant	Anthropology	University of Maine
Dr. John R. Bort	Research Assistant	Anthropology	University of Maine ²
Fran Danowski	Graduate Student	Anthropology and Sociology	University of Rhode Island
Dr. Toby Lazarowitz ³	-----	Anthropology	University of Maine
Jayne Lello	Research Assistant	Anthropology	University of Maine
Dr. Marcos Miller	Research Assistant	Anthropology	University of Rhode Island
Dr. John J. Poggie, Jr. ⁴	Research Associate	Anthropology	University of Rhode Island
Dr. Richard B. Pollnac	Research Associate	Anthropology	University of Rhode Island
Robert Reidman	Research Assistant	Economics	University of Maine
Dr. John Van Maanen ⁵	-----	Sociology	Massachusetts Institute of Technology
Dr. James A. Wilson	Research Associate	Economics	University of Maine

¹ Several additional people worked on the project as interviewers, but did not write any of the material contained in this volume

² Also worked on University of Rhode Island staff for two months

³ On the project only part-time, in the fall of 1979

⁴ In charge of University of Rhode Island crew

⁵ No formal connection with the project

This project had five objectives: (a) to provide baseline data on the fishing communities and fisheries of New England, (b) to provide information on key values and social institutions, (c) to collect and analyze data on innovation in the New England fishing industry, (d) to provide a model other social scientists could use to apply social science information to problems of fisheries management, and (f) to integrate social, economic and biological information in ways that provide a coordinated picture of fishing behavior. Volume I of this report contains the information on the baseline data. This information is being published in two parts. The port study data on the area between Eastport, Maine and the New Hampshire/ Massachusetts boundary has been published by the University of Maine Sea Grant Office in a volume entitled "The Fishing Ports of Maine and New Hampshire." The port study data on Massachusetts, Rhode Island and Connecticut has been published by the University of Rhode Island Sea Grant Office in a volume entitled "The Small Fishing Ports of Southern New England." The fifth objective -- the integration of social, economic and biological data -- has been written up in the third volume entitled "An Adaptational View of New England Fisheries."

This volume contains articles concerned with objectives (b), (c), and (d). Section I entitled "Key Values and Social Units in New England Fishing Ports" consists of a series of articles on institutions and values. These range from articles on occupational commitment, types of fishermen, and fish markets, to studies of fishermen's wives and kinship. All are studies of important institutions in fishing and ones which strongly influence the behavior of various sets of New England fishermen.

Section II contains information on innovation among New England

fishermen. In this section, we report on several different kinds of innovations in New England and the social and economic factors that determine their adoption or non-adoption. It should be noted that we deliberately studied innovations at different levels of complexity and cost. Metal lobster traps (reported by Acheson) are a relatively simple, low cost innovation; the kinds of electronic gear and fishing gear reported on by Acheson and Reidman is more complicated, and costs are considerably higher. The adoption of pair trawlers, reported by John Bort, concerns a very complicated innovation and one which is a major investment by any standard.

Our initial reason for focusing on innovation stemmed from a concern with the impact of the new 200 mile limit bill. We assumed that PL 94-265 would open new economic opportunities to the members of the fishing community and that the ultimate effect of the bill would be related to their ability to respond to the opportunities presented. We assumed that if members of the fishing community were able to respond positively to the opportunities presented, this bill would ultimately result in larger boats and crews, more equipment, more investment, larger catches and greater sales, and ultimately more people employed. If they were unable to respond, we assumed that the fishing industry would be taken over by corporate conglomerates. Our information indicates that the industry is very much able to respond to the opportunities presented. However, it also demonstrates that the phenomenon of innovation among New England fishermen is by no means as uncomplicated as we had previously thought, and that far more is involved in technical and economical change in this industry.

Section III contains four articles on applications of social and

economic information to specific problems facing fisheries managers in New England at present. It should be noted that our initial objective was to provide a model to other social scientists on ways to apply social science data to problems of fisheries management. We quickly discovered that there was no single model that could be applied and that each management situation was unique. That is, the kinds of management schemes proposed for one fishery and the net effects it would have vary greatly with the fishery. We also discovered that social scientists could contribute greatly to fisheries management efforts, but only through specific studies on the effects and responses to specific fisheries management schemes. Accordingly, we did separate studies of four different fisheries and the management schemes which have been proposed for each. We comment on some of our more general findings in the last section of the volume. With fortune, some of our data, conclusions and commentary on these studies will be of aid to other social scientists attempting the same task.

As is noted, the final report on the entire N.S.F. project report consists of three volumes. Volumes I and III are books whose sections are written sequentially. This volume, number II, is composed of a series of independent articles. The decision to produce a volume of unrelated articles was deliberate and undertaken for two reasons. First, one of the primary aims of the RANN (Research Applied to National Needs) Program was to produce information which would be of use to policy makers in areas of pressing national concern. RANN, accordingly, was concerned not only that the research produced under its auspices be of use, but that it be made available to concerned groups and individuals in industry, government, academia, and the public. In fact, one of the requirements for recipients of

NSF-RANN Grants is to disseminate the information produced to potential user groups and to submit as part of the final report a "utilization plan" indicating how the information has been made available to the public, who has made use of it, and future plans for further dissemination. Because of this strong emphasis on producing and communicating pertinent information, we decided to present part of our reports in the form of articles. We knew that, given the state of the publishing market, if we produced nothing but one or two books, nothing might be published from the project. Even if they were eventually published, they might not be read by our intended audience. Fishermen overall read few books. By producing a volume of articles, we could be sure that at least some of them would eventually be published in magazines, journals, or reports that would reach members of the industry or agencies concerned with fisheries management. It is apparent now that our fears that much of our data would never be published were groundless. Our entire first volume has been published by Sea Grant and seven articles in this volume have been accepted in journals ranging from The American Ethnologist and Human Organization to Fisheries and The Transactions of the American Fisheries Society.

Second, many of the articles in this volume were written to present data and ideas which could be drawn on in presenting the argument in the third volume of this report. This third volume, which presents an adaptational view of fishing behavior, builds upon a wide variety of data concerning all aspects of fishing behavior. Some of these data are presented in Volume III itself, but much of the required data in many disparate ramifying fields is presented in Volume II and simply referred to again in Volume III.

Although several of the articles in this second volume have already

been accepted for publication, others are not in final publishable form. These articles were written with a view toward preserving the data we collected during the course of the project. Much of the factual information will have to be condensed or deleted when these papers are submitted for publication. Thus, the final published versions will be shorter and more concise, but will lack some of the detail presented here.

Several different factors influenced what articles would be produced for this volume and who would write them. The press of time was certainly one factor as well as our desire to have people write up information they were interested in and in areas where they had special competence. In this regard, in the fall of 1978, after we had completed most of our field work, we decided to divide up the data we had jointly collected because we had such a massive amount of material that specialization was necessary if we were to meet our deadline. Accordingly, the University of Rhode Island crew took all the data on occupational choice and commitment, which was collected by both crews during the first six months of the project, since it was agreed they could make the most of it. Using these data, John Poggie and Richard Pollnac produced the articles on occupational commitment which appear in this volume. The University of Maine crew analyzed all of the data on another joint study which focused on innovation, changes in fishing practices, and attitudes towards various management options. These topics were of special interest to this crew. The result is series of papers produced by Acheson, Bort, and Acheson and Reidman on innovation, gear changes, and limited entry.

It should be noted that there are articles in this volume from eight other distinct studies besides these mentioned above which were undertaken in connection with this project.

First, Fran Danowski, a graduate student at the University of Rhode Island, did all of her own interviewing under the direction of John Poggie, her advisor, using only a small amount of project funds. The paper in this volume, authored by Danowski, is also her master's degree thesis.

Second the four papers on lobster traps and lobster catches by Acheson and Acheson and Reidman were produced from data from a study which was begun under the auspices of Sea Grant in the summer of 1977 and continued periodically throughout the N.S.F. study (i.e. until October 1979).

Third, the data for two of the papers by Poggie and Pollnac were collected during an earlier study sponsored by Sea Grant. These data were analyzed and written up during the course of this N.S.F. project and with this project's goals in mind.

Fourth, James Wilson, an economist, did all of the interviewing on fresh fish markets during the course of this project and wrote up these data.

Fifth, James Acheson and Toby Lazarowitz, who both have an interest in kinship, collected some interviews on kinship and community and produced the two articles on these topics appearing in this volume.

A sixth project was undertaken in the spring of 1978 by John Roberts and James Acheson on crew composition and fishing success. Although the results of this study are surprising and very good, we did not have time to write up an article for inclusion in this volume. The article will be jointly written by Roberts and Acheson in the winter of 1980.

Seventh, Jayne Lello attended all the meetings of the Fishermen's Wive's Association of Portland -- an important lobbying group. This resulted in the article by Acheson and Lello on that Association.

Eighth, Marcos Miller gathered qualitative information on the fishermen of Gloucester, Massachusetts during the year he lived in that port. Miller and John Van Maanan used these data and insights to produce two articles on social differences among fishermen.

It should be noted that the entire effort of our study was to obtain information on the three most important fisheries in New England and to focus on what we considered the most important topics. In this regard, it should be noted that the URI crew focused completely on groundfishing -- the most important type of fishing in southern New England. The Maine crew split its attention between the lobster fishery -- the most important one in northern New England -- and herring and groundfishing. No attention was focused on species which are currently relatively unimportant, such as queen crab, squid, alewives, quohogs, marine worms, or sea urchins.

In addition, we focused on topics which we were certain would prove to provide important kinds of information for those concerned with management. In studying lobster management, we focused on the 3.5 inch measure, since this is the most critical and controversial aspect of the current lobster management plan. For the same reason, we concentrated attention on limited entry programs in the groundfishery because management by limited entry is constantly cropping up in professional discussions concerning groundfish management.

It is especially important to note that not all the ways this information can be used for purposes of marine fisheries management are apparent on the surface. This is particularly true of the articles in Section I concerning key values and institutions. In this regard, it should be recalled that the biologists, managers, and industry representatives

often have a good deal of information on the biology of the species in question, and good economic data on catches, income, and so on. They have no systematic information on the social organization of fishing communities or the values of people who live in them. In short, they have very little information on the differences among the communities they are trying to regulate, the basic socio-cultural factors which so strongly influence the impact of fisheries management plans, and the reactions of fishermen to those plans. The managerial implications of the articles contained here are discussed in some detail in the last section of this volume.

Each of the authors edited his own work. First drafts of these articles were typed at the University of Rhode Island and the University of Maine. The final draft of this volume was typed by Justine Shea of Orono, Maine. Ann Acheson proofread the final version, and made minor editorial changes on most of the articles.

SECTION I

KEY VALUES AND SOCIAL UNITS IN NEW ENGLAND FISHING PORTS

ADAPTATION TO UNCERTAINTY AND SMALL NUMBERS EXCHANGE:

THE NEW ENGLAND FRESH FISH MARKET

James A. Wilson

Research for this paper was supported with funding from the National Science Foundation and Sea Grant. I am indebted to Ms. Robin Peters of the University of Maine Marine Advisory Service for her excellent and insightful field work and to Ms. Peters, Joel Dirlam, Tom Duchesneau, David Wihry and an anonymous referee for their critical and very helpful comments on drafts of the paper.

Introduction

This paper is based on five years of fairly intimate contact with one particular market--the New England fresh fish market, especially sales made by fishermen to the first buyer. At first glance this market appears to operate under a set of conditions which reasonably approximate the textbook picture of a perfectly competitive market: there are many buyers and sellers; exit and entry are easily accomplished; and there appear to be relatively homogenous products and an adequate flow of market information. Upon close examination, however, one finds that the conditions surrounding almost every individual transaction are far from representative of a perfectly competitive market. The reasons for this are twofold: (1) the relatively inaccurate, slow and unequal distribution of information about market conditions to buyers and sellers gives rise to considerable uncertainty, and (2) the private ownership of facilities for off-loading boats effectively precludes the existence of spot markets with many buyers and sellers.

Normally one would expect that the twin problems of uncertainty and a small numbers bargaining situation would give rise to potentially large misallocations of resources and to inequities caused by opportunistic behavior. To a certain extent, however, these potential problems have been mitigated by the evolution of a variety of implicit contractual arrangements, almost all of which emphasize relatively long term bilateral exchange patterns. In the more successful cases, the parties to these bilateral arrangements tend to experience better access to relevant market information, leading to more efficient resource allocations. Additionally, by bringing past and future behavior under their purview, these bilateral arrangements tend to constrain potentially opportunistic acts by one or the other party. Parties to the

more successful arrangements, as a result, tend to be placed in relatively favorable competitive positions. Nevertheless, what appears to be highly significant about these bilateral arrangements is that their widespread use tends to reduce seriously the amount and quality of information generated by the market. Depending on the circumstances, this appears to lead, or, at least, to contribute to highly volatile prices, inventory gluts and product wastage, inefficient allocations of fish harvesting effort, and problems with product quality--impairments which impact upon all actors in the market.

In effect, the individual benefits of this relatively uniform adaptive behavior do not appear to be self-reinforcing; instead, the collective effect is to create significant impairments which tend to erode the beneficial aspects of each individual agreement. Interestingly, recent theoretical works by Darby and Karni (1973), Goldberg (1974), Williamson (1975) and others have addressed the operation of markets under similar conditions and have predicted outcomes reasonably consistent with those found in the New England market for fresh fish.

In the paper which follows, the basic circumstances of the market are first described. This is followed by a description and analysis of the two most common forms of bilateral arrangements--what are called here reciprocal and consignment agreements. The paper then turns to an analysis of the performance of the market under the circumstances of pervasive and relatively stable bilateral exchange patterns.

The Market

In order to understand the operations of the fresh fish market it is necessary to describe, at least briefly, the conditions under which the market functions. The source of supply, the fishery, ranges from the Mid-Atlantic

Bight to the waters off Nova Scotia and the Gulf of St. Lawrence. It is conducted by a heterogeneous group of approximately 1800 vessels, mostly individually owned, ranging from 25 to over 150 feet in length, equipped with almost every conceivable kind of fishing gear (hooks, trawls, traps, seines, weirs, etc.). Fish are landed at over 200 ports and harbors from Connecticut to Maine. There are over 400 licensed dealers and processors who buy directly from the fisherman (Peters and Wilson 1977).

The product is some 27 commercially valuable fish species. All species are caught wild. For each species, variations important to the market arise because of differences in the size of individual fish, time out of water (which bears heavily on expected shelf life and final market quality), methods of handling and storage aboard the catching vessel and after landing, and season/location of harvest which, in some species, also affects the quality of the meat.¹ Except for fish size, these variations are not easily observed at either the first buyer or wholesale market level and do not give rise to consistent, market-wide quality premiums.

The initial market transactions begins as fish are off-loaded from the vessel. The off-loading agent may be a cooperative, the fisherman himself, or an independent buyer, any one of whom may also function as a shipper, buyer, broker or processor or some combination of all four. Prices of transfer are frequently stated at the time of off-loading, although it is more common, especially in the ports more distant from the central markets, for fish to be shipped to a broker in the Boston or New York area on a consignment basis. Payment may be made immediately, at the end of the week, or frequently, two or three weeks after the sale depending on the method of sale and the buyer's particular practice. Payment is calculated on the basis of a rough sorting of the catch into categories determined by weight, species type and fish size.

It is estimated that approximately 60 percent of the product is consumed in restaurants, with a significant additional amount going to institutions of one sort or another.² These sources of final demand, as well as retail fish markets, tend to exhibit very strong preferences for a steady, reliable supply of product. This preference is not absolute in that there is room for the substitution of one species for another and, depending on the 'class' of restaurant or retail establishment, of frozen for fresh product. However, it is a preference which has an important impact on behavior at the first buyer level.

At the time of the initial transaction, three crucial pieces of information are only imprecisely known by one or both of the parties: (1) Current market prices are generally not well known to either party as prices are highly variable over short periods of time and even among transactions taking place at about the same time (for reasons--elaborated later--having to do with the institutional structure of the market). (2) Established product quality standards, such as those commonly applied to meat and other agricultural products, are absent. Hence, quality determination is highly subjective. This gives rise to a situation in which prices cannot be unambiguously correlated with variations in quality, which means that knowledge of any stated price does not necessarily convey any information about the product. (3) The quality of the fish in the boat hold cannot be known until the fish are actually off-loaded and inspected. Consequently, at the time the parties agree to conduct the transaction there are no unambiguous, market-generated measures of value available to accurately assess the current value of the fisherman's load, nor is there a way to accurately determine the precise characteristics of the load. In addition to these informational impairments in the market, private ownership of off-loading facilities by individual first buyers, coupled with the

cost and time associated with moving a boat from wharf to wharf, effectively prevents fishermen from soliciting multiple bids for the product of any given fishing trip.

These circumstances of the market appear to have effectively prohibited the formation of reasonable spot exchanges.³ In response to the absence of such exchanges individuals have evolved a variety of alternative transactional modes. Many of these modes, such as roadside truck sales by fishermen to tourists and "midnight" export sales of over-quota landings, are the results of attempts to exploit special circumstances.⁴ This paper describes and analyzes the more common modes of transaction in the initial market, namely, those that are not solely dependent upon idiosyncratic supply, product market, or regulatory conditions for their existence.

These more common modes of transaction are appropriately categorized according to the location of buyers and sellers relative to one another and to the fish at the time of the transaction. Relative location is important because it determines the amount of information available to the buyer and seller regarding the actual conditions of the fish being bought and sold, the ease of communication during the transaction, and the possibilities for resolving disputes. Consequently, it is useful to distinguish between situations in which buyer and seller are both present with the product at the time of the sale and situations in which one or the other is removed. The following discussion considers two transactional modes --reciprocal agreements and consignment sales--that are most representative of this criterion of relative location. The reader should be aware, however, that the analytical convenience which is achieved by this categorization can possibly leave the impression of homogeneous behavior within transactional modes. In fact, the importance of the adaptive behavior analyzed here is the subtle accommodation to very particularistic external conditions which it permits.

Reciprocal Agreements: Sales at the Dock

The most common and, from the point of view of the fisherman, the most preferred transaction mode is a relatively personal, unwritten, long-term, reciprocal agreement between fisherman and dock-side buyer. The basis for this form of agreement arises primarily from the contractual arrangements the buyer maintains with his clients--restaurants, institutions and processors. As mentioned above, the buyer's clients tend to exhibit a strong preference for a reliable and steady supply of fish. The dock-side buyer can meet these supply requirements either with fish purchased directly from fishermen or through exchanges with other buyers. For a variety of reasons--the short shelf life of the product, the need to physically transfer and inspect purchased fish in order to assure product quality for his clients and the frequent unavailability of fish from other buyers--buyers tend to rely heavily upon supplies purchased directly from fishermen. This dependence is sufficiently strong that the threat of withholding future supplies provides the fisherman with a reasonable amount of leverage with respect to the valuation of each boatload of fish.⁵ That is, since market information is usually known to a greater degree by the buyer, and since the valuation placed on the fisherman's catch is dependent upon this information, the fisherman employs his threat of withholding future supplies to off-set the buyer's advantage of greater access to current market information.

The aspect of repeated transactions which is explicit in the fisherman's position in this bargaining effectively transforms a simple transaction into a relatively long term, quasi-contractual relationship.⁶ The acceptance of such a relationship by both parties provides the basis for a trustworthy relationship capable of further refinement for mutual benefit. In other words,

once the initial agreement is reached, other, trust-dependent arrangements can be developed. To the individual the economic significance of a trustworthy relationship lies in the reduction in his costs of verifying the statements of the other party. This reduction in transactions costs creates strong economic forces which favor the extension of the bilateral relationship to exchanges of other goods and services.

In the case of reciprocal agreements, almost all the extensions of the relationship which arise appear to be elaborations of the original basis for the agreement—the fishermen's relatively poor knowledge of market conditions and the buyer's dependence on reliable supplies--and, significantly, tend to come about in response to very specific problems encountered as part of the relationship. For example, a buyer may purchase a boatload of fish at a price above that necessary to provide a normal margin (or to avoid loss) in order to assure the fisherman a positive return on his vessel's trip and to avoid the trauma of dumping the fish into the harbor.⁷ The nature of this kind of transaction tends to further reinforce and elaborate the relationship: at a minimum, some form of reciprocation, usually the continued delivery of fish in the future, is expected of the fisherman; additionally the buyer may be accorded an informal advisory role in directing the species composition and timing of the seller's future fishing effort in order to minimize future losses by both fisherman and buyer. In effect, the buyer tends to assume some of the risk of the fishing operation, and, in return, is assured a more dependable source of supply. On the other side of the arrangement, the fisherman tends to gain better access to market information, is generally accorded relatively favorable short-term financial backing for new equipment, repairs, and so on, and can expect fairly even-handed and relatively argument-free evaluations of his catch. To a certain extent the more refined reciprocal agreements

tend to create the kind of coordinated action typical of an integrated firm. However, the most significant difference between these relationships and an integrated firm lies in the fact that the relationship is constrained by the expectation that over time the accounts of the agreement, which include many immeasurable aspects of the process of reciprocation such as personal favors, loans of equipment, and so on, need to maintain a rough balance.

Reciprocal agreements are also characterized by the withholding of information which would not occur in an integrated firm. Fishermen are most likely to withhold information about the location and other details of their catch in order to reduce the probability that other fishermen will acquire that knowledge. This deprives the buyer of a 'trade item,' valuable in his dealings with other fishermen; and to the extent that those other fishermen do not catch as many fish as they might otherwise, the withholding of information by the seller may also deny the buyer (and 'his' other fishermen) a certain amount of income. The buyer's greatest advantage in these situations is his more current information about prices and inventories in the central markets around Boston and New York. The withholding, distortion, and/or selective use of this information and a generally superior ability to analyze it is highly valuable to the buyer at the time of valuing the catch. There is always a strong tendency to exploit this advantage, of course. The Commerce Department issues a daily market information sheet which provides a check on the most blatantly opportunistic acts of information manipulation, but this is sufficiently aged by the time it reaches the subscriber (1-3 days) and non-specific with regard to quality variations to provide room for considerable maneuvering around the facts. Consequently, it is the reciprocal agreement itself which provides the greatest constraint on opportunistic behavior, for maneuvering for short term individual advantage is done only at the risk of jeopardizing the future benefits of that agreement.

Maintenance and Enforcement of Reciprocal Agreements

Reciprocal agreements are not easily maintained over long periods. One of the reasons for this is that the agreement is rarely, if ever, a written contract which carefully defines the rights and obligations of each party. Such a contract would, of course, be almost impossible to write. The circumstances which might arise over its life would be almost impossible to foresee--as would equitable means for dealing with those circumstances (Williamson 1975: 65-70; 91-94; Goldberg 1974: 462-463). Consequently, the agreements between buyers and fishermen tend to be informal, in a legal sense, with a strong emphasis placed upon reciprocation as a means for balancing the accounts of the relationship. If these agreements are to work satisfactorily, both buyer and seller must share a common sense of what is fair, a more or less consistent method of accounting for the status of the current 'balance' of the agreement, especially the more difficult to measure aspects of reciprocation, and a consistent sense of the rights and obligations to be accorded one another (Macauley 1963). The procedure, which is repetitively enacted to fulfill the terms of the agreement, involves the adjustment of the terms of current transactions as the arrival of new information better illuminates the market circumstances pertinent to previously completed transactions. In effect, reciprocation over time provides an avenue for the resolution of many of the problems--especially the distributional problems--which arise in individual transactions characterized by uncertainty and small numbers.

Needless to say this method of transaction is not without its costs. The primary cost is the time required to work out the current balance and, in general, to negotiate the continuance of the agreement. By and large this time is independent of the quantity of fish changing hands, a circumstance which tends to work against smaller fishermen. On the other hand, the negotiation

process is thoroughly, almost inextricably, mixed in with "irrelevant" gossip, banter, fish stories, and technical discussions which are obviously pleasurable and valued. A small boat fisherman who is adept at these kinds of personal exchanges can essentially use that ability to off-set his lack of supply leverage, a possibility that is not open to the fisherman with an 'ugly personality' and untrustworthy character. In effect, even the process of negotiating the balance of the account carries with it subtle entries on both the debt and credit sides of the ledger.

Given the vague nature of the agreement--its openendedness, the difficulties of language (in terms of proper accounting for the many immeasurable aspects of the reciprocation)--and the frequent large changes in the circumstances surrounding the agreement, it is not surprising that disputes and terminations of agreements are frequent. When agreements break down, usually one or both parties is of the opinion that the accounts of the agreement remain unbalanced in a manner not favorable to his interests. In fact, this is generally the reason agreements fail. Normally one would expect that a settling-up could be pursued, through the courts if necessary. However, the ill-defined accounts associated with reciprocation and the informally and incompletely specified terms of the contract make it impossible for a third party to successfully arbitrate disputes over the balance of the account.

Given this virtual unenforceability of individual agreements, one might suspect considerable room for opportunistic behavior. There is, undoubtedly, some. However, given the reasonably close-knit nature of the market community, opportunism is fairly tightly constrained, in this instance, through the creation of individual reputations. That is, over time the community learns about and discriminates among patterns of individual behavior. For example, if the arrangement between a particular fisherman and buyer breaks down, other

buyers will attempt, nevertheless, to establish a new relationship with the fisherman and other fishermen will not necessarily avoid dealing with the buyer. This occurs because everyone understands the difficulty of maintaining reciprocal agreements. A single dispute is not taken as incontrovertible evidence of the untrustworthiness of either party. It is only after repeated involvement in failures of reciprocal agreements that a fisherman or buyer acquires a 'bad name' in the market (Darby and Karni 1973: 81-83; Goldberg 1974: 462-463). After that point the transactions undertaken by the (literally) discredited fisherman or buyer are usually carried out under conditions of the highly impaired spot market or in the more preferred consignment market (described below). For such fishermen and buyers the advantages of shared risk are foregone, access to capital is more difficult, and, most importantly, the flow of information about market and product supply conditions is reduced. Such conditions lead to more frequent losses, misallocations of fishing effort, and a marginal or failed position in the fishery.

In a sense, a selection mechanism appears to be at work here. Those individuals possessing the linguistic and social abilities necessary to reduce the cost of maintaining reciprocal agreements tend to be placed in relatively favorable economic circumstances. These requirements for successful adaptation to market impairments appear to significantly modify the traditional measure of individual economic success--efficiency in the production or distribution of fish. Efficiency is not unimportant to the economic position of the individual in these circumstances, but other factors, given by the criteria for successful adaptation, are likely to be highly significant for the 'marginal' individual. In fact, failure to fulfill these criteria may deny an individual access to those factors--especially market information--necessary to achieve efficiency in the first place.

Consignment Sales

Fishermen who are not parties to reciprocal agreements (either because their unreliable or low volume supply characteristics provide little basis for establishment of an agreement or because they are unable to maintain the personal relationships required of reciprocal agreements) generally have recourse to what the market terms 'consignment selling.'⁸ In consignment sales, fish are off-loaded, sorted, boxed and iced, and then transported by truck to a broker's 'house' usually in the Boston or New York area. The broker then disposes of the fish either to his clients or another broker. The price obtained by the broker at the time of this transaction, less the broker's fee and all other costs up to the time of this transaction, is the price received by the fisherman. A seller will typically establish a long-term arrangement with a single broker. Any one seller generally provides only a small part of the broker's total supply since most of the fishermen-sellers who rely on brokers lack the large and reliable supply necessary for the establishment of a reciprocal agreement with a dockside buyer.

In common with sales at the dock, consignment sales are conducted in the face of considerable uncertainty--with regard to price, quality premiums, and the actual quality of the fish. However, two other characteristics of a consignment sale considerably increase the probability that opportunism will enter the transaction. First, at the time of the transaction, one party--usually the fisherman--is physically removed from the fish and, hence, is deprived of direct knowledge of their condition. Second, since the individual fisherman's threat to withhold future supplies has little potential for damaging the broker, the only threat to the broker's supply is the possible loss of his reputation (Goldberg 1974: 472; Darby and Karni 1973: 81-83).

This is a much less binding constraint than that faced by the dockside buyer dependent upon a few, large (relative to his size) suppliers, because the latter constraint on broker behavior can be effectively exercised only if sellers from widely scattered locations collectively pool and jointly analyze their experience ratings of the broker--a costly and unlikely possibility.⁹ Put differently, the cost of accurate collective experience rating by sellers under the circumstances of the consignment market is sufficiently high that it only lightly constrains the broker's potential opportunism.

On the other hand, one would normally expect that in markets characterized by many buyers and sellers--and the consignment market is characterized by potentially large numbers--bidding among brokers for the supply of sellers would tightly constrain the market power of the broker. There should be no need for collective experience rating in such a market. However, for a variety of reasons similar to those given to explain the nature of transactions at dock side, this does not happen. First, because of the wide variation in quality and the lack of adequate product standards, quoted prices are, at best, ambiguous. Additionally, because prices lack market-wide uniformity and are frequently volatile over short periods of time, it is never clear to the seller whether the sale price reported or offered by the broker is accurate. Neither the Commerce Department's market information sheets nor other information available to the seller (for example, from other sellers) is sufficiently precise in terms of quality designation, time and location for him to verify independently and accurately the broker's statement of price. In short, an essential requirement of price-bidding is the comparability of offers, but the very nature of the market impairment prevents precise comparisons. Consequently, price-bidding and experience rating together constitute a relatively slack constraint on the broker's price-setting

ability, allowing a consistent leeway of a few cents a pound. The income distributional effects of this lightly constrained market power are the subject of considerable discontent in the harvesting sector of the industry since each transaction is likely to involve thousands of pounds of fish. Nevertheless, in spite of the very clear awareness of their vulnerability to 'nickel and dime' opportunism fishermen tend to maintain relatively stable bilateral relationships with individual brokers. In the light of the high costs of obtaining alternative bids or experience ratings, this behavior, which may seem paradoxical at first, is thoroughly reasonable.

Institutional Influence on the Performance of the Market

The stable bilateral transactional patterns which have evolved in response to uncertainty and small numbers are of interest not only as instances of individual adaptive behavior but also because the institutional structure which is created by the pervasiveness of these patterns has a strong impact on the performance of the market. These impacts appear to be traceable primarily to the nature of the market information generated under this institutional structure and tend to manifest themselves most clearly in terms of their effect on market clearing dynamics and product quality.

Market Clearing

The amount, the quality, and distribution of information generated by the market will tend to vary with changes in product supply and demand conditions. For example, individual buyers, especially when they are processors, face a raw material supply that is highly vulnerable in the longer term and a growth rate effectively constrained by the number of supplier-fishermen with whom they can maintain working reciprocal agreements.

The reason for this is that rather than being able to bid on the supply provided by all sellers, each buyer is restricted to the particular group of suppliers with whom he has reciprocal agreements. In times of shortage it is the nature of the reciprocal agreement for the supplier to honor the requirements of the other party to the agreement rather than to allow his fish to be bid away by another buyer. In fact, generally, a buyer with whom a seller has no reciprocal agreement cannot buy directly from that seller. Rather, he must purchase from the buyer with whom the seller does have a reciprocal agreement. Since the first buyer tends to be bound by long-term agreements to supply his clients, the ability of another buyer to bid away fish can be severely constrained in times of short supply. As a consequence, individual buyers are often caught short of necessary supplies. This not only raises the buyer's costs of operation but is a severe threat to his ability to fulfill supply obligations inherent in his essentially similar relationships with clients further along the market chain.

This need to honor reciprocal agreements tends to create situations in which the determination of prices can be highly problematical. One of the effects of pervasive reciprocal agreements (and any other form of stable bilateral exchange pattern) is to minimize price-bidding and therefore the frequency at which price information enters the market. In periods of adequate supply (that is, when total, but not necessarily individual, supply is sufficient for all buyers to meet their obligations to their clients), trading among buyers occurs with sufficient frequency to establish a price subject to no greater informational uncertainty than described to this point. During periods of scarcity, however, the frequency of transactions outside the narrow transactional chains defined by reciprocal agreements falls to such a low level that the price statistic becomes almost meaningless.

At these times market participants tend to dismiss reported prices entirely on the grounds that they merely reflect the idiosyncratic conditions governing isolated transactions. Although it is difficult to determine exactly how valuations are made at these times, it appears that rough trends of past prices and seasonal conditions tend to be used. Little or no urgency seems to be attached nor effort expended to obtain more timely and accurate reflections of market valuations. Instead reliance is placed upon the ability to adjust the terms of future transactions should future information prove the terms of the current transaction to be significantly at odds with the market. To a certain extent this market-wide effect of bilateral exchange patterns tends to defeat the beneficial aspects of each individual arrangement. There is definitely room in these situations for less constrained opportunistic behavior on the part of the buyer (but this appears generally limited to the ability to follow the market rather quickly as prices seem to fall and rather slowly as prices seem to rise). Furthermore, given the informational void which appears, there is little basis for correct allocation of fishing effort.¹⁰

Bilateral exchange patterns also tend to accentuate another form of inefficiency. For example, it is very unlikely that at a given time the supply of fish coming to each broker or buyer will exactly match (in terms of species, sizes, and quantities) the demands of his clients. As a result, there is a considerable amount of trading among brokers and buyers--especially during periods of strong supply. Because of the problem of defining product quality, these transactions frequently require that the fish physically change hands. This tends to consume a good deal of time; a relatively large inventory of goods in transit tends to accumulate, and, since shelf life is fairly short, quality declines and product spoilage increases, apparently to fairly high levels (20-30 percent of total) at the retail level.

In the consignment market, especially, periods of strong supply of the major species (cod, haddock, flounder) also bring out peculiar inventory and price behavior. At these times the inventories of any particular type of fish often exceed the broker's desired level of inventories or inventories anticipated on the basis of expected landings. Prices at the dockside then tend to fall rapidly to a level that effectively discourages the beginning of further fishing for that type of fish. There appears to be little or no short-term adjustment in retail prices which might encourage increased consumption and, hence, relieve such inventory gluts. It is not clear whether this short-run retail price inflexibility is attributable to an inability to alter prices rapidly or to some degree of market power. Whatever the case, this characteristic of the retail market does not operate significantly to alleviate short-run over-supply. Consumption tends to remain relatively constant. Consequently, market adjustment takes place on the supply side, mitigated only by the so-called fresh freezing of fish--which permits greater inventory accumulation--but only at the cost of freezing, holding, and reducing the wholesale price of the fish.

The behavior of prices in these circumstances is interesting because their signalling function with regard to supply seems to take on a binary (on-off) characteristic. The phenomenon appears traceable to two conditions: (1) very low variable costs in harvesting tend to create a situation in which the supply curve is highly price-inelastic in the short run (Noetzel and Norton 1969)-- a circumstance which attenuates the allocative function of prices; and (2) the lack of extensive price bidding tends to keep prices stable until inventory channels are full, at which time further deliveries are effectively refused--the device for communicating this refusal being a price known to be below the fisherman's variable costs. This latter aspect

of the phenomenon may be attributable to the fact that the costs of negotiating new prices would exceed the benefits of higher margins for the brokers. Alternatively, since the consignment sale method provides no incentive for the broker to conserve inventories, the broker may simply not respond to increasing over-supply until his inventory capacity is physically saturated (Williamson 1975).

In short, the market-wide effect of these arrangements is to introduce rapid price movements at the dockside (but not at the retail level). This affects the allocation of fishing effort (generally by reducing fishing effort at times when species are most efficiently harvested) and tends to slow product movement towards final markets which reduces quality and increases the probability of product wastage during distribution and final sale.

Price Incentives and Product Quality

In some circumstances information problems also lead to the effective suppression of price incentives with regard to product quality. The problem traces back to the difficulty of maintaining a working agreement in the face of ambiguous or non-existent definitions and measures of product quality. In well-functioning reciprocal agreements there appear to be many instances where quality premiums are consistently present in transactions. But, in keeping with the nature of a reciprocal agreement, quality premiums attached to each transaction are not related solely to the quality of the fish in that transaction. Rather the basis for the premium tends to be a function of the quality of past and expected deliveries of fish. Better quality is merely one of a number of factors including volume and reliability of supply which are mentioned as reasons for the existence of premium prices. Nevertheless, it is clear from the methods of handling fish aboard

the vessel and at off-loading that the premiums do tend to induce changes in behavior leading to better quality fish.

Many reciprocal agreements and almost all consignment arrangements, on the other hand, are characterized by neither quality premiums nor better quality product. Experience with several failed attempts to improve product quality through the device of premiums seems to indicate that the problem is rooted primarily in the nature of the transactional arrangement—specifically the ability to reach an agreement about a precise premium to be attached to very subtle and difficult to measure changes in product quality—rather than to insufficient demand for better quality product. Assume, for example, that a broker or dock-side buyer wishes to encourage the delivery of higher quality fish. He announces his intention to pay higher prices for better quality and fishermen respond with offers to deliver higher quality, but more costly to produce, fish.¹¹ Immediately the problem arises of the correlation between quality and price. Given the absence of measures of quality, the problem of valuation of a delivery of fish becomes almost insurmountable unless the parties to the transaction can embed the immeasurabilities of the transaction in the broad sweep of the accounts and mutual trust of a reciprocal agreement.

In a consignment sale resolution of this quality/price problem tends to be especially difficult because the parties to the consignment transaction are in different locations. This increases the between-party disparity in information (in favor of the broker, since the transaction is not concluded until after the fish have arrived at his 'house') and greatly increases the potential for opportunistic behavior on the part of the broker and/or, just as important, the seller's suspicion of such behavior since the conditions surrounding the transaction do not produce enough information to verify

trustworthy behavior.¹² Lacking a third party or set of standards to which a disputed valuation may be referred for arbitration, the relationship between buyer and seller degenerates into a series of unresolved disputes.

In effect, this impairment of the market appears to arise because attempts to use differential prices to encourage a higher-quality product tend to place an informational burden on the transactional arrangement which is beyond its capacity. In these instances the relationship between price and quality tends to reduce to a simple dichotomy: the fish are 'acceptable' and a price is paid, or the fish are 'not acceptable' and there is no payment. Since higher quality fish can only be produced at a higher cost to the fisherman, this dichotomous quality standard tends to cause the actual quality of landed fish to approach the lowest acceptable level.

Summary

Individual and market-wide behavior in the New England fish market is very much a product of individual traders' adaptive response to the problems of uncertainty and small numbers bargaining situations. This response is embodied primarily in implicit contracts which tend to reduce the otherwise severe problems of equity and efficiency which would be likely to occur in a highly impaired spot market. By far the most common arrangements are those which involve some form of stable bilateral transaction pattern. In its most preferred form the implicit contract is based upon mutual dependence--the buyer's on a steady supply of fish and fisherman's on reduced costs of selling--and a system of reciprocation over time which allows the adjustment of the accounts of the agreement upon the arrival of new information about past transactions. Reciprocation is an important adaptive process which provides a means for partially resolving the efficiency and equity problems

which arise from slow and inaccurate transmittal of market information. Additionally, it allows for the establishment of a trustworthy relationship under circumstances where it would otherwise be very difficult. Maintenance of such agreements requires an on-going process of negotiation over the accounts of the agreement which, in the face of ambiguous standards of valuation provided by the market, often leads to disagreements and termination of the relationship.

A less preferred bilateral transaction pattern arises when parties are unable to maintain or establish reciprocal arrangements. In this case, fishermen tend to sell to a large buyer, or broker, on consignment. There is little mutual dependence; the sole basis for the stability of the transactional arrangement arises from the cost to the fisherman of obtaining meaningful alternative bids on his product. The efficiency and equity problems which tend to be reduced or resolved within reciprocal agreements are not handled well within a consignment sales arrangement. Lacking the constraint of either an active and inexpensive bidding process or a reasonable basis for experience rating on the part of the fisherman, brokers tend to have an important, although limited, price setting ability which skews the gains from trading heavily in their favor and eliminates the need for them to pass on costly market information to fishermen. Consequently, a strong competitive advantage accrues to those fishermen who can maintain a reciprocal agreement with a dock-side buyer.

The pervasiveness of these stable bilateral transactional patterns causes peculiar market clearing and product quality problems. In both cases the problems are traceable to the frequency and accuracy of information generated under the circumstances of these contractual arrangements, or, viewed from a somewhat different perspective, to the amount of information capable

of transmission under these arrangements. The problems of market clearing are most pronounced both at times of relatively short and strong supply. At times of short supply the frequency of transactions outside the narrow boundaries of the bilateral chains from fishermen to first, second, and so on buyers fall to such low level and transactions are so often subject to special circumstances that the information generated by the market process becomes almost worthless. At times of strong supply, inventory gluts often appear with little or no market information generated as a warning. The result in both cases is costly inefficiencies and a reduced constraint on opportunistic behavior.

Product quality problems tend to appear in their most pronounced form when the nature of the agreement is such that it cannot support the volume of information necessary to differentiate subtle but potentially important variations in quality and does not give rise to circumstances in which disputes over product quality can be arbitrated. As a result, implicit product quality standards often tend to approximate a simple 'acceptable or unacceptable' state, and actual product quality falls to the lowest level consistent with acceptability.

Consequently, in spite of the ability of individual contractual arrangements to reduce the efficiency and equity problems inherent in situations of uncertainty and small numbers bargaining, there still remain considerable impairments in the market, some of which, interestingly, arise from the consistency of individual adaptations to other market impairments.

Notes

1. For example, certain fish have a characteristically soft flesh immediately before and after their annual spawn. Spawning does not take place at a precise time in the year but is determined by factors, such as water temperature, which are likely to vary widely over the range of the fishery. Hence, fish of the same species caught on the same day at locations not far distant from one another may exhibit different qualities of flesh.
2. Personal communication from G. Grant, Harmond Assoc, Inc., Washington. These figures do not include fish sticks, burgers, and other highly processed forms of fish not supplied by the domestic fleet. Mr. Grant also notes that Americans are twelve times more likely to eat fish in a restaurant than at home.
3. There are organized spot markets in New Bedford and Boston, but the volume and relatively special and impaired conditions of these exchanges considerably reduce their informational usefulness to the rest of the market. For example, although prices in these markets are widely disseminated, for the simple reason that they are easily obtained by Commerce Department agents, their meaningfulness is confounded by the inability to assign quality to the price statistic and the time required for dissemination. For a discussion of the impairments which led to the decline, especially in Boston, of these exchanges, see White (1950).
4. The regulatory authority, the New England Regional Fisheries Management Council established as part of the law (PL 94-265) declaring the 200-mile fisheries zone, has placed fleet-wide limits on the catch for conservation purposes. A large number of regulation-evading transactions have developed in response. It is possible that these conservation regulations are responsible for the spawning of more new transactional modes than of fish.
5. Needless to day, this transactional mode is not attainable by small scale, part-time, seasonal fishermen. Their supply characteristics do not provide them with a credible threat to withhold.
6. Darby and Karni (1973) apply the term 'client relationship' to a similar situation in the provision of repair services. A number of anthropologists have observed similar market relationships. In his classic ethnography, Malinowski (1922: 181-191) describes a highly ritualized system of long-term, bilateral exchange among the inhabitants of the Trobriand Islands. Geertz (1978) describes a more informal system among participants in the modern bazaar economics of Morocco.
7. Dumping can occur because prices are stated net of the costs of off-loading. Off-loading costs are borne by the fishermen and can exceed the value of the fish. When this happens the fish are literally dumped in the ocean.
8. Many fishermen who land in the small ports typical of Maine and the Cape Cod area tend to have to resort to consignment selling simply because there are not enough fishermen in these ports to support a dock-side buyer. In other instances a dock-side buyer or cooperative in a small port will simply take on the function of a shipper or agent for a broker or for the fishermen.

9. The unlikelihood of collective experience rating arises from the requirement that competitors (fishermen-sellers) reveal to each other at least some information which is important to their perception of their competitive position, for example, the volume and kind of fish caught at a particular time. In short, the situation gives rise to incompatible incentives. See Hurwicz (1973).
10. In a multiple species fisheries relative prices of the various species are an important factor in the allocation (by species) of fishing effort.
11. The quality of fish is very much a function of how they are handled immediately after they are caught. If placed in a sanitary environment, gutted, iced and containerized (boxed), meat quality and shelf-life are considerably improved. For the fisherman these procedures are costly.
12. See Akerlof (1970) for a discussion of a similar problem in the used car market.

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"BOATS DON'T FISH, PEOPLE DO": SOME ETHNOGRAPHIC NOTES
ON THE FEDERAL MANAGEMENT OF FISHERIES IN GLOUCESTER

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Introduction

People will not accept uncertainty. No matter what materials are at hand, people will try to define, control, order, and otherwise interpret and make meaningful their everyday world. The ongoing process by which uncertainty is managed is, of course, a social one mediated by both circumstances and culture. In mass societies such as our own, this process is enormously complicated because neither circumstance nor culture is widely shared across the many segments of the population. The standards of conduct which come to be followed by members of a particular group within the American society are manufactured more or less by the members themselves. When two previously unacquainted segments collide, there will be at least a momentary period of uncertainty (and perhaps conflict) as members of each group attempt to control the interaction between groups in ways that reflect their own understanding and interests.

In this paper, we focus on some of the results of one such social collision. More precisely, we examine the patterns of conduct that emerged after the federal government tried to impose certain policies (and the formal rules to operationally define them) on the community of fishermen in Gloucester, Massachusetts. We saw that uncertainty, disruption, and in general, trouble for all inevitably result whenever formal rules (no matter how they are constructed) are viewed by people expected to abide by them to be at odds with their more immediate problems.

It is these more urgent matters that we turn to in the next section. We examine some historically based occupational and social distinctions made by fishermen which organize and segment the Gloucester community along several somewhat independent dimensions.¹ We then recount several dramatic occasions

of hostility, violence, rule breaking, social distress and loss which have occurred in Gloucester. We argue that these occasions are a direct result of the rather gross insensitivity recent governmental policies have displayed toward the problems faced by Gloucester fishermen. A short commentary section summarizes and concludes the paper.

The Social Organization of Fishing in Gloucester

The following description of key aspects of an American commercial fishing community centers on the work, boats, and fishermen of Gloucester.² Within each of these categories, an impressive degree of social segmentation exists which suggests that the fishing community of Gloucester is hardly a monolithic or homogeneous one. Fishermen differ in their beliefs, practices and values. These differences, as we shall show, are downright crucial when it comes to understanding why members of the community acted as they did toward the apparently well-intentioned efforts of the federal government in Gloucester.

Fishing as an Occupation

Certain occupational groups in industrialized societies have been treated traditionally by sociologists as relatively separate subcultures, complete with interests, specialized languages or idioms, philosophies toward their work, and their own codes of conduct. A strong case can certainly be made for regarding occupation as the focus of identity in mass society (see Simmel 1950; Hughes 1958; Glaser 1968; Salaman 1974; Van Maanen 1977). Gloucester fishermen are not exempt from this organizing principle.

Fishing in Gloucester (population 30,000) has figured prominently in the history of the fishing industry in the United States for over 350 years.³ Today, fishing traditions in Gloucester are maintained by over 900 fishermen who are involved in the inshore and offshore fisheries. The Gloucester

fishing fleet is composed of some 200 otter trawlers or draggers, most of which were made of wood before 1950.

Fishermen in Gloucester are distinct from their nonfishing counterparts. Fishermen typically refer to themselves as "fishermen" and are seen by others in the community primarily in this light. They are not viewed, nor do they view themselves, as "employees" who simply happen to work on a boat instead of in a factory or office. Despite the various factions within the occupation, fishermen, under most conditions, present a rather unified front to others in the fishing community since they share the same problems. For example, fishing requires large amounts of time spent isolated from the rest of society; the practitioners of the trade face considerable economic uncertainty in their day-to-day activities; they risk their lives even in the best of weather; they wear distinguishable work clothes; they almost always work in groups; and a lengthy learning period under intense scrutiny is required to become a fisherman. These features strongly suggest that fishermen are likely to create and sustain a rather tight occupational community marked by a definite insider versus outsider spirit, close bonds of mutual regard and care for the welfare of one another, and a healthy respect for that most uncertain of environments, the sea.⁴

However, the occupational group is not necessarily a corporate or shared one. Indeed it is not, for there are many, somewhat more subtle, but nonetheless critical contrasts within the fishing community which puncture this overdrawn characterization. In the remainder of this section, we describe the central work-related distinctions made by Gloucester fishermen which make visible and explicit several different patterns of work activity.

The distinction fishermen make between offshore draggers and inshore draggers is the single most important intraoccupational contrast to be found in

Gloucester. From this flow a number of fundamental understandings shared by all members of the fishing community. In short, crucial differences in attitudes, job requirements, and fishing strategies are related directly to the difference between the day trips that mark the experiences of the inshore draggerman and the extended trips that mark the experiences of the offshore draggerman. An inshoreman is more likely to share interests, beliefs, and fishing strategies with another inshoreman than with an offshore fisherman.

Fishermen on the offshore boats have mixed feelings about the advantages of their jobs, as do inshore fishermen. Offshore fishermen are quick to point out that while they know they are making more money than other fishermen, they also must spend much more time at sea. Many claim, however, that they would be unhappy working an inshore ("daytripper") job since they prefer the regular pattern that is part of offshore fishing. The uncertainty and tension associated with not knowing if one would work the next day does not appeal to the offshore fisherman. Yet, offshore fishermen have their own concerns. These revolve mainly around the prospect and reality of being at sea for prolonged periods of time.

The inshore dragger fleet is limited by size from straying far from port or fishing in poor weather. It outnumbers the offshore fleet by perhaps as much as three boats to one and attempts to operate as often as it can. In winter months though, its fishing is severely restricted. The fishermen of this fleet may fish 150 days in a year, but 50 or so more days are typically lost in abortive efforts to fish. And perhaps at least as many days are wasted simply standing by and waiting to go fishing: "We didn't get out this week, but I couldn't go anywhere." The most economically important and thus sought after species for the inshore draggers are principally the same as those for offshore draggers: cod and haddock. Unlike offshore boats, however, flat fish

and whiting are also a part of the typical daily catch for inshore vessels, though these species are worth less than cod and haddock on the local market.

If there is an anomaly in the Gloucester fleet, it would have to be the middle-sized dragger. These boats appear to have some choice in terms of the type of fishing in which they will engage. They are sturdier than the small boats; they can fish in poorer weather; and can stay at sea up to four days at a time. In this they resemble the offshore boats. But, because their expenses are considerably less than the larger boats, they can also afford to "fish like a small boat" (i.e., inshore) should that alternative seem attractive. The extent to which a middle-sized boat operates in one way or the other depends on several factors: (1) the prevailing fisheries management plan; (2) the weather; (3) the age of the craft; and (4) the background, training, and ambition of the skipper.

It is somewhat misleading, however, to picture the Gloucester dragger fleet as clearly divided into large, medium, and small boats. The situation is considerably more complicated. For instance one fisherman noted: "See that boat over there? It's in my class yet she would sell for \$30,000 more than mine. They're both the same length and tonnage, but she's got a 500 horsepower engine and mine's 300."

It appears, too, that classifying boats by technical criteria such as size, age, length, tonnage, or even horsepower would also cloud other equally important distinctions made by members of the trade. Another fisherman commented on a proposed list of small, medium, and large boats by saying:

"There's a problem with this list. Boats don't fish, people fish. And you shouldn't think of just these boat names. Each of these boats is a business. Let me tell you, boats don't mean shit; it's the size of the captain that counts. When I look for a site [a job], I look to the captain, it's the captain that gets me the money."

The small draggers have crews ("gangs") of three to four men including the captain. The middle-sized draggers have crews of five to seven men, and the larger vessels have crews of at least seven men. There are a number of rather specific jobs to be worked aboard the Gloucester draggers, e.g., captain, first mate, engineer, cook, fish-hole, deckhand, and twineman. Each of these jobs carries a set of responsibilities though most fishermen do more than one job. Other than the captain's job and perhaps that of the engineer, fishermen can and do work all jobs. This is particularly true on the small boats. One man may be twineman and first mate, another may be engineer and deckhand, and so on. Sometimes, one job, cooking, for example, will be done by several men who alternate.

Most of the jobs done aboard are done without direct orders. Turnover among crews tends to be low and some crews have worked together for decades. To a degree, each crew develops its own routines and work pace so that each member comes to know his place well and can function independently. The neophyte can feel useless and clumsy among the regular crew for usually he will not know what to do or when to do it. And, knowledgeable or not, crew members would not be likely to remind each other of their duties, so taken for granted are these work routines.

Deckhands can learn a great deal about the operation of a vessel and its machinery in the course of their daily work from various members of the crew. The only way to learn about fishing strategies, however, is to talk directly with a captain. He spends most, if not all, of his time in the pilot-house. Typically, he alone monitors the electronic devices used to scan the bottom for fish. On some vessels, crew members are permitted in the pilot-house when they are not needed elsewhere. Fishermen who take advantage of these opportunities to be instructed by the captain obtain scarce, valuable,

and somewhat guarded information about the contours of the ocean bottom, the location of wrecks, the algorithms of particular tows, and the movements of fish. It is clearly not the case though, that all fishermen aboard a boat will know how to find fish.

Fishermen, like boats, acquire reputations about their skill, reliability, and ease with which they work with other fishermen. Not surprisingly, a fisherman with a good reputation in Gloucester is a much sought-after resource and will usually have little or no trouble finding employment. After a man has learned how to be a fisherman, he can switch vessels more or less at his own discretion when opportunities arise: new boats in the harbor, fishermen leaving a crew, or the retirement or death of a crew member. There are various criteria used for switching from one vessel to another. In this regard, money is probably the most important, and since the Gloucester fleet is small, virtually all fishermen are well aware of a boat's reputation for landing fish.

Finally, the family plays a significant role in parceling out the fishing jobs in Gloucester. Almost all of the boats in the dragger fleet are owned and operated as small family businesses. Kinsmen cooperate to purchase vessels and typically will work together. There are kinship ties on at least 80% of the Gloucester boats. Intergenerational continuity is maintained as younger family members are trained to take the place of relatives. Thus, most of the fishermen in Gloucester have followed their line of work because it has been a tradition in the family. Sons discover that they have been born into a fishing family and cannot easily avoid learning about the occupation and working in it. A common story among fishermen is that they never really decided or intended to fish, but that they "fell into it" or "fell back on it." When asked why they fish, however, fishermen (particularly crew members) typically respond in financial terms—"the money is good." To a certain extent then, high

incomes are responsible for keeping a fisherman fishing although income per se seems to have little to do with bringing him to fishing in the first place.

The Fishermen of Gloucester: "Guineas" and "Greasers"

The largest ethnic group within the Gloucester fleet is Italian. About 85% of the fishermen (and owners) of the dragger fleet are of Italian, Italian-American, and Sicilian descent. Actually, Gloucester's "Italian fleet" is predominantly Sicilian, but what is important to the fishermen is the strength of a fisherman's tie to the "old country" rather than the location of the tie. Fishermen in Gloucester compare themselves with other fishermen of Italian and Sicilian origins on the basis of recency of arrival. New "immigrants" are referred to as "greasers" in contrast to the earlier "immigrants" who are more Americanized Italian-Americans, or "guineas."

Of crucial importance is the fact that guineas do not like being called greasers and consider it to be an insult. They do not object, however, to being called a guinea by a guinea. On the other hand, this linguistic system is not symmetrical, for it is more or less meaningless to refer to a greaser as a guinea. Nor do greasers call guineas, guineas. Though greasers and guineas know well to which group they belong, both terms are used exclusively by guinea fishermen. The use of both terms is fashioned normally as a joke, a mild epithet, or a casual rebuke. But, despite such offhand and light conversational practices, important social distinctions relating to the occupational culture can be found when contrasting both groups.

In the strictest, most apparent and stereotypic sense, a greaser is a recent immigrant who has come to Gloucester only to be a fisherman. The greaser boats, which are said to "fish in packs," are often thought to be those draggers which concentrate on the most easily caught species. According to one

fisherman, this is because "greasers just like to be knee deep in fish no matter what their market value." Greasers, as seen by guineas, are notorious for being greedy, anti- or at least un-conservation minded, and, in general, uncivilized. They are said to be the first to maximize catches at the expense of fish species. Greasers are said also to fish differently from guineas, or at least to fish from a different perspective: "They stay on the small fish using small mesh nets and then throw 75% back," "they will scrub a seed lobster and then sell it," "they will fish inside the three-mile limit and tear up all the set gear."

Many of the Gloucester guinea boats have fished the same grounds for years and their charts reflect this fact for they are full of markings indicating safe lanes and alleys. The guineas are knowledgeable about soft bottoms and they run a low risk of getting hung up (torn net) on either rocks or wrecks. Greasers do not have much local experience and wind up making more repairs. This distinguishes them from the guineas who are proud of their records of safe sets. By this criterion, guineas are considered to be better fishermen by other guineas. Yet, despite rimwrecked nets, greaser boats land considerable amounts of fish from fishing the hard bottom and exploring new grounds into which guinea boats rarely venture.

Greasers have been thoroughly successful as fishermen in Gloucester. From the guinea perspective, greasers then:

"...come over here from the old country and can't read or write. They ain't got nothing. They just eat bread and spaghetti and don't go out or do nothing but fish. Next thing ya know, they got their own boat, two houses, and a fancy car even though they don't even have a license."

Guineas also point out that greasers have multiplied significantly in Gloucester. Furthermore, guineas believe that greasers see America only in terms of money, since they are both hungry and ambitious. Guineas wonder sometimes how greasers achieved their success so quickly and several explanations have

been proposed. The most popular one at present is somewhat circular and can be seen to work to the disadvantage of guinea fishermen. It suggests that because greasers are ignorant of American ways, they cannot be expected (by the officials in this country) to know or understand the laws. Greasers can take advantage of this and do whatever they please without fear of repercussion. Greasers can fish inside the three-mile limit, exceed their quotas, or stream carelessly through the fixed gear of lobstermen. To guineas, however, such tactics are impossible for, as one fisherman put it: "If it was me they'd caught, they'd say I shoulda know better. But a greaser now, they'll just let 'm go."

Greaser success has not been taken particularly well by the guineas who have "been here longer." Some guinea fishermen now avoid former haunts such as the St. Peter's Club because they say that the greasers have "taken over" and enjoy nothing more than flaunting their new wealth in front of guineas. Many guineas in Gloucester say that greasers tend to be both flashy and concerned with exhibiting a distinctive style. To many guineas, greasers are associated with big wads of folded bills, tailored leather jackets, black Cossack fur hats, expensive gold jewelry, and long, heavy bright red American cars. In many respects, the caricature of the greaser parallels the portrayal by Whites of the on-the-make urban Black in a Superfly mode.

Despite the claim that "once a greaser, always a greaser," the label itself is not necessarily permanent. It can be avoided or outgrown. In the latter case, 20 years in Gloucester can change a greaser into a guinea. As one fisherman observed, "He was a greaser, now he's a guinea." Another fisherman suggested that a greaser was really "someone who hasn't been here long enough to be Italian." An important prerequisite for this transformation is, of course, the ability to speak English. Almost by definition, all greasers speak Italian or a regional dialect learned in Italy. Guineas, by contrast, have spent considerable time in America, and young guineas may speak little or no Italian.

Recent immigration does not automatically make a greaser. For example, one fisherman referring to a new arrival from Sicily noted, "We don't call him a greaser because he sees things our way." This notion of "seeing things our way" is necessary to understand fully the distinction between greaser and guinea. The basic complaint against greasers is not their recent tie to Italy per se, nor is it necessarily their perceived conspicuous consumption. Rather, guineas see greasers as unappreciative of the benefits of American life. Guineas say that greasers flood the labor market while continuing to maintain their ties to Italy (or Sicily) through both word and deed. For example, the potential but nevertheless "non-greaser" fisherman alluded to above is accepted by guineas because "he's the only guy who doesn't say 'Italy gotta stronger iron' or 'Italy gotta bigger tomatoes.'" The feeling among guineas is that "if you come to Gloucester to make a living, you should keep your mouth shut about how great things were where you came from."

If there is one thing about a greaser that all guineas can agree upon, it is that they are seen, without exception, as hard workers. Indeed, along with the stereotype of a typical greaser as "ostentatious," there is also an image of the greaser as one who "never goes out," or who "puts all of his money in a bank," or who is "out and out cheap." One guinea fisherman put it most strongly:

"Greasers don't live at all. All's they do is fish so of course they make the money. They just fish, fish, fish. But when they do stop, what they'll do is go out an' buy a new Pontiac LeMans."

Somewhat more thoughtfully, another fisherman noted that all greaser boats were well maintained and that no greaser boat in the Gloucester fleet could even remotely be considered to be poorly maintained ("a lowliner"). Somewhat puzzled by what he had just said, this same fisherman quickly, but in jest, added: "greasers are afraid of water and that's why they keep their boats painted and work so hard to maintain them."

In closing, we should note that by and large, to a guinea, whatever a greaser is, a guinea is not. That this internally inconsistent notion is hardly flattering to a greaser (or, for that matter, to a guinea), is not the main point, however. What matters is the recognition that the community of Gloucester fishermen is a bifurcated one in which, at least to one group, there are real differences based roughly on the acculturation continuum that separates the two. As we shall see in the following section, these social differences, in conjunction with the occupational differences discussed earlier, are critical when we look at the responses of Gloucester fishermen to the official policies designed and invoked by the federal government to regulate the local fishing industry.

On the Federal Management of Fishermen in Gloucester

Before 1977, Gloucester fishermen shared access to fisheries in the northeast Atlantic with a large number of fleets from other countries. Many, if not most, of the vessels of these foreign fleets were considerably larger, more modern, and wider ranging than the American boats and consequently were capable of much greater catches. The American government in 1976 declared fish to be a scarce national resource and extended its jurisdiction over a much greater section of the ocean, through what is known as the Fishery Conservation and Management Act (P.L. 94-265). The act, commonly known as the "200-mile limit," provided for a national program designed to protect fishery resources within a declared Fishery Conservation Zone extending 200 miles from the seaward boundaries of the United States. The act also established eight Regional Fishery Management councils to be responsible for the development of management plans for selected species of fish subject to the approval of the secretary of commerce.

Gloucester fishermen were initially enthusiastic and supportive of the 200-mile limit legislation and were pleased that modern foreign fleets would be denied access to American fisheries. They soon realized, however, that the law itself went far beyond "keeping the foreigners out." In particular, fishermen were surprised to discover that government biologists and economists considered certain New England fisheries to be so critically depleted of some species of fish that strict conservation measures were to be taken to ensure an adequate rebuilding of the stocks. Fisheries management, the fishermen learned, was not simply a matter of the 200-mile limit; it also involved, for the first time, the direct governmental regulation of domestic fishing. In short, fishermen themselves were to be managed.

In March of 1977, The Atlantic Groundfish Plan was prepared by the New England Regional Fishery Management Council and it specified what was to be allowed in terms of the annual landings of three species of central concern to Gloucester fishermen--haddock, cod, and yellowtail flounder. The bureaucratic euphemism for these limits is "Optimum Yield" and its calculation is based on a most obscure, mysterious, and apparently complex process that is said to involve a consideration of social, biological, and economic factors.⁶ However, increased landings during the first half of the year (due perhaps to the absence of foreign fleets) made it apparent the the Optimum Yield figures would be exceeded if domestic fishing was not regulated more strictly. As a result, the Management Council, in conjunction with the National Marine Fisheries Service and the Office of the Secretary of Commerce, issued a new, more restrictive, and considerably more detailed management scheme which would differentially affect the various fishing interests (as we outlined in the preceeding section of this paper). The fishermen in Gloucester were particularly upset and vocal in their opposition to the formal restrictions embedded in the various manage-

ment schemes. And, as we detail below, this opposition was expressed in ways that went far beyond verbal forms of counteraction.

Quota Violations

In midsummer, 1977, the secretary of commerce called for the closure of two New England fisheries--the Gulf of Maine and the Georges Bank. In early October, both cod and haddock (the most important species to Gloucester fishermen) were restricted to "incidental" catches; i.e., they could not be the "principal" or "target" species sought by a boat. This restriction was defined by the secretary of commerce as bringing back more than 5,510 pounds of cod or haddock per trip.

The Gloucester reaction to this "55-10" limitation was immediate. Most fishermen felt that the law favored the smaller, less expensive to operate in-shore boats over the larger, more expensive to operate offshore vessels. In the weeks that followed, numerous Gloucester fishermen, particularly those in larger boats, violated the imposed restrictions openly. Several factors are important to understand why these violations occurred. In the first place, fishermen were allowed to sell the fish they landed illegally. Whereas a captain might be cited under the law for landing certain amounts of restricted species, he nevertheless could still sell the catch, since no penalty scheme existed for fish dealers who purchased illegally landed species. Secondly, bureaucratic processing of the 80 or so citations that were logged was so slow that fishermen came to believe that there would be no repercussions at all for their violations of the quota. So, they continued to fish the restricted species despite the law. However, there is a third factor involved that is directly related to the social organization of fishing in Gloucester and is of paramount importance to understanding why the fishermen responded as they did.

In brief, 80% of the cited quota violations involved "greaser boats." As mentioned earlier, the greaser boats in Gloucester have the reputation of being the hardest working vessels in the port and the most ambitious. Thus, some observers in Gloucester attributed the high rate of greaser violations to pure and simple "greed," though of course there are other equally plausible explanations. Regardless of the reason, greaser fishermen placed considerable importance on filling their deck with fish, quota restrictions or not.

The quota story was complicated further on November 3, 1977 when "emergency regulations" were enacted by the secretary of commerce. The new regulations created new quotas and tied them to boats on the basis of vessel size as determined by "hold capacity"(gross tonnage). As defined by the new regulations, small boats were permitted to land up to 2,000 pounds each of cod, haddock, and yellowtail flounder per trip. Middle-sized boats were permitted up to 2,500 pounds of the same species per trip and large vessels were allowed 3,000 pounds per day of each species. Although the larger vessels were required to subtract two days "steaming time" for trips over three days in length, fishermen were quick to find loopholes in the new quota rule. For example, by leaving port one minute before midnight and returning to port one minute after midnight five days later, fishermen were able to legally claim they were at sea seven days. This was discovered only after fishermen realized that if they were not careful, the restriction would work to their disadvantage: five days could be technically corrected to three days at sea if two were subtracted for steaming.

Again, as with the "55-10" law, fishermen continued to break the law repeatedly and, again, greaser boats were the major offenders. But this time, most of the offenders were the middle-sized boats whose captains were dissatisfied

with their trip allocations. These boats continued to fish well after they had achieved their limits and many captains openly belittled other captains for not taking advantage of what they took to be a fruitful opportunity. This chastisement was not taken lightly by fishermen who obeyed the law, and the Gloucester fishing fleet was divided sharply into almost warring factions. One group consisted primarily of greasers who scorned the law and the other group consisted primarily of guinea fishermen who chose not to exceed the limits. The law-abiding fishermen wanted the violators punished, feeling that they were being denied the considerable profit that was realized by the offenders (although it was well known that only a small fraction of the estimated violations resulted in citations) and that the "overfishing" which was occurring would be subtracted from the Optimum Yields yet to be set for 1978.

The Groundfish Closure

On December 23, 1977, the secretary of commerce once again surprised the Gloucester community by calling for the immediate halt to all fishing until the end of the year. This unanticipated action came less than a week after the first heavy fines (up to \$25,000) had been levied on a few Gloucester fishermen who had been caught violating the federal regulations in the months before. Grounds for the closure were based on the fact that the permissible quotas of cod, haddock, and yellowtail flounder had not only been filled, but had been greatly exceeded.

The closure of these fisheries for the last week of 1977 was of little practical consequence since the Gloucester fleet has historically relaxed its fishing efforts during the Christmas holidays. Symbolically, however, the closure was a grave error. "This isn't conservation," said the chairman of the Regional Management Council, "it's a slap in the face to close a fishery one week for nothing." Gloucester fishermen were similarly moved by the action.

Finding it difficult to understand such a move, fishermen struggled nonetheless:

"They must be trying to keep the price down"; "They know the price will jump and they don't want to pay"; or, more generally, "They're trying to kill us."

To close the fisheries officially, the National Marine Fisheries Service issued an ambiguously worded statement which further confused the situation. From the statement itself, fishermen were unable to discern whether all ground-fish (a generic term for cod, haddock, yellowtail flounder, whiting, and other species), or just some, were to be considered an illegal catch. Nor was it clear what provisions, if any, were to be set up to enforce the closure order. Even the term "catch" was problematic since it left open the question of whether fishermen could discard certain fish at sea and still be operating within the law. Consequently, the fishermen had little choice but to interpret the law themselves and, once again, the interpretations that resulted produced a fleet divided against itself.

On the 27th of December, believing they would be immune to the law if they were to discard cod and haddock at sea, the captains of a half dozen small Gloucester draggers went fishing for other less profitable species, despite the closure. Some of these captains had been told by Marine Fisheries officials that no boardings would be made at sea but that all catches would be inspected at the dock. One captain remarked: "It was like finding a hundred bucks on the street and having to throw the twenties back and keep the fives."

The captains of the larger boats felt they simply could not afford to operate their vessels by focusing on only nonrestricted species. They were furious at what they interpreted as a divisive action by captains of smaller boats. One of these men put the matter succinctly:

"We can't make a living fishing like that after whiting. Here we sit having two meetings a day trying to figure out what to do and they off and go fishing."

In an expression of outrage, 20 captains of big boats and their followers met the incoming small draggers at the wharves and blocked the transfer of their legally landed fish to the transport trucks. Wives, relatives, and friends of the fishermen also arrived at the wharves to offer moral support to one side or the other and there was a rather wild scene as tempers flared between those who were attempting to unload their catch and those intent on stopping them. Several fights broke out in which brothers fought brothers.

No boats went fishing again until the ban was lifted, though the atmosphere in Gloucester remained tense for weeks afterward. The controversy around the quota violations had set guineas against greasers primarily because of the different culturally shaped values each group held regarding the respect they accorded the law. The groundfish closure now pitted fishermen against fishermen on the basis of the different economic considerations associated with inshore and offshore fishing. By the end of the year, Gloucester fishermen were disorganized, demoralized, and thoroughly bewildered by their occupational fix. Only a general state of uncertainty and worry seemed to be held in common across the community.

The Present Situation

Policymakers seemed to have learned little from the fisheries management experiences in 1977. Although the "Optimum Yield" for cod, haddock, and yellow-tail flounder was allocated on a quarterly basis in 1978, instead of a yearly basis as had been the case, no provisions have yet been made to reflect the interests of the differing occupational and social segments within the Gloucester community. All fishermen are treated as though there were no important distinctions between them in terms of fishing objectives and practices.

The new year began with essentially the same regulations as the old and resulted in something of a free-for-all among vessels as they competed with one

another until 50% of the allocation for the winter quarter was landed, at which time trip limits were imposed again. This plan, like previous ones, made no provisions for the fact that larger boats can operate in severe weather while the smaller boats cannot. And, while no one in Gloucester was surprised that the offshore vessels were responsible for the overwhelming majority of the landings in the first few months of the quarter, many were incensed that the smaller boats had not been guaranteed the same opportunity.

One final episode bears mention. The secretary of commerce again called for a closure of the groundfish fisheries shortly before the winter quarter was to expire on March 31, 1978. According to this closure order though, all boats could qualify for one last trip if they left the harbor before midnight March 19th, the beginning of the closure. To the large boats that were capable of spending eight days at sea, this amounted to only a slight inconvenience. For the small boats that daily return to port, it was disastrous. The majority of the entire Gloucester fleet set out on the 19th, but bad weather conditions forced most of the boats to "lay to" (wait) at sea for better conditions. The closure forced many of the small boats, out of economic necessity, to forego the protection of the harbor when they needed it most. During this period, two boats were lost from the fleet.

Given this expanding chain of events, it is no wonder the Gloucester fishermen have come to place little faith in those who profess to manage their affairs in "their best interest." The problems continue as new recommendations are being considered. True to form, one management policy that was discussed recently would both prohibit the discard at sea of smaller, less marketable fish and at the same time require that groundfish be thrown overboard if another closure occurs.⁷ Fishermen may then find themselves in the unenviable position of being able to possess legally only the fish they can neither discard nor sell.

Comment

We have described in this paper a few of the more dramatic occurrences stemming from the attempts of the federal government to regulate fishing practices in Gloucester. We have shown also that these fishing practices were far more embedded within the historical, economic, and cultural context of the community than was allowed for by the regulatory provisions. Indeed, appropriate fishing behavior in Gloucester was defined for fishermen by the kinds of social and occupational distinctions they themselves made. The management policies of the federal government, because they ignored these distinctions, were viewed by virtually everyone in the occupational community as most unwelcome intrusions into their everyday working lives. Moreover, to the extent that the imposed federal regulations were seen by some members of the community to be irrational, implausible, impractical, unjust, or just plain unenforceable, they were (and will be) violated. And, importantly, the observed patterns of rule breaking (examined in the second section) were not merely idiosyncratic occurrences of a fisherman scattered here and there, but rather these patterns represented collective conduct that corresponded to the way in which the occupational community was organized socially.

In Gloucester, the contrasting value systems of the guineas and greasers were most visible when the quotas and trip limits were set. Violators of these regulations consisted overwhelmingly of members of one social category (greasers) who differed from members of another social category (guineas). The observation that it was essentially an acculturation factor which distinguished these two groups suggest that a sort of "reverse colonialism" may be at work in Gloucester: the newly arrived immigrant population represents the exploiter rather than the exploited. Indeed, it appears to be the case that the consid-

erable material success of greasers in Gloucester has come, in part, because of their general disregard for the protection of natural resources.⁸ That greaser fishermen chose to blatantly defy the law and risk the penalty assessments is a matter of fact. Whether this strategy will prove fruitful in the long run remains a matter of conjecture.

Presumably, changes in the fisheries management practices can and will be instituted so that the plans better reflect the segmented interests of the Gloucester fleet. But the distrust, resentment, and defiance generated by the first year's experience is almost certain to characterize the feelings of most Gloucester fishermen for some time to come. In sum, fishermen have survived the first year of a federal regulation and are the wiser for it. As one guinea fisherman put it: "We aren't stupid like they think, we'll learn the loopholes. A good fisherman these days must know when and how to break the law."

Notes

1. For a more detailed ethnographic report on the fishing community in Gloucester, see Miller and Pollnac (1978). For a most comprehensive and complete summary of the literature and state of the art in "marine anthropology," see Pollnac (1976).
2. The data presented in this paper pertaining to the occupational and social distinctions observed by the fishermen of Gloucester were collected primarily by Marc L. Miller, who lived in Gloucester from September, 1977 through September, 1978. Miller presented himself to members of the community as "researcher/anthropologist/outsider" interested in social organization of fishing, the lives of the local fishermen, and the ways in which the occupation was or was not changing. The principal data-gathering techniques employed were those of the cultural anthropologist: participant observation and extended interviewing of key informants. The information about the actions of the New England Regional Fishery Management Council was obtained by attending the public meeting of this body. The information concerning the actions of the more remote management bodies (such as the Department of Commerce and the National Marine Fisheries Services) was collected through secondary sources, primarily newspaper accounts and official bulletins.
3. For an introduction to the lengthy maritime history of Gloucester, see Connolly (1940), Haberland (1946), and Bartlett (1977).
4. Several other studies offer a rather similar picture of fishing communities. See, for example, Fraser 1966; Firth 1966; Norr 1973; Norr and Norr 1974; Cove 1973; Poggie and Gersuny 1974; McGoodwin 1975; Orback 1977; and especially Pollnac 1976. These studies suggest that fishermen, because of their work experiences on the water, are perhaps best understood as an occupational culture that cuts through traditional social, economic, and cultural distinctions.
5. A fisherman on an offshore boat can expect to make over \$25,000 a year. A fisherman on a medium-sized boat (which can fish both offshore and inshore) can expect at least \$20,000 per year, and a fisherman on a small boat can expect to make over \$13,000 a year. These figures are supplemented from time to time by fishing bonuses and the "social" (unemployment benefits during the less active winter months).
6. The use of the phrase "obscure, mysterious, and apparently complex" to describe the manner in which "Optimum Yields" are determined is a very conscious one. The phrase works on at least three different levels. First, it complements the government's own rhetoric surrounding Optimum Yield calculations and suggests the calculation relies heavily on esoteric technical and scientific methods of measurement and estimation. Second, the phrase works because no matter how sophisticated or scientifically rational the Optimum Yield calculation may appear, there has not been any explanation as to how social considerations (mandated by law) have entered into the process. Third, both local and national politics explicitly play a part in Optimum Yield decisions and, like similar policy decisions, some of this political work goes on out of sight. It would seem therefore that considerably more research is required before these

calculations become anything more than "obscure, mysterious, and apparently complex" to both the social scientist and the fisherman.

7. Contrary to uninformed public opinion, all captured fish that must be discarded will most certainly be dead by the time they return to sea. The present technology of Gloucester's fishing fleet prohibits a reprieve for endangered species caught in a dragger's net. At any rate, fishermen know this too and though they understand the principles of marine life conservation, they cannot understand discarding marketable fish and consider such a practice senseless.

8. We do not wish to overemphasize this point for it is also the case that much of the economic success of greaser fishermen is a result of their fishing skill, savvy and hard work. Nor is it the case that guinea fishermen are altogether staunch protectors of natural resources; as a group, though, guinea fishermen do seem to regard environmental issues as more serious, immediate and important than do the greasers.

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GETTING INTO FISHING: SOCIAL IDENTITIES AMONG TRADITIONAL
AND NON-TRADITIONAL NEW ENGLAND FISHERMEN

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In mass societies, many designs for living, each tuned to a somewhat different version of what is important in the world, are present. Moreover, each design is more or less distinguishable as a separate activity system with a set of special meanings, social rules of conduct, sacred symbols, and unique kinds of public performances that contrasts with other designs (Simmel 1950; Schutz 1964; Douglas 1973; Lofland 1976). Within the buzzing, loosely coordinated, and often conflicting social world, some designs for living are relatively stable and fixed within a society by virtue of the success with which they have been transmitted across generations. Other designs seem to be more or less spontaneous creations since those who follow them will often claim credit for fashioning such designs themselves.

In this paper, we examine the occupational world of New England fishermen.² In particular, we direct our attention to the different designs for living that are presently followed by fishermen. Keeping with a rather well established precedent, we treat the occupation of fishing as a relatively separate subculture existing within the larger society. Certainly, a strong case has been made for regarding occupational pursuits in America as the primary determinant of one's place in society and of one's characteristic patterns of thought, feeling, and action (Berger and Luckman 1966; Hughes 1970; Salaman 1974; Dubin 1976). As Hughes (1953:3) suggests, "a man's work is as good a clue as any to the cause of this life, his social being and his identity."

Fishing appears to be no exception to this general rule. In particular, many observers have noted that fishermen throughout the world create and sustain rather tight occupational communities marked by close bonds of mutual regard and care for the welfare of one another, a definite insider vs. outsider spirit, and carefully considered work routines designed to minimize the unavoidable risks to life and limb inherent in the occupation (Firth 1966;

Norr and Norr 1974; McGoodwin 1975; Orbach 1977; Firestone 1978). The picture that emerges from previous study is that commercial fishing represents a rather homogeneous and stable occupational culture within which membership is gained primarily through kinship affiliations.

Of course, this characterization is most abstract since the studies of fishermen to date have also been rather careful to note that fishing itself is but a generic occupational classification which can be broken down into many component parts along a number of dimensions. Thus, from the available literature, we learn that tuna seinermen can be contrasted to groundfish draggermen who can be differentiated from fixed-gear lobstermen (Orbach 1977; Pollnac 1976; Acheson 1972). We learn too that some fishermen are "daytrippers" while others work at sea for days and even months at a time (Miller and Van Maanen 1978). Some fishermen work alone while others work in gangs (Poggie and Gersuny 1974). And so on. Although this quasi-area study approach to the occupation suggests that the traditions of particular fishing ventures vary, the central focus of these studies has nonetheless been placed upon traditional practices, although, at times, very local and specific ones.

There are several troublesome issues associated with the above approach to the study of fishing and fishermen. First, comparative empirical studies have been few and far between. Thus, it is quite difficult at present to distinguish between the generic and specific aspects of fishing. This is particularly problematic when examining the occupation within a society characterized by high technology, rapid communications, and great mobility wherein the isolation of a local community from social, political, and economic change is so rare as to be almost nonexistent. Fishermen, like all participants in the American society, are not immune to the wider cultural changes that typify our time, though many of the research reports on American fishing ventures

seem to arrest the changing times by offering analyses based only on a discontinuous slice of life cut from the continuous reel.³

Second and relatedly, social stability is an essential heuristic condition for the sorts of structural, functional, or casual analyses which typify the fishing studies carried out to date. For example, only by assuming a condition of relative stability is it possible to locate the contribution of a particular technology, socialization mechanism, or strategic fishing practice to the continuity and functioning of the specific social system under study. When stability is lacking--as indeed is the case in most of the American fishing communities studied--the analyst must assume its "as if" existence (Gluckman 1969). Thus, in most cases, analysts have of necessity concentrated on what they regard as the traditional parts of the culture under study and have lightly dismissed the rest under the residual label of "social change." Change has been treated therefore as something of an annoying nuisance which disturbs the traditional parts of the culture, disrupts an otherwise orderly, if static, study, and is considered at best to be of peripheral interest when investigating the social organization of fishing activities.

Third, and of most relevance to this study, virtually all of the dimensions of contrast which have been used to distinguish various groups of fishermen from one another in the past have been non-social dimensions such as species sought, scale of operations, gear configuration, and so forth. Certainly such dimensions can and do segment different fishing activities but they are essentially analytic dimensions of greater value perhaps to a researcher than to a fisherman. Following Goffman (1955; 1956; 1959) and others, the principal modern problem facing the individual in everyday life is the maintenance of social respect (i.e., the self as a sacred object deserving the esteem of others) and there is little reason to believe apriori that for

fishermen such maintenance work is accomplished solely by non-social means.

Our analysis below addresses these delicts in the following fashion. In the first section, we describe the fishing activities which take place in three New England ports and contrast the environments of each port in terms of their shifting physical and political characteristics. In the second section, we present a typology of the kinds of New England fishermen presently engaged in the occupation across the three ports. This typology is based on distinctions fishermen themselves make among one another in terms of what we label "social identity." The analysis suggests the importance of a heretofore ignored category of fishermen, the "non-traditional" types who are actively and visibly engaged in the process of creating, sustaining, and elaborating certain social identities for themselves which are, for the moment at least, quite different than the social identities of the more "traditional" types of New England fishermen. Finally, in the last part, we permit ourselves to speculate on some of the causes, consequences, and longer term prospects of an occupation undergoing considerable change. What surfaces from our speculation is a comment upon the typically ignored expressive or symbolic side of fishing, as emphasized by the non-traditional fishermen involved in what we will call the "fishing scene," as well as a comment upon the instrumental or utilitarian side of fishing, as emphasized by the traditional fishermen involved in the more familiar "fishing culture."

Three Fishing Ports: Gloucester, Chatham and Newburyport, Massachusetts

There is considerable diversity within the fishing industry of New England. Vessels vary from small skiffs with outboards to steel-hulled offshore boats several hundred feet in length. Some fishing trips are half a day in length, others take up to ten or more days to complete. Notable among commercial lan-

dings are species as diverse as lobster, menhaden, cod and giant bluefin tuna. Nor can fishermen themselves be viewed as an undifferentiated labor force: some belong to unions, some are members of cooperatives, and some work with their kinsmen on independent, owner-operated family boats. Moreover, different types of fishermen have different backgrounds and attitudes concerning who they are, what they do, and how they do it. Finally, New England ports differ significantly from one another in terms of physical geography, harbor facilities and layouts, and the place fishermen occupy within the social and political fabric of the local community.

Environmental and ecological factors greatly influence and constrain fishing activities in New England. The severity of the winter forces a reduction in fishing effort, particularly for the inshore fishermen, the vast majority of whom work on boats which are under 35 feet in length and which must be taken out of the water and put into dry storage during the cold periods of the year. And, even in the milder and more pleasant seasons, fishermen must constantly contend with some of the most difficult and dangerous meteorological patterns in the world and coordinate their fishing strategies accordingly. Within the United States, only the Alaskan patterns are said to be worse. The unpredictable New England weather amplifies the importance of safe and accessible shelter, since fishermen must always be able to retreat quickly to port in the event of storm conditions.

However, perfect natural harbors are a rarity along the world's coastlines and the New England seaboard is no exception. Fishermen long ago established operations in the best of the area's ports, of which Gloucester, New Bedford, and Boston are prime examples. As settlement patterns and the fishing industry expanded, however, the less desirable harbors were transformed into minor ports which, in some cases, entailed massive man-made mod-

ifications of the sort undertaken to create the harbor of Point Judith, Rhode Island. Today, the situation is such that, although many ports maintain fishing fleets in New England, each port has its own peculiarities. Thus, the physical characteristics of a port represent a most important variable which influences the type of fishermen and fleet attracted to the port.

While the physical characteristics of a port provide fishermen with the necessary protection from the elements, safe ports rarely provide in and of themselves a solution to all a fisherman's occupational problems. Ports also vary greatly in terms of their distance to the major fish markets as well as the transportation, loading, and storage facilities they provide for various commercial fishing operations. More importantly, however, it is difficult to find in New England a port or a town where fishermen exert significant political control or even influence over the making of community policies which could assist or retard their occupational pursuits. Part of the reason behind this relatively recent phenomenon is the dramatic growth of non-fishing industries in conjunction with the decline of the traditional commercial fishing industry (White 1954; Pollnac 1976; Bartlett 1977). Although the absolute number of fishermen has increased in some ports, the proportion of fishermen in all ports had dropped considerably throughout the last century. Furthermore, oceanfront acreage has become a scarce resource in high demand, particularly by those well-to-do segments of the population who are in the position to do something about it. Young fishermen, for example, find it difficult to own or sometimes even rent homes near the water—a notion inconceivable in days past. Finally, tourism has become big business in many New England ports and has served to dislocate fishermen from their landings as developers and businessmen collaborate to modify cosmetic aspects of potentially popular ocean communities. With the exception of parts of Maine, the days of the

oceanside settlement being strictly for fishermen are over. Fishermen must share their ports and towns with many kinds of people, most of whom are not even remotely concerned or interested in the fishing industry.

Social status is, of course, an important factor which affects the potential political clout an individual or group can exert in New England as elsewhere. The social status of fishermen in New England is at best an ambivalent one, and one that seems to vary widely across the region. Several reasons for the ambivalence with which individual fishermen are viewed within their ports stand out. First, fishermen by the very nature of their occupation share little of their work environment with non-fishermen. The vast majority of a fisherman's work day is spent at sea where he is observed only by other fishermen. Indeed, only the captain of a boat will regularly interact with a non-fisherman during the course of a work day and even this contact--with a fish dealer--is likely to be brief, almost pro forma, and marked by the social distance that only mutual suspicion can generate (Miller and Van Maanen 1978). Second, most fishermen appear to respect occupational boundaries even when they are not fishing and it is therefore difficult for a non-fisherman to interpret the behavior of fishermen ashore since they are also unfamiliar with a fisherman's non-working obligation, duties, and needs.

Along with this almost fundamental ambivalence toward individual fishermen, the status of the occupation itself varies from port to port and hinges on factors such as the importance of fishing to the local economy, the perceived income differentials between fishermen and non-fishermen, the connotative meaning of "fishermen" to local residents, and the politics of inter-ethnic relations in a given community. Offshore fishermen in New Bedford, for example, claim that they are held in low esteem by other residents. The daughter of one of these fishermen in this port recently conducted a small

survey asking people to rank order a number of local occupations and found that "fisherman" was placed at the bottom of nearly every list. Commenting upon her own experience, this young woman remarked, "...and when we moved here we got notes in the mail box saying we smelled like fish. Everyone I've ever talked to seems to think that the only thing a fisherman can do besides fish is drink a lot."

By comparison, however, the fishermen of Chatham appear to be held in somewhat higher esteem than their New Bedford counterparts. Fishermen are considered an important part of Chatham's heritage, as well as an effective drawing card for tourists. If they are not always identified as the most affluent of the town's citizenry, they at least do not report being discriminated against or treated poorly by others in the community. In the words of a Chatham fisherman's wife, "I've never heard anything bad about a fisherman in the twenty-seven years I've been in this town."

More critically, fishermen, despite an occasional gathering in of local prestige (though largely of the individual and not collective variety), have had very little success in managing and controlling port resources. In almost every community, fishermen in New England have found themselves at a severe disadvantage since local controlling interests generally regard the entire fishing community as expendable. Although citizens have formed various ecological and historical interest groups intent on saving certain natural resources, no such organization yet exists to rescue the fishermen. In sum, fishermen in most New England ports have been unable to muster even weak opposition to the wide array of special interest groups ranging from those intent on maximizing financial gains in a community to those intent on preserving (or enhancing) a community's local history and ecology.

Given this background, we now examine three New England ports, paying attention to both the physical and social aspects of the fisherman's present situation in each port. These matters, as we suggest in the second section, are crucial in coming to understand both the emergence of non-traditional fishermen in the three ports and the distinctions fishermen themselves make in terms of their own and their fellow fisherman's enacted social identity.

Gloucester, Massachusetts

Gloucester (pop. 30,000) has been at the forefront of commercial fishing in the United States for over three hundred years. There are at present over nine hundred fishermen involved in Gloucester's inshore and offshore fisheries. In terms of employment, Gloucester is primarily a manufacturing community dominated by the processing of fish products. However, the contribution of local fishermen to this industry is put into perspective when it is realized that over ninety percent of fish processed in the city arrive in frozen form, transported from Canada by truck.

To fishermen in other ports, Gloucester has an image of being a "big boat" port in which most of the vessels in the fleet are committed to the offshore fisheries. This image is false, since small inshore boats outnumber the larger offshore boats by a factor of roughly three to one. More important, the image also obfuscates the diversity of vessels in the port (Miller and Pollnac 1978). With the possible exception of scalloping, virtually every kind of commercial fishing activity is found in Gloucester. In a sense, the port is a microcosm of the entire New England fishing community.

The Gloucester fleet is, however, mainly a dragger fleet and a relatively old one at that since the wooden, eastern-rigged (pilot house aft) vessels of the fleet have a median age of 27 years. For the most part, draggers in

Gloucester are of two types: the inshore boats and the offshore boats. The inshore vessels are small, return to port daily, and concentrate on groundfish (a generic term for cod, haddock, yellowtail flounder, whiting, and other species). The larger offshore vessels can and do remain at sea for extended periods (typically 6 to 8 days) and tend to focus more intensively on the haddock and cod fisheries.⁴

In terms of protection and access to both fishing grounds and markets, Gloucester is certainly one of the best ports in New England. The inner harbor is protected from all but the infrequent southwesterly winds. Perhaps the single disadvantage to be found in the physical environment is the inconvenience inshore or day fishermen experience by not being able to utilize the Annisquam River as a short-cut to Ipswich Bay during the winter months when the river is frozen.

Despite its favorable physical characteristics and proximity to the Boston fish markets, the Gloucester port facilities are neither adequate nor up-to-date. For example, while the port typically leads the nation in groundfish landings, it cannot handle the quantity of whiting the fleet is potentially able to land during the summer months. Consider too the fact that during the past year (1977-78) when fishermen were encouraged by the Federal government to diversify, Gloucester fishermen discovered that there were no local fish dealers in a position or with an interest in building to a position in which they could process "underutilized species" such as squid, saltwater catfish or dogfish. To many, the Gloucester fishing industry is more limited by its antiquated processing firms than by its ancient wooden fleet.

These problems exist in part because the economic context within which the fleet operated is understandably resistant to change. The fresh fish firms, like the boats, are small, independent and owner-operated. And, like the boat owners of the fleet, the owners of the processing firms are reluctant

to take the risks a significant outlay of venture capital would entail were they to attempt expansion. Marketing and mooring arrangements in the harbor are also a part of the total picture for they are negotiated privately, singly, and informally. Overcrowding is not yet a problem, but boat owners are expected to purchase all their fuel from the dock where they are said to "moor for free." And, the traditional marketing structure is such that Gloucester fishermen receive an "ex-vessel" (on the dock) price five cents lower per pound than that offered in Boston, some 30 miles away, despite the common understanding that dealer transport costs amount to only several cents per pound.

Two major interest groups currently contend for political and developmental control in Gloucester. These are: (1) the local retail business factions seeking to "improve" the waterfront by building hotels, motels, boutique-like retail stores, and swank restaurants; and (2) local and corporate business interests seeking to expand the port docking facilities to entice international trade. By and large, the objectives of both camps are mutually exclusive, though neither option is attractive in the least to the local commercial fishing interests who are caught in the middle of the conflict with little or no voice of their own.

A further complication concerns the relatively low social status of Gloucester fishermen compared to those who are presently fighting for civic direction. The city has a Yankee heritage which the current official (and unofficial) leadership mirrors. However, over eighty percent of the city's fishermen are of Italian descent. Though most fishermen are highly esteemed in the Italian social community, such regard (even for big boat owners who may earn upwards of one hundred thousand dollars per year) rarely translates across ethnic boundaries. Adding insult to injury, the city fathers also actively promote

an image of fishing in Gloucester as it was some one hundred years ago in its tourist brochures, restaurant motifs, and mass produced curios. Wherever one looks in the town, Yankee fishermen are prominently displayed using anachronistic handlines and dories: in the windows of the novelty shops; on Chamber of Commerce literature; and upon the granite pedestals of the city's institutional art. Clearly, the Italian-ness of both the city and the fleet are underemphasized.

Finally, one anecdote bears mention. During 1977-78 which, in all respects, was a critical year since it represented the first time the Federal government has become directly involved in fisheries management, fishermen in Gloucester were unable to persuade the Mayor to simply appoint a lobbyist to act on behalf of the fishing fleet in its interactions with various governmental bodies. Gloucester's Mayor, if his public statements and actions could be taken at face value, was far more attentive to leashing the city's dogs than to appointing a suitable fisheries representative.

Chatham, Massachusetts

Chatham (pop. 7,000) is a small coastal community some 90 miles southeast of Boston, with a fishing tradition that dates back to the time of the Pilgrims. It is estimated that about 165 boats fish out of Chatham. In all, some 300 fishermen are said to work out of the port on various full or part-time schedules (Dewar, et al. 1978).

Unlike Gloucester which has a "net fishery," Chatham is best known for its "hook" fishery, though, like Gloucester the principal species sought by the Chatham fleet are cod and haddock. Approximately 70 boats are sturdy and big enough to operate from early spring to late fall. Additionally, a fair weather fleet of some 60 boats, referred to locally as the "tin" or "mosquito"

fleet, utilizes the harbor during the summer months. Importantly, fishermen in Chatham, in contrast to those in Gloucester, rarely specialize in their choice of either fishing style or species sought, opting instead to participate in a number of different inshore fisheries depending upon the season. Surveying the gear types found on boats in the spring of 1978, the Chatham fleet appeared to be quite diversified, including, for example, long-liners (8), jiggers (30), sea scallopers (8), inshore lobstermen (8-10), trap fishermen (4), Scottish seiners (1), Canadian pair seiners (2), bass fishermen (2), and shellfishermen (2).

Situated on the outside of the elbow of Cape Cod, Chatham is close to fisheries in both the Atlantic Ocean and Nantucket Sound. The entrance to the Chatham harbor is, however, extremely dangerous, due to the constantly shifting Chatham sand bars. To avoid running aground, vessels must make some sixteen changes of direction to enter or leave port. Heavy local fog also complicates fishing in Chatham, since inshore fishermen must rely on "land" marks to guide them at sea. Vessels over 50' in length are prohibited by the dangerous entrance (and town ordinance) from using the harbor.

Another disadvantage of the Chatham port is its remoteness from the Boston and New Bedford fish markets, although this problem has been offset somewhat by the existence of a fisherman's cooperative. In theory, the cooperative makes all the arrangements necessary for the dealing of fish including transportation. Yet, the popular image in New England of Chatham fishermen united by the "Co-op" is a misleading one. In fact, in recent years, many fishermen have dropped out, feeling the co-op has "outlived its usefulness." Some are openly dissatisfied with co-op benefits, citing poor or corrupt management, the discontinuance of gear discounts, and a general failure to deliver on its economic promise. Those that have left the co-op have elected

to sell their catch to a competitive private business which shares the town pier with the co-op.

In terms of facilities, Chatham fishermen stress the need for the present landing areas to be modernized and enlarged. On a bill of particulars, Chatham fishermen would also argue strongly for a cold storage plant, a fillet-processing plant, and, because overcrowding is a pressing problem, more dockage. As one fisherman remarked, "it's very quaint and all that we row out to our boats, but it's also a goddamn waste of space and time."

If some of these expansion goals were realized, the fishing picture would dramatically change in the port—though perhaps to the ultimate disadvantage and displacement of the small-scale fishermen who have, to date, been supporting the change. In particular, if the harbor entrance and channels were dredged to accomodate larger craft, as some have suggested, the fishing potential of Chatham would dramatically increase. However, such an eventuality is unlikely since the fishermen of Chatham, like those of Gloucester, appear to have very little say in how their community is managed. The not-so-loyal opposition to Chatham's commercial fishing interests emerges directly and indirectly from the Cape Cod development and tourism boom which began shortly after World War II and which has begun to accelerate again in the past five years. Specifically, Chatham fishermen find their interests opposed by both the rapidly growing retirement community (which in 1975 represented over one-third of the town's population according to the U.S. Census Report) and local businessmen who seek to profit from land transactions.

Ostensibly, there is no obvious conflict between the in-migrant retired citizens of Chatham and the fishermen. Indeed, most of the elders in the town publically praise the fishermen for their courage and perseverance. However, an alliance between the two groups is remote since the wants and needs

of the older members of the community differ sharply from those of the younger members of the community actively engaged in fishing. One observer on the scene illustrated precisely this point when he noted, "you'll see that at every town meeting the police budget goes up. Most of us fishermen figure we're just not wanted around here, we get in the way."

It seems clear that the fishermen of Chatham do not possess the sort of political influence they would like. Though they are relatively better off than their Gloucester counterparts, as an interest group in the community they are a distinct minority. The words of another Chatham man summarize well the general perception of fishermen on the matter of 'who governs' their town: "One thing wrong with Chatham is that it's too rich a town. The people who retire to Chatham control it since most retired people have nothing else to do but get involved. They have the vote."

The other set of visible interests at odds with those of the fishermen in Chatham is represented by residential property owners, real estate promoters, and home builders. Significantly, the retirement community's interests are often served by the land development faction, and an almost natural alliance exists between the two. Perhaps best symbolizing the clash between the real estate interests and the fishermen (as well as demonstrating vividly who wields the power in Chatham) is a recent court case in which a local fisherman was denied the right to store his lobster pots in his yard because they were considered by his neighbors to be unsightly and likely to depreciate land values. We should note, too, that the Chatham phone directory lists twenty-three real estate offices with a local prefix and countless others serving nearby towns. This works out to ratio of about one real estate office for every 260 residents, a ratio that matches the police-to-citizen index (though perhaps not for long).

Newburyport, Massachusetts

Newburyport (pop. 16,000) is thought of in local lore as either "Massachusetts' largest town or Massachusetts' smallest city"--legally it is the latter, having a Mayor like Gloucester instead of a Board of Selectmen like Chatham. Currently operating out of the port are eight inshore draggers, eight inshore lobstermen, four gillnetters, four eel fishermen, and a fleet of a dozen or so party and charter boats. While estimates are difficult to come by, local residents note that a great many part-time fishermen come to the area to participate in the seasonal giant bluefin tuna fishery.

Thirty miles north of Gloucester, Newburyport lies at the mouth of the Merrimac River, on its southern side. The entrance to "The River" is nearly as perilous as the entrance to Chatham's harbor. An ebbing tide in conjunction with the Merrimac current cause "breaking waters" to form at the mouth of the river when the wind blows from an easterly direction. And during the winter months, ice floes coming down the river force all but the handful of boats with protected moorings to operate out of other ports.

Until 1978, Newburyport fishermen had no support facilities whatsoever. However, the emergence of a fishing cooperative has alleviated some major problems by building a central landing dock adjacent to marketing facilities and arranging for temporary moorings for commercial boats in the harbor. Fishermen previously landed fish and tied up their boats wherever they could, often at private, party boat, or restaurant docks. Furthermore, an ice plant was recently constructed in Newburyport at city expense, thus severing the dependence of local fishermen on facilities in the nearby ports of Gloucester and Portsmouth.

While the co-op and ice plant are major improvements and, in fact, symbolize

the more or less favorable position of fishermen in Newburyport compared to those in Gloucester and Chatham, local fishermen still face further battles to achieve an acceptable port configuration. Fishermen must continue to convince the city government that the needs of the fleet are of high priority. In particular, the future of the fledgling fishing industry will be significantly affected by how the city chooses to allocate the several million dollars granted by the Federal government to renovate Newburyport's historical waterfront district. Although the abstract notion of Newburyport supporting a fishing fleet is held by nearly all residents to be an attractive proposition, the reality of fishing-related activities being located in or near the "charming and quaint" downtown waterfront area also distresses many. In particular, tourism and real estate interests may well find broader citizen support than they now enjoy as various proposals for commercial fishing in Newburyport are discussed in public meetings.

What is clear, however, is that, for the moment at least, Newburyport fishermen are in an advantageous position relative to their brethren in other nearby New England ports. As implied above, part of the reason for such an enviable situation is perhaps to be traced to the fact that the city has never had to contend with much if any commercial fishing in its midst. One Newburyport wag went so far as to suggest that "the reason fishermen are so well liked here is that the locals have never seen one." To this point, the marine tradition of Newburyport is anchored in shipbuilding, notably, the elegant clipper ships of the last century. Local fishermen are therefore able to draw on this related and ennobling seafaring heritage for some (though probably not much) symbolic leverage.

Somewhat surprisingly, fishermen in Newburyport seem unaware or at least unconvinced of their relative good fortune and respected standing in the community.

To a man, they feel that they are not wanted by the local citizens. While this may well reflect a general sense of social stigma many fishermen are said to carry with them on land, there are a few indications that the local fishermen may be on to something more tangible. In particular, a very visible example of the poor treatment Newburyport fishermen expect from non-fishermen is the public bulkhead and dock recently constructed on the waterfront by the city. This facility and small protected inlet adjoining it has yet to be made available for use by commercial fishermen, though it sits virtually unused by the public. Fishermen are thus reminded of their tenuous social position in the community every day as they row out to their vessels rafted together beyond the new dock in a make-shift and precarious mooring arrangement.

On Fishing and Social Identity: A Typology of New England Fishermen

Social identity, as we use it here, is similar in some respects to Goffman's (1959:75) early interpretation of the concept of social role:

"It is not a material thing to be possessed and then displayed; it is a pattern of appropriate conduct, coherent, embellished, and well articulated. Performed with ease or clumsiness; awareness or ignorance, guile or good faith, it is nonetheless something that must be enacted and portrayed, something that must be realized."

More exactly, our use of the concept of social identity refers to a particular social role which an actor rather fully embraces, supports, and seeks to affirm in all its sterling detail. It may be based upon occupational, leisure, or family ties and be presented with deceitful, virtuous, or banal intent. Of course, a person can carry in what Goffman (1961) calls the individual's "identity kit" many social identities relevant to many social situations. But, given a specific recurring situation, a person's social identity refers to the presumed congruence between the kind of person others in the situation

take the individual to be by virtue of his public conduct and the kind of person the individual considers himself to be. As such, the claiming of a social identity entails behavior that falls conceptually somewhere between what we conventionally define as individual or personality-based behavior and formal or functional role behavior. In short, the notion of social identity allows us to make relatively fine-grained distinctions among actors who fill the same functional role, yet the concept stops short of requiring the sort of depth psychology approach to personal character wherein the role itself vanishes from view and only idiosyncratic aspects of a social actor's personality remain.

In this light, fishing in America represents the sort of occupational role that still has not been well codified, rationalized, or studied. It is a role similar in many ways to that of the farmer, the independent merchant, and the autonomous professional. It is one of many rapidly disappearing and often lamented occupations that can be pursued in splendid isolation or as a family and friendship venture in which individual independence, choice, and initiative are rewarded (Poggie and Gersuny 1974). It is also marked by self-employment, which according to the 1975 Census report, typifies only nine percent of the U.S. population.

This point gains special meaning because as one moves further away from organizations, formality, official titles, and the like, there is a corresponding tendency to conceive of the roles people play occupationally as being "really them." There is, of course, some risk associated with this tendency because all social roles can be both assumed and cast off by an individual much like an actor can assume and cast off roles in stage plays. If we are to understand fishermen, therefore, it becomes crucial to chart the social structure which lies submerged beneath the generic occupational role.

As Klapp (1958:674) has observed: "Between knowing a person's formal status and knowing him intimately there is a kind of knowledge that 'fills in'." We seek to "fill in" our present understanding of the American fisherman by describing below the different kinds of social identities that are to be found among them in three New England ports.

Primary Distinctions: Traditional and Non-Traditional Fishermen

In the introduction to this paper we briefly mentioned our interest in the "non-traditional" fishermen who contrast with the "traditional" fishermen conventionally studied in New England and elsewhere. Regarded by traditional fishermen and social scientists alike as marginal because of their apparent lack of fishing qualifications, small numbers, and minimal sea experience, these non-traditional fishermen are social anomalies and if for that reason alone, merit attention. Simply because "they are there" calls for some sort of social explanation. We begin working toward such an explanation in this section by elaborating upon the distinction between "traditional" and "non-traditional" fishermen, a distinction fishermen themselves make. Secondary subtyping of this primary distinction is accomplished in following sections.

A traditional social identity in the commercial fishing world of New England turns primarily on two criteria. The first has to do with a displayed continuity of experience or permanence. For fishermen, as for other occupational groups, the recognition of a traditional type is dependent upon the sequential involvement of successive generations within the occupation. The second criterion is somewhat more arbitrary but is nonetheless important and concerns the intra-occupational frequency and dominance of the group from which successive generations of fishermen are recruited. By this definition, **traditional fishermen are both conspicuous and enduring, non-traditional are not.**

To be a traditional fisherman is to be born into a fishing family. The intergenerational commitment of entire families to fishing is best exemplified by the Italian fishermen of Gloucester. Virtually all boats in the dragger fleet are owned and operated as small family businesses. Kinsmen cooperate to purchase vessels and typically work together. Kinship ties are to be found on at least 80 percent of the Gloucester boats, and younger family members are frequently trained in the occupation as captains, engineers, and twinemen to ultimately take the place of relatives.⁵

Traditional fishermen in Gloucester have followed their line of work because it has been a family custom to do so. Sons discover that, like it or not, they cannot really avoid learning about the occupation and working in it, since "helping the family out" is a chore few young people can heedlessly avoid. A common story among fishermen is that they never really decided or intended to fish, but they "fell into it," or "fell back on it." When asked why they continue to fish, however, fishermen (particularly crew members) typically respond in financial terms—"the money is good."

Learning the trade in time-honored fashion is a lengthy process. Traditional fishermen make their first fishing trips while in early adolescence. And, simply by being aboard, they begin gaining familiarity with the routine and rhythm that marks the work life of a draggerman. In subsequent stages, they typically work as deckhands during the summer months of their high school and sometimes college years. Once joining a crew full-time, however, they begin to specialize, and it is common for family members to specialize in tasks that are complimentary. Thus, only the captain's eldest son trains to be a captain (who is virtually the only man aboard most Gloucester vessels who knows how to find fish and operate the boat during drags). The second son learns to be an engineer. The third son a twineman. And so on. When openings

occur or when the family grows numerically and financially, a second boat is sometimes purchased, thus allowing for the possibility of adding another captain in the family. Not all men strive to be captains, however, since the heavy responsibilities that go with the job as well as the limited opportunities that exist to assume the job seem to keep the expectation of many traditional fishermen in line.⁶

Several features of this socialization process stand out in terms of the social identities traditional fishermen come to assume. First, since potential recruits come from fishing families and are exposed to the occupation at a very young age, they cannot help but notice that they are viewed by others in the community primarily in terms of their own family's identity as a fishing family. In a sense, the son of a fisherman is himself a fisherman until he demonstrates that he is not. Second, a fisherman's son comes to understand fishermen through understanding his family. The on-going process of understanding one's kin is, in this case, inextricably tied to the process of being socialized into the world of commercial fishing. Thus, the transition into the adult occupational world is relatively smooth, sequential, and omnipresent. A fisherman's son knows precisely where he fits in the occupational world, knows rather precisely what is (and what is not) expected of him, and is familiar early-on with the order of progression that changes ordinary deckhands into specialists and captains. Moreover, the entire process of becoming a fisherman is, if not inevitable, at least reasonable and understandable to a fisherman's son. He is a realist when assessing the merits of the occupation and is unlikely to be overly romantic about the "lure of the sea." Third, because following in one's father's footsteps is such an obvious choice, sons of fishermen can expect to experience considerable difficulty in justifying any alternative life plan to their families. This seems to be particularly be the

case if the alternative occupation does not have a high(er) status. Traditional fishermen sometimes encourage their sons to seek a higher education, but expect (as do most parents) the attainment of an education to result in a high status job for their offspring. They are hardly delighted if their college-educated son chooses, for example, an occupation outside of fishing which offers less pay along with an ambiguous or lower status. Fishermen's sons who find themselves in positions of this sort will experience some very real family pressures and expressed discontent, and it is at this point that some reluctantly "fall back on fishing."

If traditional fishermen, by definition, come from fishing families, where do non-traditional fishermen come from? The answer is that they come from nearly everywhere and range in age from the man just out of high school or college excited by the prospects of being his own boss to the middle-aged man who is switching occupations to the old man seeking to supplement his retirement income. Non-traditional fishermen do, however, share several rather significant attributes. First, by and large, they cannot be considered to be "upwardly mobile" in the conventional and striving sense of the concept. Indeed many non-traditional fishermen verbally eschew the pursuit of higher social standing and many shun the pursuit of the dollar as well. They are hoping to survive as fishermen to be sure, but they do not entertain the notion that fishing will bring them great wealth or status in the community. Second, non-traditional fishermen are virtually always white and distinctly middle class. Young non-traditional fishermen, in particular, fit this description almost perfectly in the three New England ports described in the first part of this paper. As one citizen in Newburyport remarked: "The funny thing is that all the people I know who are fishermen grew up in really wealthy areas." Third, as we shall show, their recently assumed social identity as fishermen

is important to them and is held quite self-consciously. Unlike traditional fishermen, non-traditional ones are trying on a role to, in part, see if it fits and are quite aware of what they are doing. Fourth, as a loosely coupled arrangement of people, non-traditional fishermen may be changing the nature of the fishing industry both by replacing traditional fishermen and by living side by side with them. These attributes can be seen more clearly by examining the socialization patterns of non-traditional fishermen.

Some non-traditional fishermen enter the occupation only after first being drawn to a port for aesthetic reasons. This is most often the case for those who fish on Cape Cod. New fishermen in Chatham, for example, say they are as attracted by the "lifestyle" as they are by fishing per se. Many of the newcomers are also young men with few or no dependents, and they therefore do not immediately require a substantial income. One such fisherman discussed his initiation into the Chatham non-traditional fishing scene in the following manner:

"I had gotten a divorce in the city and came to the Cape. I then heard you could make some money fishing in Chatham. I got into fishing one day on a date when I caught 53 pounds of white perch. Someone said, 'go sell it.' So I did and got 35 cents a pound."

Then too, some non-traditional types became fishermen almost accidentally. This version of "being in the right place at the right time" is, for non-traditional fishermen, the functional equivalent of "being in a place where fishing won't interfere with a lifestyle." A Point Judith "Hippie" fisherman remarked:

"Well, my folks used to have a summer house on Great Island before they moved south. When I got out of college I didn't know what I wanted to do or where to go, so I went back to Great Island 'cause I like it. One day a friend asked me if I wanted to crew. One of his regulars was sick. And so I got into it. He said the pay was good and the work hard."

There are, of course, other routes taken by non-traditional fishermen into the occupation but, for many, the socialization process can be characterized as marking a significant disjunction between their past and present activities. Since these fishermen do not come from fishing families and most report having had little previous fishing experience, they do not ease into the fishing world through a set of nearly imperceptible minor adjustments as is the case for traditional fishermen. For the non-traditional types, the jump from a non-fisherman to a fisherman (albeit neophyte) is an abrupt and readily identifiable one.⁷

There is another rather obvious but important way the early experiences of non-traditional fishermen differ from those of the traditional fishermen. Whereas the latter are familiar with the structure of the occupation, its language, statuses, and culture, the former are not. Thus, non-traditional fishermen have a very limited and different set of resources to call upon for aid and comfort at the onset of their fishing careers. The traditional fisherman relies upon his family for assistance, information, and occupational clues. But, the non-traditional fisherman is in literally a sink-or-swim position for he has placed himself within a competitive occupation without the benefit of having ties to a knowledgeable support community. He is in the position therefore of inventing his own socialization process and to do this he must worry first about establishing at least some communication channels with other fishermen of virtually any type.

Social Identities: Traditional and Non-Traditional Fishermen

In this section, we wish to point out that sociological or "etic" descriptions of a fisherman's background may be less useful in predicting his choice to become a fisherman or his behavior as a fisherman after he has decided to become one than is an understanding of the social identity he has explicitly

selected for himself within the occupation. As more and more men join the ranks of commercial fishing from non-fishing families, it becomes even more crucial to understand these men's perceptions of the kinds of social identities the fishing occupation allows. This approach differs from a number of recent studies which have discussed the psychological or personality characteristics of fishermen (Poggie and Gersuny 1974; Pollnac 1976; Orbach 1977). These studies emphasize the adaptation (or self-selection) of the individual to marine environments, and note how the personalities and behavior styles of fishermen reflect (or come to reflect) the independence, social isolation, challenge, and risk associated with fishing. The obvious implication of these studies is that the occupational environment is compatible for only those with the "right" personality. This almost Darwinian conclusion suggests that, in the end, it is the environment that either alters individuals such that they can survive its ubiquitous force or that only those individuals who somehow psychologically "match-up" to that environment will survive in it. To the extent that this is the case, we would expect fishermen to be similar to one another and this, in fact, is what is claimed of the available data.

But, similarity of personality does not necessarily imply similarity of values or goals. The non-traditional fishermen we have discussed thus far may indeed have similar psychological characteristics to traditional fishermen for both groups may well satisfy certain deep-seated personal needs by working at sea. What is clear, however, is that non-traditional fishermen are fishing and it is apparent that they are doing so for reasons strikingly different than traditional fishermen. It is true too that they inhabit very different social worlds than those populated by traditional fishermen.

From our perspective, the personality question is moot for we are concerned with only the constructed and enacted social identities of fishermen that are easily recognized by participants (and observers) in the fishing community. It may well be that someday the personality concept will be operationalized such that it can be made visible and related to the distinctions members of a particular social world make among one another. But, for now at least, we think this possibility remote.⁸

As a way of illustrating the relevance of social identity to the everyday life of fishermen, consider the following exchange:

Anthropologist: "What do they call you?"
Fisherman: "Oh, a hippie, a long-haired freak."
Anthropologist: "And what do you call them?"
Fisherman: "Rednecks" (laughter)
Anthropologist: "What's the difference?"
Fisherman: "The difference is that we take an ounce of grass instead of a case of beer on an 8-day trip."

The terms "hippie" and "redneck" in the above conversation are references to social types and, as such, communicate information about the priorities and needs thought to be advanced by those to whom the label is meant to apply.⁹ When the label is both sought and embraced by an individual, it becomes, when mirrored back at him in social interaction, a social identity. It is true, of course, that the tags or labels people (including social scientists) invent to symbolize the complex bundle of social information which makes up a given social identity may come from many domains.

Critically, social identities are often derived from or related to occupational activities and titles. When fishermen, for example, wish to stress the work relevant origins of another's behavior, they can draw upon a rich vocabulary of occupational titles to do so. This is evident in the fixed-gear disputes between lobstermen, gillnetters, and draggers (Miller and Pollnac 1978). There are many occasions, however, when occupational titles are judged by a

speaker as irrelevant to the matter at hand and the speaker must call upon another frame of reference to achieve his conversational purpose (Goffman 1976). A person may be described as having behaved in a special way not, for example, because he is a "fixed gear fisherman" but because he is a "bible-thumping Christian." Both types can and do serve as social identities.

We are, however, not concerned in this paper with social identity in a context-free fashion. While there are no doubt broad social identities that do sometimes transcend situational boundaries such as "underdogs," "good guys," "bigshots," "smart operators," and so forth, we are interested here in only those social identities which fishermen take to be occupationally germane. What we seek to uncover is the fisherman's answer to the question: "What kinds of fishermen are there?" Clearly, a technical answer, the sort most often used by social scientists, though occasionally used by fishermen too, could be based on any number of material, physical, or otherwise non-social dimensions such as formal role (deckhands, engineers, captains), fishing strategies (inshore, offshore), or even age (old, young). As we have already suggested, the problem with such distinctions is that they rarely reveal the social organization of the occupation as seen by insiders, which is based far more upon the connotative meanings such non-social dimensions hold for members of the occupation than upon their denotative meanings (Spradley 1970; Tyler 1969; Cicourel 1974). It is here that social identities surface most dramatically, for such identities typically cut across denotative occupational dimensions. Thus, fishermen who employ different fishing strategies or go after different species may, in fact, share quite similar social identities within the occupation. This, in terse form, is the principal argument we present below where we demonstrate that traditional fishermen, despite their

tremendous variation along all the convention denotative dimensions which can be applied to segment the occupation, still see themselves as distinguishable and set apart from non-traditional fishermen (and vice-versa). To make this point, we look first to the symbolic side of fishing where social identity plays its most pivotal role.

Costume, articles of adornment, cosmetics, material possessions artfully displayed, and the like all serve to suggest and reinforce the bearer's selected social identity. In this context, clothes are almost unspeakably significant. Commercial fishing garb such as boots and slickers serve significant symbolic functions for fishermen particularly when they are worn outside the immediate working environment. The wearing of such garments socially displays to others who may come from different walks of life that the wearer is a "fisherman" in more places than one. Intra-occupationally, more subtle bits of information about the wearer's identity and character may be gleaned such as the sort of "taste" the wearer displays in his choice of boots and slickers. Consider also the fact that, in New England, hats do more than keep the sun from a fisherman's eyes: they also tell other fishermen where the wearer is from and the sort of involvements he is likely to have in the occupation. For example, Gloucester draggersmen of the traditional sort wear fluorescent orange billed caps, New Bedford fishermen wear striped engineer's caps, and Point Judith cooperative members sport distinctive black baseball caps. Many non-traditional fishermen are, however, breaking new ground with their choice in headgear. Particularly prominent among non-traditional types are the billed "trucker's" caps and obscure baseball caps. Both are distinctive because of their non-fishing logos and ensignia.

Car choice and decoration also mirror aspects of the social identity of fishermen, and this matter illustrates another difference between traditional

and non-traditional types. Some Gloucester fishermen, "greasers" to be precise, are, in fact, so well known as a "type" to those familiar with the preferences of this community that they are sometimes recognized as being fishermen only because their car is "exactly what a greaser fisherman would buy." In New Bedford, Portuguese fishermen are said to always drive white Cadillacs (Jessen: personal communication). By contrast, non-traditional fishermen, in part, because they must use their cars for transporting gear to and from their boats, tend to drive vans or pickup trucks. Traditional fishermen rarely use their cars for business purposes because the boats they work on are typically large and their gear stays aboard. To drive a vehicle about town that announces its utilitarian use, would be, to the traditional fisherman, unthinkable and a sure sign of one's failure to have made economic progress.

Importantly, traditional fishermen have less interest than most of their non-traditional counterparts in emphasizing the occupational aspects of their biography when not at work. The traditional fisherman would rarely look like a fisherman to the unsophisticated observer unless he were near a boat either beginning or ending his work day. He sharply distinguishes between the working and non-working aspects of his life and chooses his dress accordingly. In short, the traditional fisherman tends to maintain a working identity only when working and a social identity only when socializing. By contrast, many non-traditional fishermen tend to promote a social identity while working and an occupational identity when socializing. He is, for example, as prone to wear a rock 'n roll tee shirt while fishing as he is to wear a fishing knife on his belt while on a date. The single earring frequently worn by some non-traditional types is something of an all-purpose symbol since it has meaning in both the occupational sphere of maritime tradition and in the social

sphere of hippie folklore. It is generally the case, however, that traditional fishermen are far more concerned about maintaining a strict separation between their occupational life and their social life than is the case for non-traditional fishermen.

As a last example in this symbolic domain, consider the boat naming practices in New England. Traditional fishermen are rather serious and solemn when naming their boats. Gloucester draggers, for instance, have names with obvious religious overtones--Mother and Grace, St. Mary, St. John, Joan of Arc. However, many non-traditional fishermen disregard seriousness and custom, naming their boats after family members, plays on words, and not-too-subtle put-ons. The diversity in Chatham boat names reflects a certain irony, humor, and perhaps detachment from the investment a boat represents: Benjo, Black Russian, Wendy Jean, Big John, Frenzy, I'm Alone, Peachez, Wee Marc, Ready Boy, and Bearded Clam.

We have attempted to document by numerous examples that establishing a social identity is an important matter to traditional and non-traditional fishermen alike. It is also important to the traditional fisherman's understanding of non-traditional types. The following comment is typical of the traditional fisherman's view of the non-traditional: "There's not a real fisherman in the bunch...These guys just drink and talk...He's not a fisherman 'cause he's only gone out twice this month."

This traditional fisherman has a point, for it is generally true that non-traditional fishermen are as interested in establishing and maintaining a social identity as a fisherman on land as they are in establishing and maintaining that identity while fishing at sea. By staying on land, by "talking shop," and by simply being visible, they are nonetheless still laying claim to a social identity. They are attempting to prove to themselves, to

friends, to visitors, if not to traditional fishermen, that they are, in fact, fishermen. To a large extent, non-traditional types are as eager to be taken in public as a fisherman as traditional types are loath to be seen in public in this light.

This point can be illustrated vividly by examining the bar behavior of fishermen, a locale that has almost myth-like stature among fishermen. Indeed, fishermen have always been linked, in the public mind at least, to rowdiness, fraternalism, and hard drinking in bars. But, in actuality, most traditional fishermen rarely drink in public. Traditional fishermen, by and large, go home after work, thus complimenting the above view of traditional fishermen as being basically uninterested in projecting a social identity with strong occupational overtones in public. Those traditional fishermen who do drink frequently outside their homes (or the homes of their friends and kin) do so most often in poorly marked bars that are rarely entered by non-fishermen. Traditional fishermen drink in semi-private places with other traditional fishermen where the question of their social identities as fishermen is of little consequence or concern. Non-traditional fishermen are, however, quite visible in their public drinking patterns. They do not drink with the traditional fishermen, preferring those locales where they can interact with persons having a wide variety of other social identities. They are proud of the impact of their occupation on their cultivated social performances and take care to occupy territory where they can display their canny fisherman's ways.

We now consider a deeper taxonomic ordering of fishermen by cutting the first order differences between traditional and non-traditional fishermen into second order differences which distinguish types within types. When this task is completed, some concluding comments are offered which speak to the origins and consequences of the mix of fishermen now operating in New England ports.

Traditional Fishermen: Subtypes

Two kinds of traditional fishermen are to be found in the studied ports. The first is composed of "Swamp Yankees" and "Cape Codders" who represent the traditions of the "American" fisherman. The second group is composed of the "Greasers" and "Guineas" who are descendents and relatives of the immigrant Italian fishermen of Gloucester.

Swamp Yankees and Cape Codders

"Nothing is more striking about the deep-rooted, traditional Yankee fisheries than the absence of New England Yankees...except in the small villages along New England's northern coast, the Yankee fisherman is about as common as the native Indian."

(Boeri and Gibson 1976:37)

In the days of Captains Courageous, the stereotypic New England fisherman was a "Yankee" and it is a label rich in connotative meaning. The Yankee has been most commonly depicted as hard-working, shrewd, stubborn, thrifty, and persevering. He is reticent, rugged, fiercely independent, self-reliant, and, most significantly, of ruddy Anglo-Saxon descent. Pictorial versions of this Yankee are omnipresent in New England kitsch art, curio motifs, and commercial images such as the Yankee fisherman (always in a slicker) who appears as the mainstay of Gorton's fish products' logo.

It has been a long time, however, since Yankee fishermen have dominated the major southern New England ports. The Gloucester, New Bedford, and Provincetown fishermen, for example, are primarily all of Italian or Portuguese descent. But the working Yankee fisherman has not vanished entirely. In Maine, New Hampshire, and many of New England's minor ports, which never experienced waves of European immigrants, the Yankee fisherman continues to personify a status quo which has lasted 200 years. There are a few lobster ports in Maine, for example, where Yankee fishermen even retain considerable

social and political control of the community (Acheson 1972). In most cases, however, they have not been so fortunate.

Yankee fishermen sometimes claim to be able to trace their family's involvement in New England fishing back to Colonial times. In fact, the name tag "Swamp Yankee" is itself a reference to times long since past--a period during which large portions of the New England coast were characterized by lowland bogs. Cape Codders, while similar in most respects to Swamp Yankees, acquire their status by virtue of birth on Cape Cod, though they, too, often lay claim to possessing historical family ties to fishing. Both groups share, however, the social advantage of inherited and, for the most part, unquestioned respectability in New England ports. They are rarely, if ever, called upon to justify their status as fishermen to anyone within the local community. And, it is to the Swamp Yankees or Cape Codders that outsiders such as anthropologists are referred by most port authorities, observers, and residents who, in good faith, wish to assist the questioning stranger.

The fishermen of Chatham provide a case example of this type of traditional fisherman. Within the Chatham fishing structure, the Swamp Yankee and Cape Codder represent the establishment. They are the oldest, have been there the longest, and are the only fishermen in the port who can claim a "tradition." They have well-defined routines, understandings, and beliefs about fishing. In short, it does not stretch credibility to suggest that they also have a culture.

10
Greasers and Guineas

The dramatic impact of immigrant workers on this country's labor force has been evocatively described many times over. Within the New England fishing community, both the Italian and Portuguese immigrants have played a

prominant role. So prominant has their role been that they now represent the vast majority of southern New England's fishermen, and for several generations have been the keepers of the area's fishing traditions. While we only discuss the Italian fishermen of Gloucester in this section as a type of traditional fisherman (though, numerically, the most significant in the region), the reader should be aware that much of what we have to say about the Italian community could be said about the Portuguese community too (and the smaller Norwegian community of fishermen also part of the New Bedford fleet).

The Gloucester dragger fleet is overwhelmingly Italian. Some 85 percent of the total fishermen in Gloucester are Italian, though within this group the fishermen compare themselves with other fishermen of Italian or Sicilian descent on the basis of recency of arrival. New immigrants are referred to as "Greasers" in contrast to the earlier "immigrants" who are more Americanized Italian-Americans or "Guineas."

As might be expected, Guineas do not like being called Greasers and consider it to be something of an insult if they are. They do not object however to being called a Guinea by a Guinea. On the other hand, this linguistic system is not symmetric for it is more or less meaningless, rather than complimentary, to refer to a Greaser as a Guinea. Nor does one find Greasers who call Guineas, Guineas. Though Greasers and Guineas know fully well which group they belong to, both terms are used exclusively by Guinea fishermen. The use of both terms is, however, fashioned normally as a joke, a mild epithet, or a casual rebuke. But, despite such offhand and light conversational practices, important social distinctions are to be found when contrasting Greasers to Guineas (and vice versa).

In the strictest, most prominent, and stereotypic sense, a Greaser is a recent immigrant who has come to Gloucester only to be a fisherman. Critically, Greasers have been thoroughly successful as fishermen in Gloucester. From the Guinea perspective, Greasers then:

"...come over here from the old country and can't read or write. They ain't got nothing. They just eat bread and spaghetti and don't go out or do nothing but fish. Next thing ya know, they got their own boat, two houses, and a fancy car even though they don't even have a license."

Despite the claim that "once a Greaser, always a Greaser," the label itself is not necessarily permanent. It can be avoided or outgrown. In the latter case, twenty years in Gloucester can change a Greaser into a Guinea. As one fisherman observed, "He was a Greaser, now he's a Guinea." Another fisherman suggested that a Greaser was really "someone who hasn't been here long enough to be Italian." An important prerequisite for this transformation to occur is, of course, the ability to speak English. By definition, all Greasers speak Italian or a regional dialect learned in Italy. Guineas, by contrast, have spent considerable time in America. And, young Guineas, having concentrated on English in school, may speak little or no Italian.

Not all of being a Greaser has to do with one's status as a recent immigrant. For example, one fisherman referring to another who had recently arrived from Sicily noted, "We don't call him a Greaser because he sees things our way." This notion of "seeing things our way" is necessary to fully understand the distinction between Greaser and Guinea. The basic complaint against Greasers is not their recent tie to Italy per se nor is it necessarily their perceived conspicuous consumption. Rather, Guineas see Greasers as unappreciative of American benefits and advantages. Greasers are said to flood the labor market while continuing to reaffirm their connection to Italy (or Sicily) through both word and deed. For example, the potential but nevertheless

"non-Greaser" fisherman alluded to above is accepted by Guineas because "he's the only guy who doesn't say 'Italy gotta stronger iron' or 'Italy gotta bigger tomatoes'." The feeling among Guineas is that "if you come to Gloucester to make a living, you should keep your mouth shut about how great things were where you came from."

If there is one thing about a Greaser that all Guineas can agree upon, it is that they are seen without exception to be hard workers. Moreover, Greaser success in Gloucester has not been taken particularly well by the Guineas who have "been here longer." Some Guinea fishermen now avoid former haunts such as the St. Peter's Club since it is said that the Greasers have "taken over" and enjoy nothing more than flaunting their new-found wealth in front of Guineas. To a Guinea, whatever a Greaser is, a Guinea is not. Common word among Guineas in Gloucester holds that Greasers tend to be both flashy and concerned with exhibiting a distinctive style. In the minds of many Guineas, Greasers are associated symbolically with big wads of folded bills, tailored leather jackets, black Cossack fur hats, expensive gold jewelry, and long, heavy, bright red American cars.

We should note too that the wives of both Greasers and Guineas are deeply involved in the business of fishing. Because the men spend so much time at sea, women are most often responsible for paying bills, mortgages, and, if it is owned by the family, the boat. Many wives are in fact the legal owners of the vessels. Most of the women in Gloucester are not at all timid about such financial matters. As one wife remarked: "They bring it home and we spend it. You think I'm gonna let him walk around the bars with fourteen hundred dollars on him?"

In closing, we must reemphasize the fact that both the Greasers and Guineas of Gloucester are traditional fishermen. Like Swamp Yankees and Cape

Codders, they have learned their craft as a result of being born into a fishing family and the orientation they have toward their social position as a fisherman rests on parental, family, and community influence which began very early in life. Unlike non-traditional fishermen, traditional ones are hardly self-conscious of their social identity. For the most part, they seem to wear their fisherman identity as naturally as they take a breath. It is only when they step out of their familiar worlds that they recognize that they are, in fact, traditional fishermen.

Non-Traditional Fishermen: Subtypes

Four kinds of non-traditional fishermen are to be found alongside traditional fishermen in the three ports discussed here. The first group are those who have had some sort of formal training in fishing techniques, technology, and strategies. We call this group "Educated fishermen" not to elevate their status or imply that they are somehow wiser than other fishermen, but simply because this phrase seems to be the one most frequently used by other fishermen. The second group is comprised of "Hippies" and "Outlaws" who together make up the "Granola Generation" of commercial fishermen. The third type are represented by fishermen who are interested solely in the economic gain to be had by fishing, the "Entrepreneurs," who themselves break down into sub-categories illustrated by the "Newcomers" and "Scallopers" discussed here. The fourth group is a sort of residual classification which includes all "Part-time" and "Seasonal" fishermen who exist on the outermost fringes of the commercial fishing world.

Educated Fishermen

As the commercial fishing industry becomes more sophisticated through advances in boat design, sonar sounding techniques, radio electronics, and the understandings of patterns of fish behavior, training programs for would-be

fishermen have also begun to appear in New England and elsewhere. Those who promote these ventures argue that innovation and information can be most directly and usefully diffused into commercial fishing through schools of formal preparation rather than through the more traditional schools of "hard knocks." It should be noted, however, that not all fishermen are interested in the "new technology" as evidenced by the persistent use of anachronistic Eastern-rig side draggers in some ports (though even some traditional fishermen are beginning to regard such craft as collector's items much like a vintage Model-T Ford).

The marine fisheries program offered at the University of Rhode Island is one such training option which provides potential fishermen with immediate access to fishing knowledge. Students who participate in the URI two-year, undergraduate, and graduate degree programs take courses in marine technology, meteorology, equipment maintenance, navigation, microeconomics, fisheries management, and so forth. It is claimed that through these programs, a young man (or woman) will obtain an invaluable overview of the trends, technologies, and problematic concerns associated with commercial fishing, and graduates of the programs are said to have a decided advantage over traditionally trained fishermen when it comes to matters of evaluating the merits of different scales of operation, methods of finance, new machinery, and so forth. Not to be dismissed either are the benefits associated with a graduate's ability to utilize the University as an informal informational resource long after he has left the campus. A number of specialists affiliated with the University are, for example, quite willing to assist those fishermen they have come to know through the program. Thus, fishermen with a fisheries program background may well acquire at a relatively young age what other fishermen may not obtain for decades.

That some fishermen are able to learn systematically in college what others are only able to learn informally on-the-job is not to depreciate the more traditional pattern. Indeed, many fishermen, both traditional and non-traditional, are quite critical of those who select the formal route into the occupation. They believe that the college version of learning to fish discounts the role experience must necessarily play in the process. The situation is obviously very similar to that of other occupations where established, but self-taught, practitioners of a trade are confronted by "book learned" and "course taught" recruits (Greer 1972).

In general, however, Educated fishermen are viewed by other fishermen in very personal terms--almost on a case-by-case basis. Because they are still something of a rarity in New England, their social standing in the occupational community has yet to be firmly established. While there is much talk about their strengths and weaknesses, no one has yet been able to convincingly locate this type of fisherman in the overall scheme of things. An Educated fisherman can be distinguished by other non-traditional fishermen, however, in the sense that it is he, more so than they, who is likely to succeed. It is this feature that is crucial for the social identity of an Educated fisherman.

Traditional fishermen, such as those in Gloucester, observe, comment upon, and occasionally interact with the educated types, but they are nonetheless wary of them and the level of interaction between the old and the new fishermen depends largely on the "attitude" of the new. Many of the Educated fishermen have, for example, no interest whatsoever in being accepted by traditional fishermen (or, for that matter, by other non-traditional fishermen). No doubt, a good part of this has to do with the values they have acquired in training as well as the social network graduates of the program

form which, in turn, support these values. To most of the formally trained fishermen, traditional fishermen appear hopelessly inefficient and downright unecological. Perhaps the most telling illustration of this point is the disdain many Educated fishermen express toward the Greaser draggers of Gloucester who are thought to be shamelessly raping the sea by using only small-mesh nets in their routine fishing operations.

At any rate, the Educated fisherman is less dependent upon any assistance, advice, and training than those who engage in fishing without the benefit of formal training. But it is also the case that the Educated fisherman has access to more continuing assistance, advice, and training than any other group of non-traditional fishermen. Thus, the Educated fishermen are the ones who are maximally prepared and qualified to experiment, not only with new equipment and new strategies, but with new ports as well. The present "highliner" (the most successful fisherman) in the Newburyport dragger fleet is one of the Educated fishermen. Highly respected by the local fishing community, he serves as an example of a man who has best prepared himself for fishing. He may well represent a prototype of the future fishermen of America.

Hippies and Outlaws: The Granola Generation

The young men of fishing who most emphatically claim to have become fishermen because it appeared to satisfy their personal "lifestyle" requirements are the "Hippies" and "Outlaws." Together, as longtime observer of the Gloucester fleet, Silky Sullivan, suggests, they constitute the "Granola Generation" of the American fishing industry.

Fishermen in these two categories contrast with other fishermen in that they clearly do not rely on formal contracts, cross-generational relationships, or ethnic fishing ties for support. There are no Hippie fishermen whose sons are Hippie fishermen, there are no father-son Outlaw teams, and no Hippies

or Outlaws have yet gone to school explicitly in order to be fishermen.

Outlaws and Hippies both claim to respond to what they perceive to be the "inequities" of the American sociopolitical order. While the former are mainly "anti-establishment," the latter are "counter-establishment." Both groups are easily identifiable since they favor highly stylized, visible, and expressive forms of dress and mannerisms. The Hippies wear the out-of-date clothes and the longer hair; the Outlaws sport the cowboy hats, buck knives, and modified pick-up trucks.

The term Hippie is used generically by fishermen (perhaps most frequently by non-Hippies) to tag those individuals who are seen to behave in at least two different, though not mutually exclusive, ways. First, Hippie fishermen are those "outsiders" who overtly bring with them a strong and visible social identity into fishing. This is to say that they do not gracefully or respectfully renounce their past identity (or, as some have said, "cleanse themselves") when they enter the occupation. In a sense, they seem to expect the other fishermen to modify their own social identities to accommodate Hippies rather than vice-versa. That they are something other than fishermen and are now extending their domain to fishing is a crucial point of significance to fishermen. Second, Hippie fishermen are often identified by other fishermen as being extremely dedicated to fishing for a number of humanistic, ecological, and romantic reasons. In explaining why they have entered fishing, Hippie fishermen often cite such factors as the lure of Mother Ocean, the integrity connected with doing a fair day's work with one's own hands, being outdoors all the time, being self-sufficient, and being part of the "natural" food chain linking fish to fishermen.

Many Hippie fishermen have been to college (though not in fishery management programs); therefore, they also claim to have rejected other occupa-

tions before coming to fishing. Their choice is depicted as a reasoned one. Such rejection of other possibilities is often said to have been based on a failure to locate another endeavor in a "healthy" social and physical environment which would also be consistent with their values. Because Hippie opinions are apparently deeply held and are typically well-articulated, members of this category may well be the least likely non-traditional fishermen to assimilate with the more traditional types.

Outlaw fishermen, like some of the Hippie fishermen, are also concerned with a distinctive social identity and its projection. If an almost religious dedication to fishing characterizes the Hippie, then an almost religious defiance of social convention and legal limit characterizes the Outlaw. The best example of this kind of fisherman is a notorious Gloucester captain who has for some years now thwarted and challenged law enforcement officials by dragging surreptitiously inside the 3-mile Commonwealth limit. This same fisherman is also known for his volatile nature and unscrupulous techniques of settling civil suits out of court. Perhaps because these acts are treasured symbolically, if not expressed, by other fishermen, this captain is highly respected for his exploits.

For the most part, the Outlaw label is to be taken literally, though both the derring-do and seriousness of the violated social proprieties and legal restrictions vary widely. This Outlaw category seems not to be an entirely isolated phenomenon for Velez (1978) reports upon a social category of Mexican-American fishermen in San Pedro, California, called Renegades, whose infamous escapades in the Los Angeles harbor would undoubtedly earn them the Outlaw's badge were they to suddenly appear in New England. Combining these two social types, it appears that in fishing, as in many other lives of endeavor, rule breaking is, to some, inherently satisfying and "getting away with it" is itself considered rewarding.

Entrepreneurs: Newcomers and Scallopers

This category refers to those fishermen who view their occupational involvement strictly in economic terms. Often middle-aged and with lengthy experience in other related fields, these men are neither romantic nor scientific about the relationship they wish to establish with the fish in the Atlantic Ocean. They are explicitly "in the business to make money" and are not at all hesitant in making that claim. However, because of the current problems surrounding fish quotas, federal intervention in fisheries, restrictive banking policies ("tight money for fishermen"), many of the Entrepreneurs are now considering alternatives to fishing.

An underlying continuum based on the amount of time one has spent as a commercial fisherman can be used to discriminate among Entrepreneur subtypes. Using this time dimension, we can contrast recent arrivals or "Newcomers" to all other groups of Entrepreneurs. Since there are, however, a number of 'other groups' to be found along the time continuum, we describe only one of these groups, a group of fishermen falling near the long-tenure end of the continuum, the "Scallopers."

Newcomers to fishing are, almost by definition, overly optimistic about their prospective economic future. Part of the reason for this is that they have had very little exposure to the occupation. Unlike the Educated fishermen who have been exposed to the hard financial realities of fishing in school or the members of the Granola Generation of fishermen who are relatively unconcerned about financial gain, Newcomers of the Entrepreneurial stripe believe it possible to "make a killing" in fishing and that the "bottom line" will prove their point. For the most part, their rhetoric has not been matched by their performance.

The classic example of a Newcomer in our scheme is a former New York insurance agent, now in Chatham, who has outfitted himself with a new, high-powered, V-bottom skiff. From his point of view, he has "maximized his options" for his boat is swift and not impeded by the infamous Chatham Bars. Thus, he believes he can easily participate in several potentially lucrative fisheries. Whether or not he will "make a bundle" remains to be seen.

It is worth noting that this sort of jump to immediate fisherman status (and captain's status at that) is quite literally purchaseable. As one long-time traditional fisherman in Chatham observed:

"I don't know where these guys get the money to start at the top in this field but I'll tell you what happens when they do. New fishermen come to Chatham and Chatham retires the old ones. There are any number of people born in Chatham who were forced to retire because of the influx of boats. A twenty boat port cannot become an eighty boat port."

Some fishermen in the Entrepreneur class have, over time, created for themselves a social and occupational niche in various ways. Scallopers are fishermen who have created such niches, particularly those mobile Scallopers of the Maine fleet that operate seasonally in southern New England.

Scallopers and their world differ from other fishermen in several important respects. First, scallops are found in beds close to shore and are, strictly speaking, harvested, not fished. Scallopers work an area until it has been cleaned of sea scallops and then move to a new location. Fin-fishermen, on the other hand, deal with a considerably more evasive resource. Second, scalloping, compared to other forms of fishing, is somewhat more strenuous and much more monotonous. Because of the heavy equipment used, scalloping is characterized by an almost industrial-like work atmosphere. Third, there is a certainty to scalloping that sets Scallopers apart from other fishermen. Many fishermen regard them as a "different breed altogether." Scallopers seem also to both acknowledge and accept this diagnosis. "There's no certainty in

fishing," said one Scalloper, "but this is stable and steady 'cause those scallops are always out there so you can get your half a loaf of bread every day."

Many of the scallopers operating in or near Chatham in the spring are not from Cape Cod but come from as far south as New York and New Jersey and as far north as upper Maine. Unlike most fishermen, Scallopers are mobile. They utilize a port because it is near scallop beds and are rather outspoken about it:

"As far as I'm concerned there are two kinds of people, the 'doers' and the 'can't doers'. We know the people in this town don't like us but who gives a shit. I'd rather live in Maine anyway though I wish the prices there would go up."

The future of the sea scallop Entrepreneurs like others in this category is most uncertain. Some of these fishermen say they fully intend to return to or switch to other types of fishing (e.g., jigging, longlining, lobstering) when the scallops are exhausted this season. One man reasoned:

"I'd go Scottish seining if it cost less. I expect to go back to line trawling in a year. I think we'll see more Scottish seiners and less scallopers in the next few years."

Money is an important factor in any fisherman's decision regarding his work strategy although for Entrepreneurs, without family, training, or anti-capitalistic values to fall back on when scarcity strikes, money is perhaps more important than to other fishermen. Indeed, their willingness to be mobile documents this point, for other fishermen are all more or less attached permanently to a given port.

The Entrepreneur is also something of an endangered species for financial backing is apparently difficult to obtain these days through impersonal sources. Consider the following remarks which are, unfortunately, all too representative of the pinch Entrepreneurs are presently feeling:

"My boat payments are around \$9,000 a year and I burn 80 gallons of fuel at 60 cents a gallon. Christ, including insurance and wear-and-tear, it costs me a hundred fucking dollars just to leave the dock."

"My old dream is gone. My dream was a 127 foot Bender trawler. My dream now is to sell out...I can't generate no local bank interest. Once they find out I'm a fisherman, they say 'no.' I can't get a \$500 loan on \$12,000 worth of equipment. Its the same in Maine. The banks stink toward fishermen."

"The way I see it, at least half these guys are going down the tube. The only way they make it now is if they got wives who work."

Part-timers and Seasonals

The Part-time fisherman, as his label connotes, is not fully committed socially or occupationally to being a commercial fisherman. Part-time fishermen in this area, are rarely even year-round residents of the ports in which they fish. Many, for example, operate on Cape Cod only during the warm summer months. More often than not, Part-timers were drawn initially to a port for recreational reasons and only later discovered that they also had a chance to supplement their regular incomes by fishing.

Unlike Entrepreneurs, the start-up and fixed cost investment for a Part-timer is relatively small. Several thousand dollars will be sufficient to outfit a man for hook fishing in a port such as Chatham, providing him with an 18 foot skiff, outboard engine, and jigging lines. This equipment is portable, thus making it as easy for a Part-timer to stop fishing as it is for him to begin.

Because of overcrowding in the mooring and landing areas of some ports and because the catches of all fishermen are considered in the calculation of the yearly fishing quotas, Part-timers are often resented by some of the other fishermen in a port. This is especially true of non-resident "weekenders" who also catch fish to sell, but, unlike Part-timers, do not pay for a commercial

license to do so. A Chatham Entrepreneur remarked:

" The tin fleet drives me nuts. These guys used to go after bass for fun but they found out they could make a buck doing it... They're usually guys whose father gave them a boat and now they think they're working or they're school teachers with the summer off. They don't know how to fish or operate a boat and they follow us around.. Maybe 15 out of 100 are legit."

For obvious reasons the number of Part-timers operating out of any port is exceedingly difficult to estimate. Because of their sporadic interest in fishing, they are almost invisible since they do not form tight or enduring social networks as a result of their individualized fishing activities. Their boats too are invisible to the rest of the fleet since they are kept in private dry storage when not in use.

Seasonal fishermen are in many ways similar to Part-timers. These fishermen are distinguished from Part-timers because they tend to focus on only a single fish species and are active only during defined seasons of the year. When the season for the species terminates, these fishermen revert to only non-fishing activities to generate their incomes. As is true for all fishermen, however, the fishing effort of the Seasonal fisherman varies in intensity from man to man and many Seasonals participate on a part-time basis even during the season of their favored species.

Among the most popular species for the Seasonal fisherman in the giant bluefin tuna. The bluefin is allocated to New England fishermen during the summer months according to a quota system. Weighing between 300 and 900 pounds, bluefin are favorite targets of the so-called "big game" sportsmen as well as commercial fishermen. Until recently, fishermen have experienced some difficulty selling tuna but the current Japanese demand for "sashimi" (a raw tuna delicacy) is high enough to warrant ex-vessel prices of well over a dollar per pound late in the season when the fat content of the bluefin is high and the quota

for the species has been nearly met. The market value of the bluefin, the pleasant summer weather, and the challenge catching the fish offers to both commercial and sport fishermen generates an annual phenomenon in Newburyport known as "tuna fever." Literally hundreds of fishing vessels converge on two corners of an offshore bank to catch the bluefin, where the basic strategy of extravagant chumming has led more than one fisherman to hypothesize that the fish follow the fleet rather than the reverse.

Both the Part-time and Seasonal fishermen are, from our standpoint, unique in that they straddle the conceptual border between commercial and recreational fishermen. More often than not, they fish for pleasure yet they sell their catch for profit. Their fishing gear is similar to that employed by commercial fishermen but their boats double as pleasure craft and are frequently moored at recreational and yacht landings instead of with the boats of the commercial fleet. More importantly, their motivation to fish is amplified on two counts. On the one hand, they value the social activities which surround their fishing activities as well as the individual thrill of landing, for example, a giant bluefin. On the other hand, they know they will be paid for whatever success their pleasurable ventures bring. There is indeed more than a grain of truth in the Part-timers' claim that they "have the best of both worlds."

Of the fishermen we have considered, Part-timers and Seasonal appear to be farthest from the mainstream of commercial fishing since: (1) they maintain other jobs, statuses, and interests; (2) they fish for social as well as economic reasons; and (3) they are likely to live out of town. It would be a serious mistake, however, to assume that because these fishermen operate on an irregular basis that their commitment to fishing is not valid or firm. And, the traditional fishermen, in particular, seem to respect the position of the Part-timer and Seasonal in the world of commercial fishing. This seems to be the

case mainly because these fishermen acknowledge and do not attempt to modify or minimize their differences in style, interest, and background to that of the other fishermen. Seasonal and Part-timers exist at the social periphery of an occupational environment but their ability to gracefully place themselves in and regularly extricate themselves from the world of commercial fishing may secure their future in the industry and enable their numbers to rise.

Some Closing Comments

We have described a number of cultural forms associated with fishing in certain New England ports. In particular, we have argued that the non-traditional fisherman is very much present and significant within an occupational world dominated, economically and numerically, by traditional types. But there still remain the nagging and nasty questions concerning why non-traditional types are there in the first place and why, given that they are there, that many of them seem so intent on maintaining their distance from those in the mainstream of the occupation.

The notion of a "cultural scene" is useful in this regard.¹¹ A cultural scene, in essence, represents a kind of re-occurring magnetic occasion which attracts participants to it primarily because of the immediate gratification available to them in such scenes. They exist primarily because they serve expressive functions for people. Within them, personal biographies are of little importance, thus enabling people to become whatever the scene allows. In a society marked by its emphasis upon economic achievement and the much talked about presence of a Protestant ethic, cultural scenes allow members of such a society to "break out" of the dominant mode and, at least momentarily, pursue certain activities for their own sake rather than for some longer-term utilitarian function. The ski scene, the surfing scene, the disco scene, the CB scene, the

bar scene, the dope scene, the raquetball scene, the jogging scene, and so forth all offer convenient examples.

We believe fishing, as it is approached by many of our non-traditional types, represents another such cultural scene. Moreover, it is a rather democratic one which does not require great investments of time and money to enter. Nor is it associated with particularly high social or skill requirements which would effectively serve as barriers to entry. Fishing, in most respects, is easy. Take lobstering for example. In the words of one traditional fisherman: "Anybody can lobster. There's no intelligence involved at all, you just have to move the pots every so often."

We think many people now engaged in commercial fishing are so engaged because it allows them the opportunity to construct a social identity with which they are comfortable. By the judicious use of eccentricity, a dash of fashionable color here and there, and the avoidance of the almost hyper-conventionality and propriety demanded in so many other occupational pursuits, non-traditional fishermen are actively carving out a rather admirable design for living. Like perhaps certain kinds of other modern workers such as independent modern truckers, communal farmers, college-educated construction workers, and cowboys, these "new" fishermen are challenging an older, more mundane and established order.

That is not to say that the older order is about to collapse. Indeed not, for, as we have shown, there are few areas of the traditional fisherman's world that the non-traditional fishermen have entered, let alone altered. Structurally, traditional fisherman have not played a significant role in the socialization of non-traditional fishermen nor are they particularly desirous of doing so in the future. The channels of communication between the two types are, by and large, closed and few members of either group seem willing to act as go-betweens or gatekeepers to bring them together. But, this situation

also suggests that considerable innovation in the occupation is possible in the non-traditional camp where routines, styles and attitudes are still relatively loose and unburdened by the weight of custom and life-long training. The so-called Educated fisherman may indeed bring new ideas to practice in the industry which may eventually filter into traditional circles.¹²

It is true of course that the fishing scene, unlike the fishing culture possessed by traditional fishermen, could be but a passing fad or fancy. Overcrowding, tourism, land sales, quota restrictions, rising operation costs, and other economic factors could eventually drive out all but the most dedicated (and independently wealthy) non-traditional fishermen. Social factors may precipitate the decline of the scene if the "lifestyle" itself were to lose its attractiveness or stagnate. Marriage, the responsibilities of raising children, and simple aging or physical decline may also take their toll and drive non-traditional types elsewhere. The scene is indeed a precarious one.

If we are right about the "scenic" properties of fishing, it seems equally clear that those non-traditional types most concerned with these scenic properties are at the moment, really only "at play" in the sense that Mead (1932) first used the idea. That is, these fishermen are presently trying out or toying with an occupational identity for the "fun of it" and they may not stay if and when it ceases to be fun. But, it is also true that even if it merely is fun, they are still at the entrance stage of a fishing career and this social location is analytically very similar to the entrance stage of any career. The point here is that their expressive concerns with both feeling out the role and with determining what, if any, impressive functions it may serve are not unlike actions common in other, more familiar occupations. Consider, for instance, the young interns who are said to wear stethoscopes to family dinners (Becker et al. 1960), or police recruits who, while chumming about

with old friends, will invariably make visible their off-duty revolvers in a variety of "offhand" ways (Van Maanen 1973), or the new college teacher who finds ways to be called "Professor" by even the checkout clerk in the supermarket (Douglas 1976). From this standpoint, there is nothing exotic about the self-consciousness with which non-traditional fishermen seem to display their social wares. It may well be an altogether necessary stage in their coming to terms with the occupation if they are in fact to remain in it. There is then an altogether compelling logic to the once heard remark in Chatham, "you don't have to fish to be a fisherman."

There is a final point to be made. We also wish to suggest that the strength of a social identity may not vary directly with the homogeneity of situations in which an individual moves--as is the conventional "Gemeinschaft" theory in the social sciences. For years, the standard tenet among anthropologists, sociologists, and psychologists had been that the individual's sense of self-hood is most developed in those orderly, serial, integrated societies which are marked by permanence and little social change--those societies wherein "everybody knows their place." What we have shown here, however, is that those fishermen with apparently the most strongly held sense of self-hood were precisely those who lacked such a backdrop of stability. It is at least plausible then to suggest that social identity is perhaps most complete when it must be carved out of a fragmented, incompatible, conflicting, and uncertain environment. To have a social identity is to have many foils in mind, if not in your midst. This is, of course, merely another way of saying that we act at our most personal level only when we are provided the opportunity to take part in a real social drama.

NOTES

1. This study was supported by a National Science Foundation Grant (Research Applied to National Needs) under the title "University of Rhode Island, University of Maine Study of Social and Cultural Aspects of Fisheries Management in New England under Extended Jurisdiction (1977-1978) (James M. Acheson, University of Maine, Principal Investigator). Marcos Miller is an Anthropologist at the University of Rhode Island and John Van Maanen is a sociologists at M.I.T.
2. The data presented in this paper pertaining to port descriptions, social identities, fishing lore, and other ethnographic detail were collected primarily by Marcos Miller who has spent over 16 months living in various New England fishing communities—mainly in Gloucester, Massachusetts. Mr. Miller presented himself to members of the communities studied as a "Researcher/Anthropologist/Outsider" interested in the social organization of fishing, the lives of the local fishermen, and the ways in which the occupation was or was not changing. The principal data-gathering techniques employed were those of the cultural anthropologist, namely participant-observation and the extensive interviewing of key informants.
3. We should note that the one conspicuous exception to this rule is the work of University of Rhode Island anthropologists Richard B. Pollnac and John J. Poggie who are responsible in more ways than they may realize for the focus of this study (though, as the liturgy requires us to say, they are, of course, not responsible for any errors to be found herein). In fact, the financial support for this study was generated as a result of the exact theoretical point raised in the text. Both Pollnac and Poggie recognized this flaw in American fishing studies long before we did and our work here is a direct response to their insight. The interested reader can profit from a reading of this project's proposal as well as some of its results, see, in particular, Miller and Pollnac 1978.
4. This simple division of Gloucester boats glosses over the more ambiguous "middle sized" draggers also found in the port. As we have suggested elsewhere, the captains of these boats have considerably more flexibility in the choice of fishing strategy compared to the captains of either the big or small boats (Miller and Van Maanen 1978). We do not raise issues related to these kinds of options in this paper though the reader should be aware that the middle sized draggers are important beyond their numbers within the Gloucester fleet.
5. Bartlett (1977) argues that kinship ties as recruitment criteria operate to protect Gloucester boat owners (captains) against personal injury suits since kinsmen, it is thought, are unlikely to sue one another. Boat owners can then conveniently avoid the expense of purchasing liability insurance. McGoodwin (1975), however, found among shark fishermen in Mexico that a very different recruitment pattern held, and he argued that boat owners (captains) would choose non-relatives over relatives

because the former were more likely to be more compliant ("take orders better") than the latter. At any rate, the origins of the kin-based recruitment pattern in Gloucester is unlikely to be fully rationalized by Bartlett's materialist assumption though it may play a part in supporting the evolved pattern. See also Fraser (1966) and Blehr (1963) for accounts of the role kinship plays in selecting fishing crews.

6. There is something of a riddle involved when one considers the incongruity between the career paths and career aspirations of Gloucester draggermen. Most of the men indicate publically that they want very much to be boat owners and captains, though because the size of the fleet is more or less stable (or shrinking), they must also realize privately that only a few of them can ever achieve this goal. We do not have a ready answer for how such unrealistic aspirations are managed as smoothly as they apparently are in Gloucester, where the matter never seems to surface in obvious ways. The only clue we can present is the fact that younger fishermen, more so than older ones, are more strident and vocal in presenting their goals. This suggests that the answer may be located in the sort of "cooling out" mechanisms discussed by Goffman (1952) and empirically documented in the works of Chinoy (1955) and Clark (1960).
7. This point deserves considerably more comment than we can afford to make here. But, in brief, many non-traditional types become fishermen literally overnight. They are transformed in almost the flicker of an instant into fishermen by self-definition. True, such self definition can be self-delusion as well and it may take an "instant fisherman" many patient days, weeks, or even years to convince others that the transformation is "for real." Moreover, it would seem that such voluntary conversions are analytically similar to those that mark religious transformations in this society as discussed by Lofland (1966). As such, they deserve further investigation into the interaction context within which such conversions occur because it is quite unlikely that the accounts of those fishermen which stress spontaneity and flashes of insight are quite as instantaneous as they are made out to be—though structurally the transformations can and should be taken literally, "today a stockbroker, tomorrow a fisherman." Crucial to this passage (both structurally and procedurally) is the fact that on land there are few tests a listener can employ with much certainty to "call out" a speaker who claims to be a fisherman. For the most part, anyone can claim to be a fisherman and expect the claim to be honored, even among the most experienced of fishermen. While there may be much skepticism aroused in the audience, such skepticism will usually be kept private. It should be noted that this feature of the occupation is not overlooked by those considering entrance into the occupation.
8. To be candid, "character type" imputations such as the sort most personality theories promote are probably inescapable no matter how hard an analyst tries to avoid them. It is the case that any social science that grants an individual a degree of choice and freedom must ultimately sponsor some concept of deep character. Our view here, however, is that

for social identity to emerge, the individual need only have the ability to calculate his or her position in the scheme of things social. Whatever else is to be discovered by plumbing the depths of the human psyche we leave to psychologists and those other most clever tinkers, psychiatrists.

9. When reading the dialogue in the text, a colleague noted with some surprise that the terms "hippie" and "redneck" were not terms used by the fishermen he knew (i.e., traditional types). Our response was that this was precisely our point since we argue, in part, that what sets non-traditional fishermen apart from traditional ones is that they bring with them a culture into fishing rather than leave one behind. We should note too that the social type "redneck" is one that is intrinsic to hippie thought, for without it there would be no hippie to stand in opposition. Hippies, to hippies, are inconceivable without a foil ("rednecks"). We move toward Lévi-Strauss' (1968) thought on this matter and it is one that is best left abbreviated there.
10. We draw extensively on our earlier work in this section. See Miller and Van Maanen (1978).
11. On the concept of a "cultural scene," see Spradley and McCurdy (1972), Irwin (1977) and Van Maanen (In press). In some ways, the idea is very similar to Shibutani's (1962) savvy presentation of "reference group worlds."
12. On the related matter of what can be called "innovative" versus "custodial" orientations toward an occupational role, see Van Maanen (1978). The argument presented suggests that the manner of induction into a particular role is perhaps far more important than the content of that role in terms of how an individual will respond at later stages to the role requirements. In brief, social processes that are informal, individualized, disjunctive, non-sequential, and open-ended are more likely to allow for individual innovation than those processes which are not marked by such social processes. These processes can also be seen to build upon an individual's entering social identity rather than to systematically break it down.

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FISHERMEN'S WIVES: COPING WITH AN EXTRAORDINARY OCCUPATION

Fran Danowski

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Introduction

New England fishermen. You see them in all the tourist gift shops: bearded, pipe in hand, wearing a yellow slicker. Or you hear the barroom legends: hard workers, hard drinkers. When you conjure up the wives, you see them pacing the widow's walk or standing on the rocky shore waiting. The picture is probably of a hardy, capable woman, even tough.

Some romance is bound to color our impressions of the people involved in commercial fishing. In reality, the stereotypes are as farfetched as stereotypes usually are. Just as the majority of fishermen fail to conform to expectations. Call it Yankee individualism or human nature, fishermen's wives are as different from each other as all of them are different from other women. At least this appears to be the case in one southern New England fishing community.

Southern Rhode Island has a mild climate in comparison to the rest of New England. The area can be described as suburban-rural; there are no heavy industrial complexes or urban concentrations. John Poggie and Carl Gersuny

give a detailed profile of this community, including demographic, historic, and economic background, in Fishermen of Galilee (1974: 13-27). The port studied is interesting because of the wide diversity of fishing methods and species sought and because of the independence of fishing operations. There are no unions, and boats are owner-operated. It is also the home of a successful fishermen's cooperative, which assists the independent fishermen in marketing their catch and making supply purchases.

Between January and June of 1978, 50 women were interviewed who are married to men fishing out of Galilee, Rhode Island, on Point Judith. Their husbands were part of the total 79 fishermen used as a random sample in a study by Poggie in 1978. The purpose of this survey of fishermen's wives was to shape a general ethnography of the group and to look at relationships between fishing and the lives of these women.

The decision to address fishermen's wives stems from various interests. Presently, considerable attention is being given to the New England fishing industry. The implementation of the 200-mile limit and application of government licensing regulations and quotas are new attempts to control access to the limited resources of the Atlantic waters. Advanced fishing technologies, equipment, and training are also changing a traditional industry interlaced with sociocultural patterns. Because fishing is not an occupation which can effectively be isolated from other areas of a participant's life, any changes in a fisherman's job will have a profound effect on his daily habits and life-style. Of the total sample of fishermen interviewed, 74.7 percent were married. Fishing modifications not only personally affect the fisherman, but also his family and the community around him.

Naomi Quinn and others have urged us to re-examine the roles of women with an appreciation of their multiplicity and complexity (1977: 181-225). The roles played by the women in this study are not only complex, involving a

variety of skills and sensitivities, but they are very important. Though this group has been chosen for study because of their husbands' involvement in a particular occupation, this in no way implies that the women's status is secondary or subordinate to their husbands'. The roles of these women are not seen simply as being supportive to husbands but are viewed in a wider perspective as being a significant contribution to society. This is an etic viewpoint, however; a few women in this study do appear to see themselves in roles which are purely supportive.

Centering as it does on the fishing business, this study is in a sense one-dimensional, but the women interviewed are not. They have wide-ranging interests, involvements, and abilities which have nothing to do with fishing. Their individuality may have led to their involvement with fishermen or may have been encouraged by it, but it is a difficult population to characterize. There is no one way to be a fisherman's wife.

Wives are involved with and affected by their husbands' occupations to varying degrees. In recent years, as more women shape their identities to make them independent of their roles as wife and mother, the influence of a husband's occupation has probably lessened. However, because the husband is a significant other, whose well-being, activities, and income do concern his wife, we would expect his occupation to have some effect on the way she perceives herself and the world. The more unusual the occupation, the more pronounced the effect is likely to be. As shall be seen, fishing is greatly unlike the usual nine-to-five job.

Because a man is frequently at sea, the responsibility of maintaining a safe and comfortable home life falls largely on the woman's shoulders. Most fishermen's wives feel their home life is different. Not only must the wife maintain affective relationships within the nuclear and extended family, but

she must also make the decisions, arrange for family property maintenance, improvement, and replacement, and discipline and guide the children. She often works with her husband besides, keeping the business going in a number of different ways. The amount of energy and single-minded purpose a man can devote to fishing may depend on the degree of confidence he has in his wife's management abilities. In Fishermen of Galilee, Poggie and Gersuny state, "Many fishermen said that the success of a fisherman often depends on 'what kind of wife he has'... the wife's attitude toward her husband's work is very important for fishermen mainly because a fishing family is forced to adjust to the absence of the father/husband during many family activities"(1974:85). The woman in a fishing family maintains the continuity and sees to the day-to-day crises.

A fisherman's wife must have some understanding of the demands and unpredictability of her husband's job. One woman stated that "a nagging wife could even be dangerous" to a fisherman whose attention should be on equipment and sea conditions.

What the women like best about fishing is its favorable effect on their husbands and on their finances. They find the least desirable aspects of the job the problems it creates with their friendships, social life, and marriage. As dangerous as the occupation is, more than half the fishermen's wives say they don't worry. About three-quarters of them don't want their husbands in a different job, but only half of them want their children to become involved with fishing. The equilibrium worked out by fishermen's wives is complex and interesting.

A total of 87 items were included in the interview schedule, which was developed for this specific population. Pre-testing indicated that the response time would be one hour. However, response and related discussion

averaged 2 1/2 hours. Refusal rate was very low (4 out of 54 contacted), and most refusals were due to understandable circumstances (e.g., advanced pregnancy). Most women were very happy and even anxious to talk about themselves and their husbands' jobs. Those who knew their husbands had been interviewed were pleased to be able to add their impressions and opinions. In his study of mobile military and nonmobile couples, William L. Wilson found that "mobile women appeared quite eager and willing to discuss their lives. The interviews of these women had the quality of a release of tension... It was often difficult for the interviewer to stay on track with the interview guide with these women" (1977:72). Women married to military career men experience separation from their spouses and additional responsibility which may give them some feelings of isolation and differentness that are similar to what is experienced by the wives of fishermen. The unexpected length of time spent on each interview and the enthusiasm of fishermen's wives were similar to those Wilson encountered with mobile military wives. In some cases, women seemed to have saved up years of reactions, both positive and negative, and were relieved to have the opportunity to share them.

This report of fishermen's wives adds to the studies of women in their varied roles. It is also timely because the fishermen's important contribution to the nation's food supply is being highlighted at the same time that the nature of the occupation is changing. It is important to see this occupation from the perspective of the wife in order to get a complete picture of commercial fishing in New England.

The Job

The Work

Commercial fishing is big business. Complicated technology and terminology

are in every-day use. The industry spreads into the community, involving associated businesses and support services such as fish-processing, ice houses, welding ships, etc. An increasing number of fishermen are entering the field with some formal fisheries training. As businesslike as the industry is now, it still retains elements of folk knowledge. Fathers pass on to their sons solid information about favorite grounds and boat maintenance as well as the hunches and superstitions they have gathered over the years. Experience is the teacher that can never replace classroom learning when it comes to things like reading weather signs, getting the feel of sea bottom conditions, and judging safe risks that could make the difference between subsistence and profit.

Imagine a big game hunt in an enormous jungle. A handful of men with the best equipment they can manage approach the prey with all the experience and know-how they can muster. These men hope to earn their living by the volume and regularity of their catch. Also in the jungle are competitive teams, and the size of the catch must be balanced against the most fortuitous market arrival time. Change the image somewhat by picturing the hunting team in a floating vessel that is isolated and dwarfed by the vastness of an environment alien to man. The sea they ride on hides their quarry and can instantly threaten them with harsh winds, sudden temperature shifts, and capsizing waves. This is a modern team and they use airplanes and radar to see what they are after. They rely on the most sophisticated weather equipment to protect themselves from the hostility of the environment. They do their job as efficiently as possible, yet they are still exposed to the caprice of the ocean and the uncertainties of the hunt.

In many commercial fishing ports throughout the world, company boats identical in size, color, and equipment line up at the docks ready to work for

owners who live far from the smell of salt water. There is no such uniformity at Galilee. Though this port is known primarily for groundfish trawling and lobstering, there is still much variety in the species sought and the method used. Day fishermen are usually engaged in scalloping, clam dredging, inshore lobstering, or inshore dragging. Fishermen out for two to three days at a time do offshore dragging, offshore lobstering, and purse seining. The long-trip fishermen (six to ten days) are offshore dragging or are swordfishing in the summer. Frequently, a boat will be equipped to take advantage of seasonal changes, e.g., pair trawling in the winter and swordfishing in the summer. Vessel size ranges from small wooden lobster boats to the steel-hulled draggers of 50 to 60 feet. Shellfishermen may have a crew of one or two fishermen, while larger operations may employ three or four men as crew members.

The largest boats out of Point Judith, the trawlers, are after bottom fish, such as flounder, pollock, cod, and haddock. At the fishing grounds the net is set out from the side or the stern and held open by heavy wooden "doors." The net is then dragged along the sea floor at a speed judged appropriate to bottom conditions and species habit. As the net is dragged, the fish are forced to the funneled and "cod end" of the net. The net will be towed for two to three hours, emptied, and reset. Between hauls, fish are gutted, sorted, iced, and stored. Generally, the horsepower of the engine rather than vessel size affects the catch and earning potential of a trawler; however, many would say that it is the skill and knowledge of the fisherman that most determines it.

Even on the smallest boat, heavy equipment is in constant use. A saturated wooden lobster pot encumbered with ballast, seaweed, and snails will weigh 70 to 80 pounds even if it does not contain lobsters. The pots may be hand-hauled, or winches and pulleys may be used.

Besides being knowledgeable about engine and boat repair, weather conditions, fish habitats and behaviors, the fisherman must also be familiar with the sophisticated electronic equipment used on some of the larger boats, such as radar, echo scanners and sonar, radio, etc. Though most crew quarters are cramped, some of the long-distance boats are equipped with color TV and wall-to-wall carpeting.

While commercial fishing requires some sophisticated knowledge, the work is still rugged and backbreaking. The job is not well understood by outsiders. Some think of it simply as unskilled labor. Others cannot understand why their fisherman neighbor is so exhausted when they know he has all the latest equipment on board. One fisherman's wife showed me a drawing done by their child: "My son drew that picture of his Dad's boat in kindergarten. I asked him what this closet here was for. He said, 'That's where they keep the fishing poles.'" The boy was too young to have observed his father's work firsthand and had no basis for visualizing "fishing" other than with a pole. Unfortunately, most adults outside the industry are just as confused about what a commercial fisherman does for a living. Many disparaging comments about the high earnings of fishermen or the high cost of fish are due to a lack of understanding about the job itself.

(For graphic descriptions of commercial fishing past and present, consult Jeremy Turnstall and Kim Bartlett for their work on British seamen and Gloucester, Massachusetts, fishermen. There is also John Sainsbury's Commercial Fishing Methods, which offers clear descriptions and photographs.)

The Schedule

"I wouldn't want to be married to a nine-to-fiver. There's a lot of spontaneity in our lives because of the changeable schedule. When the weather turns bad, it's a surprise holiday for all of us. But, at the

same time, the worst thing about fishing is that you can't plan anything. You get a wedding invitation months in advance and still you can't let people know if you'll be there till the last minute. I could never ask my husband to skip a trip for a wedding, especially during the busy time of the year. I used to work before we were married, and when the children are both in school I'd like to work part-time again. But when my husband's home I want to be home. Our family's schedule is just too crazy."

"Last winter he was gone so much that when he came home he was like company. It felt like an outsider had come and taken over.

"The main difference between fishermen and nine-to-fivers is that fishermen don't have regular free time that they can count on. I wound up going to more than my share of Little League games when the boys were little. And to weddings and funerals alone. It's awkward. I was only 18 when we got married and it was very, very hard for me to accept his schedule. I'd get a new dress for some special occasion and get all excited about it, then at the last minute he'd have to go out on a trip and I'd be stuck at home alone. There've been a lot of disappointments. Some wives are real steppers and go out without their husbands. But I could never be comfortable doing that unless it was all family or something. I'd say it took me about five years to finally accept the fact that I couldn't make plans."

"Fishing is an abnormal life. He's gone from home for so long, and then you have to cram in a lot of living when he is home."

The most glaring difference between fishing and other occupations is the irregularity of schedule. It is not simply as irregular as New England weather; it also depends on fishing quotas, the condition of the equipment, market prices, and the whim of the captain. "Normal" households move from breakfast to dinner, from weekend to weekend, with regular stops at holidays. None of these benchmarks work for the fishing family. All that can be predicted about their entire year is that the fishermen will be out more in the good weather than in the bad.

Trip Length

In this study, three distinctions were made concerning the length of the fishing trip. Trip length sets the pattern of activity for both the fisherman

and his family and can have a great effect on job satisfaction and family adjustment.

Day Trips. Of the wives interviewed, 48% have husbands who fish days. Depending of the type of fishing, the season, and who they're fishing with, the workday will span hours such as 6 a.m. to 3 p.m., 5 a.m. to 5 p.m., 3:30 a.m. to 7 or 8 p.m., 2 a.m. to 4 or 6 p.m. In the summer, fishing may take up all available daylight hours and include predawn preparation and after-dark cleanup. Inshore shellfishermen tend to have the most nearly "normal" schedules, with more flexibility, because they have smaller operations which involve less travel time to the fishing grounds. Some women who like day fishing want their husbands home every night, no matter how late. One woman states that "as long as he's home at night to sleep, I feel safe." She is probably commenting on her sense of his safety as well as her own. Others say they hate day fishing. It means that their husbands leave before dawn and return exhausted sometimes as much as 15 hours later.

Short Trips. Of the sample, 38% of the women are married to short-trip fishermen. The fishermen will usually leave well before dawn, fish two days, and return late on the evening of the third day. Usually they stay home one or two days between trips. The short trip seems the happy medium for many. The time at sea is balanced with enough time at home for husbands to both rest and be with the family.

Long Trips. Of the women interviewed, 14% are married to long-trip fishermen. The long trip will go from six to eleven days out, with about three days spent at home between trips. This is the most extreme pattern of the three, with the longest periods at sea and the most time spent at home. Yet some wives are comfortable with this and find it the most relaxing of the three.

Table 1
Attitude by Trip Length

Would you prefer your husband to be in a different occupation?

	<u>Day</u>	<u>Short</u>	<u>Long</u>
positive	19	15	2
mixed feelings	2	-	2
negative	3	4	3

χ^2 : p .05

The wife's attitude toward fishing appears to depend on the trip length, with the shorter trip being preferred. But trip length alone cannot be used to determine the time a man has available to spend with wife and family. In some cases, crewmen are expected to spend many of their in-port hours working on the boat. At-home time must be used first for rest, to allow recovery from very strenuous work, before it can be counted as leisure or family time.

There was no "ideal" pattern of fishing trips for the 50 women in this study. The only ideal that held was that the fisherman not change his pattern radically or frequently.

Living with Unpredictability

The majority of fishermen's wives in this study felt that their family's home life is different from the home life of nonfishing families, as shown in Table 2.

The differences they perceive have to do primarily with the lack of routine and the relative closeness or separateness of fishermen and their families. The question of schedule came up frequently during the interview. Description of schedule disruption and inability to plan went from the specific to the general:

"I never know how much to cook or when to serve dinner."

"My husband often couldn't attend scheduled Lamaze classes with me."

"My husband misses the children's school events and dance recitals."

"The children's dinnertime and bedtime is always changing."

"Sometimes our 'weekends' are in the middle of the week, depending on the weather."

Respondents often expressed both annoyance with the lack of regularity and enjoyment of the spontaneity in the same sentence. Though they had to struggle with confusion in any long-term planning, they also enjoyed the surprise of a canceled fishing trip and the consequent impromptu holiday: "It keeps things interesting. I like living day by day rather than in the future." For some, the liabilities and the benefits of the unpredictable schedule seem balanced.

Table 2
The Effect of Fishing on Family's Home Life

Is home life different for families in which the husband/father is a fisherman than for families with a land-bound husband/father? (First two responses recorded.)

<u>Response</u>	<u>Frequency</u>
no difference	3
don't know, most friends and relatives fish	1
yes:	
there is no routine or schedule	13
you never can plan social or family events	8
wife has more responsibility for children and home	8
family doesn't see much of father, do much together	6
husband doesn't have much free time, more work hours	4
husband sees more of family	4
husband is closer to family	2
husband/father is appreciated more	1
husband is thought of often during the day	1
fishermen are hardier and braver	1
fishermen are closer to nature	1
husband not available to help with problems	1
husband is away more	1
kids don't have day-to-day contact with father	1
children are more independent	1
fishermen's wives don't get involved outside the home	1
thoughts are always on the weather	1
social life is different, often alone	1

A consistent complaint about the husband's absence has to do with problems and emergency situations. It seems that pipes break and flood the house, children fall and break limbs, the whole family simultaneously suffers from the flu only when husbands are out fishing. The women report that crises rarely occur when their husbands are home. Fishermen can be reached by the Coast Guard or by radio contact in case of emergency, but this is often a process too slow to help the situation. Husbands are needed in a crisis primarily to share the burden and responsibility with their wives, not necessarily because they can alter the outcome. Because of this, women are reluctant to alarm their husbands by trying to reach them while fishing. Consequently, fishermen's wives have to react to whatever emergencies occur as best they can. The women generally feel the irony of this rather than feel any resentment. Being alone in frightening situations seems a quirk of fate rather than their husband's fault. Interestingly, one woman reported that her husband was totally competent in handling anything that happened on the boat, but the one time he was faced with a domestic emergency, he froze. She had to take over and did so with no problem because she was more used to that kind of emergency.

The Daily Routine

What kind of day does a woman have when her husband is at home compared to her routine when he is at sea? Tables 3 and 4 report the first three responses per individual to questions concerning differences in daily activities between husband's time at home and husband's time at sea.

The ideal way to evaluate differences in daily schedule would be to have respondents keep a detailed diary of activities for days when husband is at home and days when he is out fishing. The validity of this information depends upon the women's ability to distinguish the different routines. Even though this is not totally reliable, there seems to be some agreement.

Table 3
Daily Life When Husband is at Home

What kinds of things do you do when your husband is at home that you wouldn't do when he's out fishing?

<u>Activities</u>	<u>Frequency</u>
go out together	36
increase in housework, faster home pace	14
socialize with others	13
normal routine is disrupted	9
work together	9
husband, wife, and family are together	8
relax, enjoy ourselves	8
stay home together	5
camping, sports	5
nothing is different	2

Table 4
Daily Life When Husband is Out Fishing

What kinds of things do you do when your husband is out fishing that you wouldn't do if he were home?

<u>Activities</u>	<u>Frequency</u>
housekeeping, errands, yard work	27
hobbies	18
social activities	17
shopping, movie, recreation	12
there is more order in the home	6
there is nothing different	4
sports, outdoor activities	3
child-related activities	2
salaried work	1
stays home more	1
day is more spontaneous	1
peaceful time to self	1
day is very quiet and long	1

The days when the husband is at home are apparently treated as weekends, regardless of where they appear during the week. These days are unusual, different from the normal routine, and are reserved for activities in which husband and wife and family are together. Specific joint activities mentioned were:

eating breakfast and dinner out, going to the beach or to the Point, going to movies, taking short trips, working around the yard and house, playing cards, watching TV, fishing, canoeing, snowshoeing, bowling, camping, going to jai alai games, entertaining friends, visiting friends.

Some responses indicate that the husband's time at home is a break in normal routine that is not totally welcome. Fourteen women reported that the husband's presence in the house means more housework, more shopping, more cooking, generally a more hectic pace. Nine commented that when their husbands are not fishing, they get nothing done in the home, the children stay up later, they spend time catering to their husbands and pampering them. In Table 4 we see that six respondents feel there is more order in the home when the husband is at sea:

"There is a schedule which holds."

"The pace is more relaxed."

"The house is neater."

Normal, ordered activity is thought to occur when husbands were operating in their sphere, and the wives and children in theirs. The same mental separation of normal routine and abnormal routine would probably be reported in non-fishing families when wives speak of weekends or holidays. The difference here is that fishermen's wives do not have the security of knowing just when the disruptions in their "normal" routine will occur. They have to be ready to enjoy or tolerate the difference whenever weather, quotas, or other unpredictable factors keep their husbands home.

Table 4 shows that husbands' extended time at home may upset wives in another way. Besides catching up on housework and maintaining an ordered home, many women seem to use their husbands' time away as time for themselves as individuals. They do things then which would normally be put aside in

favor of spending time with their husbands. They visit friends, have lunch and window-shop, read, paint, play the piano, take voice lessons. play tennis, sew, work at different crafts and hobbies, or just enjoy a "peaceful time." Realizing that fishermen's wives often carry an unusual burden of family responsibility for unusual lengths of time, this allowance of personal enjoyment becomes very important in keeping a healthy balance. Events which threaten to keep husbands home for unusual periods of time not only disrupt "normal" routines; they also threaten to curtail the wives' much needed personal time. Most fishermen's wives have adjusted with some difficulty to coping with many hours alone. Many have turned this adjustment to their advantage and enjoy and need to have a certain amount of time to themselves. Disruption of this pattern would necessitate further adjustments on the part of both husband and wife.

The women were asked what work schedule for their husbands would be ideal from their own point of view. Almost invariably they chose the current schedule. However unusual the work schedule might be, the fisherman's wife finds some consistency in the fluctuating pattern. She can tolerate or even enjoy the day-to-day unpredictability as long as it fits the general flow she has grown accustomed to. Let a day-tripper switch to long trips, or vice versa, and you will find a very unsettled wife. Seasonal shifts are also part of the pattern. "Summer widows" know their husbands will be at home much more in the winter and they adjust their time and their expectations accordingly. The fisherman's wife learns to react to schedule irregularities with great flexibility, but a pronounced variation could cause great discomfort.

Likes and Dislikes

"I don't really have any feeling about it, positive or negative. My husband fishes. It's what I'm used to. I can't imagine anything else."

"I hate it, can't get used to it. I'm sorry, but I guess I don't make a very good fisherman's wife."

"I like everything about it, from the free fish to the free time in winter."

The 50 women have an average of 14 years of experience living with men who fish for a living. Even a brief introduction to such an unusual occupation would shape strong opinions about its good and bad points. The women were asked "What is liked about fishing?" Their first three responses are coded in Table 5.

Table 5
Positive Attitudes Toward Fishing

<u>What is liked about fishing?</u>	<u>Frequency</u>
Its positive effect on:	
husband	33
finances	31
myself	9
husband/wife relationship	4
the family	2
generally positive	6
neutral	1

The greatest number of responses had to do with husbands:

"It's healthy, outdoors work."

"He's his own boss."

"He's happy."

"It's good for him."

This makes sense on several different levels. It is easier to live with a man who is happy with his work. If a man spends his working hours in misery or under tension, some of that is bound to go home with him. Similarly, if the job is satisfying and rewarding, the worker should bring home a sense of well-being and equanimity. It is personally pleasing for a woman to see the husband she cares about happy and healthy in his work. We will see that

fishermen's wives have an unusual amount of involvement in their husbands' work. Some of the husband's job satisfaction may be experienced as the wife's own job satisfaction because of her active participation and interest, particularly if the wife is not herself employed outside the home. One woman said that her husband seemed to enjoy his work so much more than she enjoyed hers that she became motivated to look for changes in her own work routine.

Secondly, fishermen's wives like the money:

"We have all the comforts."

"It's a good salary."

"You can work for extra money and earn a lot in a short time."

"We are financially secure."

Despite seasonal slowdowns, fishermen generally earn an excellent salary, enabling the family to enjoy a high material style of living. Table 6 gives a sample of an inventory of material possessions for 1972 and 1978. The increase in luxury items in 1978 may reflect the fishermen's increase in salary since 1972.

Table 6
Material Life-Style

<u>Own</u>	<u>1972 (n=26)</u>	<u>1978 (n=50)</u>
home	46.2%	76%
color TV	65.4	90
dishwasher	30.8	56
air-conditioner	19.2	32

The women seem convinced that their husbands could not do as well financially in any other occupation. They are probably right. Most of their husbands are self-taught, or they learned by working for more experienced fishermen. Their knowledgeability and their willingness to work hard and take occasional risks results in immediate monetary reward at the end of

each trip. So many other occupations require special training or expensive educational preparation and then a slow rise from an entry-level position. Increases may come regularly but slowly, and may not correspond at all to the effort expended. It is difficult for the wife of a successful fisherman to envision her husband rerouting his energy into this kind of job.

Nine women focused on the personal benefits they felt fishing allowed them. For example:

"I like the personal independence, the time to enjoy myself."

"I like living near the shore."

"I enjoy the irregularity, the spontaneity of the unpredictable schedule."

Four felt fishing was beneficial to the relationship with their husbands:

"The wife is more involved in her husband's occupation."

"Husbands and wives appreciate each other more and don't take each other for granted."

"Couples get along better. There's no time to argue, you have to fit a week's worth of living into two days."

"Petty irritations don't have time to grow into full-scale arguments."

Wilson found that mobile military wives had similar reactions:

Short separations of a week or two were seen as giving the couple a little breathing room and letting them get some distance from each other. (1977:73)

Two women commented that fishing was good for their families:

"The fishing schedule can be worked around the family schedule."

"The family can get involved in fishing."

Table 7 is the counterpart of Table 5, and gives the first three responses from the women when they were asked what they disliked about fishing. It is interesting to see how the positive reactions compare with the negative ones.

Table 7
Negative Attitudes Toward Fishing

<u>What is disliked about fishing?</u>	<u>Frequency</u>
nothing, generally positive	4
the danger	7
industry-connected (government, prices, weather)	11
Its negative effect on:	
husbands	6
finances	10
myself	9
husband/wife relationship	15
the family	7
friendships and social life	19

While 33 women liked the effect fishing has on their husbands, six disliked it. They felt their husbands worked too hard, worked more than their share, or were unable to forget their responsibilities and relax. Thirty-one women appreciated the financial benefits of fishing, but ten disliked the irregularity of income or the insecurity brought about because of the lack of benefits. Health insurance and retirement plans do not automatically come with the job. It is up to the fisherman or his wife to make arrangements for such insurance. Such individual plans are costly and require monthly payments even though the fisherman's income has no monthly uniformity. Keeping up with income tax requirements is an additional burden.

Nine women disliked fishing for personal reasons. This is equal to the number who liked fishing for personal reasons. Negative comments include the following:

"The irregular schedule has me always up in the air."

"I hate being alone. I hate waiting."

"The boat always comes first."

"There is too much responsibility."

As opposed to the four women who felt fishing is a positive influence on the husband/wife relationship, 15 women thought it detrimental and made comments such as:

"We have no time together."

"I hate the long hours."

"We are 'summer widows'."

"He is gone too much. Our time together is too crowded with catching up; it is unnatural."

"Fishing is unhealthy for marriage."

Seven women disliked the effect fishing has on their family. Some of the comments included:

"We can't plan family activities."

"My husband misses all the family crises."

"The kids are attached to the mother rather than to both parents."

"My husband does not have enough time with the children."

Industry-related complaints and the issues of personal, marital, and family adjustment in relation to fishing will be studied in more detail in the next section.

Only seven women claimed dislike of the danger involved in fishing. This is interesting in view of the fact that danger is one of the factors that distinguish this occupation from others. A full discussion of this factor follows.

As with most questions asked in this study, the one concerning likes and dislikes elicited a wide spectrum of responses, some diametrically opposed. Undoubtedly, if asked the same questions today, these women might give a different variety of gripes and approvals. However, there is enough evidence to generalize on several points. Fishermen's wives are happy to have their

husbands doing work they enjoy. They like the monetary rewards of fishing, but believe that fishing is hard on a marriage and hard on their social life.

The Danger

"I don't worry about him. I never have. I know it's dangerous. I saw a movie once filmed from my husband's boat, about 240 miles out, in March. It was unbelievably rough. I know about some near-tragedies. You have to watch out for whales, submarines, freighters. But, all in all, more can happen to you onshore than out here."

"I used to worry about him when I was younger, but I know this captain doesn't take chances. I don't hear till later, through the grapevine, that there were 12-foot seas. He doesn't want to worry me. My neighbors seem to worry more about the weather than I do."

"I can't sit home for days and worry about the boat sinking. I ignore it."

"See that boat over there?" (She points to a watercolor hanging on the living room wall.) "My husband and three crewmen were off New Bedford in heavy fog when it was cut in half by a freighter. Two of the men went off the front and two off the back. Luckily, somebody from the freighter saw what happened and they only spent a couple of hours in the water before they were picked up. The Coast Guard called me to come and pick him up. The next day he spent looking for another boat. But he liked that one best. No, I don't worry."

"One of our friends was on that boat that went down. He spent three hours in the water and it's still pretty cold this time of year. We were talking with him and he was pretty shook up about it. Said he wouldn't go out again without a survival suit. It makes you think."

"Sure, it's dangerous. Especially at night or in bad weather. Someone could fall overboard and you wouldn't even know. But I know when to expect him home within a couple of hours, and I don't even begin to worry unless he's late. After all, when your time is up, it's up, whenever."

Does commercial fishing justify worry? The media in the New England coastal area report almost weekly on fishing injuries and fatalities, on boats lost in storms or disabled in collisions. Fog, wind, and cold plague offshore New England waters. Heavy equipment carried on board can malfunction or fail in severe weather, posing additional hazards. Fishermen trying to take advantage of a good run of fish or of a high market price may risk staying at

sea too long, to the point of exhaustion, increasing possibilities of accident. Poggie and Gersuny compared fishing fatalities to those of the most dangerous land occupation, coal mining. They found that fisheries recorded 21.4 deaths per million man days and coal mining 8.3 (1974:90). There is no doubt of the danger.

There are some measures that can be taken to reduce risk. A fisherman can make sure he works on a well-equipped, well-maintained boat for a responsible captain. Money can be invested in the finest safety equipment. Still, there is little that can be done about a freak storm or a freighter bearing down upon you in the fog. A man who fishes for a living has come to terms with potential danger. He knows the work is largely routine for an experienced and careful worker. He is confident in his ability to handle emergencies. He deals with danger as it occurs. What about his wife, who will not know until some time after the fact just how routine his trip has been? Table 8 gives the first two responses to the question "How do you feel about fishing as a dangerous occupation?" Thirty-three responses involve varying degrees of worry and 23 responses concern worry on certain occasions. Twenty-seven responses claim no worry, ten of these denying the dangerous aspects of the occupation. There was no significant relationship between the length of the fishing trip and the reaction to danger.

How is it possible for so many women to ignore the possibilities of danger? Leon Festinger's theory of cognitive dissonance (1957) gives us some insight into the problem. When environmental reality is inconsistent with psychological comfort, there is a drive to reduce the dissonance and to achieve consonance. If the threat to equilibrium cannot be changed, reality can be reinterpreted, ignored, or counteracted with social support. Since there is little a woman can do to change the dangerous nature of fishing, she

may choose to ignore that aspect, focusing instead on the fact that accidents are possible in any occupation. In the newspapers she will notice the number of accidents people encounter simply by driving on the interstate to work. Information concerning incidents at sea will not be dwelt upon. If confronted with such incidents, she may claim the captain was not trustworthy, the boat in poor condition, or cite other explanations which would rule out discussion of general danger and interpret the event as having been caused by obvious mistakes.

Table 8
Reaction to the Danger of Fishing

<u>How do you feel about fishing as a dangerous occupation?</u>	<u>Frequency</u>
worried more when first married/when he first started fishing	10
worries if it is late, if there are any storms	10
it is dangerous, but doesn't worry	9
is dangerous, refers to accidents, incidents, possibilities	8
it is not any more dangerous than other jobs	8
never worries or thinks about it	6
worries, but trusts her husband or the captain	5
it is dangerous, worries	5
it is very dangerous, is very scared, worried	5
worries more now than when younger	4
worries on long trips	3
it is dangerous, but anything can be dangerous	2
it is very dangerous, but doesn't worry	1
worries about accidents	1
has no fear, accepts it	1

If the danger is acknowledged and causes no worry, it may be that the woman is the type that deals with life on a factual, day-to-day basis and is simply not the worrying kind. Or she may have grown up with a fisherman in the home and be thoroughly accustomed to the occupation and familiar with its hazards. A woman whose husband has been fishing for ten years has seen him return safely from hundreds of fishing trips. She keeps this uppermost in her mind, disregarding the storms or near-misses that may actually have threatened

him. Certainly, fishermen themselves do not talk as though the next trip might be their last. Women who are married to fishermen must operate under the same assumptions.

Still, there are many women who admitted that they do worry. They commented that they are very relieved when their husbands return after particularly long trips or stormy weather.

The women were asked how they cope with the danger of fishing. Table 9 outlines their coping strategies, giving the first three responses, many of which correspond to Festinger's theory.

Table 9
Coping With the Danger of Fishing

<u>How do you cope with the worry?</u>	<u>Frequency</u>
trust the captain or husband's judgement	14
call other crew wives, captain's wife	8
keep busy	7
radio contact	6
try never to think about it	6
never think about it	5
get used to it, accept it	4
watch the harbor, watch at the dock	3
wait	3
spend money on safety equipment	2
listen to weather reports	2
faith in God	1
call Coast Guard	1

Keeping busy, trying or succeeding in never thinking about it, getting used to it and accepting it are ways of ignoring the threat of danger. Spending money on safety equipment is an active attempt to reduce the danger. Making radio contact, listening to the weather reports, calling the Coast Guard, the captain's wife or other crew wives are activities that keep the women informed and reassured that all is normal. Having faith in God or in the competency of her husband or the captain allows a woman to relieve herself

of some of the worry. Occasionally the worry may be so pervasive that watching and waiting are the only possible activities.

From the women's comments, it would appear that many believe it is childish and self-indulgent to spend too much time worrying. Particularly when there are children in the home, it is felt, a woman must keep busy and continue normal activities even though she may be especially worried about her husband's safety. Excessive worry is probably something that a fisherman's wife grows out of as she gradually learns to cope with the idiosyncracies of the occupation. Coping gradually becomes adaptive behavior. Ten women stated they worried more when they were first married or when their husbands first began to fish.

Interestingly, four women stated they worry more now than when they were younger. Having children in the home is a distraction from worry and keeps women occupied and intent on creating and maintaining a normal atmosphere. When children are grown and gone, there is not only more time to think about the dangers, but there may also be more to worry about. In their later years, fishermen have valuable experience to rely on, but they no longer have the stamina or quick reaction time they had in their youth. Women may see their husbands coming home more and more exhausted as the years go by and worry more about their safety.

For the most part, fishermen's wives seem to take the dangerous aspect of fishing in stride. At least most of the worry is kept below the surface so that day-to-day living can proceed unaffected.

Captains and Crewmen

"There is a difference between owners and crewmen. It kind of bothers me because I'm not a snobby person, but I don't feel comfortable with crewmen's wives. I don't feel any better than them, just not comfortable.

Most of our friends are owners. Maybe it's because we have more in common, sharing the same responsibilities and point of view."

"Some captains don't mingle. They're kind of aloof. But most of them are regular people. And their wives are always friendly."

"Some of them really like being the captain. They keep it a secret when the boat's going out next. When we were dating, my husband told me to be careful about talking with the captain. I wasn't supposed to kid around with him as much as with the others in the group."

One obvious distinction among fishermen is their status on board. In this port, virtually all boats are captained by their owners. Socially, the separation is detectable though not rigid. People generally are more comfortable spending time with those most like themselves.

Several things keep the crew/captain boundary flexible. Fishermen are more apt to separate themselves by the kind of fishing they do rather than by status on board. Thus, the captain from one lobster boat may have more in common with a crewman from another lobster boat than with the captain of a trawler. If a captain has the same crew over a period of years, it is likely they will become friendly. One captain's wife mentioned annual Christmas get-togethers with the crew and their families. This particular port has so much family involvement the crewmen and captains may be distant or close relatives. Also, a crewman aspiring to boat ownership may form a friendship with the captain from whom he is learning the business. Status distinctions are relaxed because they will soon be working on the same level.

Mobility

Captains earn more money and risk more. Crewmen have less personal control over their schedules. Twenty-three of the women in this sample are married to captains. Table 10 gives the responses of the remaining 27 when asked if they would like their husbands to become captains.

Table 10
Desirability of Upward Mobility

Do you want your husband to become a captain/owner?

<u>Response</u>	<u>Frequency</u>
no	37.1%
mixed feelings	18.5%
yes, but too old	11.1%
yes	33.3%

N = 27

With captain status comes added financial rewards, plus the possibility of more independence and flexibility. One woman had a very strong opinion of its benefits:

"Fishermen are of a very low caliber. They have no family and they have a fast life-style and think only of themselves. If you hang around people like that, strange values begin to rub off on you. The only way to survive is to become an owner and make enough money to move away from other fishermen."

But many women see ownership as less desirable:

"I'm flattered that he doesn't want his own boat. Owners are married to their boats, and their wives and families take a back seat."

"Boat owning is a tremendous responsibility. The paperwork and expense is unbelievable."

Some of the women who were not interested in captain status may have had some doubts about the future of fishing. Owning a boat is a great financial burden. A few bad seasons at the beginning of operation can make it impossible to keep up the stiff payments on a boat and they could lose it. There are also the government quota regulations, which limit the possibilities for profit. Much must be considered before a woman will opt for a change.

Status

The status of fishermen has improved in recent years. Previously, fishermen were stereotyped as men unable to hold down normal jobs and hard drinkers who made poor family men. One woman commented that "fishermen were

regarded as social lepers, but now it's the thing to be." There is now more recognition of the skill involved in fishing as well as of the economic importance of the industry and of the resource itself. Presently, fishing income is often higher than local land-based jobs. The approximate median family income in the port area in 1970 was \$10,004 (Poggie and Gersuny 1974:26). In 1978, crew members on one boat were averaging \$50,000. This was unusually high, but not unrealistic for a top crew and vessel in a good year. Even though fishermen's reputation and economic status had improved, seven women in this study married fishermen without their family's approval. No doubt parents worry about their daughters spending too much time alone, about the dangerous situations their sons-in-law may be stuck in, about the irregularity of the income.

The recent government involvement with the fishing industry has had an interesting side effect. Fishermen are in the news. They are beginning to organize their reactions to new restrictions. Because the government is regulating them, they have lost something of their outlaw image and gained a kind of respectability. The job has become somewhat more conventional in its public image. It is now possible for fishermen's wives to commiserate with wives married to government-regulated businessmen.

A Way of Life

His work changes with the seasons in a way that keeps him free from the dullness that comes to people who have always the same occupation. The danger of his life on the sea gives him the alertness of a primitive hunter and the long nights he spends in his curagh bring him some of the emotions that are thought peculiar to men who have lived with the arts. (J. M. Synge on the fishermen of the Aran Isles, in J. M. Synge and His World, by Robert Skelton, p. 54)

Individually, fishermen are as varied as the men in any occupation, but hardships...exposure to danger and the most unremitting labor have bred a sturdy, persevering race, full of resource, essentially

non-conformist, recognizable anti-authoritarian, blunt, uncompromising and genuinely sincere.

Yes, to be afraid of the sea's the wrong thing altogether but you've got to respect it. You're only a puny thing, only a small thing there you know. It's much bigger'n you are...I think a lot of people go through life and they don't have anything to bring them down to size, do they? It's the job that counts. If you're a coal miner, I think that brings you down to size in the same way. (S. Festing on North Sea herring fishermen, in Fishermen, pp. 12, 95-96)

"My husband is proud to be independent and self-employed and making good money to boot. And I'm proud of him."

"I think fishermen are friendlier and nicer than most people. They stick together and help each other. A couple of years ago a fisherman lost an eye in a fight. All the other fishermen chipped in to help him. Maybe they're nicer because they're happier with their jobs. They stay healthy and like what they're doing. I'd be pleased and proud to have my sons grow up to be fishermen."

"Both my family and his have been fishing for years. If his boat goes down or if he's lost at sea, he's told me not to grieve for him because he's doing the work he loves."

Poggie and Gersuny examined the ideational characteristics of fishermen and found that fishermen had a "personal commitment to the occupation " (1974:61). This statement was frequently echoed by fishermen's wives.

When a woman says "fishing is a way of life," she is expressing the sense of pride and the romance of the occupation she shares with her husband. She is also saying it is different. It may sometimes be different in alarming and distracting ways, but it is also somewhat exclusive. Not everyone can fish for a living; the way of life is different enough to make it a bit mysterious to land-bound workers.

When husbands in Poggie's 1978 interviews were asked, "Would your wife rather see you in another occupation?", 72% responded no, 8% in part, and 20% yes. For the majority of the wives who have apparently accepted fishing, comments indicate that their acceptance has a lot to do with adapting and being used to the occupation:

"It seems natural to be married to a fisherman."

"I can't imagine any other way of being married."

In response to the true/false item "I can't imagine being married to a banker," 84% agreed. Many women laughed at this idea, and, when questioned, said:

"I'm not that type."

"Bankers are stuffy and inflexible and more educated."

"I'm more outgoing."

"I prefer a more casual life-style."

Being married to a fisherman seems to add up to a life-style that is casual and flexible and just the opposite of what women imagine it would be like if they were married to a banker.

The decor in a fishing family's home often includes items with a fishing or sea motif, including framed oils and photos of previously owned boats, seascapes, ship's clocks, statues of fishermen, anchors, ship models, etc. Though home decor was not a formal part of this survey, this fishing motif was noticed in nine of the homes visited and would probably have been found in more if looked for specifically.

Fishing cannot be compartmentalized. During fishing season, there is a peculiar quality to the time a fisherman spends in the home. He stays near the telephone, listens to the weather constantly, compares notes with other fishermen. He is on call and waiting. It is difficult for his family to forget that another trip is imminent. There is seldom enough leeway for overnight jaunts, and even dinner dates are cut short in case the next day is a work day.

It is a wrap-around occupation, affecting and shaping a way of life.

The People

The Women

The ethnicity of this group appears to be "Yankee," corresponding to the 1974 ethnic description of fishermen in this area (Poggie and Gersuny 1974: 52-54). None of the women are foreign-born, and their homes lack the European influence that might be found in other New England ports (i.e., Gloucester and New Bedford). Sixty-six percent of these women were born in Rhode Island, and 16% originate from the county in which they now live. The interviews were conducted in their homes, which were located within approximately a 25-mile radius of the fishing port. The area of their residence falls within one county and seven townships. Sixty percent of the respondents live within five miles of the port. This is an area dominated by its proximity to the water. There are summer cottages, seafood restaurants, state and private beaches. Some of the women live within walking distance to where their husband's boats are docked. From her kitchen window, one can look out on the channel to the harbor and actually watch her husband come home.

Two respondents who live on the fringes of the residence area reported that they purposely avoided a location more convenient to the port. These women saw closer residence as undesirable or even dangerous to their marriage. One woman whose husband worked day trips disapproved of the way of life of trip fishermen and their families from the port area, saying that wives there were too independent and families and couples were not close enough. Another stated that the physical distance from the port area helped the family maintain a more normal, "civilian" life because her husband and she were able to avoid socializing with other fishermen, socializing instead with neighbors having more "normal" occupations.

Table 11
Age

<u>Age</u>	<u>Frequency</u>
19-20	3
21-25	6
26-30	11
31-34	9
36-39	6
41-47	5
50-54	5
57-58	4

n=49
mean=35.1

Table 12
Education

<u>Years Completed</u>	<u>Frequency</u>
9	3
10	2
11	2
12	31
13	2
14	3
15	1
16	4
18	1
19	1

n=50
mean=12.5

Table 13
Years Married

<u>Number of Years</u>	<u>Frequency</u>
1-5	12
6-10	9
11-15	12
18-20	6
21-29	4
31-38	7

n=50
mean=14.2

Table 14
Number of Children

<u>Number</u>	<u>Frequency</u>
0	8
1	6
2	20
3	10
4	2
5	3
7	1

n=50
mean=2.1

Table 15
Present Employment

<u>Job Type</u>	<u>Frequency</u>
store salesperson	3
secretarial	2
factory	2
beautician	2
student	2
fishing crew*	2
fishing for eel	2
cooking shellfish	1
waitress	1
babysitting	1
nurse's aide	1
X-ray technician	1
bus driver	1
ceramic teacher	1

*Crew work was seasonal or occasional, not year round.

Table 16
Previous Employment

<u>Job Type</u>	<u>Frequency</u>
secretarial	13
store sales	10
waitress/hostess	6
bank teller	3
teacher	3
nurse	2
millweaver	2
teacher's aide	1
nurse's aide	1
dental assistant	1
bookkeeper	1
cook	1
cook shellfish	1
shellfish co. clerk	1
phone operator	1
counselor	1
department store buyer	1
factory worker	1
babysitter	1
fishpacker	1

The mean age is 35.1, and the average years married is 14.2. Their husbands have been fishing from 2 to 41 years. The women in this study have an average of 12.5 years of formal education. Median school years completed is 12.2 for women over 25 in this country. Many of the women have had professional training and two are presently college students, one working for a B.S. and the other for a Ph.D. degree. Thirty-five of the women have children under the age of 18 and eight have no children. Some interview questions asked of the women without children were phrased, "If you had children..." Because of the wide range of variation in the population, Tables 11 through 14 should be consulted for a clear picture of this demographic information.

Forty percent of the women are presently paid employees, both part-time and full-time. (Of the total women in the Rhode Island labor force, 43.9% are married.) They have a variety of occupations, as listed in Table 15.

To increase background knowledge, the women were asked about the kinds of jobs they had previously held. Their responses indicate a considerable experience at varying levels of professionalism and skill. It is interesting to note that eight women are or have been involved in fishing-related occupations (Table 16).

Personality

What kind of person marries a fisherman? Is the kind of person a woman who might be related to fishing? In an effort to find out something about the personalities of fishermen's wives, a projective section was added to the interview schedule. Twenty-seven true/false items were either created specifically to fit the population or excerpted from various projective tests and modified for this instrument. As an example of item design, the statement "I would prefer to try a new restaurant in Providence rather than

eat at a local restaurant" reflects the interviewer's prior knowledge of the community and insight gained from pre-study interviews. Most of the respondents are comfortable with a casual lifestyle. One woman commented that she and her husband would not eat at a place that required dressing up. Even though Providence is only a 40-minute drive from most fishermen's homes, long-time residents of this southern county are not characterized by close cultural or social ties to the city of Providence. It was assumed, therefore, that a "true" response would indicate a modern, or adventurous, perspective.

The projective section of the interview was based on personality analyses and theoretical work on modernity, independence, and fatalism by Richard Coan, Joseph Kahl, and Everett Rogers. Kahl analyzed the modern personality using scales of individualism and activism. In his analysis, the modern person is an individualist and an activist who can plan for the future with confidence in his or her ability to bring plans to fruition (1968:133). Rogers describes a modern social system as one that values education, allows system members to see themselves in different roles, and has a positive attitude toward change (1971:32-33).

The results of the projective item responses were subjected to factor analyses. This is a method to determine statistically the independent clusters of related variables into which responses fall. Thus, sets of questions which were planned to address a specific trait may statistically be grouped otherwise. The procedure used principal components analysis with varimax rotation. The number of factors rotated was determined using an eigenvalue cutoff of 1.0. This analysis resulted in four independent clusters or factors, in contrast to expectations of three based on the dimensions of modernity, independence, and fatalism discussed above. The first four factors appear to measure styles and degrees of personal autonomy, and

Table 17
Factor Analysis of Personality Items

	Factors			
	I	II	III	IV
1. If given \$6,000, I would rather learn to fly a plane than buy a car.	.62	.17	.05	.17
2. Most of us are victims of forces we cannot understand, let alone control.	-.60	.10	-.07	-.11
3. In order to be happy, one must behave in ways that other people desire, even if you have to suppress your own ideas sometimes.	-.58	.02	-.24	-.13
4. I'd rather find out about a dangerous situation than not think about it.	.56	-.01	.11	-.06
5. I do not need to buckle my seat belt, because "when your time is up, it's up."	-.52	.24	.14	.04
6. I cannot imagine being married to a banker.	-.49	-.05	.06	-.12
7. Some people are born losers.	-.48	-.28	-.36	-.05
8. If income were temporarily restricted, I'd rather get a temporary job than manage the house with limited funds.	.35	.39	-.07	.12
9. Making a lot of money is a matter of getting the right breaks.	-.29	.16	-.04	.20
10. It is acceptable for unmarried young couples not planning to have children to live together.	-.19	.75	.33	.06
11. Being politically and socially active can change the world we live in.	.04	.73	.02	-.25
12. I would like all my children to go to college if possible.	-.09	.56	-.25	-.33
13. Women have as much right as men to sow wild oats.	-.01	.55	-.11	.44
14. If I spend enough time working on it, I could be a musician or auto mechanic.	-.13	.14	.69	-.39
15. Fishing boats will never be built to accommodate women.	-.03	.16	-.68	.10
16. Rather than discuss with my husband the purchase of family gifts, I prefer to choose them myself.	-.39	-.01	-.61	-.09
17. When I'm not feeling well, I'd rather have my husband cook dinner than cook it myself.	-.12	.11	.46	.49
18. When something is broken or not working, I'd rather try to tinker with it myself than call the repairman immediately.	.12	.32	.46	-.33
19. I do not want to see the local business area grow anymore.	.18	-.18	.24	-.04
20. I would prefer to try a new restaurant in Providence rather than eat at a local restaurant.	.02	-.08	-.18	.60
21. What happens to me is my own doing.	.24	.18	.09	-.36
22. Most things that happen to us are for our own good.	-.36	.11	-.24	.53
23. Because I can count on my family and friends, I don't worry much about solving problems that come up.	-.12	.08	-.05	-.45
I = <u>self-controlling</u> (14.1% of variance)				
II = <u>ideal-modern</u> (11.5% of variance)				
III = <u>active-modern</u> (8.5% of variance)				
IV = <u>oppressed</u> (7.6% of variance)				

factors appear to measure styles and degrees of personal autonomy, and account for 41.8% of the variance.

Table 17 shows the interview items, grouped according to their rankings. The groupings are examined and an attempt is made to name the groupings or factors in a way that is consistent with what the items represent in terms of personality traits.

The first factor concerns self-control and acceptance of responsibility (items 2-5, 7-9). Responses to items 1 and 6 may indicate satisfaction with present life allowing for adventurous choices. Factor II is an ideal-modern factor, indicating a progressive, broad-minded outlook (items 8, 10-13).

While Factors III and IV are comparatively weak, accounting for 8.5% and 7.6% of the variations, respectively, they are still conceptually interesting. Factor III concerns active-modernism (items 14-19). Factor IV appears to describe someone who feels somewhat oppressed by circumstances and is desirous of change (items 9, 17, 18, 20-23).

Relationship Between Personality and Other Sociocultural Variables

The four personality factors identified are interesting to this study in terms of how they are correlated to other sociocultural variables, including fishing-related variables. This relationship is illustrated in Table 18.

Table 18 indicates that three of the independent variables are significantly related to Factor I, self-controlling: education, family involvement, and husband's status. Factor II, ideal-modern, is significantly related to trip length. There is a significant negative relationship between Factor III, active-modern, and the independent variables of age, length of marriage, and husband's status. Factor IV, oppressed is not significantly related to any of the independent variables.

Table 18
Relationship Between Personality Factors and Independent Variables

<u>Independent Variables</u>	<u>Factors</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
education	.40**	.18	-.07	.21
age	.09	.05	-.28*	-.05
negative attitude towards husband's job	-.09	.24	-.01	.17
family involvement	-.32*	-.06	.06	.07
length of marriage	-.07	.10	-.29*	-.10
years of fishing	-.13	.05	-.23	-.10
husband's status	.41**	-.06	-.41**	-.13
trip length	-.24	.38**	-.05	-

* P > .05 (.273)
 ** P > .01 (.354)

I = self-controlling
 II = ideal-modern
 III = active-modern
 IV = oppressed

Discussion

Factor I, self-controlling, accounts for the largest percentage of the variance (14.1%). Education is positively related to this factor, suggesting that as years of formal education increase so does a woman's sense of self-worth and confidence in her own capabilities. The wife with more than the average education (12.5 years) may feel more in control and able to meet all circumstances with reasonable solutions. There is a negative relationship between the self-controlling factor and family involvement in fishing. A possible explanation for this finding is that having relatives who fish would make the occupation seem less unusual and may leave fewer opportunities for assuming unusual personal and family responsibility. A woman with relatives who fish may be part of an understanding network which offers mutual assistance and support. Additionally, a woman with relatives in the industry, might be more willing to accept the status quo and be more passive or agreeable in respect to her husband's work, or to the world in general.

It is not surprising that self-controlling is positively correlated with being married to a captain. There are a number of reasons why a captain's

wife might feel in control and satisfied with her life. An established captain can provide more financial security. The captain's wife may actually be a business partner, helping with boat accounting and dealing with land-based fishing operations, such as finding and purchasing supplies or parts for boat repair. This would give a strong sense of active participation and self-worth. There is also a certain amount of status that goes with being married to a captain. Crew wives and girlfriends will call her to find out when the boat is due and may go to her to pick up the paychecks. The captain is also able to exercise more flexibility in setting his schedule to avoid conflict with some family events, so his wife will probably feel less manipulated than might a crew wife with a totally inflexible and unpredictable schedule.

Although not statistically significant ($-.24$), there is a tendency for trip length to be negatively associated with self-controlling. This is somewhat surprising if one assumes that a woman left more on her own would score higher on this factor. It is suggested that many wives in this category are married to small boat owners whose trips are not lengthy, but whose in-shore time is often tied up with gear and boat maintenance.

Factor II, ideal-modern, is positively correlated with trip length. This finding can be interpreted to indicate that the more time her husband spends at sea, the more time a woman has to form stronger personal opinions and to become an independent, progressive thinker. There may be fewer opportunities for the couple to share ideas and perhaps less chance that the wife's opinions will be modified by the husband. It is interesting though not statistically significant that persons scoring high on ideal-modern tend to want their husbands in different occupations. They may be unhappy with the status quo because of time-limited marital relationships or because

of the amount of family responsibility that must be shouldered alone. This would be an expected relationship. The least satisfied person is often the most radical, and within the limits posed by the instrument, this ideal-modern factor represents progressive, if not radical, thinking. It should be noted that Factor II is ideational in nature, indicating professed philosophy and not necessarily corresponding activism.

Factor III, active-modern, is negatively related to captain's status. This seems unexpected until we see that high active-modern scores also belong to women who are younger and married fewer years to less experienced fishermen. Younger, less experienced fishermen would tend to be crew members rather than captains. Active-modern may simply be a function of youth. The young wife may have a greater sense of future opportunities and personal power. Years of possibilities stretch ahead and there are few disappointments or failures behind. The feminist movement may also have affected the outlook of these young wives and increased their belief in their own potential.

Though Factor IV, oppression, is not significantly related to any of the independent variables, the highest correlations may indicate some interesting tendencies. Education is positively related to oppression (.21). The more educated women may have a wider perspective and be more aware of other possible ways to earn a living. Fishing may be an impediment to her expectations for her marriage or for her husband's status. This logic follows when we note that the second highest correlation is dissatisfaction with husband's occupation (.17). Oppression also has a mild negative relationship (-.13) with captain's status. In the interview process, several wives expressed dissatisfaction with their husband's crew status. Some said their husbands were expected to work harder than other crew members, or that their work

schedule and therefore their income was subject to the captain's whim.

From the previous discussion, it is apparent that variance in the personality variables may be tentatively explained exclusively by conditions independent of fishing in only one case. Active-modern is clearly related to youth. Self-controlling and oppression are all involved with fishing-related conditions, as well as with one other external variable, education. Ideal-modern is related totally to fishing-related concerns. This suggests that aspects of a wife's personality are related to her husband's participation in the extraordinary occupation of fishing.

It is interesting to note the relationship of education to the very different self-controlling and oppression factors. When other positive fishing-related conditions are present (captain status, no relatives in fishing, and, possibly, shorter trip length), more than average education may have the effect of helping a woman find satisfaction in a life she believes she controls. On the other hand, when fishing-related conditions are undesirable (crew status, other occupation desired), increased education may cause increased frustration.

At the present stage, the data show that aspects of a woman's personality are related both positively and negatively to aspects of her husband's involvement in fishing. It is important that proposed innovations be evaluated using the depth of this perspective. The direction of this relationship, however, remains to be resolved. Do fishermen select wives whose personality preadapts them to their husband's occupation or do the fishermen's wives psychologically adapt to the demands of the occupation after marriage? There may be a certain amount of self-selection operating. For example, independent women may be attracted to independent fishermen. However, it is also possible that personality characteristics are significantly

molded in young adulthood, and by marrying a fisherman when relatively young, a woman more easily adapts her personality to the demands of this particular life-style.

Husbands and Wives

There are a few women who fish as crew or co-owners out of this port. Still, this is overwhelmingly a male occupation. In New England fishing has always been men's work. The men have gone out to fish and face the elements while the women watched the home fires and waited. Does this traditional separation of labor extend to other areas of life when the husband is at home? Do fishermen adhere closely to male roles and not interfere with their wives' home and family management? Who makes the decisions in these families? We know from asking about likes and dislikes that some fishermen's wives think fishing is hard on a marriage, while a few think it has a beneficial effect. What kind of adjustment problems do these couples face?

Partners

One of the most outstanding aspects of being married to a fisherman is the amount of communication and the degree of awareness a woman has about her husband's job. If the division between male and female roles were strict, one would suspect the man would keep details about his work to himself, preferring to keep this sphere of his life separate from his wife's involvement. Twenty percent of the women report that their husbands rarely or never talk to them about their work. Seventy percent say that their husbands do discuss their trips, their work, the crew, boat equipment, etc., and an additional 10% say their husbands "constantly," "automatically," or "always" talk about their work. In one case, the fisherman and his crew were "at home" during

the interview via the short-wave radio in the kitchen. The woman responded to the items in the interview with half her attention on the situation at sea, excusing herself to make a phone call to get equipment her husband had mentioned needing.

Virtually all the women have been on their husband's boats in port, and many have accompanied their husbands on fishing trips or local trips on the boat. Often when a man is doing boat maintenance at port, his wife and children will join him at the dock area, to watch or to help, or simply to be near him. Net work and lobster pot maintenance is often done right in the backyard or garage. One woman commented, "The work is tangible." They know about the daily routine and about the potential for extraordinary events such as equipment failures, extra-bountiful catch, weather hazards, and accidents.

A woman can carry a mental picture of the fisherman's work activities. Because of this, one would assume that there would be less conceptual distance between the husband's and wife's worlds. For example, a woman married to an office worker may be less interested and less imaginatively and/or concretely involved in that area of her husband's life. This would be an interesting theme for a comparative study which could contrast possible spouse involvement in the husband's tangible/intangible work.

Eleven women cited industry-connected items among their dislikes. Their complaints ran from nature to politics and included the weather, government quotas, fish prices, and licensing requirements. These comments show an active awareness of the problems that plague the industry. A woman who claims to dislike industry-connected aspects of fishing takes industry issues personally.

In addition to job awareness, fishermen's wives can be involved in the occupation in more direct ways. Almost half the sample are married to captains who are in business for themselves. Frequently in self-employed situations the husband's business becomes a family endeavor. One skipper's wife consistently said "we" when speaking about her husband's boat and about fishing activities. From her viewpoint, fishing was a joint endeavor, his work was her work, his risks were her risks. Another claimed she was "one-half the operation." She was the land-based partner who located and obtained boat parts and checked on supplies. Running a crewed fishing boat is a major financial enterprise. Yearly expenses on an average boat run in the vicinity of \$54,000 with each trip costing between \$1,000 and \$1,500. Boat owners most often have a professional accountant handle their books and assist with tax preparation. It is often the wife's responsibility to keep accounts in order on a day-to-day basis before handing them over to the accountant for quarterly checks. Even crew members' finances are more complicated since the government changed their tax status to self-employed. They are individually responsible for keeping track of their earnings and for putting tax money aside.

The interviews with the husbands in the study conducted by Poggie give information about the extent of the wives' assistance. When asked, "Who helps you with fishing?," 23 men said their wives do. Table 19 records the ways the husbands claimed their wives help.

Occasionally a captain's wife will cook food for the crew to take on their trips. As has been mentioned, she may also serve as a link between crew wives and their husbands, either by relaying messages, keeping them informed of the boat's activities, distributing paychecks, or occasionally reassuring younger wives.

Table 19
Wife's Assistance

<u>How does wife help with fishing?</u>	<u>Frequency</u>
does books and settlements	14
keeps tax records	2
helps with books	1
sets up stuff for accountant	1
does all books and records poundages of species and logs where caught	1
pays bills	1
goes with him on days when father doesn't	1
makes flags	1
is deckhand and helps with books and bills	1

n=23

Though fishing separates husband and wife by time, distance, and danger, it also offers unusual opportunities for sharing. The women who feel that fishing has a positive effect on themselves, their family, and their relationship with their husbands may be benefitting from the enthusiasm, interest, and involvement they have with fishing. It is equally possible that these women have simply adapted well to the demands of their way of life and have come to enjoy the life-style their adjustments have allowed.

Division of Labor

The previous discussion describes the woman's awareness of her husband's work activity. Is there a reciprocal involvement by the husband in what is traditionally thought of as "the women's world?" One might expect male participation in domestic activities to be minimal. Fishermen work extremely long hours and can't be expected to run home and wash the dishes and play with children. Fishing is rugged work; perhaps men who fish are too "macho" to be bothered with "women's work."

Elizabeth Bott describes segregation in conjugal role relationships as participation in different activities which are complementary or independent. Integrated or joint conjugal relationships are those in which individuals

carry out the same activities together or separately. Bott found the degree of role segregation to change at different points in a marriage and to be related to closeness of social networks. In her work in a London suburb, she also found that for couples with the greatest degree of role segregation, husbands were in manual occupations (Bott 1971).

This study tried to gauge the husbands' involvement in domestic activities in several ways. The question "Does your husband help around the house?" evoked varied responses, which referred to both the kind and the degree of assistance given. Table 20 gives the first response per individual.

Table 20
Husbands' Domestic Assistance

<u>Kind of Help</u>	<u>Role Segregated response</u>
none	12%
only when has to	6%
with yard work	10%
with heavy cleaning	4%
handyman kind of work	10%
house maintenance	6%
	<u>48%</u>

<u>Degree of Assistance</u>	
never	12%
rarely	22%
with traditional male jobs	16%
	<u>50%</u>

<u>Kind of Help</u>	<u>Role-Integrated Response</u>
cooks	10%
general domestic assistance	42%
	<u>52%</u>

<u>Degree of Assistance</u>	
always helps	12%
great help	6%
	<u>18%</u>

helps sometimes (too indefinite a response to code as integrated or segregated)	32%
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These responses do not indicate an overwhelming tendency on the part of fishermen to stay within traditional male roles. The responses, however, are very general and do not give a clear picture of husbands' domestic involvement. When specific activities and decision processes were mentioned, a more accurate picture of participation was drawn (see Tables 21 and 23)

In 1955, Blood and Wolfe conducted a study of 731 Detroit families. Some of their data on division of labor in household tasks (1960:500) can be compared to the Point Judith population in Table 22.

This limited comparison suggests that fishermen's wives not only perform stereotypical tasks (straightening out the house); they also may take greater responsibility for tasks which are more often shared in nonfishing families (bill paying) and for tasks which are stereotypically men's work (lawn mowing). In looking for determinants of the division of household labor, Blood and Wolfe found that the pragmatics or sheer availability were most significant:

If circumstances arise which make it impossible for the customary performer to do his duty, the "show must go on." In this sense, every husband is a "stand in" for his wife, and every wife for her husband... Not every spouse rises to the occasion but the moral pressure and the practical urgency are there. (1960:57)

The well-being of the fishing family depends upon the woman being able to "stand in" for her husband when necessary. The well-being of this marital relationship may depend on the husband's willingness to reciprocate in kind when circumstances allow. Wolfe speaks of the family as a multipurpose organization par excellence. He sees it as maximally efficient for the least amount of cost and maximally adaptive: "Labor can be increased to meet variable demands...without incurring expenses other than exploitation of self" (1966:7-8). Because current data do not show strict stereotypical role adherence among fishermen and wives, it appears that there is reciprocal "standing in" in household tasks which prevents destructive exploitation.

Table 21
Participation in Domestic Activities

Activity	Person Most Responsible				
	Neither	Wife	Wife Only in Husband's Absence	Husband	Shared by Husband and Wife
have car repaired	1	22	4	10	13
pay bills	1	41		4	4
do income tax	23	13		10	4
discipline children	3	16			31
boat accounting	33	11		4	2
wash car	4	20	1	9	16
transport children to, activities, doctor, etc.	2	40	1		7
take care of pets	8	27	2	3	10
mow lawn	16	9	2	15	8
do errands around town	1	33	1	1	13
take out garbage	5	19	3	10	13
clean, straighten house		42	1		7
wash windows	3	36		1	10
paint house interior	13	18		7	12
at night, turn off lights and lock house		28	2	6	14
dress, feed, entertain children	2	31			17
laundry		48			2
act on complaints about consumer goods or services	3	30		4	13
% of possible responses	17.8%	49.2%	1.9%	9.3%	21.8%

n=49

Table 22
Performance of Household Tasks: Detroit and Pt. Judith

Partner Who Mostly/Always Performs the Task	Detroit	Pt. Judith
wife pays bills	41%	82%
husband pays bills	25%	8%
both share	34%	8%
wife mows the lawn	13%	18%
husband mows the lawn	75%	30%
both share	6%	16%
wife straightens house	80%	84%
husband straightens house	2%	--
both share	17%	14%

Decisions

Stephen Blair has observed that "in most existing studies, decision-making has been assumed to be an indicator of power, and the two terms have been used interchangeably" (1974:168). In contrast to the high participation in the activities listed in Table 21 (49.2%), the women list themselves as decision-makers in only 25.7% of the ten situations given (see Table 23). This may indicate that some women carry a large percentage of the burden of domestic responsibility but defer some of their decision-making power to their husbands, in favor of mutual decisions. Blood and Wolfe theorized that the source of power in marriage lies in the comparative resources each partner brings to the marriage (1960:12). The fisherman as provider of financial security may retain more decision-making power than his physical presence and share in domestic responsibility warrant. In her study of sexual egalitarianism among the !Kung, a hunting-gathering band in southern Africa, Patricia Draper states:

Frequent male absence may result in viewing men as a scarce commodity with higher value than women who are constantly present in the household. If men in this sense are a scarce commodity, their homecoming must have greater significance to those who stay at home, and their influence in even routine domestic affairs may be heightened simply because others are less habituated to their presence. (1975:86)

Fishermen's wives hinted at this when they commented on their children's behavior, which is different when fathers are home, becoming either more or less disciplined. Perhaps the absence of fishing husbands has an effect on domestic decision-making which is similar to the effect Draper found among the !Kung.

It should be pointed out that one woman commented that she made certain decisions but involved her husband in discussion so that he would believe the decisions were jointly reached. Her rationale is that because her husband

is frequently absent, it is important to keep reinforcing his feeling of active participation in family life. This might help prevent his losing interest and leaving things up to her entirely.

It is interesting to note that there are not many activities or decisions taken care of by wives when their husbands are at sea and then relinquish to them on their return. Such practice would probably lead to role friction. One woman stated that she had been asked to choose a car in her husband's absence. When he returned, he vetoed her choice and chose and purchased another car. Another wife mentioned that she had taken care of some home repairs. Upon her husband's return, she was told everything had been done wrong (not according to her husband's wishes or expectations). Such incidents can cause frustration and hard feelings between husband and wife.

Table 23
Participation in Domestic Decision-Making

<u>Decision</u>	<u>Person Most Responsible</u>				
	Neither	Wife	Wife Only in Husband's Absence	Husband	Shared by Husband and Wife
to spend \$100 on furniture		11		3	36
to begin orthodontist treatment for child	2	10	1	3	34
to choose and buy new car		3		9	37
to give relatives surprise anniversary party		20			30
to campaign for school committee candidate	17	22		1	10
to purchase set of encyclopedias		18		3	29
to invite new acquaintances to dinner		11		4	31
to give adolescent child permission to date	2	7	1	1	39
to loan car to friend for 2 days		8	1	10	31
to take a new part-time job		18	1	5	27
% of possible responses:	4.2%	25.7%	1%	7.9%	61.2%

Interestingly, Wilson found that mobile military women reported "the worst part of separation for them was when their husband returned and reasserted himself." This was in direct contrast to the husbands, who experienced the worst time of separation at the actual time of departure (1977: 73). For the fishing couples as well, a pattern of adjustment must be worked out. Husbands and wives must develop an awareness of what is experienced in separation and what is expected when reunited. Assuming total responsibility for most domestic activities and delaying major decisions until the husband can participate is probably the best adaptive response to a situation of periodic absence. The necessary gets accomplished and the husband and wife learn to trust each other's judgement.

It is unclear whether or not Tables 21 and 23 reflect reality. They may instead represent the ideal or most desirable division of labor and decision-making. When 61.2% of the group say that ten decisions are made by both husband and wife, they may be saying they hope the decision lies equally in their hands. In reality it may not. This listing of activities and decisions might be more meaningful if compared to a nonfishing sample. A more accurate way to gather information on real activities and decision-making would be to request a detailed diary from some of the sample. The actual behavioral information could then be analyzed.

Tables 21 and 23 probably do indicate a belief in sharing family responsibilities and decisions. Assuming some accuracy of response, it does illustrate male involvement in the woman's world. The degree of sharing may be questioned, but strict role segregation is not apparent. In terms of the husband's involvement in the wife's world, there is also the uninvestigated possibility that the husband is involved and interested in his wife's career or occupation.

Though this issue would be clarified with comparative study, it appears that, contrary to expectations, these marriages are not strictly role-segregated.

Quality of Relationship

Something needs to be said about the quality of the husband-wife relationship. It is extremely difficult to delineate such a relationship, let alone judge quality in any objective fashion. Certainly, the task is beyond the scope of this study. However, after interviews with these 50 women, there appears to be a possible pattern of three kinds of marital relationships.

Some women are satisfied and/or happy with their marriages. They enjoy their husbands' time at home but also enjoy the time they have to themselves when they are at sea. They are comfortable with flexible schedules, and enjoy the spontaneity of bad weather holidays at home.

Another group appears to be satisfied with their marriages, but the balance is somewhat more precarious. They find themselves occasionally resentful at having to bear the brunt of home and family responsibility. They are anxious when their husbands are away any length of time and become uncomfortable when the weather has kept them at home too long. The equilibrium of the marriage depends on a careful balance of time together and time apart. Concern was raised about changes in this balance. Retirement, for example, loomed as a threat to some women. One woman said it would not be good for a husband and wife to be constantly together after years of alternating togetherness with separateness. Another said it makes her nervous when her husband is around the house too much, and she is apprehensive about the time when he doesn't have to go out anymore.

There is a third possible group of women who seem worried about their marriages. They are unhappy about the amount of time spent apart from their

husbands. Irregularity of income tends to trouble them. They worry about the dangers their husbands face. Their life-style feels unnatural and uncomfortable. They express the need for an independent life, but then feel the guilt of leaving children with babysitters too often, or not not being home when their husbands are.

Respondents themselves stressed the necessity of adapting to this kind of marriage. As one said, "Some never do." Those women who have not grown up with a fishing relative or who don't have the advantages of close kinship or friendship networks to turn to may have a very difficult time of it. During the time of interviewing, the media reported the suicide of a woman married to a fisherman from another New England port. Though the circumstances of this incident are unknown, one can imagine how a woman bearing too much responsibility for home and young children, worried about her husband, and left alone too often may suffer from the strain.

Stereotypically, fishermen are heavy drinkers. This study did not approach the complicated issue of alcohol abuse among fishermen, but several women alluded to the problem. The most common reference was to drinking among "other fishermen," usually the single or divorced men. No one said they worried about their own husbands drinking and some counted themselves fortunate in this respect. The fact that drinking was mentioned voluntarily indicates not necessarily personal knowledge of the problem but perhaps a certain apprehension. The two women who purposely want to live a distance from the port may be thinking of the potential danger of being too near the fishermen's bars.

In the section on danger we saw that peak worry times may occur in the beginning of a marriage and later, when the husband nears retirement age. These times correspond with stages of difficult adjustment in all marriages,

and may cause additional tension when it is least needed. In the beginning of his career, when the fisherman is most enthusiastic, is enjoying the challenge, and is beginning to make some financial headway, his wife is probably going through her most difficult period of adjustment.

"His first year in fishing was my worst. We hadn't been married too long and I was pregnant for the first time. It was a terrible strain. He was working like crazy, making as many trips as he could, two days and three nights out. I was stuck at home with all the housework and no one to talk to at night. It was a bad time. We had a lot of fights."

Many women talked about having a hard time adjusting in the beginning.

They remember resentment, strain, and loneliness:

"While we were dating, he would fall asleep on the phone all the time. The night he gave me my engagement ring, he had to leave early to go fishing."

"Our honeymoon was even on his fishing boat."

"In the middle of my labor pains he left for a while to work on the boat."

"When our second child was born, someone else had to bring me to the hospital."

"You almost have to be brainwashed into this kind of life."

"There is an art to being a fisherman's wife and some people never learn."

"Their (fishermen's) motivation is so strong, it's almost obsessive."

"Before the children were born, I was very depressed to be alone so much."

"It's very difficult and hard on a marriage until you adjust to it. You have to learn to live separate lives. This was never my idea of what a good marriage would be like, but still we have a good marriage."

Later, when he is reaping the rewards of experience and risk and hard work, his wife has more time to worry, and is more worried than ever because of her husband's age.

"There is a lot of stress in being married to a fisherman. You have to be made for this kind of life. You've got to be able to be independent. I've been comfortable with this life for about 21 years now. But now I'm beginning to worry."

If she then wishes him in another occupation, she regretfully realizes it is too late for him to learn a new way to make a living. While fishing causes daily worry, with which a woman must cope in one way or another, the worry itself can put a strain on a marriage at different times.

In any marriage, there is a period of adjustment when expectations meet reality. Perhaps being married to a fisherman forces an earlier adjustment which settles more quickly into a way of life.

Children

The question of closeness and separateness of fishermen to their families is interesting when thought of in terms of quality and quantity. Quality vs. quantity of time spent with children has often been an issue discussed in relation to working mothers. It would be revealing to compute the actual and potential time a father working nine to five spends with his children--not simply being in the house, but interacting with the children. This could be compared to the actual and potential time father and children spend together when the father is spending two to ten days at sea and two to four days at home. What the father/child relationship suffers in terms of continuity could be made up for by more concentrated time together. The man who is at home 48 hours during the week may get to know his family in a different way from the man who is home at 6 p.m. weekdays and every weekend.

Other family members were not interviewed, so it is difficult to determine accurately their reactions to fishing. However, women were asked what their children think of their fathers' occupation. Because it is impossible to discount impression management when mothers are asked questions about their childrens' attitudes, these responses can be also seen as an additional indicator of the wives' opinions concerning fishing.

Table 24
Children's Attitude Toward Fishing

What do your children think of their fathers' occupation?

<u>Attitude</u>	<u>Frequency</u>
somewhat negative	4%
neutral	20%
somewhat positive	18%
very positive	42%
no response (inappropriate)	16%

Sixty percent reported that their children have varying degrees of positive attitudes toward fishing. The ten neutral responses were given when children were too young or when mothers felt their children had no strong opinions because they had no basis for comparing fishing to any other occupation. Some of the "very positive" responses indicate that children too may share in the romance of the occupation:

"They're proud their father's a fisherman."

"They want to become fishermen themselves."

"They're always wanting to go down to the boat."

"They think it's exciting."

Younger children may see fishing as a form of recreation. As one respondent said, right now it's the thing to be. Telling your friends your father is a fisherman is more interesting than telling them he works in an office. Two women spoke of their children talking about fishing in school and drawing many boat pictures, obviously proud of their fathers' occupation.

It may be comfortable and enjoyable for women to say their children like the kind of work their fathers do. There may be reason to reconsider when they think about their children actually being involved in fishing. Jeremy Tunstall reports that in the years of unregulated labor on the British high seas, fishermen would throttle the sons they heard even hint at a fishing career. They

demanded something better for their progeny. Table 25 shows responses when mothers were asked whether they would like their sons to be fishermen or their daughters to be married to fishermen.

Table 25
Desirability of Children's Involvement

Do you want your children involved in fishing?

<u>Response</u>	<u>Frequency</u>
not applicable	2%
neutral: no opinion, it's up to them. I wouldn't object	42%
no: it's dangerous, there wouldn't be enough fish, it wouldn't pay, I don't like it, not a trip fisherman, no future, I wouldn't encourage it, would prefer something else, hours too long.	10%
mixed feelings: o.k., but fears for them, would prefer a normal life for them, it's hard work, o.k. for son but not for daughter.	14%
mixed feelings: they are fishermen, but I'm not pleased, daughter doesn't like being married to fisherman, would have preferred him to have more education	4%
positive: they are fishermen, it's a good life	6%
positive: I would be proud, they like the way of life, it would be fine	22%

While 72% of the sample indicated that they didn't want their husbands in a different occupation, only 50% of the women expressing an opinion would be pleased to have their children involved in fishing. This may indicate that some women have adapted well to fishing but still have reservations about the future of the industry.

Family

New England fishing is connected to kinship more than most American occupations. Eighty percent of this sample have relatives who are involved in

fishing. Twenty of the husbands have fathers who were or are fishermen, as compared to five wives whose fathers fish. Husbands have 125 relatives who fish, while wives have 18. Because kin fishing links are primarily through the husband, and because only 66% of the women were born in Rhode Island, one might expect the women to have more geographic accessibility to their husbands' families than to their own. However, Table 26 shows that women's parents and parents-in-law are almost equally accessible.

Table 26
Geographic Location of Parents

<u>Residence Relative to Respondents</u>	<u>Wife's Parents</u>	<u>Husband's Parents</u>
different state	26%	28%
same state	36%	38%
same township	14%	14%
same village within township	6%	10%
within 1/2-mile radius	18%	10%

Several studies have suggested a matrilateral bias in kinship interaction in American families (Poggie and Pelto 1969:2-3). If the American family generally interacts more with the wife's relatives, what happens in a group which has occupation links predominantly with the husband's relatives? Several interview items addressed the question of kinship interaction. These items concern only the woman's interaction and do not necessarily indicate the whole family's kinship orientation. However, the traditional affective role women have in the American family frequently includes the initiation of kinship contacts. For this reason, and because the responses to these items concern both ordinary events of the immediate past and generalized attitudes, it may be feasible to assume that the women's kinship interaction is, to a certain extent, representative of the family's interaction. The women were asked who they had spoken with on the phone and visited with in the last few days. They were also asked who their closest friends were personally and as

a couple. A list of approximately three names was given in answer to each question. At the end of this section, the interviewer went back over the lists with the respondent to label the names, first according to relationship, and second according to whether or not the person has a connection with fishing (i.e., person has fisherman in family). Responses pertaining to nonrelatives will be addressed in a later section.

Table 27				
Wife's Kinship Interaction				
<u>Type of Interaction</u>	<u>Wife's Relatives</u>		<u>Husband's Relatives</u>	
	<u>Fishing</u>	<u>Nonfishing</u>	<u>Fishing</u>	<u>Nonfishing</u>
phone conversation	8/16*	28/36	17/20	6/7
visits	6/8	23/33	9/10	7/10
closest friend	6/10	8/8	9/10	2/2
couple's closest friend	4/6	7/8	8/11	6/6

*number giving kin response/frequency of mention in list

Table 28			
Total Kinship Interaction			
<u>Wife Interacts With</u>	<u>Fishing</u>	<u>Nonfishing</u>	<u>Total</u>
wife's relatives	24/40*	66/85	90/125
husband's relatives	43/51	21/22	64/73
total	67/91	87/107	

*number giving kin response/frequency of mention in list

Tables 27 and 28 indicate closer interaction with husbands' fishing relatives than with wives' fishing relatives. This is not surprising, since husbands have many more fishing-connected relatives. It is interesting to see that, without occupational connection, matrilinear asymmetry is clearly evident; women are closer to their nonfishing relatives than to their husband's nonfishing relatives. For this issue in particular, a comparison group would be valuable. Including both fishing and nonfishing relatives, wives' connections to husbands' relatives still seem high, but there are no comparative data. Also, it would be interesting to determine whether

fishermen's wives are more likely to mention relatives in response to these questions when other respondents would mention friends. Because of their husbands' frequent absence, fishermen's wives may have more interaction with relatives than would another population.

One would expect that, given equal access to both her family and her husband's family, a woman would choose to interact more with her own family. Table 29 indicates that most of the fishermen's wives in this sample feel closest to their own relatives. This appears to be the overall pattern of association. However, family involvement in fishing does seem to influence this tendency in kinship interaction. Of the respondents, 23.3% do list their husbands' relatives as being among their closest. Further research may show the connection between fishermen's wives and their husbands' families to be relatively strong when compared to populations with less familial occupational involvement. This is expected not only because these husbands have a considerable number of relatives who fish, but also because of the nature of the work. Where there is heavy family involvement, fishing may blend instrumental and affective roles. There may be greater interdependency throughout kin networks in terms of both practical and emotional support.

Table 29
Three Closest Relatives

mother	28
mother's sister's daughter	2
mother's brother's daughter	1
father	14
father's brother	2
father's brother's daughter	2
father's sister	2
father's sister's son	1
sister	25
sister's husband	2
sister's daughter	1

Table 29 continued.

brother	17
brother's wife	2
brother's daughter	1

family of origin = 74.4% of response

husband's mother	10
husband's father	1
husband's sister	12
husband's brother's wife	5
husband's brother	1
husband's sister's husband	1

husband's family = 23.3% of response

son's wife	3
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family of procreation

"no one"	1
listed only 1 relative	3
listed only 2 relatives	13

Friends

Because of the unique nature of the business, it is expected that fishermen's wives have a friendship network that relies more heavily on people connected with their husbands' occupation than would be the case with another occupational group. Fishing families generally live in the same area, they may meet if their husbands are crew on the same boat, they have many common problems to share, and they have the comfort of knowing they need not explain their husbands' frequent absences.

When asked, "What do you dislike about fishing?," the largest number of responses concerned friendships and social activities (19 responses in Table 7). One woman stated that she and her husband had lost many new friends over the years because the friends couldn't understand why she and her husband could not accept invitations and make plans in advance. Another commented

that friends were very important to her and her husband, but, because of her husband's schedule, she felt it had become her responsibility to make all the arrangement, find compatible people, begin the friendships. She was not comfortable having sole responsibility for this area of their lives.

So many social activities are planned around couples. A woman who is married but is often lacking a husband as a social partner is likely to be invited mostly to gatherings of old friends who are understanding of her life-style. Because her husband can seldom plan to accompany her, she may eventually be excluded from joining new circles. She would be the odd person at the card game or dinner party or theatre trip; her status would be suspect. Feeling uncomfortable with the constant necessity of explaining or defending her husband's occupation, a woman may stop bothering to extend her friendship network but still feel a loss of social activity and companionship. If some men become fishermen because they are strongly independent or are "loners," their wives might be the ones most needful of establishing social contacts, although they are in a very difficult position to do so.

Contrary to expectations, Table 30 illustrates that fishermen's wives do not limit their social interaction exclusively to those who are involved in fishing. Of the 353 responses that mentioned nonrelated friends, 59.5% concerned friends who are not connected to the fishing industry in any way.

Table 30
Social Interaction With Friends

<u>Type of Interaction</u>	<u>Fishing-connected</u>	<u>Nonfishing</u>
phone calls	25/36*	30/55
visits	17/20	26/40
closest friend	27/37	36/66
couple's closest friend	33/50	32/49
Total	102/143	124/210

*number responding/frequency of mention in list

A few women indicated that they purposely chose friends who were not connected with fishing:

"I wouldn't want to be getting together with other fishermen's wives. The fishing business is best kept on the boat."

"We know some fishermen but it didn't work out. They had different schedules, different life-styles, and different standards. We wouldn't want our daughter exposed to them."

"My husband gets enough of fishing during the day; he doesn't want to talk about fishing while he's socializaing."

One wonders whether the unusual life-style of fishermen and their families affects the wives' involvement in the community. Do fishermen's wives tend to stay within a small network of friends and acquaintances rather than get more actively involved in their community? Table 31 outlines the community involvement of fishermen's wives.

Table 31
Community Involvement of Fishermen's Wives

<u>Memberships in Clubs/Organizations</u>	<u>Frequency</u>
yes, in more than 2	2
yes, in 2 or less	15
used to belong	2
no membership	31

Kinds of organizations include community service (4), social (4), sports (2), child-related, religious, hobby, professional, political.

<u>Church Work</u>	<u>Frequency</u>
yes	18
used to	1
no	31

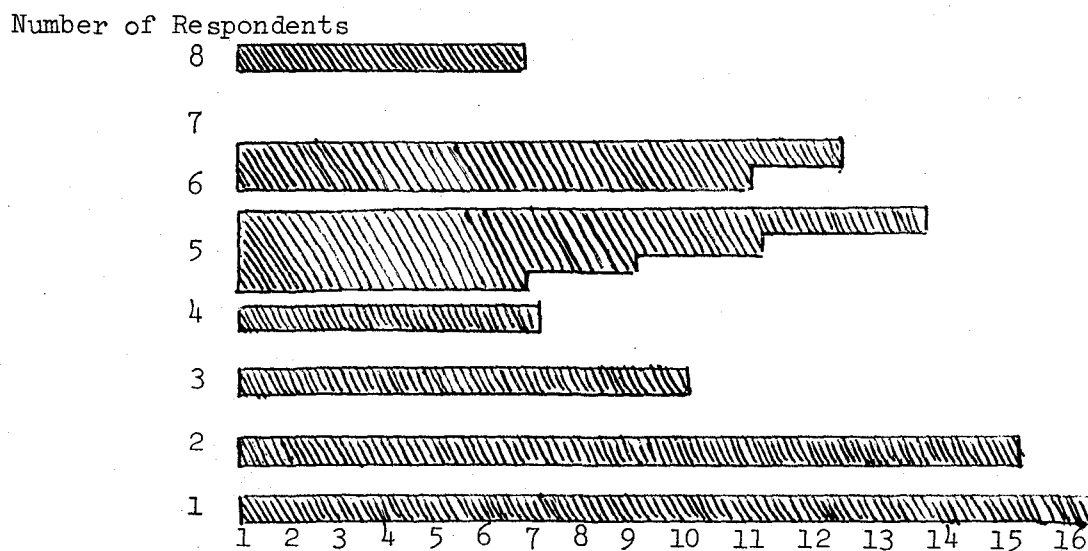
Note: 12 of the women spoken to were Jehovah's Witnesses and had considerable involvement in religious work.

<u>Volunteer Work</u>	<u>Frequency</u>
yes	7
occasionally	2
used to	3
no	38

Though a comparison group would better define the community involvement of fishermen's wives, their community involvement does not seem particularly limited, considering that 84% of this sample have children, that the sample varies greatly in age and marriage length, that 40% are employed outside the home, and that the group has more than average responsibility for home and family. As a group, fishermen's wives could not be considered isolated from their community. Blood and Wolfe found that community involvement is reflected in more active participation in family decision-making (1960: 38). Because their situation frequently forces them to make more family decisions, fishermen's wives may be potentially more likely to take on leadership roles when they do become involved in their community.

Another interview item attempted to measure the dimensions of the social networks of fishermen's wives. Respondents were asked whether or not they were casually acquainted with any individuals in 16 varied occupations (e.g., millworker, policeman, administrator, restaurant worker, etc.). Figure 1 indicates variety in the occupational background in the social networks of fishermen's wives.

Figure 1
Occupational Breadth of Social Acquaintances



Number of People in Dissimilar Employment Known to Respondents

mean=10.3

Thus, we have a social sketch of fishermen's wives. They are involved in their community to a reasonable extent, they are acquainted with individuals from other walks of life, and a little over half their friends are not involved with fishing at all.

The Future

Political Awareness

At the present time, women married to Point Judith fishermen do not constitute a cohesive political force. There are no active fishermen's wives' organizations such as exist in other New England ports. The one activity that brings fishermen's wives together is the annual scholarship fund-raising dinner. Otherwise, there are a few ideas, but little action. During 1977-78, two women began a campaign to organize fishing families to adopt a group health insurance plan. Though some of the women spoke positively of the idea, nothing has ever come of it. Another woman strongly feels that fishermen should be required to be trained in life-saving techniques and wants to see someone organize such training.

The lack of organization among the wives has to do with the independence and diversity of Point Judith fishermen. Boats are privately owned and most often operated by the owners. Unionization has not yet occurred in this port. Also, the considerable variation in the kind of fishing done out of this port (different boat size and gear, species sought, trip length, crew size) does not encourage cohesiveness or unification of purpose. There is, however, a new factor which may alter the political passivity of fishermen's wives, and that is government intervention. During interviews, 22 of the 50 women volunteered comments on the new government regulations such as quotas or new

licensing requirements. Five women specifically mentioned government involvement as one thing about fishing they disliked. Specific comments include:

"The government never gives (200-mile limit) unless it takes away (quotas).

"The fish don't know the quota rules and get in the net anyway."

"Excess fish caught can't even be given away, they have to be thrown overboard. It's a terrible waste."

"Foreign vessels are given permits, while our fishermen are restricted. Then the fish we buy in the market is marked 'imported from Canada.'"

"Fishing is a political football."

"Fishermen's personal laws of privacy and confidentiality (of territories, charts, records) are being violated by the government's requests for detailed information."

Generally, there was a strong awareness of the situation. Many husbands discuss their opinions on the subject at home, and some families have been financially affected by the quota regulations. Previously, a man waited for weather and sometimes the market price before he could fish. Now government catch limitations may also stop him from fishing. This alteration not only has financial effects, but, as we have seen, can affect a precarious marital balance.

Some of the women are optimistic and feel that the government and the fishing industry will learn to get along and understand each other. But there are some who feel threatened by this interference and see the need to do something about it. At least eight of the women are beginning to become actively interested, keeping track of hearings and government action. As one stated, "I'm as much involved as he (her husband) is. He fishes; I stay home and fight." A fisherman must take advantage of weather opportunities and sea-

sons; he cannot afford to stay home and give steady attention to the increasing numbers of meetings and hearings at which he could represent himself and defend his livelihood.

Opposition to government policy could be an organizing force that will move fishermen's wives to unified action. We have seen a similar development in the farming industry since 1977, when farmers' wives demonstrated and lobbied concerning government farm policy. Interestingly, two women compared fishing to farming:

"Like farmers, you have to be big to survive. You have to get bigger boats, more modern equipment."

"Like farmers, fishermen never have a day off."

It has been noted that fishermen's wives appear to be involved in their husbands' jobs to a considerable extent. They help with the bookkeeping, take care of land-based details and errands, occasionally crew or work on the boat, and, to a certain extent, share in the romance of the occupation. They are strong and capable individuals who have learned much through dealing with the exigencies that go with this extraordinary occupation. It would not be surprising to see fishermen's wives more involved in the future. There are, of course, obstacles to increased activity. The wife is still largely responsible for the home and family in her husband's absence, and the male-oriented fishing industry is not an easy world for a woman to become involved in, even as an advocate. Still, farmers' wives have managed, with the same kinds of difficulties, and it would not be surprising to see fishermen's wives do the same.

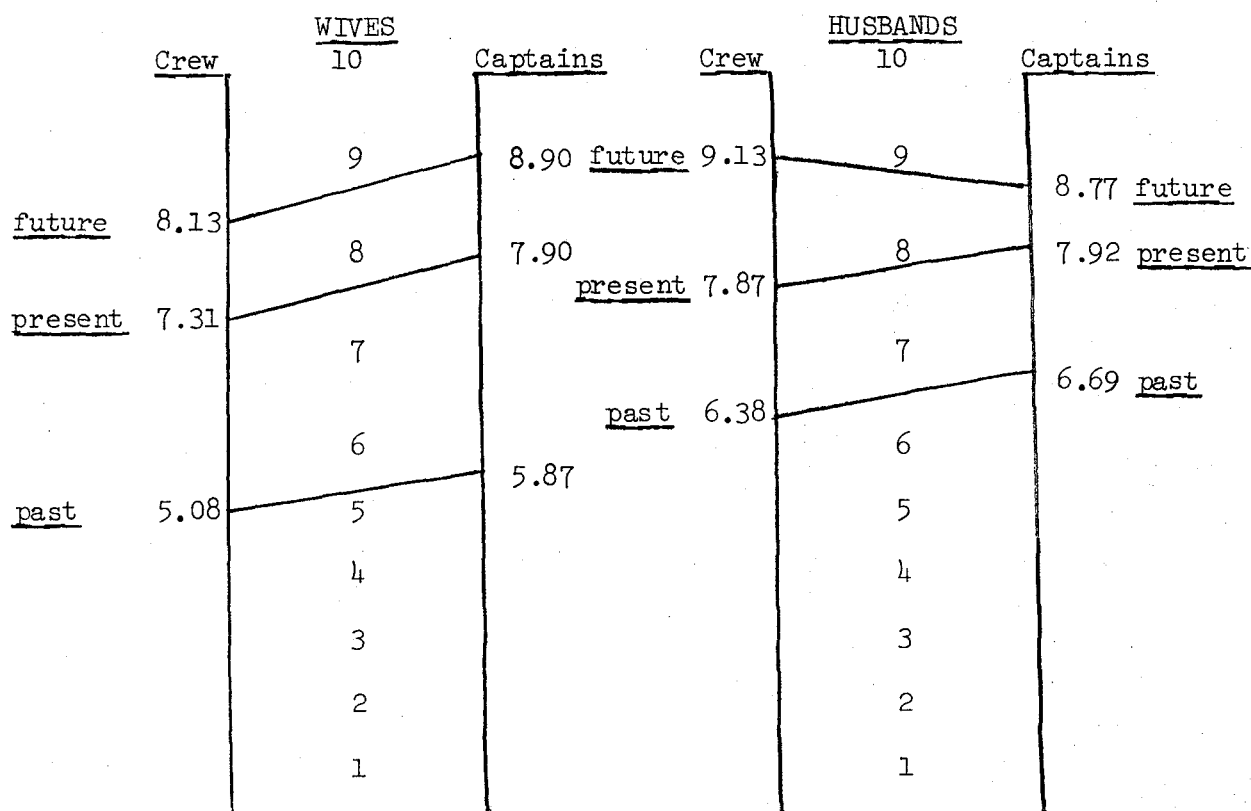
Self-Anchoring Scale

Hadley Cantril's self-anchoring scale (1963) was used in Poggie's interviews with the husbands as well as in these interviews to determine past, present, and future levels of optimism. Respondents were given a ten-level ladder

scale on which 10 represents the best possible life and 1 the worst. They were asked to place themselves on the scale according to where they are at the present, where they were five years ago, and where they anticipate being five years in the future.

Figure 2 illustrates the means of both the husbands' and the wives' responses. Because crew and captain status present much different sets of rewards and demands, a difference in ladder rankings was expected between these two groups. However, there are no significant differences between the way crew members and their wives and captains and their wives view their past, present, and future. Generally, wives are slightly more conservative in their rankings than their husbands, and captains' wives are more optimistic in their rankings than crew wives. For both groups, wives see a greater improvement over the last five years than do their husbands. The difference between past and present for wives is 2.29 for crew and 2.04 for captain, while the difference for husbands is 1.50 and 1.23. This is in agreement with reports that women face a difficult period of adjusting to fishing and that it gets easier as they get used to it. Also, women may be thinking of a lessening of the heavy child-related responsibilities as their children get older. Fishermen who are crewmembers are more optimistic about their futures than are their wives. This may be because eventually they expect to improve their status and earning power by owning their own boats. In their more conservative ranking for the future, crew wives may be expressing the ambivalent attitude toward this mobility, which was illustrated by Table 10. Interestingly, captains do not expect as great an improvement in their futures as do crewmen. They are the ones who, having achieved the dream of having their own fishing operations, are now dealing with the worrisome realities of large mortgage payments, government-restricted catches, and dwindling resources.

Figure 2
Self-Anchoring Scale of Optimism



The women were asked why they predicted their particular future ladder positions. Though the ladder was meant to measure their personal sense of well-being, and no emphasis was put on a connection to fishing, 50% of the women mentioned fishing in their responses. Thus, for half the fishermen's wives, ideas about the future are tied up with such things as completing boat payments, getting a new or bigger boat, the fishing business staying the same, improving, or deteriorating. Excluding specific mention of fishing, Table 32 gives their rationale for their estimated ladder positions.

Table 32
Rationale for Future Position on Optimum Scale

Why will you be at that point in 5 years?

	<u>Frequency</u>
things should stay the same	12
money, material life-style will improve	11
generally optimistic	7
familial, marital relationships are good	4
things get harder with age	4
children will be older	3
personal: health, career, self-knowledge	3
because of belief system	2
with age comes more security and common sense	2
no guess	2

One woman reported that she felt it was her responsibility to remain optimistic and boost her husband's morale. None of the respondents predicted that their ladder position would decline in five years, though seven felt that their position would be the same and nine reported an increase of only one step or less (this excludes individuals who presently rank themselves at 9 or 10). Some of the reservations expressed about the future include comments on age, cost of living, desirability of another occupation, the possibility of retirement, increased expense of boat upkeep, and three specific mentions of government quotas.

Conclusions

In 1973, Poggie and Gersuny cautioned fishing communities about the possible family repercussions of industry regulation and change. The research at hand certainly confirms the validity of their warning. The fishing family operates on a delicate system of learned adaptive behavior. In a business with little regularity or predictability, whatever routine does exist is responsible for holding together the household and providing continuity and stability. In fact, the fisherman's very chances for success in his job may be diminished or enhanced according to his wife's understanding and adjustment to the idiosyncracies of the work. The woman's contentment with the situation depends on her husband's job satisfaction, the financial reward, and the opportunity to enjoy regular time for personal pursuits. Fishing is more than a job; it is a way of life that "is catchy." Family involvement spreads, and many sons expect to follow in their fathers' footsteps. Quotas and limitations on issuance of licenses appear to be more immediate threats to the delicate balance than the problem of dwindling resources that these measures are meant to correct.

The most difficult times in the life of a fisherman's wife seem to be at both ends of their marriage span. Coping with the burden of a young family with only sporadic assistance from the husband can be overwhelming. Added to this is the intense worry about the husband's safety, which is not yet familiar enough to be handled well. After some years, behavior and lifestyle adjust and settle. Then comes the ambivalence of retirement.

These are vulnerable times in the life of a woman and of a marriage relationship. Survival may be very difficult without access to the support of family, friends, or social services. While the husband is going through problems of his own at the beginning and end of his fishing career, it is extremely

important that he be sensitive to his wife's well-being. These are the hazardous times natural to the cycle. Introduce other hazards, such as a particularly bad fishing season, disappearing fish stocks, government regulations, and offshore oil exploration, and there is more potential for problems.

But this is a population that has learned to roll with the punches. They should be able to adjust to change better than most. Perhaps. It has been traditional for many married women to "find themselves" only after their children have grown and left home. Relieved of their child-rearing tasks, they are forced to find replacements for filling time and giving their lives as individuals new meaning. Because fishermen's wives are so dependent on themselves for regulating and filling their time, some of these developmental issues may be resolved more naturally, without reaching the proportions of a personal crisis. Some of the independence forced on fishermen's wives may be very healthy. One woman said a fisherman's wife would be better equipped to handle sudden widowhood than anyone else. But there are limitations to everybody's flexibility. One more strain may be too much. Fishing communities and government regulatory agencies need to be aware of the far-reaching effects of change in this industry.

Kurt Finsterbusch comments on the usefulness of small-sample surveys in defining a population and mapping parameters for future study (1976). It is hoped that this work can serve the purpose by encouraging more specific research with fishermen's wives and for comparative work with other occupational groups.

Although this study clarifies our picture of fishermen's wives, there is still the lingering impression of the romance of the business. The women

interviewed were interesting, welcoming, energetic, and obviously capable individuals. So many of them were enthusiastic about their way of life despite all the drawbacks. Their positive outlook and openness are admirable, a credit to themselves and an asset to their husbands and the industry of commercial fishing.

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SOCIOCULTURAL VARIABLES RELATED TO VARIANCE IN PERCEPTIONS OF
ALTERNATIVE FISHING TYPES IN SOUTHERN NEW ENGLAND

Richard B. Pollnac

John J. Poggie, Jr.

Introduction

The passage of The Fishery Conservation and Management Act of 1976 (PL 94-265), extending U.S. jurisdiction and management over fisheries to 200 miles, has the potential of resulting in wide ranging changes in the New England fishery. There is a strong possibility that these changes might necessitate drastic shifts in the fishing strategy of New England's fishermen. Several possible shifts are being discussed at the present time. Most important for the purposes of this paper is the impression that the reduction of the foreign fleets in the area of extended jurisdiction has left a vacuum that will be filled by new vessels in the U.S. offshore fleet.

Fishermen make a clear distinction between the offshore and inshore fleets. Fishing style, time spent at sea and away from home, and other characteristics have resulted in many sociocultural distinctions which are related to these two types of fishing (cf. Miller and Pollnac 1978; Poggie and Gersuny 1974). The purpose of this paper is to examine fishermen's attitudes towards these contrasting styles of fishing in an attempt to determine the possible sociocultural ramifications of a major shift in strategy.

Changes in any sector of an economy will proceed most smoothly when they are carried out with an understanding of attitudes, beliefs, and values of people in the affected occupations. With respect to possible changes in the New England fishery, one area of potential importance involves comparing individual perceptions of different types of fishing. It is clear that people act on the basis of their perceptions of reality rather than on an "objective reality" (cf. Bennett 1976; Burgers 1975; Johnson 1974); therefore, it is important to determine perceptions of differences between the various types of fishing along dimensions of demonstrable salience to potentially affected fishermen. Proceeding under this assumption, we can argue

that fishermen will either be likely to resist moving into negatively perceived fishing types or will suffer psychocultural dislocations until they psychoculturally adapt to the new occupation or, if unable to adapt, leave the occupation.

There are several factors which may influence fishermen's perceptions of different types of fishing. First, perceptions of the type of fishing one is presently involved in will probably be more positive than perceptions of the same occupation by noninvolved fishermen. Several factors contribute to this apparent shift in perceptions: first, fishermen participating in a given type of fishing have had time to be selected out or to psychoculturally adapt to the demands of the occupation; and second, the shift in a positive direction can probably be attributed, at least in part, to an attempt to reduce cognitive dissonance (cf. Festinger 1957). When one finds oneself in a position originally perceived as having negative attributes, one often reduces the dissonance created by searching out positive aspects.

Another factor potentially related to perception of fishing types is number of years fishing experience. The longer one has been fishing, and the earlier one began fishing, the more likely one is to place differential salience on the various dimensions which serve to distinguish the fishing types. Age, for similar reasons, may also influence job perceptions. Additionally, various kinship related variables may influence a fisherman's perception of fishing types. For example, a married man with many dependents may place a greater emphasis on income than a single man. He may also perceive time spent at sea in a different manner. Further, fishermen who come from a fishing family may, because of differential socialization (e.g. exposure to role models) in the family context, be pre-adapted

to fishing in a way which might influence job perceptions. Specific job on board a vessel may also have some relationship to the way one views his job--a skipper who also owns the vessel probably has a different perception of his occupation than a crewman. Finally, formal education, a variable which theoretically should influence one's world view, probably also influences one's perceptions of various alternative occupations.

We have detailed a number of variables which potentially affect perceptions of different fishing types, but we have provided little indication of the effects these variables may have. The research, therefore, is largely exploratory. We are assuming that the variables to be examined experientially affect fishermen in such a manner that their perceptions of various types of fishing and alternative occupations will be influenced. These effects will be explored in the remainder of this paper.

Research Population and Sample

Data for this report were gathered from fishermen who use the facilities at Point Judith, Rhode Island and New Bedford, Massachusetts. Point Judith fishermen are primarily day fishermen (DF) and two to three day or short trip (ST) fishermen. Those at New Bedford are primarily long trip fishermen (LT) who go out for more than 3 days at a time. A sample of forty fishermen were interviewed at New Bedford and seventy-nine at Point Judith. More detailed information concerning these ports and the samples can be found in Jessen (1978), Pollnac and Poggie (1978), Poggie and Pollnac (1978), and Poggie and Gersuny (1974).

Tests

A primary concern in construction of the instrument used to determine perceptions of different types of fishing was to compare them on characteristics

of demonstrable salience. Characteristics for comparison were derived from interviews with 108 southern New England fishermen¹ who were requested to tell what they liked and disliked about the occupation of fishing. Responses manifesting the four highest frequencies of occurrence (Income, Independence, Family/Social Life, and Personal Enjoyment) were judged to be the most salient characteristics for occupational comparisons. A fifth characteristic "Best Future" was added because of its applicability to our research goals. Each of these five characteristics was treated as a dimension along which each fisherman was requested to rank as first, second or third² each of three alternative types of fishing (DF, ST, and LT). These rankings were treated as the dependent variables.

Independent variables such as fishing type, age, marital status, number of dependents, years formal education, and years fishing experience were derived from responses to direct questions. Fishing family origin was measured with the use of two variables: (1) number of ego's relatives who are fishermen, and (2) whether or not ego's father was a fisherman. Early entry into fishing was measured as a dichotomous variable. Fishermen were asked how old they were when they began to fish, and those who began fishing before they were 20 were coded as early entrants. Finally, for this paper, job on board was also treated as a dichotomous variable. Fishermen who were both skipper and boat owner were coded as owner/skipper. All others were treated as non-owner/non-skipper.

Analysis

Sample means for the three types of fishing along each of the five dimensions of contrast are plotted in Figure 1. Figure 1 indicates that, overall, ST is ranked most favorably (the lower the rank the more favorable).

LT and DF are almost mirror images of one another with DF more favorably ranked than LT on the Family/Social Life, Independence, and Personal Enjoyment dimensions and less favorably with respect to Best Future and Income. The perceived trade-off between DF and LT with respect to the dimensions of contrast is clearest on the Income and Family/Social Life dimensions.

The graphs in Figure 2 illustrate how the different subgroups of fishermen perceive the different types of fishing. The most obvious observation concerning Figure 2 is that it indicates that ST fishermen perceive their type of fishing as ranking first on all dimensions. In contrast, LT fishermen rank their occupation first only with respect to Income. Finally, DF perceive their occupation as highest on the Family/Social Life, Independence, and Personal Enjoyment dimensions.

Turning next to the analysis of the influence that individual, experiential variables may have on the perception of the various fishing types an overall distance measure between the fishing types was constructed. The distance measure (\underline{D}) is the sum of the differences in rank between each pair of occupations on all five dimensions of contrast. For example, \underline{D} between day fishing and short trip fishing ($D-DFST$) equals $(DF \text{ income rank} - ST \text{ income rank}) + (DF \text{ independence rank} - ST \text{ independence rank})$ and so on for the five dimensions. The maximum possible \underline{D} value is ± 10 and the minimum is zero. Because the more favorable names have the "lower numbers" if $D-DFST$ were negative, it would indicate that, overall, DF is ranked more positively than ST. The converse would be true if $D-DFST$ were positive. Item-total correlations for the three possible \underline{D} values ranged between .56 and .88 and are all statistically significant at better than the .01 level. Mean item total correlation for the \underline{D} values is 0.72.

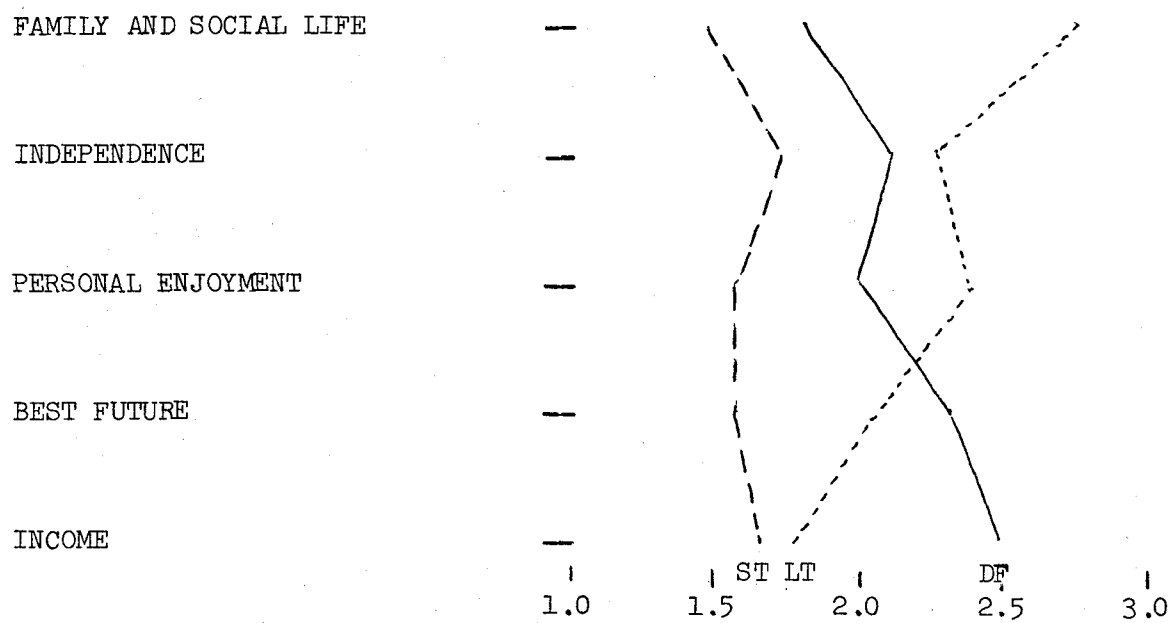


Figure 1

Mean Ranks of Fishing Types on Five Dimensions
for Total Sample

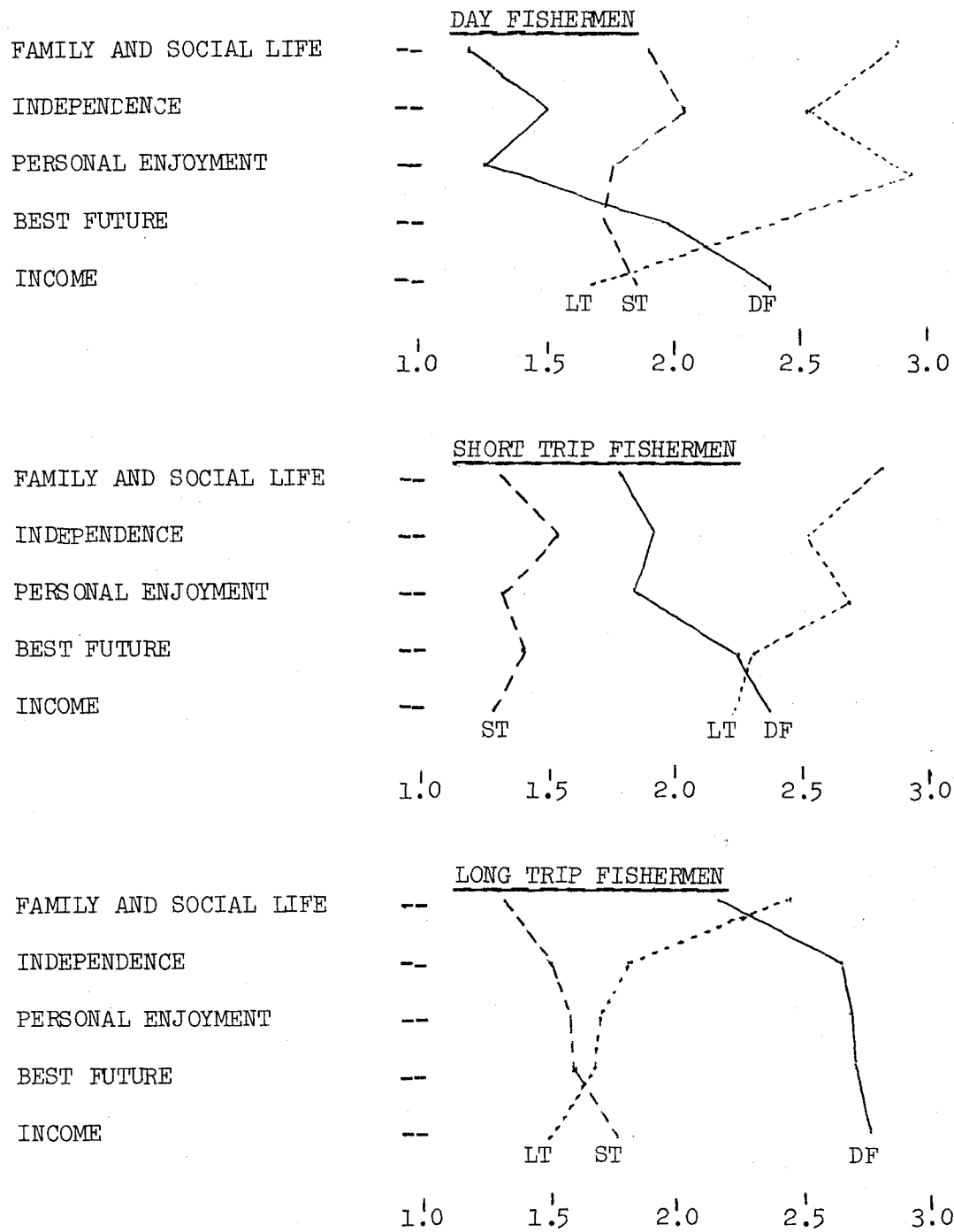


Figure 2

Mean Ranks of Fishing Types on Five Dimensions
for Each Subgroup of Fishermen

Turning first to the individual relationships between the dependent and independent variables, correlations were calculated between each D value and the independent variables. The results of this analysis can be found in Table 1.

Table 1
Correlations Between Independent Variables and D-DFST,
D-DFLT, and D-STLT

Independent Variables	Dependent Variables		
	<u>D-DFST</u>	<u>D-DFLT</u>	<u>D-STLT</u>
Fishing type ^a	.61**	.64**	.24**
Age	.08	.17	.14
Marital Status	.08	.04	-.03
Number of Dependents	.12	.12	.04
Years formal education	-.37**	-.54**	-.36**
Father fisherman	.14	.24**	.19*
Early entry into fishing	-.17	.01	.20*
Number of relatives fishing	.11	.21*	.17
Owner/skipper status	-.14	-.19*	-.12
Years fishing experience	-.00	.15	.21*

N = 119 * = p < .05 ** = p < .01 ^aRanked in terms of time out: DF=1, ST=2, LT=3

Table 1 indicates that, overall, fishing types and years formal education are the most important predictors of D. As trip length increases, D increases. The converse relationship holds for the D values and years formal education. Having a fisherman father and number of relatives fishing (two related variables) is positively correlated with D-DFLT. Father fisherman is also positively correlated with D-STLT. D-DFLT is negatively related

to owner/skipper status. Finally, D-STLT is also positively correlated with early entry into fishing and years fishing experience.

Step-wise multiple regression was used to determine the patterning of combined relationships between the independent variables and each dependent variable (e.g. D-DFST, etc.). In this procedure all independent variables are intercorrelated with the dependent, and the variable which explains the most variance in the dependent variable is entered into the equation first. The next variable entered is the one which explains the most variance with the first controlled. This procedure is continued until all variables are entered or until a previously set criterion is reached. In this analysis, entry into the regression equation is restricted to variables whose F-Ratio-to-enter is at least 3.0. The results of this analysis are shown in Tables 2 and 3.

Table 3 indicates that there are a number of statistically significant relationships between the independent and dependent variables. For both D-DFST and D-DFLT fishing type is the strongest predictor. Fishing type is also significantly related to D-STLT ($r = 0.238$, $p < .05$), but when years formal education is entered first into the regression equation because of its higher correlation, the partial between fishing type and D-STLT reduces to 0.09. Marital status enters into the equation on both D-DFLT and D-DFST with negative partials indicating that married fishermen tend to have lower D-DFLT and D-STLT values. Finally, early entry into fishing enters with a positive partial as a predictor of D-STLT.

As a means of determining the relative importance of each of the various dimensions within the dependent variables, canonical correlations were calculated for each occupation pair between the independent variable set and a dependent variable set composed of distances between the pair of occupations on each of the 5 dimensions. The results of this analysis can be found in Tables 4 and 5.

Table 2
Correlations Between Independent Variables

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
1. Fishing type ^a	-									
2. Age	.19	-								
3. Marital status	.15	.39	-							
4. Number of depend- ents	.17	.33	.62	-						
5. Years formal education	-.47	-.20	-.34	.17	-					
6. Father fisherman	.23	.13	.27	.14	-.42	-				
7. Early entry into fishing	-.12	.07	-.03	.02	.05	.26	-			
8. Number of rel- atives fishing	.23	.22	.28	.16	-.43	.53	.08	-		
9. Owner/skipper status	-.26	.26	.25	.24	.10	.04	.09	.08	-	
10. Years fishing experience	.13	.87	.39	.31	-.27	.28	.33	.31	.27	-

^aRanked in terms of time out: DF=1, ST=2, LT=3.

Table 3
Stepwise Multiple Regression of Independent Variables on D Values

DEPENDENT VARIABLE	VARIABLE ENTERED AND CONTROLLED	PARTIAL* TO ENTER	F RATIO TO ENTER	MULTIPLE R
D-DFST *****	Fishing type ^a	.61	68.31	.607 ^b
D-DFLT	Fishing type ^a	.64	81.79	.641 ^b
D-DFLT	Years formal education	-.36	17.09	.698 ^b
D-DFLT *****	Marital status	-.21	5.53	.715 ^b
D-STLT	Years formal education	-.36	17.12	.357 ^b
D-STLT	Early entry into fishing	.23	6.37	.416 ^b
D-STLT	Marital status	-.18	3.74	.446 ^b

N = 119

^aRanked in terms of time out

^b p < .01

Table 4
Canonical Correlations Between Independent Variables and
Dependent Variables for all Possible Pairs of Fishing Types

<u>FISHING TYPE PAIR</u>	<u>Rc FIRST VARIATE</u>	<u>CHI SQUARE</u>	<u>D.F.</u>	<u>P</u>
DFST	.681	103.35	50	.00001
DFLT	.780	141.53	50	.00000
STLT	.576	93.62	50	.00018

Table 5
Canonical Variable Loadings (1st Canonical Variate)

<u>VARIABLES</u>	<u>FISHING TYPE PAIRS</u>		
	<u>DFST</u>	<u>DFLT</u>	<u>STLT</u>
Income	.30	.40	.18
Independence	.88	.74	.44
Family/Social Life	.78	.66	-.04
Best Future	.45	.57	.55
Personal Satisfaction	.88	.98	.92
Percent of trace	.49	.49	.28
Redundancy of coefficient	.23	.30	.09
Fishing type	.97	.92	.84
Age	.15	.26	.17
Marital status	.10	.09	.14
Number of dependents	.18	.21	.32
Formal education	-.62	-.69	-.69
Father fisherman	.22	.34	.37
Early entry into fishing	-.17	-.05	.02
Number of relatives fishing	.24	.31	.46
Owner/skipper status	-.33	-.20	-.06
Years fishing experience	.06	.24	.29
Percent of Trace	.16	.18	.18

The analysis indicates that there is a statistically significant relationship between the two variable sets for all three fishing type pairs. Since only the first canonical variate extracted from each analysis was statistically significant at better than the .05 level, second and later canonical variates are not presented here.

Table 5 presents the canonical variable loadings on the first canonical variate for occupation pairs manifesting significant canonical correlations between the independent and dependent variable sets. These loadings can be interpreted as correlations with the canonical variate (Levine 1977). For example, among the dependent variable set for DFST, Personal Satisfaction and Independence manifest the highest correlations and Income the lowest with the first canonical variate. In turn, the canonical variates can be viewed as factors of the variable sets. Percent of trace for a given variable set is the sum of the squared elements of a column of canonical variable loadings divided by the number of variables in the set, and is therefore the proportion of a set's variance associated with each canonical variate (cf. Levine 1977). The redundancy coefficient is not symmetrical and can only be interpreted as the amount of variance in the dependent variable set trace accounted for by the independent variable set canonical variate (Levine 1977). Thus, for the occupation pair DFST, 23 percent of the variance in the dependent variable set trace can be accounted for by the independent variable's canonical variate.

For all three fishing type pairs, fishing type loads highest and years formal education second highest in the independent variable set. The positive loading of fishing type indicates that as length of trip increases, the numerical value of perceived distance between the fishing types also increases on the various dimensions. The converse holds true for formal education--as years formal education increases, the numerical value of perceived distance

between the types decreases. Turning to the dependent variable set, we find that for all three pairs Personal Satisfaction loads highest, indicating that it is the dependent variable contributing most to the significant canonical correlations. Family/Social Life loads next highest for DFST and DFLT, followed by Best Future and finally, Income. STLT manifests a different pattern. As noted above, Personal Satisfaction loads highest, but this is followed by best Future, Independence, Income, and Family/Social Life in descending order. The extremely low loading for the Family/Social Life dimension indicates that the independent variables contributing most to the first canonical variate for the STLT analysis (fishing type, formal education, and number of relatives fishing) do not covary with perceived distance between these two fishing types on the Family/Social Life dimension. As examination of the zero-order correlations between the independent variables and the perceived distance between ST and LT on the Family/Social Life dimension, however, indicates that early entry into fishing is significantly related to this distance ($r = 0.23$, $p < .05$).

Overall, the results of the multiple regression and canonical correlation analyses are quite similar. The canonical analysis, however, gives us some indication of the relative weights of the component parts of the composite distance measure.

Discussion and Conclusions

It is clear that there are important differences in the way that the three types of fishing are perceived along five dimensions of contrast. Overall, ST is perceived most favorably. DF and LT show important trade-offs with respect to Income and Best Future versus Personal Enjoyment, Independence, and Family/Social Life, with DF being ranked higher on the latter and lower

on the former. It is also evident that the three types of fishermen differ with respect to their perceptions of DF, ST, and LT along the five dimensions. ST fishermen perceive their type as ranking first on all dimensions. DF fishermen rank their type as highest on all dimensions except Income and Best Future. In contrast, LT rank their occupation first only with respect to Income. Overall, LT fishermen rank ST higher than their own type of fishing. This tendency for some fishermen to prefer shorter trips is best exemplified in the responses to a question concerning preferred fishing type among this same sample (cf. Pollnac and Poggie 1978). The responses to this question can be found in Table 6.

Table 6
Present Fishing Type Cross-Tabulated with Preferred Type
PREFERRED FISHING TYPE

<u>PRESENT FISHING TYPE</u>	<u>DF</u>	<u>ST</u>	<u>LT</u>
Day Fishing	33	05	01
Short Trip Fishing	08	21	01
Long Trip Fishing	03	25	22

N = 119

Table 6 indicates that only 6 percent of the fishermen prefer longer trips in contrast to 30 percent who prefer shorter.

The correlation analysis indicated that fishing type is positively correlated to the D values (perceived distances between the three fishing types), suggesting that the longer the trip, the greater the numerical value of D. Recalling the technique used to calculate this distance figure (cf. above) it will be remembered that a lower value signifies a more positive evaluation of the shorter trip length type; thus our findings indicate that the longer the

individual's trip type, the more favorable he will be toward long trip types. A possible explanation for this finding is that individuals who go to sea for extended periods of time are more adjusted with respect to the effects that length of time at sea can have on the various dimensions of contrast and thus are more favorable in their judgements of the longer trip types.

Years formal education was also found to be a strong correlate of D. However, when the effects of fishing type are controlled, the partial correlation between years of formal education and D-DFST reduces to -0.13 which is not statistically significant at the 0.05 level. Nevertheless, when fishing type is controlled, the partial correlations between years formal education and D-STLT remain statistically significant ($r = -0.36$ and $-.29$ respectively; $p < .01$). This suggests that as years formal education increases, there is a tendency for the numerical value of D-DFLT and D-STLT to become smaller. This indicates that the more educated are evaluating DF and ST more positively along the dimensions of contrast. An examination of the correlations between years of formal education and rankings along each of the five dimensions indicates that those with more formal education tend to rank DF more favorably and LT less favorably with respect to Income ($r = -0.30$ and 0.27 respectively; $p < .01$; remember, rank of 1 is best and 3 is worst; thus the signs of the correlation coefficients are the opposite of what would be expected for this interpretation). With respect to Independence we find the same relationship ($r = -0.41$ and 0.39 respectively; $p < .01$). Turning to Family/Social Life, we find that those with more formal education tend to rank DF highest and ST and LT lowest ($r = -0.38$, 0.24 , and 0.32 respectively; $p < .01$). Finally, with respect to the Best Future and Personal Enjoyment dimensions, we find a pattern similar to that which we found for Independence—those with more education tend to rank DF higher and LT lower (Best Future, -0.27 and 0.36 respectively:

Personal Enjoyment, -0.50 and 0.51 respectively; all significant at better than the .01 level). These relationships suggest that the lifestyle preferred by the more educated can be better realized following a DF pattern. This suggestion is supported by the finding that those with more formal education tend to prefer DF (cf. Pollnac and Poggie 1978).

The multiple regression analysis indicated that after the effects of fishing type and years formal education were controlled, the partial correlation between marital status and D-DFLT and D-STLT increased to a respectable level ($p < .05$). The partial correlations indicate that, with the previously entered variables controlled, married fishermen tend to manifest lower values than single fishermen on D-DFLT and D-STLT. This finding indicates that married fishermen tend to rank LT less favorably than single fishermen. This makes sense if we assume that separation from home is less stressful for single than married fishermen.

Another important correlate of perceived distance between LT and the other fishing types was having a father who was also a fisherman. An examination of the correlations between father fisherman and ranks on the five dimensions provides us with some rather interesting information. Those with a fisherman father tend to rank LT higher on the Family/Social Life dimension ($r = -0.20$; $p < .05$). Additionally, those with a fisherman father tend to rank DF lower and LT higher on the Personal Enjoyment dimension ($r = 0.23$ and -0.27 respectively; $p < .01$). These findings suggest that a fishing family origin may pre-adapt one to the demands of LT fishing, and thus result in ranking it more favorably. This suggestion is born out by an examination of the correlation between number of relatives fishing and evaluation of the three types of fishing along the five dimensions. Here we find that those with more relatives fishing tend to rank DF lower and LT higher along both the Independence

and Personal Enjoyment dimensions (Independence, $r = 0.22$ and -0.27 respectively; Personal Enjoyment, $r = 0.21$ and -0.24 respectively; $p < .05$).

Finally, early entry into fishing and years fishing experience are both positively related to D-STLT suggesting that the longer one has been fishing and the earlier one entered the occupation, the more positive the evaluation of LT. This suggests that experience and early socialization into the occupation results in a more positive evaluation of LT.

In sum, we have seen that a number of factors influence fishermen's perceptions of different types of fishing along five salient dimensions of contrast. Perhaps the most important determinant of variance in perceptions is present fishing type, suggesting that changes in the structure of the fishery which necessitate changing from one type to another would result in dissatisfaction along the dimensions analysed. There were, however, differences in evaluation across fishing types which can best be described as a tendency to be more favorable towards spending less time at sea. This preference conflicts with the projected tendency for the fishery to shift more and more to longer trip fishing. It therefore seems probable that a shift towards longer trips will be accompanied by some sort of social and/or psychological dislocation among the present fishermen. One can only speculate concerning the types of friction that would develop if outsiders were brought in to man the new long trip vessels. It is quite likely that they would be perceived in the same manner as the domestic fisherman perceives the foreign fisherman--a perception that stimulated his backing of the "200-mile limit" in the first place.

Notes

1. A description of this sample can be found in Poggie, Pollnac, and Gersuny (1976) and Pollnac, Gersuny, and Poggie (1975).
2. Ties were handled in the manner conventional in statistics (cf. Siegal 1956).

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FACTORS INFLUENCING PREFERRED FISHING TYPE AMONG
FISHERMEN IN SOUTHERN NEW ENGLAND

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Introduction

In a recent paper Pollnac and Poggie (1978) examined fishermen's attitudes towards three contrasting styles of fishing (Day Fishing, DF; Short Trip Fishing [2 to 3 days], ST; and Long Trip Fishing [4 or more days], LT) in an attempt to determine possible sociocultural effects of a major shift in fishing strategy. Their findings indicate that a number of sociocultural variables (e.g., number of relatives fishing, education, years fishing experience, age, owner/skipper status) as well as present fishing type affect perceptions of the different fishing types along five salient dimensions of contrast. The purpose of this paper is to build on this previous research by determining the factors related to preferred fishing type and then relating these findings to actual behavior.

An examination of preferred fishing type will provide us with several important pieces of information concerning fishermen and the changing fishing industry in New England. First, a knowledge of preferred fishing types will supply information which will indicate the direction of change in the industry which will meet with either the most or the least resistance. Second, attributes perceived as being associated with preferred fishing type may identify aspects of the fishery that could be changed resulting in greater overall satisfaction among fishermen. Finally, differential weighting of attributes associated with preferred type and their relationship to real behavior (actual type) will provide us with important information concerning the tradeoffs that occur when the ideal (preferred type) is influenced by the actual situation resulting in a behavior (actual fishing type).

Several factors have been found to influence fishermen's perception of different types of fishing; and, hence, might be expected to also influence

preferred fishing type. Pollnac and Poggie (1978) report that perceptions of the type of fishing one is presently involved in are more positive than perceptions of the same occupation by noninvolved fishermen. They argue that several factors contribute to this apparent shift in perceptions: first, fishermen participating in a given type of fishing have had time to be selected out or to psychoculturally adapt to the demands of the occupation; and second, the shift in a positive direction can probably be attributed, at least in part, to an attempt to reduce cognitive dissonance (cf. Festinger 1957). When one finds oneself in a position originally perceived as having negative attributes, one often reduces the dissonance created by searching out positive aspects.

Another factor found to be related to perception of fishing types is number of years fishing experience. The longer one has been fishing, and the earlier one began fishing, the more likely one is to place differential salience on the various dimensions which serve to distinguish the fishing types. Age, for similar reasons, was also found to influence job perceptions. It was also reported that number of relatives fishing influences perception of fishing types. It is suggested that fishermen coming from a fishing family have differential exposure to fisherman role models--a factor which might be responsible for variance in perception of fishing types. Additionally, specific job on board a vessel was also found to have some relationship to the way one viewed one's job--a skipper who also owns the vessel probably has a different perception of his occupation than a crewman. Finally, formal education, a variable which theoretically influences one's world view, was also found to influence one's perceptions of various alternative occupations. In addition to the variables that Pollnac and Poggie (1978) found to be related to perception of fishing types, we also expect that marital status and

number of dependents might influence preferred fishing type. For example, a married man with many dependents may place a greater emphasis on income than a single man. He may also perceive time spent at sea in a different manner. In the remainder of this paper we will examine the influence that these various variables have on preferred fishing type.

Research Population and Sample

Data for this report were gathered from fishermen who use the facilities at Point Judith, Rhode Island and New Bedford, Massachusetts. Point Judith fishermen are primarily DF and ST fishermen. Those at New Bedford and primarily LT. A sample of forty fishermen were interviewed at New Bedford and 79 at Point Judith. More detailed information concerning these ports and the samples can be found in Jessen (1978), Pollnac and Poggie (1978), Poggie and Pollnac (1978), and Poggie and Gersuny (1974).

Tests

The dependent variable, preferred fishing type, was determined by asking each respondent which of the three fishing types he liked most: DF, ST, or LT. Among the independent variables, the different fishing types were evaluated with respect to characteristics of demonstrable salience.

Characteristics for comparison were derived from interviews with 108 Southern New England fishermen¹ who were requested to tell what they liked and disliked about the occupation of fishing. Responses manifesting the four highest frequencies of occurrence (income, independence, family and social life, and personal enjoyment) were judged to be the most salient characteristics for occupational comparisons. A fifth characteristic "best future" was

added because of its applicability to our research goals. Each of these five characteristics was treated as a dimension along which each fisherman was requested to rank each of three alternate types of fishing (DF, ST, and LT) and the alternative occupation (AO) perceived by the fisherman as being the most likely if he could no longer fish.

Independent variables such as fishing type, age, marital status, number of dependents, years formal education, and years fishing experience were derived from responses to direct questions. Fishing family origin was measured with the use of two variables: (1) number of ego's relatives who are fishermen, and (2) whether or not ego's father was a fishermen. Early entry into fishing was measured as a dichotomous variable. Fishermen were asked how old they were when they began to fish, and those who began fishing before they were 20 were coded as early entrants. Finally, for this paper, job on board was also treated as a dichotomous variable. Fishermen who were both skipper and boat owner were coded as owner/skipper. All others were treated as non-owner/non-skipper.

Analysis

Preferred fishing type was cross-tabulated with present type, and the results of this analysis can be found in Table 1.

Table 1
Present Fishing Type Cross-Tabulated With Preferred Type

<u>PRESENT FISHING TYPE</u>	<u>PREFERRED FISHING TYPE</u>		
	<u>DF</u>	<u>ST</u>	<u>LT</u>
Day Fishing	33	05	01
Short Trip Fishing	08	21	01
Long Trip Fishing	03	25	22

N = 119

It is clear in Table 1 that the majority of DF and ST prefer their present fishing type. Over 50 percent of the LT, however, prefer to be other than LT, with most of them preferring ST.

An analysis of variance across subgroups based on fishing type preference on other sociocultural background variables (e.g., age, education, kinship variables, etc.) was conducted to determine their relationship to preferred fishing type. The results of this analysis can be found in Table 2.

Table 2
Analysis of Variance of Background Variables Across Subgroups
Based on Preferred Fishing Type

<u>VARIABLE</u>	<u>PREFERRED FISHING TYPE</u>					
	<u>DF</u>	<u>ST</u>	<u>LT</u>	<u>F RATIO</u>	<u>D.F.</u>	<u>P</u>
Age	32.0	34.4	37.3	1.87	2 116	>.05
Marital Status	.75	.80	.79	0.77	2 116	>.05
Number of Dependents	2.8	3.0	3.3	0.99	2 116	>.05
Years Formal Education	12.0	10.0	7.9	12.49	2 116	<.001
Father Fisherman	.46	.45	.63	1.13	2 116	>.05
Early Entry into Fishing	.80	.57	.83	4.30	2 116	<.05
Number of Relatives Fishing	2.5	3.0	3.6	0.92	2 116	>.05
Owner/Skipper Status	.43	.20	.25	3.41	2 116	>.05
Years Fishing Experience	12.8	12.5	17.7	1.96	2 116	>.05

Table 2 indicates that only two of the background variables are related to preferred fishing type at better than the 0.05 level of statistical significance--years of formal education and early entry into fishing.

Turning next to the relationship between attributes of the different fishing types and job preference, the graphs in Figure 1 illustrate how subgroups based on preferred fishing type rank the different types of fishing

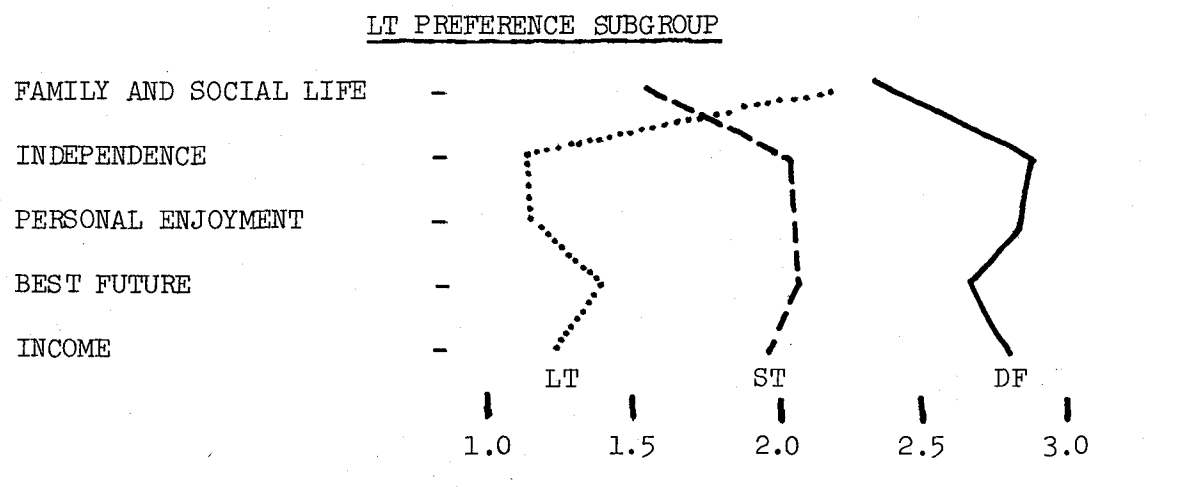
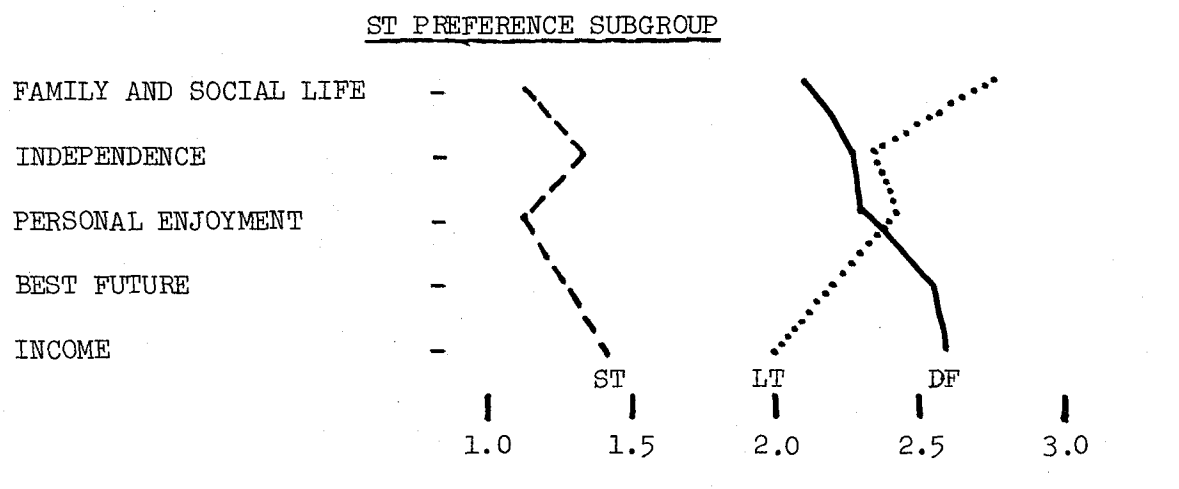
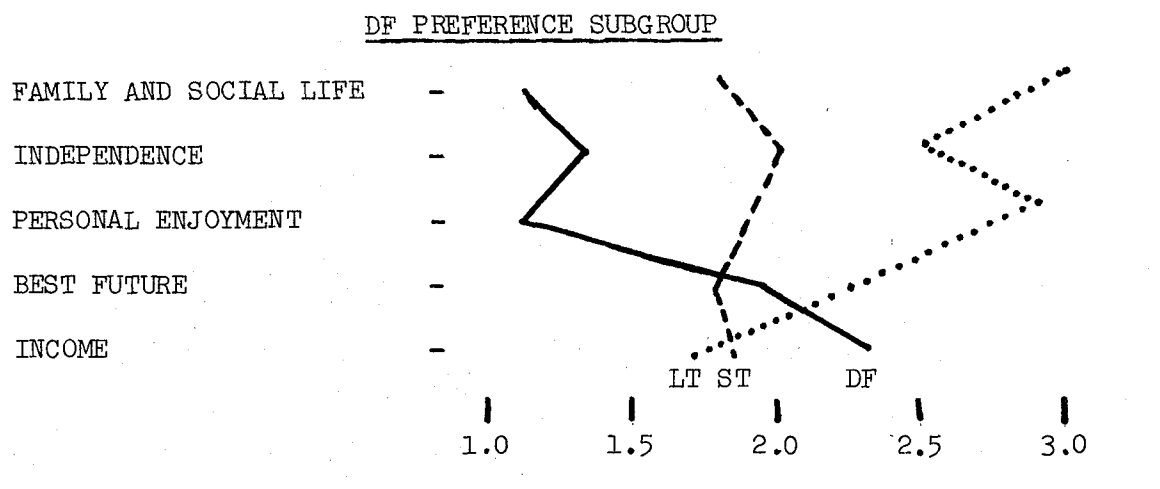


Figure 1
Mean Rank of Fishing Types on Five Dimensions for
Preferred Fishing Type Subgroups

on each of the five dimensions of contrast. Figure 1 shows that, on the average, the subgroup that prefers ST ranks ST first on all five dimensions. Fishermen that prefer LT rank LT first on all dimensions except family and social life, and finally, those that prefer DF rank DF first on all dimensions except "best future" where DF is ranked second and "income" where it is ranked lowest. The graphs in Figure 1 clearly indicate that rankings on the five attributes are related to preferred fishing type. Nevertheless, the graphs represent mean rankings and tell us little about the relative importance each dimension has in influencing fishing type preferences.

As a means of determining the relative importance of each of the five dimensions with respect to selection of preferred fishing type, ranks on each dimension for a given fishing type were correlated with the selection of that fishing type as the preferred type. The results of this analysis can be found in Table 3.

Table 3

Correlations Between Dimension Ranks and Preferred Fishing Type

<u>DIMENSION</u>	<u>PREFERRED TYPE</u>					
	<u>DF</u>		<u>ST</u>		<u>LT</u>	
	<u>r</u>	<u>G</u>	<u>r</u>	<u>G</u>	<u>r</u>	<u>G</u>
INCOME	-.27	-.46	-.37	-.63	-.32	-.65
INDEPENDENCE	-.62	-.85	-.64	-.93	-.66	-.96
FAMILY AND SOCIAL LIFE	-.63	-.93	-.58	-.88	-.50	-.80
BEST FUTURE	-.38	-.59	-.49	-.80	-.41	-.72
PERSONAL ENJOYMENT	-.77	-.97	-.74	-.96	-.74	-.95

N = 119

r = Pearson Product-Moment Correlation

G = Goodman and Kruskal's Gamma

All of the correlation coefficients in Table 3 are statistically significant at better than the 0.01 level.² Operating under the assumption that the ordinal ranks can be treated as interval in this analysis, Pearson product-moment correlation coefficients were calculated. This approach has been suggested by Labovitz (1970), but since it has had both opposition and support in the literature (cf. Mayer 1970, 1971; Schweitzer and Schweitzer 1971; Labovitz 1971; Mayer and Robinson 1977), Goodman and Kruskal's gamma is also presented for those who prefer to use strictly nonparametric statistics with ordinal data.

The negative correlations in Table 3 indicate that the higher a specific fishing type is ranked on a given dimension (higher ranks have lower numbers, e.g., the highest rank is 1, next highest 2, etc.), the more likely it will be the preferred type. Examination of Table 3 indicates a very interesting pattern—overall, personal enjoyment has the highest correlations with preferred type. Independence has the next highest correlations, followed by family and social life, best future, and income in descending order. The only deviation from this ordering is that for DF where family and social life manifests a higher correlation than independence.

One of the goals of the study is to compare the relative importance of the five dimensions with respect to predicting both real and ideal behavior (actual and preferred fishing types, respectively); therefore, the ranks on each dimension for a given fishing type are also correlated with type of fishing the respondent is presently involved in. The results of this analysis can be found in Table 4.

Table 4

Correlations Between Dimension Ranks and Actual Fishing Type

<u>DIMENSION</u>	<u>ACTUAL TYPE</u>					
	<u>DF</u>		<u>ST</u>		<u>LT</u>	
	<u>r</u>	<u>G</u>	<u>r</u>	<u>G</u>	<u>r</u>	<u>G</u>
INCOME	-.16	-.32	-.29	-.59	-.29	-.45
INDEPENDENCE	-.48	-.74	-.16	-.34	-.43	-.65
FAMILY AND SOCIAL LIFE	-.49	-.82	-.20	-.44	-.40	-.76
BEST FUTURE	-.33	-.55	-.16	-.33	-.37	-.58
PERSONAL ENJOYMENT	-.59	-.86	-.23	-.47	-.68	-.92

N = 119 r = Pearson Product-Moment Correlation

G = Goodman and Kruskal's Gamma

It is clear that there are a number of differences between Tables 3 and 4. First, in Table 3, all correlations are statistically significant at better than the 0.01 level. In Table 4, the relationships between income rank and DF, independence, best future and ST are not statistically significant at the 0.05 level for either r or G. For both r and G the correlations between the personal enjoyment and the family/social life dimensions and ST are statistically significant at only the 0.05 level, while the rest of the correlations are significant at better than the 0.01 level. The patterning of the correlations is also different. For DF the relative magnitudes of both r and G are the same as in Table 3. For LT the relative magnitudes of the r's are the same, but the G for independence is lower than the family/social life dimension. ST manifests the greatest overall difference in the patterns of the correlations. The relationships between ST (actual type) and the five dimensions are all relatively weak (two are not statistically significant and

two are at only the 0.05 level) with income manifesting the highest correlation. It is important to note, however, that the correlation (r) of the income dimension is not statistically different from either the independence or personal enjoyment dimensions ($t = 0.89$ and 0.61 , respectively, $p > 0.05$).

Turning next to the overall relationship between the five dimensions of contrast and preferred and actual fishing type, step-wise multiple regression was used to determine the combined effects of ideal (preferred) and actual behavior. In this procedure, all five dimensions are intercorrelated with the dependent variable (either actual or preferred type), and the dimension which explains the most variance in the dependent variable is entered into the equation first. The next variable entered is the one which explains the most variance with the first controlled. This procedure is continued until all variables are entered or until a set criterion is reached. In this analysis, entry into the regression equation is restricted to variables whose F-ratio-to-enter is at least 3.0. Table 5 shows the interrelationships between the rankings on each dimension for each fishing type. Table 6 provides the results of the multiple regression analysis.

Multiple regressions for actual ST and LT were not entered in Table 6 because the patterning and magnitudes of the associations between the independent and dependent variables were such that after the independent variables manifesting the highest correlations with these two dependent variables were controlled, the partial correlations of the other independent variables were reduced to close to zero. The multiple regressions in the table, however, indicate that three dimensions each explain 66 percent of the variance in preference of DF, 69 percent for preference of ST, 62 percent for LT preference, and 40 percent for actual participation in DF. The personal enjoyment, family/social life, and independence dimensions are clearly important in

Table 5
Correlations Between Rankings on Each Dimension for
Each Fishing Type

	<u>DAY FISHING</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. Income	-			
2. Independence	.35	-		
3. Family/Social Life	.28	.46	-	
4. Best Future	.28	.33	.42	-
5. Personal Enjoyment	.46	.74	.58	.46

	<u>SHORT TRIP FISHING</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. Income	-			
2. Independence	.27	-		
3. Family/Social Life	.27	.49	-	
4. Best Future	.29	.36	.30	-
5. Personal Enjoyment	.30	.53	.41	.51

	<u>LONG TRIP FISHING</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. Income	-			
2. Independence	.29	-		
3. Family/Social Life	.27	.41	-	
4. Best Future	.40	.33	.36	-
5. Personal Enjoyment	.38	.63	.47	.53

N = 119

Table 6
Stepwise Multiple Regression of Dimensions of
Contrast on Preferred and Actual Fishing Type

<u>DEPENDENT VARIABLE</u>	<u>VARIABLE ENTERED AND CONTROLLED</u>	<u>PARTIAL* TO ENTER</u>	<u>F-RATIO TO ENTER</u>	<u>MULTIPLE R</u>
Prefer DF	Personal Enjoyment	-.77	173.48	.77
" "	Family/Social Life	-.35	15.87	.80
" "	Income	.17	3.46	.81

Prefer ST	Personal Enjoyment	-.74	141.37	.74
" "	Family/Social Life	-.46	30.50	.80
" "	Independence	-.33	14.23	.83

Prefer LT	Personal Enjoyment	-.74	143.24	.74
" "	Independence	-.37	18.78	.78
" "	Family/Social Life	-.20	4.92	.79

Actual DF	Personal Enjoyment	-.59	61.94	.59
" "	Family/Social Life	-.23	6.38	.62
" "	Income	.16	3.01	.63

N = 119 * Zero-order correlations for first variable entered to indicate
direction of relationship.

predicting job preference. Further, it is interesting to note that after the effects of family/social life and personal enjoyment are controlled, income is inversely related to both preference for and participation in DF (remember that the rankings are in inverse order--one is highest, etc.; thus, a negative correlation indicates that a high ranking is associated with a preference. A positive correlation indicates that a low ranking is associated with a preference). This relationship makes sense since even day fishermen do not rank themselves highest with respect to income. Nevertheless, the correlation must be interpreted carefully since the partial is not statistically significant ($p < .05$). It is clear, however, that rankings on the dimensions explain more of the variance in ideal behavior (preferred type) than in real behavior (actual type).

Turning next to factors influencing preference of a fishing type other than the one presently involved in, Table 1 (above) indicates that while the majority of DF and ST prefer their present fishing type, over 50 percent of LT prefer another type--most of them preferring ST. It would therefore be interesting to determine the relationship between rankings on the various dimensions for ST and preferences for ST among LT fishermen. At the same time we will examine the relationship between the dimensions and preference for LT among LT fishermen. We focus on LT fishermen because only an insignificant minority of other types of fishermen prefer other than their present type. The results of these analyses can be found in Table 7.

Once again, the test of statistical significance for Gamma was a t-value equivalent to the ratio of Gamma to its asymptotic standard error (s_o) with approximate degrees of freedom equal to $0.4N$ (cf. Brown and Benedetti 1977). The analysis in Table 7 indicates that there are very strong relationships between rankings on the five dimensions and preference for ST among LT fish-

ermen. The strongest predictors are personal enjoyment, best future, and independence. The dimensions are also strongly related to preference for LT but are not quite so strong.

Table 7
Correlations (Goodman and Kruskal's Gamma) Between the Five Dimensions
of Contrast and Preference for ST and LT Among LT Fishermen

<u>DIMENSION</u>	<u>PREFERRED FISHING TYPE</u>	
	<u>ST</u>	<u>LT</u>
Income	-.82**	-.59*
Independence	-.95**	-.95**
Family/Social Life	-.74**	-.57*
Best Future	-.98**	-.80**
Personal Enjoyment	-1.0**	-.93**

N = 50

* = $p < .05$

** = $p < .01$

Discussion and Conclusions

Turning first to the relationship between the various sociocultural background variables and preferred fishing type, we find that of the nine variables considered, only two (early entry into fishing and years of formal education) are significantly related to preferred fishing type. With regard to early entry, we find that a smaller percentage of those who began fishing before they were 20 preferred ST than either DF or LT. We have no explanation for this finding. Turning to years of formal education, it appears that as trip length of preferred type increases (going from DF to LT), mean years of formal education decreases. This suggests that those with more formal education are less likely to prefer longer trips. A possible explanation for this finding is that many (52 percent) of the LT fishermen are

immigrants who have fewer years of formal education than the non-immigrant fishermen. Half of these immigrants (13) prefer LT as opposed to only 9 non-immigrant LT fishermen (out of 24). Most of the other immigrant LT fishermen prefer ST which may have contributed to its low mean for formal education in Table 2.

With respect to the five salient dimensions on which we had fishermen rank the three types of fishing, only a preference for ST is related to rankings which are, on the average, highest for all five dimensions. DF and LT clearly indicate tradeoffs with respect to various dimensions. Preference for DF indicates a tradeoff between family/social life, independence, and personal enjoyment, which are ranked highest, and best future and income. Rankings on the dimensions for LT suggest a tradeoff between family/social life and the other four dimensions. Further, the correlation analysis indicated that in no case did income rank high as a predictor of either actual or preferred type. The only case where it ranked highest (predicting ST actual type), it was relatively weak and not significantly different from the other correlations. The personal enjoyment, family/social life, and independence dimensions seemed to be the strongest predictors of both actual and preferred fishing type. These findings suggest that in cases where the income of alternative occupational opportunities is different, but sufficiently high, factors other than income will be used in making occupational choices among commercial fishermen. Finally, the dimensions were more strongly related to ideal behavior (preferred type) than real behavior (actual type), suggesting the obvious interpretation that real world contingencies often have an affect on one's behavior. Nevertheless, a tendency to prefer shorter trips was clearly indicated by the data.

In sum, our data suggest that it will take more than money to lure the New England commercial fisherman into a style of fishing which demands longer time at sea. A fishery built on that assumption will surely suffer from high turnover and dissatisfied participants until the sociocultural system adapts to the requirements of extended long trip fishing. The period of adaptation will doubtless be stressful and will probably only be endured out of necessity. It is up to the policy makers in the New England fishery to determine, in light of the best available biological, economic, and social data, if the benefits of such changes outweigh the disadvantages.

Notes

1. A description of this sample can be found in Poggie, Pollnac, and Gersuny (1976) and Pollnac, Gersuny, and Poggie (1975).
2. The statistical test of significance used with Gamma was a t-value equivalent to the ratio of Gamma to its asymptotic standard error (s_g) with the approximate degrees of freedom equal to $0.4N$ (cf. Brown and Benedetti 1977)

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SOCIAL DESIRABILITY OF WORK AND MANAGEMENT AMONG FISHERMEN
IN TWO NEW ENGLAND PORTS

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Introduction

The Fisheries Conservation and Management Act of 1976 (PL94-265) is a modern piece of legislation in that it calls for the conservation and management of United States fisheries taking not only biological but also economic and social factors into account. Much biological and some economic information exists, but little social information and theory exists on United States fishermen. Furthermore, it has been difficult for decision makers (the Regional Councils and consulting firms working for them) to develop the modes of planning that simultaneously utilize the biological, economic and social information. In reality, the first plans that have been put into effect in this country rely heavily on biological considerations with only minimal economic and virtually no real social considerations built into them (cf. Smith 1978 and Miller and Van Maanen 1978). Thus, the modern nature of the legislation for fisheries management in the U.S. has no reflection in the actual process by which management and conservation are being carried out.

The purpose of this paper is to help bridge the gap in sociocultural information and knowledge in one American fishery by examining the benefits that fishermen in New Bedford, Massachusetts and Point Judith, Rhode Island feel they derive from their work and to analyze how these benefits are related to other sociocultural characteristics of fishermen in these two ports. For example, a fisherman's age, family and kinship involvement in fishing, education, experience in the job, along with the type of fishing he is doing, his ethnicity, his particular job on board and whether ego is doing the type of fishing he prefers, are all potentially related to his pattern of satisfaction and dissatisfaction.

It is felt that with a fuller understanding of the pattern of benefits fishermen feel they get from their work, decision makers will be in a better

position to assess the relative social costs and benefits of various management options being considered. This work is exploratory in nature because there is not a large body of theory that can be employed in deductive models of the social aspects of fishing.

Research Populations and Samples

Data for this report were gathered with the use of an interview schedule from fishermen who use the facilities at Point Judith, Rhode Island and New Bedford, Massachusetts. Of the approximately 110 commercial fishing vessels that tie up in the Point Judith harbor area, 26 are predominantly day dragger boats with two to seven crew members depending on whether they fish for bulk stock such as whiting, which require more labor to handle, or a less labor intensive stock. Ten vessels are two to three day draggers (short trip) with four to five crew members; ten are four to seven day draggers (long trip) with five or six crew members; 39 are inshore day lobster boats with one or two crew members; 16 are two to three day (short trip) offshore lobster boats with four to five crew members; and eight are day clam dredge boats which go three to five handed. Further description of this population can be found in Poggie and Gersuny (1974).

The Point Judith sample drawn for this study was designed to deal with the diversity of types of fishing and was stratified according to fishing type: day fishing, short trip, and long trip. All boats were listed according to type of fishing, and a random sample of boats was drawn which resulted in type proportion approximating those in the population. Except for a few cases, all crew members on each of the boats were interviewed. The rejection rate was extremely low (2 out of 32 boats approached). The total Point Judith sample consisted of 30 boats and 79 individuals.

Although there are a variety of inshore lobster boats and draggers in New Bedford, the port is predominantly an offshore large-boat dragger and scalloper port. Of the approximately 164 fishing boats in New Bedford, 144 or 88 percent are 60 gross tons and over, and approximately 109 of these fish regularly offshore. Thus like Gloucester and Boston, New Bedford is a large vessel port. It has been argued that it is the predominance of the large boat offshore fishery that sets the lifestyle of fishermen in New Bedford (Jessen 1978). This, along with the high degree of ethnicity (particularly the large proportion of first-generation Portuguese fishermen), give this port a sociocultural character quite different from Point Judith which is predominantly an inshore-nearshore non-ethnic port (cf. Poggie and Gersuny 1974).

The New Bedford sample was designed to be representative of the large boat offshore fleet. All vessels were listed and a random sample was drawn from the list. An attempt was made to interview all crew members on each boat selected; but, because of difficulty of access to trip fishermen, this was not possible in all cases. Interviews with individuals whose first language was Portuguese were conducted in Portuguese by a bilingual research assistant. The total New Bedford sample consisted of 17 boats and 42 interviews.

The Measure of Job Satisfaction and Independent Variables

The instrument used to measure job satisfaction was adapted from a scale developed by V. Schletzer (1965). Schletzer's 62 item scale was designed to index general job satisfaction by tapping a number of job components, not all of which are applicable to each person's job. Inapplicable items were meant to be disregarded. Our modification involved discarding inapplicable and redundant items as well as adding four items that are unique to the job of

being a fisherman. These items were doing deck work, being out on the water, time it takes to get to the fishing grounds, and performance of state and federal officials. Our final instrument was shortened to a total of 26 items for the sake of reducing administration time. The items included are as follows:

1. Your earnings; 2. Time for recreation and/or family activities;
3. Community in which you live; 4. Doing deck work on vessel; 5. Opportunity to be your own boss; 6. Co-workers; 7. Performance of state and federal officials; 8. Challenge of job; 9. Physical fatigue of job; 10. Mental pressure on job; 11. Hours spent working; 12. Time away from home; 13. Time it takes to get to fishing grounds; 14. Ability to come and go as you please;
15. Living conditions on board; 16. Working outdoors; 17. Being out on the water; 18. Job safety; 19. Peace of mind; 20. Adventure; 21. Healthfulness;
22. Cleanliness; 23. Crowding, confinement; 24. Predictability of earnings; 25. Trip length; 26. Feeling you are doing something worthwhile.

Each respondent was asked to indicate if he were very dissatisfied, moderately dissatisfied, neutral, moderately satisfied or very satisfied with each of these aspects of his work. Responses were coded from one to five respectively.

The "independent variables" in this study such as age, fishing type, owner or skipper status, marital status, number of dependents, formal education, and years of fishing experience, were derived from direct questions in the interview schedule. The involvement of ego's family in fishing was measured by two variables: number of relatives who are fishermen, and whether or not ego's father was a fisherman. Early entry into fishing was measured as a dichotomous variable. Those that entered before 20 were coded as early entrants; those who entered at 20 or older were coded late. Ethnicity

was also measured dichotomously by dividing the sample into individuals who were born inside or outside the United States. This variable is applicable only to the New Bedford sample. Job on board was coded as a dichotomous variable as either owner/skipper or non-owner/non-skipper. Satisfaction with present fishing type was determined by comparing present fishing type with the type ego stated he preferred. Individuals preferring a type other than the one they were in were coded as one, all others were coded as zero. Direction of change was coded as either zero for less time or 1 as the same amount or same time. Finally ego's commitment to fishing was determined by asking respondents if they would advise a young man to go into fishing and if they themselves would go into fishing if they had their lives to live over.

The Analysis

It was expected that the 26 items in our job satisfaction instrument would fall into distinct clusters around certain main concerns, and that these clusters would be different for the two ports. For example, because New Bedford fishermen spend considerable time at sea, we might hypothesize that they would be interested in (satisfied or dissatisfied) with conditions that relate to long trip fishing. We would anticipate that there would be certain other areas of work that are important in both ports. An example of this would be earnings.

Since our work is exploratory, we are not hypothesizing specific domains of satisfaction but are following an inductive approach to discovering these factors through empirical analysis. The analytic tool which we employ to derive these hypothesized domains is factor analysis. Factor analysis allows us to determine what constellations of items in our instrument are associated with each other in multidimensional space and allows us to determine the

relative strength of each item's association with the constellation or factor (Rumner, 1970). Once the factors have been derived, it is possible to utilize the factor as a variable by means of individuals' factor scores on each of the factors.

The BMD 08m program with varimax orthogonal rotation was used to determine the factors (cf. Dixon 1974). Tables 1 and 2 show the factor patterns for Point Judith and New Bedford respectively. Only factors with eigenvalues of one or more are included in this analysis. There are four definable factors for Pt. Judith and six for New Bedford. By examining the variables which load most highly on each factor, it is possible to name the factors. In Point Judith (Table 1), factor I is a time factor. Time away from home, hours, time it takes to get to fishing grounds, load most highly. Factor II concerns outdoor adventure, with working outdoors, being out on the water, and adventure loading most highly. Factor III is an earnings factor. Earnings, co-workers, and predictability of earnings load most strongly. The fact that co-workers loads on this factor is understandable because the quality of co-workers is directly related to earnings and would appear to be cognitively associated. The more satisfied or dissatisfied one is with one's co-workers the more satisfied or dissatisfied one is with one's earnings. Factor IV is clearly an independence factor, with ability to come and go as one pleases and opportunity to be one's own boss defining it.

Turning to the New Bedford factors (Table 2), we note that there are counterparts to all four of the Point Judith factors: time, independence, earnings, and outdoor adventure. However, the content of these factors in New Bedford is somewhat different. The time dimension includes the same variables as Pt. Judith, except that crowding, cleanliness, and conditions on board have pulled out to form a separate "working conditions" factor in New Bedford.

Table 1
Factor Analysis of Job Satisfaction Items at Point Judith

<u>Variables</u>	<u>Factors</u>			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
Time away from home	.85	.04	.10	-.10
Hours	.61	.00	.09	.08
Time to fishing grounds	.50	.02	.02	.10
Peace of mind	.53	-.29	.09	-.25
Crowding	.50	-.17	.06	-.10
Time for recreational/family activities	.49	.21	.05	-.15
Trip length	.45	-.26	.22	-.07
Cleanliness of work	.38	-.35	.26	.22
Healthfulness of work	.42	-.42	.15	.08
Safety	.35	-.16	-.07	.01
Deck work	.34	-.03	.10	-.16
Condition on board	.28	-.18	.15	.21
Working outdoors	.01	-.80	.00	.06
Being out on the water	-.06	-.77	-.12	-.14
Adventure	.14	-.55	-.07	-.17
Feel doing something worthwhile	.07	-.48	.30	.08
Challenge of job	-.16	-.45	.32	-.22
Earnings	.11	.10	.68	.00
Co-workers	-.10	.08	.64	-.20
Predictability of earnings	.29	-.13	.54	.12
Physical fatigue of job	.20	-.16	.45	.31
Mental pressure of job	.28	-.15	.49	.02
Community in which you live	.16	-.09	.18	-.12
Performance of state/federal officials	.12	-.16	.23	-.68
Can come and go as please	.34	-.16	.23	-.68
Opportunity to be own boss	.04	.02	-.05	-.65

I=Time II=Outdoors III=Earnings IV=Independence

Table 2
Factor Analysis of Job Satisfaction Items at New Bedford

<u>Variables</u>	<u>Factors</u>					
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
Time away from home	-.83	.00	.16	.14	.08	.09
Trip length	-.78	.04	-.05	-.12	-.13	.15
Hours	-.74	.20	.06	.00	-.13	-.07
Time for recreational/family activity	-.68	.15	.15	-.14	-.17	.09
Time to fishing grounds	-.63	-.28	.10	-.02	.03	.00
Deck work	-.54	.18	.35	.14	.16	.34
Opportunity to be own boss	-.05	.84	-.07	.16	.00	-.02
Challenge of job	-.12	.58	.37	-.10	.37	.36
Crowding	.03	-.21	-.93	.03	-.07	.00
Cleanliness of work	.21	-.06	-.83	.07	-.23	-.02
Conditions on board	.18	.16	-.63	-.01	.03	.03
Earnings	.11	.24	-.15	.77	-.09	-.06
Can come and go as please	-.36	.39	.12	-.70	-.17	.02
Safety	-.31	.00	-.11	.60	-.18	-.01
Co-workers	.05	.07	.27	.57	.04	.07
Mental pressure of job	-.08	.04	.24	.00	.63	.16
Performance of state/federal officials	-.08	.04	.20	.00	.63	.16
Physical fatigue of job	.01	.09	.10	-.02	-.71	.08
Predictability of earnings	-.16	-.01	-.12	.06	-.52	.07
Community in which you live	.14	.42	.21	.03	-.44	-.06
Being out on the water	-.01	.21	-.35	.11	.18	.77
Feel doing something worthwhile	-.45	-.23	.21	-.16	-.03	.63
Adventure	.12	.36	.26	-.32	.25	.59
Working outdoors	-.31	.15	.27	.09	.00	.53
Peace of mind	.04	-.08	-.25	-.21	.08	.41
Healthfulness of work	-.06	-.10	.02	.10	-.17	.39

I=Time II=Independence III=Conditions IV=Earnings V=Mental VI=On Water

This new factor is clearly related to the greater salience of working conditions on trip boats which predominate in this port. Also mental pressure, predictability of earnings, officials, and fatigue form an independent "mental" factor in New Bedford. This, too, appears to be related to trip fishing where mental pressure and fatigue are more salient due to the length of time spent away from home in the close quarters of a fishing vessel. The opposed loadings of mental pressure and fatigue on the one hand and performance of state and federal officials on the other would appear to be related to the fact that people who are satisfied with the mental pressure and fatigue are dissatisfied with the performance of state and federal officials, while those dissatisfied with these aspects of their work tend to be satisfied with the performance of officials.

Since the factors in this analysis can be either the result of satisfaction or dissatisfaction, it is possible to determine the directionality of each of these by considering the mean score for each of the items that define the factors while taking into account the direction of the factor loadings. For Point Judith, all of the means of items that define factors are above the midpoint of the scale, indicating that all of the factors are predominantly "Satisfaction" factors. Only one item "performance of state and federal officials" had a mean below the midpoint, indicating an overall dissatisfaction with this performance.

For New Bedford the situation is different; 7 of the 26 variables had means below the midpoint of the scale. All of the variables in the time factor in New Bedford have means below the midpoint of the scale, indicating that individuals are predominantly dissatisfied with this aspect of their work. They are also more dissatisfied than satisfied with adventure (in Factor VI) and, like the Point Judith fishermen, more dissatisfied than satisfied with

the performance of state and federal officials (in Factor V). Thus, the overall dissatisfaction with time and adventure distinguish New Bedford from Point Judith fishermen.

In order to determine the relationships between the sociocultural variables of interest and satisfaction or dissatisfaction on each of these factors within each of the ports, we turn now to a consideration of the relationships between individuals' factor scores and the independent variables. The correlations between the independent variables for each port are shown in Tables 3 and 4. Zero order correlations between independent variables and the factors in each port are shown in Tables 5 and 6. Stepwise multiple correlations between the independent and dependent variables are presented in Tables 7 and 8. For ease of reading correlations, all factors are presented as positive factors.

As seen in Table 5, each of the four factors for Point Judith has at least one independent variable correlated with it at a statistically significant level. The time satisfaction factor is positively related to fishing type, not wishing to change the amount of time fished, number of relatives who fish, whether a person would still go into fishing, and advise a young man to fish. It is negatively related to desire to change type of fishing. The outdoor factor is positively related to both early entry and advising a young man to fish. Earnings is related positively to father fisherman, not wishing to change amount of time fished, and negatively with desire to change type. Independence is positively related to being an owner or skipper.

In New Bedford (Table 6) all but factor V (mental) have several independent variables significantly correlated with them. Advising a young man to fish, still go into fishing, early entry, age and years experience are all positively related to time. Formal education, owner/skipper status are pos-

itively related to independence, while being foreign born and father fisherman are negatively related. With conditions, marital status, father fisherman, number of relatives who fish and years fishing experience are all positively related. Being foreign born and number of relatives who fish are positively related to earnings, while formal education is negatively related. Mental stress has no significant correlates among the independent variables used here. Being satisfied with the on water factor is positively correlated with still wishing to go into fishing, age, and negatively with father fisherman.

Step-wise multiple regression was used to determine the relative importance and combined effects of the independent variables. In this analysis the variable entered first is the variable that explains the most variance. The second entered is the one that explains the most with the first controlled. This procedure continues until all variables are entered or the process reaches some previously established cut-off point. In this analysis only variables with significant ($p < .05$) partial correlation-to-enter will be considered. The results of this analysis for the two ports are shown in Tables 7 and 8. The four factors from Point Judith have multiple correlations ranging from $R=.38$ to $R=.59$. Five of the New Bedford factors have multiple correlations which range from $R=.55$ to $R=.70$. One factor (mental), as noted above, has no significant correlates.

Table 3. Correlations Between Independent Variables: Point Judith

	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>
1. Fishing type (short trip vs. day & long trip)	.12	-.21	.16	.05	.14	.14	.10	-.02	.15	-.23	.15	.13	
2. Desire to change type fishing	---	-.80	.14	.05	.01	.00	.19	-.08	.15	.04	.13	.11	
3. Direction of change less/more or same	---	---	-.16	-.10	-.02	-.10	-.17	.13	-.18	.00	-.15	-.06	
4. Age	---	---	---	.48	.23	-.26	.25	.00	.29	.34	.90	.06	
5. Marital status (married/single)	---	---	---	---	.56	-.21	.26	-.08	.20	.35	.44	.24	
6. Number of dependents	---	---	---	---	---	-.01	.16	-.04	.02	.33	.18	.15	
7. Formal education	---	---	---	---	---	---	-.28	-.16	-.13	-.05	-.37	-.07	
8. Father fisherman	---	---	---	---	---	---	---	.39	.40	.14	.40	.17	
9. Early entry into fishing	---	---	---	---	---	---	---	---	.13	.06	.20	.15	
10. Number of relatives who fish	---	---	---	---	---	---	---	---	---	.11	.36	.01	
11. Owner/skipper status	---	---	---	---	---	---	---	---	---	---	.32	-.03	
12. Years fishing experience	---	---	---	---	---	---	---	---	---	---	---	.08	
13. Still go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	
14. Advise young man to go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	

Table 3. Correlations Between Independent Variables: Point Judith

	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>
1. Fishing type (short trip vs. day & long trip)	.12	-.21	.16	.05	.14	.14	.10	-.02	.15	-.23	.15	.13	
2. Desire to change type fishing	---	-.80	.14	.05	.01	.00	.19	-.08	.15	.04	.13	.11	
3. Direction of change less/more or same	---	---	-.16	-.10	-.02	-.10	-.17	.13	-.18	.00	-.15	-.06	
4. Age	---	---	---	.48	.23	-.26	.25	.00	.29	.34	.90	.06	
5. Marital status (married/single)	---	---	---	---	.56	-.21	.26	-.08	.20	.35	.44	.24	
6. Number of dependents	---	---	---	---	---	-.01	.16	-.04	.02	.33	.18	.15	
7. Formal education	---	---	---	---	---	---	-.28	-.16	-.13	-.05	-.37	-.07	
8. Father fisherman	---	---	---	---	---	---	---	.39	.40	.14	.40	.17	
9. Early entry into fishing	---	---	---	---	---	---	---	---	.13	.06	.20	.15	
10. Number of relatives who fish	---	---	---	---	---	---	---	---	---	.11	.36	.01	
11. Owner/skipper status	---	---	---	---	---	---	---	---	---	---	.32	-.03	
12. Years fishing experience	---	---	---	---	---	---	---	---	---	---	---	.08	
13. Still go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	
14. Advise young man to go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	

Table 4. Correlations Between Independent Variables: New Bedford.

	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>
1. Fishing type	.15	.17	-.17	-.08	.10	-.10	-.04	.15	-.05	.03	-.09	-.06	-.05	
2. Foreign born	---	.31	.28	.01	.25	.07	-.74	.66	.00	.56	.13	.10	-.16	
3. Desire to change type fishing	---	---	-.95	-.08	.17	.02	.19	-.10	-.21	-.06	-.24	-.12	-.22	
4. Direction	---	---	---	.14	-.06	.04	-.10	.07	.18	.12	.26	.16	.29	
5. Age	---	---	---	---	.25	.34	-.13	-.18	.26	.03	.05	.86	.38	
6. Marital status	---	---	---	---	---	.54	-.38	.12	.04	.41	.18	.34	-.09	
7. Number of dependents	---	---	---	---	---	---	-.10	.00	.08	.25	.17	.32	-.14	
8. Formal education	---	---	---	---	---	---	---	-.43	.00	-.51	-.03	-.25	.10	
9. Father fisherman	---	---	---	---	---	---	---	---	.22	.61	-.02	-.09	-.11	
10. Early entry	---	---	---	---	---	---	---	---	---	.11	.04	.54	.26	
11. Number of relatives who fish	---	---	---	---	---	---	---	---	---	---	.29	.21	.02	
12. Owner/skipper	---	---	---	---	---	---	---	---	---	---	---	.15	.19	
13. Years fishing experience	---	---	---	---	---	---	---	---	---	---	---	---	.38	
14. Still go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	---	
15. Advise young man to go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	---	

Table 4. Correlations Between Independent Variables: New Bedford.

	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>
1. Fishing type	.15	.17	-.17	-.08	.10	-.10	-.04	.15	-.05	.03	-.09	-.06	-.05	
2. Foreign born	---	.31	.28	.01	.25	.07	-.74	.66	.00	.56	.13	.10	-.16	
3. Desire to change type fishing	---	---	-.95	-.08	.17	.02	.19	-.10	-.21	-.06	-.24	-.12	-.22	
4. Direction	---	---	---	.14	-.06	.04	-.10	.07	.18	.12	.26	.16	.29	
5. Age	---	---	---	---	.25	.34	-.13	-.18	.26	.03	.05	.86	.38	
6. Marital status	---	---	---	---	---	.54	-.38	.12	.04	.41	.18	.34	-.09	
7. Number of dependents	---	---	---	---	---	---	-.10	.00	.08	.25	.17	.32	-.14	
8. Formal education	---	---	---	---	---	---	---	-.43	.00	-.51	-.03	-.25	.10	
9. Father fisherman	---	---	---	---	---	---	---	---	.22	.61	-.02	-.09	-.11	
10. Early entry	---	---	---	---	---	---	---	---	---	.11	.04	.54	.26	
11. Number of relatives who fish	---	---	---	---	---	---	---	---	---	---	.29	.21	.02	
12. Owner/skipper	---	---	---	---	---	---	---	---	---	---	---	.15	.19	
13. Years fishing experience	---	---	---	---	---	---	---	---	---	---	---	---	.38	
14. Still go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	---	
15. Advise young man to go into fishing	---	---	---	---	---	---	---	---	---	---	---	---	---	

Table 5

Zero Order Correlations Satisfaction Factors vs. Independent
Variables: Point Judith

<u>Independent Variables</u>	<u>Time</u>	<u>Outdoors</u>	<u>Earnings</u>	<u>Independence</u>
1. Fishing type (ST vs. Others)	.26*	-.01	.01	-.16
2. Desire to change type	-.30**	-.12	-.24*	.00
3. Direction of change	.31**	-.00	.22*	.08
4. Age	.00	-.12	.06	.13
5. Marital status	.12	-.00	.10	.01
6. Number of dependents	.15	.06	.12	-.09
7. Formal education	-.11	-.08	-.01	-.10
8. Father fisherman	.06	.00	.25*	.05
9. Early entry	.19	.29**	.15	.11
10. Number of relatives who fish	.22*	.08	-.13	.17
11. Owner/skipper	-.15	-.04	-.09	.31**
12. Years fishing experience	-.02	-.10	.08	.14
13. Still go into fishing	.26*	.05	.00	-.01
14. Advise young man to go into fishing	.22*	.27*	.04	.00

N=79 *P < .05 (.22) **P < .01 (.29)

Table 6

Zero Order Correlations Satisfaction Factors vs. Independent
Variables: New Bedford

<u>Independent Variables</u>	<u>Time</u>	<u>Independence</u>	<u>Conditions</u>	<u>Earnings</u>	<u>Mental</u>	<u>On Water</u>
1. Fishing type (ST vs. Other)	.15	-.19	-.02	-.16	-.05	-.06
2. Foreign born	.05	-.32*	.22	.50**	-.05	-.23
3. Desire to change type	-.23	.13	.08	-.21	-.05	-.20
4. Direction of change	.26	-.03	-.03	.28	.04	.25
5. Age	.45**	-.10	.08	.14	-.15	.38*
6. Marital status	.00	-.09	.53**	.07	-.10	.19
7. Number of dependents	.07	-.21	.29	.06	-.03	-.02
8. Formal education	.11	.44*	-.27	-.37*	-.02	-.08
9. Father fisherman	.10	-.32*	.34	.24	.16	-.41**
10. Early entry	.48**	-.17	.22	-.27	.14	.22
11. Number of relatives who fish	.07	-.05	.44**	.37*	.16	-.12
12. Owner/skipper	.00	.32*	-.03	.13	.15	.09
13. Years fishing experience	.44**	-.14	.30*	.00	-.11	.37
14. Still go into fishing	.48**	.18	-.15	.20	-.06	.43**
15. Advise young man to go into fishing	.54**	.27	.14	.02	.18	.27

N=42 *P < .05 (.30) **P < .01 (.39)

Table 7

Stepwise Multiple Regression of Independent Variables
and Satisfaction Factors: Point Judith

<u>Dependent Variable</u>	<u>Variable entered and controlled</u>	<u>Partial (a.) to enter</u>	<u>F Ratio to enter</u>	<u>Multiple R</u>
Time	Desire to change type	-.30	7.73	.30**
Time	Still go into fishing	.31	8.24	.42**
Time	Number of relatives fishing	.31	7.78	.51**
Time	Fishing type	.26	5.34	.55**
Time	Advise young man to fish	.26	5.28	.59**
Outdoors	Early entry	.29	7.07	.29**
Outdoors	Advise young man to fish	.26	5.94	.40**
Earnings	Father fisherman	.25	5.01	.25*
Earnings	Desire to change type	-.31	7.95	.38**
Earnings	Number of relatives fishing	-.25	4.85	.45**
Independence	Owner/skipper	.31	8.33	.31**
Independence	Number of dependents	.23	4.06	.38**

*P < .05

**P < .01

N=79

(a.) Zero-order correlation for first variable entered to indicate direction of relationship.

Table 8

Stepwise Multiple Regression of Independent Variables
and Satisfaction Factors: New Bedford

<u>Dependent Variable</u>	<u>Variable entered and controlled</u>	<u>Partial (a.) to enter</u>	<u>F Ratio to enter</u>	<u>Multiple R</u>
Time	Advise young man to fish	.54	16.76	.54**
Time	Age	.44	9.62	.66**
Time	Early entry	.32	4.46	.70**
Independence	Formal education	.44	9.46	.44**
Independence	Owner/skipper	.38	6.46	.55**
Conditions	Marital status	.53	15.83	.53**
Conditions	Father fisherman	.33	4.89	.60**
Earnings	Foreign born	.50	13.51	.50**
Earnings	Still go into fishing	.33	4.65	.58**
Earnings	Early entry	-.44	9.30	.68**
Mental/physical	None			
On water	Still go into fishing	.43	9.10	.43**
On water	Father fisherman	-.40	7.49	.56**

N=42

**P < .01

(a.) Zero-order correlations for first variable entered to indicate direction of relationship.

Discussion

The configuration of satisfaction and its correlates in these two New England ports is of practical significance when considered in the light of ongoing increased management of the industry. An understanding of the patterns can help decision makers (both public and private) to shape the technological and economic changes in the industry so that they show the best "goodness of fit" to social realities. Since all aspects of an industry affect each other in a systematic way, goodness of fit of social factors with the others can only lead to greater efficiency of the system. Until the day when a fully automated fishing fleet is developed, consideration of the labor force in terms of sociocultural factors is a part of good management.

From the factor analysis we note that the time factor is the one which accounts for the greatest variance in each port. We might say that it is the first factor in each port, indicating that time away from home is one of the most salient social aspects of commercial fishing in southern New England. This is the element that most distinguishes fishing from other possible occupations in the area.

We have seen that the predominantly day and short trip fishermen of Point Judith are overall more satisfied with this aspect of their work than the trip fishermen of New Bedford. Within Point Judith, satisfaction with the time element seems to result in the desire to stay with the type of fishing one is in, feelings of satisfaction with the choice of being a fisherman, and advising others to enter the occupation. Finally, satisfaction with time seems to be the result of the type (short trip vs. day and long trip) of fishing one does and the number of relations one has in fishing.

The fact that short trip fishing is optimal in terms of time satisfaction is interesting in that it is not the type that would appear to require the

least time away from home. In fact, however, when we consider that day fishermen are away from 12-18 hours a day and can only spend limited time home interacting with their family, we understand why a 2-3 day absence interspersed with a completely free day or two is preferred. Trip fishermen do have a definite free period of time between trips, but their trips are the most extreme (7-14 days) and lead to dissatisfaction.

Besides type of fishing there are three other variables that seem to be antecedents to satisfaction with the time factor. These are number of relatives who fish in Point Judith and age and early entry in New Bedford. We might suggest that the more relatives a person has who fish, the more articulated the person and his family are with a network of fishing kin. This network might serve as an emotionally supportive and attitude influencing group. If one's kin group defines being away from home for considerable time as the "norm," a fisherman and his family are more likely to accept and be satisfied with the time element of fishing. In contrast to this is the fisherman whose wife and kin define the time investment of fishermen as "abnormal or unacceptable," which it is by "landbound" standards.

Among the long trip fishermen in New Bedford this mechanism does not appear to operate. Perhaps being away for 7-14 days is simply too long a period of time to be compensated for by a kinship network. However, we do note that older experienced fishermen who entered the occupation early in New Bedford are more satisfied with the time element of their work than are younger men. This suggests a selection mechanism at work. This could be an expression of a process whereby there is a selection for men who possess the social-psychological prerequisites for trip fishing. Older men who have been "selected for" would be more satisfied than younger men who have not. The data support this hypothesis. Early entry into fishing would insulate a person from

alternative comparative occupational life-styles which require less time commitment.

In a previous study Poggie and Gersuny (1974) identified independence as one of the main values of fishermen in southern New England. There is an independence factor in both Point Judith and New Bedford. There is a predominance of satisfaction on this factor in both ports, but the mean on the item that most strongly defines the factor (opportunity to be own boss) is 4.3 in Point Judith and 3.5 in New Bedford. Point Judith fishermen as a whole are more satisfied than New Bedford fishermen on this factor. Being an owner/skipper is a variable that appears to be an antecedent of satisfaction with independence, and is significantly related to the factor in both ports. Since the proportion of owner/skippers is higher in Point Judith than New Bedford due to size of technology and consequent crew size, this fact would account for the differences in mean scores between the ports. The fact that number of dependents is negatively correlated with independence in Point Judith shows that contingencies of family can significantly explain at least a portion of how fishermen feel about their work. Being foreign born, formal education and father fisherman are all related to the independence factor in New Bedford. These three variables are significantly related to each other (see Table 4) and represent attributes of an ethnic/non-ethnic syndrome. The fact that none of these variables have significant partial correlation with independence after formal education is entered supports the ethnic-syndrome idea. Ethnic, less educated fishermen whose fathers tended to be fishermen are less satisfied with their independence than are more educated, non-ethnic individuals, of whom a smaller proportion have fishermen fathers. If independence satisfaction is an important part of fishing adaptation as we might argue, then decision makers should consider the advisability of "importing" foreign labor

to man larger American boats. This has been suggested as a way of "getting around" the "labor problem" in expanding American fisheries.

Earnings is another common factor to the two ports. In New Bedford the ethnic syndrome seems to play a role in satisfaction with this factor. We note (Table 8) that in New Bedford being foreign born is the variable that is most strongly related to satisfaction with earnings. When this variable is entered into the multiple correlation neither formal education nor number of relatives who fish which had significant zero-order correlation, have significant partial correlation with satisfaction with earnings. The fact that foreign born is most strongly correlated with satisfaction with earnings suggests that expectations of foreign born are lower than their non-ethnic counterparts. This attitude is one which has attracted foreign labor to America over much of its history.

Early entry is negatively correlated with satisfaction about earnings in New Bedford. It was argued that early entry would insulate fishermen from dissatisfaction with the time commitment aspect of their work, but it does not appear to operate this way for earnings. Fishermen who entered their occupation before the age of 20 are less satisfied with earnings than those who entered later. However we may argue that those who entered early do not have the comparative reference from earnings at other occupations at their level of skill that those who entered later do. The early entries only have other fishermen to compare themselves with, while later entries can compare themselves with blue collar landbound occupations that, by and large, pay considerably less than fishing. This would result in more satisfaction among late entries and less satisfaction among early ones.

It is not entirely clear why Point Judith fishermen whose fathers were also fishermen are more satisfied with their earnings. It might be suggested

that the negative correlation between number of relatives is a reflection of a fisherman's knowledge of exactly how much a fisherman can earn in this port. Exact information about income is not easily obtained but kinsmen would be more likely to share this than non-kinsmen. The negative correlation of earnings satisfaction with desire to change type of fishing in both ports is a clear consequence of this satisfaction.

The factor which we have called "outdoors" in Point Judith consists of a mixture of items that have to do with being outdoors on the water and adventure, feelings of doing something worthwhile and challenge. This is a highly psychological factor having to do with non-tangible returns of work. There appears to be an antecedent and one consequence of this factor. Early entry is a temporal antecedent which may indicate that the earlier one enters fishing the more strongly one is motivated by the aesthetic aspects of being on the water. The consequence of this factor would be that it contributes to being positive enough about the occupation to advise those who have the option to seek another occupation to enter.

A somewhat similar factor emerged in the New Bedford sample, but its configuration is different enough to be named differently. The on water factor in New Bedford is related negatively to father fisherman and positively with age and still go into fishing. Father fisherman is a temporal antecedent to satisfaction with being on the water, and the negative correlation with father fisherman suggests that sons of fishermen have learned to be neutral or negative about the aesthetic aspect of the occupation through long familial involvement. However, those New Bedford fishermen who are satisfied with this aspect of their work feel they would still enter the occupation if they had their life to live over. The fishermen who feel this way tend to be the older fishermen, possibly resulting in the non-significant partial correlation between age and

satisfaction with being on the water. There was a significant zero-order correlation between these variables (cf. Tables 6 and 8).

Finally we turn to conditions which is an important aspect in trip fishing where men spend much time in the confines of their boat. Satisfaction or dissatisfaction with this factor is probably critical for understanding who will and will not adapt to trip fishing. The highest factor loading of all the items occurs on this factor. With a factor loading of $-.93$, crowding is the key to the conditions factor. Cleanliness ($-.83$) and conditions on board ($-.63$) also load highly on this factor.

Looking at the zero-order correlates of this factor (Table 6) we see that it is married fishermen with many years of experience and who come from a fishing family tradition (father fisherman, number of relatives who fish) who are most satisfied. As was the case with the time factor, there appears to be a selection process at work. Fishermen who come from a fishing family tradition and who have had considerable experience are the products of the selection. It would seem that coming from a fishing tradition (irrespective of other factors) pre-adapts individuals for long trip fishing. Since expectations are influenced by socialization, we suggest that being satisfied with crowding and the other aspects of the conditions factor is a matter of what one has been brought up to expect. If "significant others" such as father and other relatives accept these conditions, one is also more likely to. The high correlation with being married is hard to understand in this case. It could be related to the fact that there are very few unmarried fishermen and that chance alone has caused the high correlation. However, it could be due to a mechanism whereby married individuals are more flexible in their attitudes about living conditions.

The overall results of this analysis show that job satisfaction is a complex phenomenon, with a number of components or factors. These factors vary

in composition and directionality from port to port as do their correlates. While it was not possible in this exploratory stage of research to entirely explain the origin of these configurations and their correlates, one central theoretical issue did emerge. A process of selection of fishermen and thus their satisfaction with their occupation appears to operate over time. This was particularly true in the two very salient areas of time away and conditions on board. Decision makers such as government officials who propose limited entry schemes might wish to consider the long term social implication of interrupting this selection process. It would appear that limited entry mechanisms which assumed that all individuals are equally adaptable to the working conditions of fishing in different ports could potentially produce a poorly adapted and inefficient labor force.

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THE STRUCTURE OF JOB SATISFACTION AMONG NEW ENGLAND FISHERMEN

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Introduction

The passage of the Fishery Conservation and Management Act (FCMA) of 1976 (PL 94-265) extending U.S. jurisdiction and management over fisheries to 200 miles has the potential of resulting in wide-ranging changes in the New England fishery. These changes can take many forms ranging from minor alterations in species sought and techniques used to drastic shifts in style from inshore to offshore fishing or possible displacement of individuals from the industry under a limited entry plan. The changes brought by management, no matter how minor, have the potential of affecting the structure of a person's work--an aspect of life that plays an important psychological, social, as well as economic role in the well-being of the worker (cf. HEW 1973). Elliot Richardson (then Secretary of HEW), in the forward to Work in America, a report of a special task force to the Department of Health, Education and Welfare, noted that concern with the quality of work and its role in society and culture is a subject "...vitally important to much of what HEW does" (HEW 1973:i). The interrelationship between potential fisheries management effects on the structure of work, job satisfaction, and the social and psychological well-being of the involved fisherman is therefore a timely and important topic. It is not only important for the reasons cited above, but also because PL 94-265 (FCMA) mandates that conservation and management take into account social as well as biological and economic factors.

On the basis of previous research concerning job satisfaction, it can be assumed that the path leading from aspects of a fisherman's job to job satisfaction and on to social effects is a relatively complex one. For example, a fair amount of research has demonstrated a relationship between various job characteristics and job satisfaction (e.g. Voyandoff 1978; Kalleberg 1977;

Locke and Whiting 1974; Kohn and Schooler 1973; Armstrong 1971; Dunnette et al. 1967). Job satisfaction itself, however, is often indirectly related to outcomes which have potential social impact. Among variables related to job satisfaction which have social impact, perhaps the most important is longevity. Palmore (1969) reports that work satisfaction is more important in predicting longevity than rating by an examining physician of physical function, a measure of tobacco use, or genetic inheritance. The social impact of longevity on both the family and community is so obvious that it need not be elaborated here. Further, heart disease and other illnesses which reduce a person's ability to function in his social roles have also been related to work dissatisfaction (HEW 1973).

Other studies have demonstrated a relationship between job satisfaction and mental health. For example, Kornhauser (1965) found that jobs most conducive to mental health were those in which workers tend to be most satisfied. Perhaps most important, he also found that within occupational categories mental health was correlated with job satisfaction, and that workers in lower level jobs who were satisfied differed little in mental health from satisfied workers in higher level jobs. This led him to conclude that "job satisfaction is the link between objective conditions prevailing at different occupation levels and the observed variation in mental health" (Kornhauser 1965:263). HEW (1973), summing up 20 years of research by the Survey Research Center at the University of Michigan notes that the absence of job satisfaction is related to psychosomatic illnesses, anxiety, low self esteem, worry, tension, and impaired interpersonal relationships. There is no doubt that mental health problems such as these impair one's ability to function normally in society. In addition, Gelles (1974) and Strauss (1979) report a clear relationship between job satisfaction, some of its mental health correlates, and family violence,

an increasingly serious social problem. Finally, job satisfaction has been related to absenteeism, turnover (Robinson et al. 1969), performance (Inkson 1978; Jacobs and Solomon 1977), and productivity (Srivastva et al. 1975), four variables with both economic and social impact.

In sum, previous research has shown that job satisfaction is an important variable related both directly and indirectly to a wide variety of other social and economic variables. The relationships are positive, with high job satisfaction correlated with positive social and economic impacts and low satisfaction with negative impacts. These relationships justify the investigation of job satisfaction and its social and occupational correlates among New England fishermen which forms the remainder of this paper.

Sample

Data for this report were gathered from fishermen who use the facilities at Point Judith, Rhode Island; New Bedford, Massachusetts; and three locations on the Pemaquid Peninsula, Bristol, Maine (Round Pond, New Harbor, and Pemaquid Harbor). A sample of 42 fishermen were interviewed at New Bedford which is primarily a large offshore dragger, long-trip (4 or more days) port. Seventy-nine fishermen were interviewed at Point Judith which has primarily short-trip (less than 4 days), smaller inshore vessels and inshore lobstermen. Finally, 80 fishermen formed the sample interviewed at Bristol, Maine, where most of the fishermen are inshore lobstermen. More detailed information concerning the ports and their fishermen can be found in Acheson (1978), Jessen (1978), Pollnac and Poggie (1978), Poggie and Pollnac (1978), and Poggie and Gersuny (1974).

Tests

A 22 item list (see Table 1) was used to investigate the structure of job satisfaction. Many of the items were adapted from Schletzer's (1965) 62 item scale which was designed to measure general job satisfaction with a number of components, not all of which were applicable to fishermen. Redundant and inapplicable items were removed from the list, and four items unique to the occupation of fisherman were added. Many of the items used correspond to high frequency responses which were derived from an earlier open-ended interview with 108 southern New England fishermen who were requested to tell what they "liked and disliked about fishing" (for a description of this sample see Poggie, Pollnac and Gersuny 1976; Pollnac, Gersuny, and Poggie 1975). The resulting items were administered by asking each respondent to indicate if he were very dissatisfied, dissatisfied, neutral, satisfied, or very satisfied with each of the 22 items representing aspects of his job. Responses were coded from one to five respectively and factor analyzed using common factor analysis and orthogonal rotation (varimax). Number of factors was determined using an eigenvalue cut-off of 1.0, and factor scores were calculated for each fisherman on each of the three resulting factors. The factor loading matrix is presented in Table 1.

The three factors derived do not clearly correspond to the intrinsic and extrinsic job characteristic classification used so commonly in research related to job satisfaction (e.g. Herzberg 1966; Fox 1971). Other researchers have also noted this lack of correspondence (e.g. Voyandoff 1978). Additionally, Dyer and Parker (1975), noting the lack of agreement in the literature concerning the definition of the terms extrinsic and intrinsic, conducted a survey of psychologists and found little consensus between them concerning the terms.

Table 1

Rotated Factor Loadings of Job Satisfaction Items

<u>ITEM</u>	<u>FACTOR</u>		
	<u>I</u>	<u>II</u>	<u>III</u>
1. Time away from home.	<u>.81</u>	.09	.21
2. Hours spent working.	<u>.72</u>	.25	.17
3. Time for recreation and/or family activities	<u>.71</u>	.06	.12
4. Ability to come and go as you please.	<u>.61</u>	-.12	.41
5. Time it takes you to get to grounds.	<u>.47</u>	.21	.14
6. Doing deckwork on the vessel.	<u>.41</u>	.12	.40
7. Opportunity to be your own boss.	<u>.39</u>	-.21	.34
8. Community in which you live.	<u>.39</u>	.12	.21
9. Cleanliness.	-.03	<u>.59</u>	.02
10. Physical fatigue of job.	.03	<u>.56</u>	.02
11. Predictability of earnings.	.11	<u>.49</u>	.08
12. Mental pressure on job.	.18	<u>.48</u>	.03
13. Job safety.	.19	<u>.45</u>	.11
14. Your earnings.	-.19	<u>.36</u>	-.15
15. Healthfulness.	.21	<u>.31</u>	.26
16. Being out on the water.	.14	-.02	<u>.71</u>
17. Adventure.	.16	.05	<u>.71</u>
18. Challenge of job.	.18	-.01	<u>.66</u>
19. Working outdoors.	.23	.08	<u>.57</u>
20. Feeling you are doing something worthwhile	.12	.28	<u>.51</u>
21. Peace of mind.	.28	.24	<u>.34</u>
22. Performance of State and Federal officials	.20	-.15	<u>.22</u>

The dimensions resulting from the empirical analysis presented here seem to be more clearly related to Maslow's (1954) hierarchy of needs, with Factor II representing the basic levels (physiological and safety), Factor I the middle level (love and belongingness and self esteem), and Factor III the highest level (self actualization). Smith (1977) using a different list of characteristics among Northwest Coast salmon fishermen also rotated a factor which could be labelled self-actualization. His list of characteristics was sufficiently different, however, that this was the only comparable factor.

Two other measures of overall job satisfaction were also used. Fishermen were asked if they would still go into fishing if they had their life to live over (JSM1) and whether or not they would advise a young man to go into fishing (JSM2). The responses to these question (no, maybe, yes) were coded 0, 1, and 2 respectively. The question concerning whether or not a person would enter the same occupation if he had his life to live over has been referred to as one of the most informative among the several available indices of job satisfaction (Robinson et al. 1969).

Other social and occupational variables selected because of their potential relationships with job satisfaction are age (years), marital status (married or not), years of formal education, whether or not respondent is both owner and skipper of vessel versus all others (e.g. crewmen), number of years fishing, whether or not respondent's father was a fisherman, number of relatives who are fishermen, ethnicity (foreign born or not), and fishing type (e.g. offshore dragger, inshore lobsterman, etc.). The values for these variables were obtained from responses to direct questions.

Analysis

As a first step in the analysis, the relationship between overall job satisfaction and the structure of job satisfaction as represented by the three job

characteristics factors was investigated with the use of multiple regression. As a means of determining whether or not macro variables associated with community or fishing type have any effect on the differential weighting of the various factors, analyses were performed for the total sample and within subgroups of the sample based on port and fishing style. The port subgroupings used are Point Judith, New Bedford, and Maine. Fishing type subgroups are (1) Inshore (e.g., inshore lobstering, inshore dragging, etc.), (2) Middle (pair trawling, purse seining, combination of inshore and offshore), and (3) Offshore (e.g., offshore dragging, offshore lobstering). The fishermen themselves make a clear distinction between the inshore and offshore fleets. Fishing style, time at sea, and away from home, and other characteristics have resulted in many sociocultural distinctions which are related to these fishing types (cf. Miller and Pollnac 1978; Poggie and Pollnac 1978; Pollnac and Poggie 1978; Poggie and Gersuny 1974). Another subgrouping of fishing type used was to group inshore lobstermen into one group and put all other fishermen in another. The results of these analyses can be found in Table 2.

Table 2 indicates that for the total sample, the three factors are significantly related to JSM1. The strongest predictor is Factor III (High Level Needs). The multiple correlation between all three factors and JSM1 is .38 which is statistically significant at better than the .001 level. JSM2 is significantly correlated with only Factor II. The other two factors add very little to the multiple correlation.

Turning to interport differences in the relationship between job satisfaction and the three occupational characteristic factors, Table 2 clearly shows that the strongest relationships are in New Bedford. The Middle Level Needs Factor is important in predicting both JSM1 and JSM2, and the High Level Needs Factor is strongly correlated with JSM1. The multiple correlations between

Table 2. Multiple Regression Analysis of Overall Job Satisfaction and Occupational Characteristics Factors.

OVERALL JOB SATISFACTION MEASURES 1 AND 2 (JSM1 and JSM2)*

OCCUPATIONAL CHARACTERISTICS
FACTORS

	TOTAL SAMPLE				POINT JUDITH				NEW BEDFORD			
	JSM1	beta	r	JSM2	JSM1	beta	r	JSM2	JSM1	beta	r	JSM2
1. Factor I (Mid-level Needs)	.19 ^b	.13	.10	.04	.15	.08	.17	.11	.41 ^b	.54	.52 ^b	.33
2. Factor II (Basic Needs)	.17 ^a	.14	.27 ^b	.15	.19	.11	.26 ^a	.10	.03	.25	.18	.20
3. Factor III (Hi-level Needs)	.31 ^b	.25	.10	.05	.03	.00	.18	.14	.44 ^b	.53	.21	.18
R	.38 ^c			.29 ^c	.22			.36 ^a	.67 ^c			.65 ^c
N	201			201	79			79	42			42
	MAINE				INSHORE				MIDDLE			
	JSM1	beta	r	JSM2	JSM1	beta	r	JSM2	JSM1	beta	r	JSM2
1. Factor I (Mid-level Needs)	-.07	-.12	.23 ^a	-.12	.02	.00	.12	.06	-.24	-.15	.01	-.06
2. Factor II (Basic Needs)	.19	.17	.02	.17	.24 ^b	.18	.22 ^b	.12	.11	.09	.38 ^a	.23
3. Factor III (Hi-level Needs)	.22 ^a	.20	.05	.20	.21 ^a	.16	.06	.02	-.09	-.05	.03	.08
R	.28			.28	.29 ^a			.24	.30			.40
N	80			80	113			113	29			29
	OFFSHORE				INSHORE LOBSTER				NON-INSHORE LOBSTER			
	JSM1	beta	r	JSM2	JSM1	beta	r	JSM2	JSM1	beta	r	JSM2
1. Factor I (Mid-level Needs)	.44 ^b	.31	.25	.07	-.03	-.06	.11	.07	.31 ^b	.19	.24 ^b	.09
2. Factor II (Basic Needs)	.25	.26	.21	.12	.24 ^a	.19	.10	.04	.16	.11	.25 ^b	.13
3. Factor III (Hi-level Needs)	.38 ^b	.24	.33 ^b	.13	.29 ^a	.28	.04	.03	.34 ^b	.23	.19 ^a	.08
R	.55 ^c			.41 ^a	.35 ^a			.14	.44 ^c			.36 ^c
N	54			54	74			74	122			122

*JSM1 = Attitude toward going into fishing if had life to live over.

a = p < .05 b = p < .01 c = p < .001

JSM2 = Attitude toward advising young man to go into fishing.

Table 2. Multiple Regression Analysis of Overall Job Satisfaction and Occupational Characteristics Factors.

OVERALL JOB SATISFACTION MEASURES 1 AND 2 (JSM1 and JSM2)*

OCCUPATIONAL CHARACTERISTICS FACTORS

	TOTAL SAMPLE				POINT JUDITH				NEW BEDFORD			
	JSM1		JSM2		JSM1		JSM2		JSM1		JSM2	
	r	beta	r	beta	r	beta	r	beta	r	beta	r	beta
1. Factor I (Mid-level Needs)	.19 ^b	.13	.10	.04	.15	.08	.17	.11	.41 ^b	.54	.52 ^b	.33
2. Factor II (Basic Needs)	.17 ^a	.14	.27 ^b	.15	.19	.11	.26 ^a	.10	.03	.25	.18	.20
3. Factor III (Hi-level Needs)	.31 ^b	.25	.10	.05	.03	.00	.18	.14	.44 ^b	.53	.21	.18
R		.38 ^c		.29 ^c		.22		.36 ^a		.67 ^c		.65 ^c
N		201		201		79		79		42		42
	MAINE				INSHORE				MIDDLE			
	JSM1		JSM2		JSM1		JSM2		JSM1		JSM2	
	r	beta	r	beta	r	beta	r	beta	r	beta	r	beta
1. Factor I (Mid-level Needs)	-.07	-.12	.23 ^a	-.12	.02	.00	.12	.06	-.24	-.15	.01 ^a	-.06
2. Factor II (Basic Needs)	.19	.17	.02	.17	.24 ^b	.18	.22 ^b	.12	.11	.09	.38 ^a	.23
3. Factor III (Hi-level Needs)	.22 ^a	.20	.05	.20	.21 ^a	.16	.06	.02	-.09	-.05	.03	.08
R		.28		.28		.29 ^a		.24		.30		.40
N		80		80		113		113		29		29
	OFFSHORE				INSHORE LOBSTER				NON-INSHORE LOBSTER			
	JSM1		JSM2		JSM1		JSM2		JSM1		JSM2	
	r	beta	r	beta	r	beta	r	beta	r	beta	r	beta
1. Factor I (Mid-level Needs)	.44 ^b	.31	.25	.07	-.03	-.06	.11	.07	.31 ^b	.19	.24 ^b	.09
2. Factor II (Basic Needs)	.25	.26	.21	.12	.24 ^a	.19	.10	.04	.16 ^b	.11	.25 ^b	.13
3. Factor III (Hi-level Needs)	.38 ^b	.24	.33 ^b	.13	.29 ^a	.28	.04	.03	.34 ^b	.23	.19 ^a	.08
R		.55 ^c		.41 ^a		.35 ^a		.14		.44 ^c		.36 ^c
N		54		54		74		74		122		122

*JSM1 = Attitude toward going into fishing if had life to live over.

a = p < .05

b = p < .01

c = p < .001

JSM2 = Attitude toward advising young man to go into fishing.

the factors and the two job satisfaction measures indicates that in New Bedford the three factors account for over 40 percent of the variance in JSML and JSM2. Relationships within the other ports are relatively weak.

The analysis also indicated that there are inter-fishing type differences in the relationship between the occupational characteristics factors and the job satisfaction measures. The strongest relationships are found among offshore fishermen for both job satisfaction measures. Among inshore fishermen, the Basic and High Level Needs Factors are significantly related to JSML, but the rest of the correlations are rather weak. When inshore lobstermen are separated into one group, we find a pattern similar to that among all inshore fishermen--Factors II and III are the most important predictors of JSML. Fishermen other than inshore lobstermen manifest a pattern similar to the offshore group, but with somewhat weaker correlations.

Summing up the analysis presented in Table 2, we find that, overall, the three factors are most significantly related to JSML, which as we noted above has been referred to as the best single indicator of job satisfaction (Robinson et al. 1969). An examination of intergroup differences in the relationship between the job satisfaction measures and the three factors indicate that the factors are more strongly related to the measures in New Bedford, among offshore fishermen, and among fishermen who are not inshore lobstermen.

As a next step in the analysis, between group differences in level of satisfaction on each occupational characteristics factor and the two overall job satisfaction measures are examined. The groups used are the same as in the analysis presented above, and the results of the analysis can be found in Table 3.

Table 3

Analysis of Between Group Differences in Level of Job Satisfaction on
Occupational Characteristics Factors and Job Satisfaction Measures

		<u>MEAN VALUES</u>		<u>F</u>	<u>DF</u>	<u>P</u>
	<u>POINT JUDITH</u>	<u>NEW BEDFORD</u>	<u>MAINE</u>			
FACTOR I (Mid-level Needs)	0.02	-0.89	0.45	42.19	2 198	< .001
FACTOR II (Basic Needs)	0.28	0.16	-0.37	14.36	2 198	< .001
FACTOR III (Hi-level Needs)	0.35	-0.95	0.15	44.66	2 198	< .001
JSM1	1.79	1.24	1.52	7.96	2 198	< .001
JSM2	0.77	0.60	.31	20.41	2 198	< .001

	<u>INSHORE</u>	<u>MIDDLE</u>	<u>OFFSHORE</u>			
FACTOR I (Mid-level Needs)	0.31	-0.26	-0.45	16.66	2 193	< .001
FACTOR II (Basic Needs)	-0.20	0.23	0.34	9.15	2 193	< .001
FACTOR III (Hi-level Needs)	0.13	0.59	-0.60	24.90	2 193	< .001
JSM1	1.61	1.79	1.35	17.57	2 193	< .05
JSM2	0.50	0.62	0.63	1.58	2 193	> .05

	<u>INSHORE LOBSTERMEN</u>	<u>ALL OTHERS</u>			
FACTOR I (Mid-level Needs)	0.46	-0.25	26.12	1 194	< .001
FACTOR II (Basic Needs)	-0.38	0.25	30.28	1 194	< .001
FACTOR III (Hi-level Needs)	0.14	-0.09	2.26	1 194	> .05
JSM1	1.56	1.57	0.02	1 194	> .05
JSM2	0.39	0.66	14.27	1 194	< .001

Table 3 indicates that across ports all the job satisfaction measures are significantly different. Across fishing types, only JSM2 does not differ significantly. Finally, comparing inshore lobstermen with all other fishermen, neither Factor III (High Level Needs) nor JSML vary significantly across the two subgroups.

The mean position of each group is plotted in three dimensional space in Figures 1 through 3 as a means of graphically displaying the differences between the various subgroupings with respect to their levels of satisfaction on each of the three factors. Figure 1 clearly shows the large separation between New Bedford and Maine, with Point Judith occupying an intermediate position, somewhat closer to Maine. Figure 2 illustrates the separation between the offshore fishermen and the others with respect to the High Level Needs Factor. With respect to the other two factors (Basic and Middle Level Needs), offshore and middle fishermen are relatively close to each other but rather distant from the inshore fishermen. Figure 3 illustrates the separation between inshore lobstermen and all others. Inshore lobstermen are higher on the Middle and High Level Needs Factors and lower on the Basic Level Needs Factor.

As a means of increasing our understanding of the correlates of job satisfaction among New England fishermen, the interrelationships between various aspects of job satisfaction and a select group of sociocultural variables are examined. The interrelationships between the sociocultural variables (independent variables) can be found in Table 4. Stepwise multiple regression was used to determine the patterning of combined relationships between the independent variables and levels of satisfaction on each of the three job characteristics factors and the two job satisfaction measures (JSML and JSM2). In this procedure, all independent variables are intercorrelated with the dependent (each job satisfaction measure), and the variable which explains the most

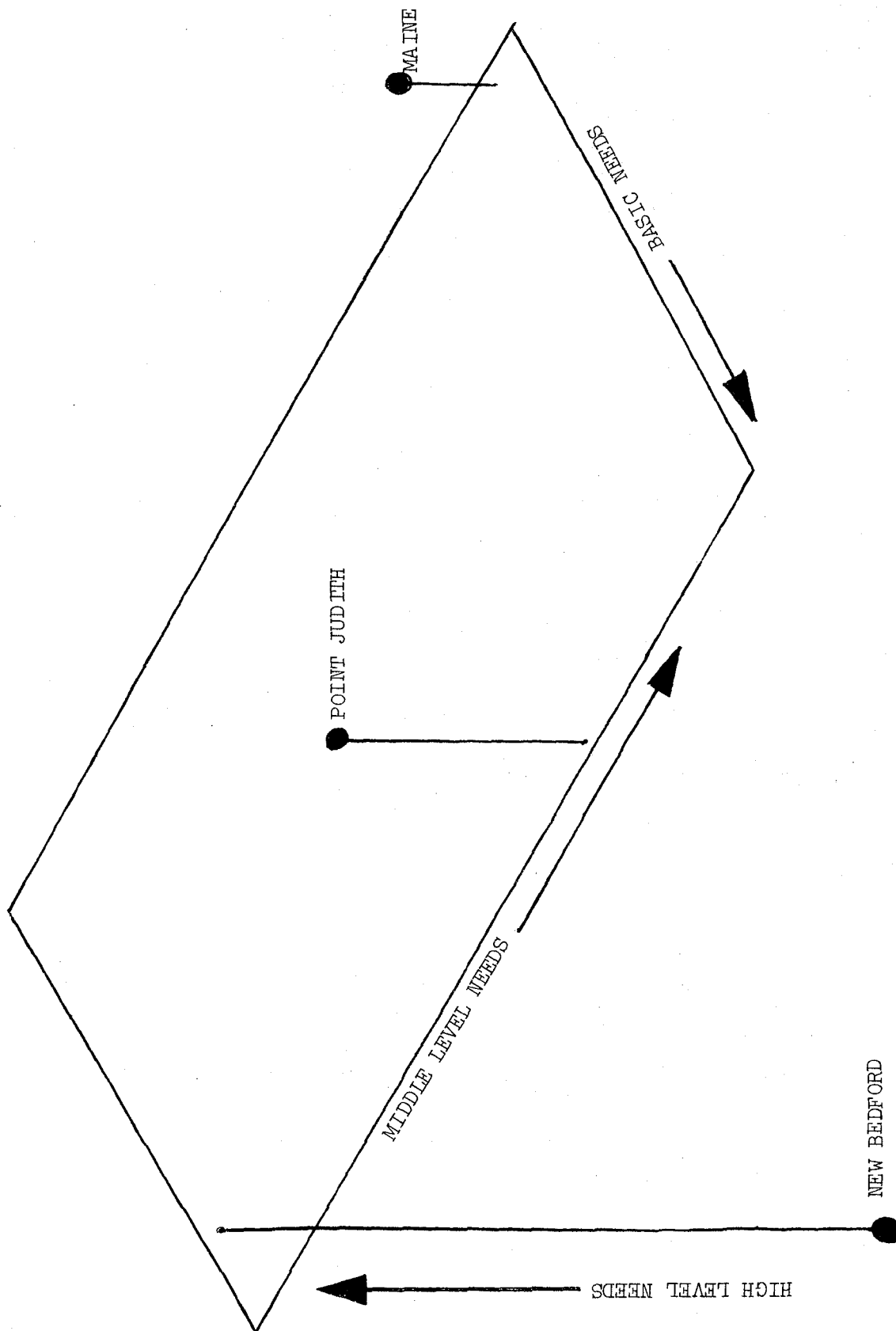


Figure 1. Mean Factor Scores for Fishing Ports Plotted in Three Dimensional Occupational Characteristic Space

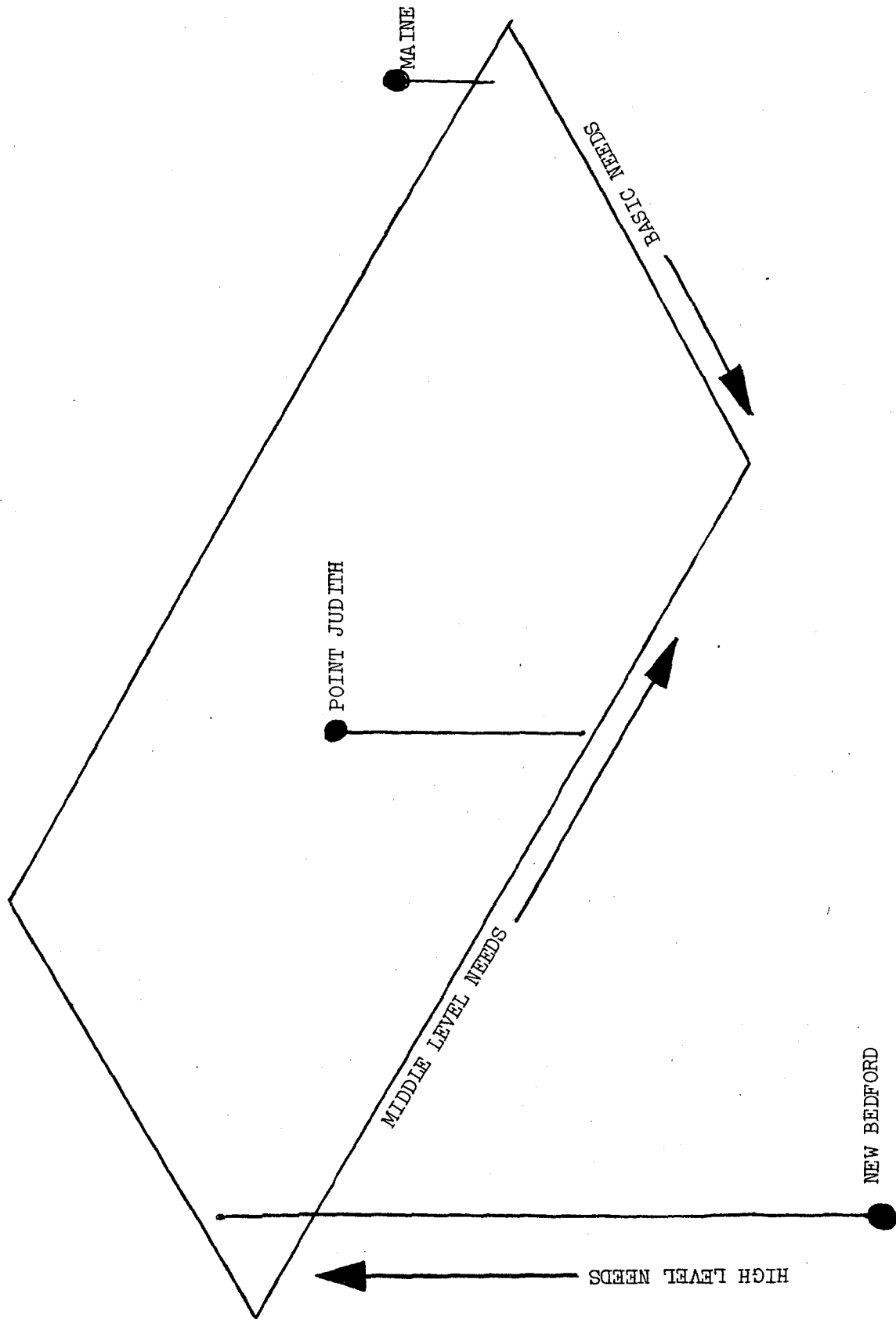


Figure 1. Mean Factor Scores for Fishing Ports Plotted in Three Dimensional Occupational Characteristic Space

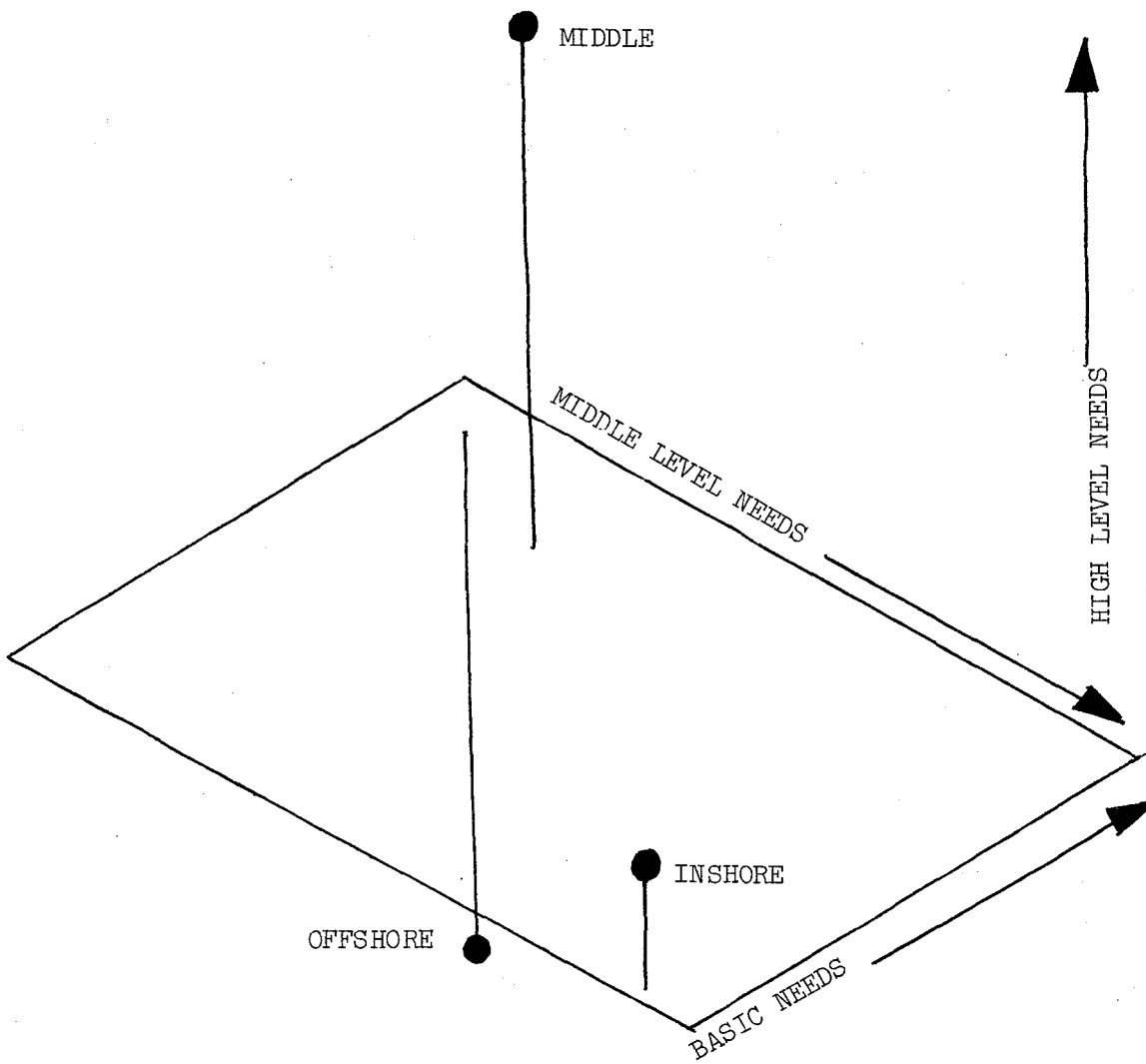


Figure 2. Mean Factor Scores for Fishing Types Plotted in Three Dimensional Occupational Characterisric Space.

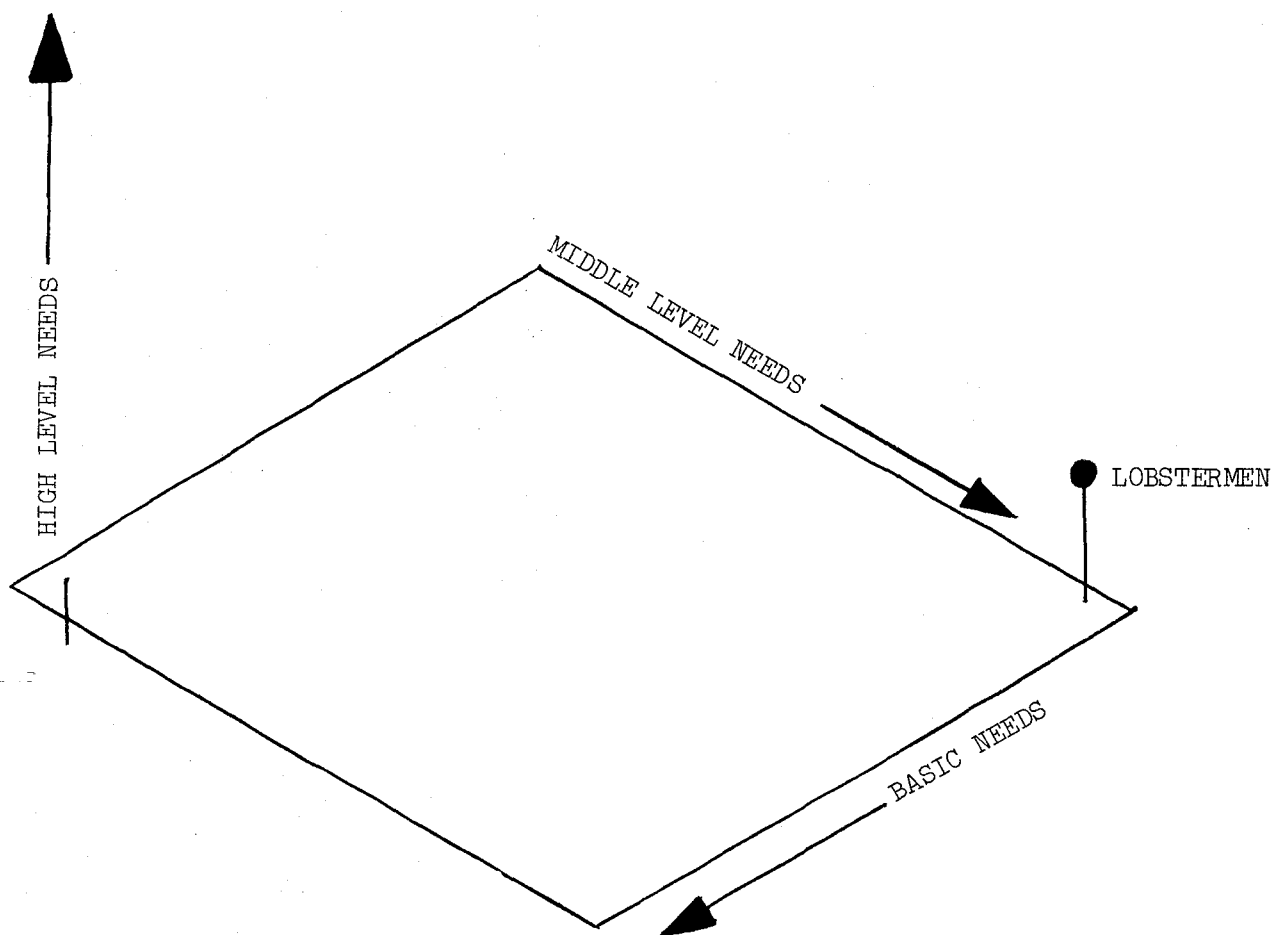


Figure 3. Lobstermen versus all others plotted in three dimensional occupational characteristic space.

Table 4

Zero-Order Correlations Between Independent Sociocultural Variables

	1	2	3	4	5	6	7	8	9	10
1. Ethnicity	-									
2. Age	-.08	-								
3. Marital status	.13	.41	-							
4. Number of dependents	.10	.16	.55	-						
5. Formal education	-.69	-.19	-.26	-.11	-					
6. Father fishermen	.28	.07	.11	.15	-.31	-				
7. Early entry	-.11	-.02	-.10	-.10	.08	.27	-			
8. Number of relatives fishing	.34	.03	.16	.09	-.34	.43	.15	-		
9. Owner-skipper status	-.29	.30	.09	.00	.13	.05	.17	.05	-	
10. Years fishing	-.01	.78	.35	.14	-.29	.22	.24	.18	.23	-
11. Other than inshore lobstermen	.27	-.17	.11	.20	-.16	.00	-.06	.10	-.54	.01

variance in the dependent is entered into the equation first. The next variable entered is the one which explains the most variance with the first controlled. This procedure is continued until all variables are entered or until a previously set criterion is reached. In the analysis presented here, entry into the equation was restricted to variables whose F Ratio to enter was at least 2.0 or the increase in variance explained at least one percent. When either of these criteria were not met, the procedure was halted. The results of this analysis for the total sample and for each port separately can be found in Tables 5 through 8.

In Table 5 it can be seen that for the total sample, being born in a foreign country (ethnicity), practicing a fishing type other than inshore lobstering, and early entry into the occupation are recurrent and important predictors of the various aspects of job satisfaction. Marital status is entered into three of the equations, but only relatively late and with relatively low partial correlations. The directions of the correlations tell us that foreign-born fishermen are less likely to have high scores on the Middle and High Level Needs Factors (therefore be less satisfied). Foreign-born fishermen are also less likely to say they would become fishermen if they had their life to live over (JSM1). Being a fisherman other than an inshore lobsterman is positively related to the Basic Needs Factor, negatively to the Middle Level Needs Factor, negatively to the High Level Needs Factor, and positively with advising a young man to enter the occupation (JSM2). Finally, early entry is positively associated with satisfaction on the job characteristics dimensions represented by all three factors and with both JSM1 and JSM2 .

Turnings to the within port analyses, we can see that there are a number of differences. With respect to the Middle Level Needs Factor, it was not significantly correlated with any of the sociocultural variables in either

Table 5

Stepwise-Multiple Regression Relating Independent Sociocultural
Variables to Job Satisfaction Variables within Total Sample

<u>DEPENDENT VARIABLE</u>	<u>VARIABLE ENTERED AND CONTROLLED</u>	<u>PARTIAL* TO ENTER</u>	<u>F RATIO TO ENTER</u>	<u>R</u>
MID-LEVEL NEEDS	Ethnicity	-.42	42.15	.42
	Other than inshore lobsterman	-.26	14.28	.48
	Age	.21	9.49	.52
	Early entry	.18	6.85	.54
	Years fishing	-.15	4.72	.55

BASIC NEEDS	Other than inshore lobsterman	.36	30.28	.36
	Early entry	.16	5.25	.39
	Owner-skipper status	-.13	3.15	.41
	Marital status	.13	3.59	.43

HI-LEVEL NEEDS	Ethnicity	-.56	91.18	.56
	Early entry	.18	6.72	.58
	Father fisherman	-.14	3.80	.59

JSM1	Ethnicity	-.23	11.60	.23
	Early entry	.14	3.78	.27
	Marital status	.12	3.00	.29

JSM2	Other than inshore lobsterman	.26	14.27	.26
	Father fisherman	-.16	5.13	.30
	Marital status	.11	2.52	.32
	Early entry	.12	2.90	.34

N = 201

*Zero-order for first variable entered a = $p < .01$ b = $p < .05$

Table 6

Stepwise-Multiple Regression Relating Independent Sociocultural
Variables to Job Satisfaction Variables at Point Judith

<u>DEPENDENT VARIABLE</u>	<u>VARIABLE ENTERED AND CONTROLLED</u>	<u>PARTIAL* TO ENTER</u>	<u>F RATIO TO ENTER</u>	<u>R</u>
MID-LEVEL ¹	-	-	-	-

BASIC NEEDS	Number of dependents	.30	7.89	.30
	Owner-skipper status	-.33	9.28	.44
	Early entry	.26	5.33	.50

HI-LEVEL NEEDS	Early entry	.25	4.93	.25

JSM1	Marital status	.24	4.76	.24
	Early entry	.17	2.29	.29

JSM2 ¹	-	-	-	-

N = 79

*Zero-order for first variable entered

a = p < .01

¹No entering variables with p < .05

b = p < .05

Table 7
Stepwise-Multiple Regression Relating Independent Sociocultural
Variables to Job Satisfaction Variables at New Bedford

<u>DEPENDENT VARIABLE</u>	<u>VARIABLE ENTERED AND CONTROLLED</u>	<u>PARTIAL* TO ENTER</u>	<u>F RATIO TO ENTER</u>	<u>R</u>
MID-LEVEL ¹ NEEDS	-	-	-	-

BASIC NEEDS	Father fisherman	.42	8.57	.42
	Formal education	-.23	2.26	.47

HI LEVEL NEEDS	Father fisherman	-.58	19.94	.58
	Years fishing	.39	6.93	.66
	Other than inshore lobsterman	-.39	6.97	.72
	Number of dependents	-.34	4.80	.76
	Marital status	.31	3.94	.79
	Owner-skipper status	.30	3.44	.81

JSM1	Years fishing	.38	6.69	.38
	Number of dependents	-.30	3.92	.47
	Ethnicity	-.22	1.88	.51
	Owner-skipper status	.23	2.06	.55

JSM2	Early entry	.35	5.66	.35
	Owner-skipper status	.34	5.27	.48
	Formal education	.20	1.56	.51
	Number of relatives fishing	.26	2.58	.55

N = 42

*Zero-order for first variable entered.

a = p < .01

¹No entering variables with p < .05

b = p < .05

Table 8

Stepwise-Multiple Regression Relating Independent Sociocultural
Variables to Job Satisfaction Variables in Maine

<u>DEPENDENT VARIABLE</u>	<u>VARIABLE ENTERED AND CONTROLLED</u>	<u>PARTIAL* TO ENTER</u>	<u>F RATIO TO ENTER</u>	<u>R</u>
MID-LEVEL NEEDS	Age	.29	7.26	.29
	Other than inshore lobsterman	-.23	4.46	.37

BASIC ¹ NEEDS	-	-	-	-

HI-LEVEL NEEDS	Years fishing	-.23	4.28	.23
	Other than inshore lobsterman	.19	2.80	.29
	Early entry	.20	3.34	.35

JSM1 ¹	-	-	-	-

JSM2 ¹	-	-	-	-

N = 80

*Zero-order for first variable entered

a = $p < .01$ ¹No entering variables with $p < .05$ b = $p < .05$

Point Judith or New Bedford. In Maine, satisfaction on this factor was positively related with age and negatively with other than inshore lobster fishing. The Basic Needs Factor was related to quite different independent variables in Point Judith and New Bedford. In Point Judith, number of dependents and early entry was positively correlated and owner-skipper status negatively correlated with Factor Two. This tells us that in Point Judith, owner-skippers are less likely to be satisfied with the items on the Basic Needs Factor while those with more dependents and those who entered the occupation early are more likely to be satisfied. In New Bedford, having a father who was also a fisherman is positively correlated with this factor and years of formal education negatively. In Maine, none of the independent variables are significantly correlated with the Basic Needs Factor.

In both Point Judith and Maine, early entry is positively correlated with satisfaction on the High Level Needs Factor. In Maine and New Bedford years fishing experience and other than inshore lobster fishing manifest contrasting correlations with this factor. In Maine, those with fewer years fishing experience and fishermen other than inshore lobstermen are more likely to be satisfied with regard to the items on the High Level Needs Factor. The opposite holds true in New Bedford. Additionally, a large number of other independent variables contribute significantly to variance in satisfaction on the High Level Needs Factor in New Bedford. In this port, six independent variables account for over 66 percent of the variance in Factor Three scores.

With regard to JSML, we once again find differential patterning between the ports. In Point Judith, marital status (being married) and early entry are positively correlated with JSML while in New Bedford, years fishing experience and owner-skipper status are positively correlated and number of dependents and ethnicity (foreign-born) are negatively correlated with JSML.

Finally, the independent variables are significantly related to JSM2 only in New Bedford where four account for 30 percent of the variance. Overall, we have seen a great deal of variation between ports with respect to the correlates of the various job satisfaction measures.

As a means of determining the overall relationship between the independent variable set (the sociocultural variables) and the dependent variable set (the job satisfaction measures) a canonical correlation analysis was conducted between the two sets of variables. The results of this analysis can be found in Table 9.

In Table 9, only the canonical variates which account for a significant proportion of the variance are presented. The analysis presented in Table 9 indicates that there is a statistically significant relationship between the two variable sets. The canonical correlation between the two sets of variables weighted by the first canonical variate is 0.77, and by the second canonical variate 0.48. Both of these canonical correlations are statistically significant at better than the 0.001 level.

The canonical variable loadings in Table 9 can be interpreted as correlations with the canonical variate (Levine 1977). For example, among the dependent variable set on the first canonical variate, the High and Middle Level Needs Factors manifest the highest absolute values in their correlations with the first canonical variate. These loadings indicate that satisfaction with job characteristics items associated with the two factors is negatively related to the first canonical variate. In the independent variable set, ethnicity and other than inshore lobsterman manifest high positive loadings while years of formal education and owner-skipper status manifest high negative loadings. Concentrating only on the highest loading variables, the first canonical variate can be interpreted as indicating that foreign-born and other than lobster

Table 9
Canonical Correlation Analysis Between Job Satisfaction
Variables and Sociocultural Variables

<u>VARIABLES</u>	<u>CANONICAL VARIATES*</u>	
	<u>I</u>	<u>II</u>
JSM1	-.27	.35
JSM2	.12	.64
Mid-level Needs Factor	-.68	-.14
Basic Needs Factor	.31	.62
Hi-level Needs Factor	<u>-.70</u>	<u>.60</u>
Percent of Trace	.23	.26
Redundancy Coefficient	<u>.14</u>	<u>.06</u>
Ethnicity	.89	-.25
Age	-.22	-.23
Marital status	.13	.20
Number of dependents	.24	.15
Years formal education	-.59	.11
Father fisherman	.20	-.28
Early entry	-.29	.31
Number of relative fishing	.21	-.03
Owner-skipper status	-.54	-.35
Years fishing experience	-.07	-.07
Other than inshore lobsterman	<u>.59</u>	<u>.68</u>
Percent of Trace	.19	.09
R_c	0.77	0.48
X^2	251.4	82.2
D.F.	55	40
p	<.001	<.001

N = 201

*Only significant canonical variates shown here ($p < .01$)

fishermen are more likely to be dissatisfied with respect to a weighted combination of the Middle and High Level Needs Factors. Conversely, owner-skipper and those with more formal education are more likely to be satisfied with these same factors.

Turning to the second canonical variate, JSM2 and the Basic and High Level Needs Factors load highest in the dependent variable set. In the independent variable set, other than inshore lobsterman loads highest, with early entry and owner-skipper status loading second and rather low. Keeping in mind the rather low loadings with respect to early entry and owner-skipper status, this canonical variate can be interpreted as indicating that early entrants and other than inshore lobstermen are more likely to be satisfied on a weighted combination of JSM2 and the Basic and High Level Needs Factors than owner-skipper.

Percent of trace for a given variable set is the sum of the squared elements of a column of canonical variable loadings divided by the number of variables in the set and is, therefore, the proportion of a set's variance associated with each canonical variate (Levine 1977). Thus, 49 percent of the dependent variable set's variance is associated with the first two canonical variates. The redundancy coefficient is not symmetrical and can only be interpreted as the amount of variance in the dependent variable set trace accounted for by the independent variable set canonical variate (Levine 1977). Thus, 20 percent of the variance in the two dependent variable set traces can be accounted for by the independent variable canonical variates. This indicates a relatively strong, as well as a statistically significant, relationship between the job satisfaction measures and the sociocultural variable set.

Discussion and Conclusions

The factor analysis of levels of satisfaction on a list of occupational characteristics resulted in three empirically derived factors more clearly

related to Maslow's (1954) hierarchy of needs than the a priori 'intrinsic' and 'extrinsic' job characteristic classification so frequently employed in research related to job satisfaction. The factors were characterized as Basic Needs (physiological and safety), Middle Level Needs (love and belongingness and self esteem), and High Level Needs (self-actualization). All three factors are significantly related to whether or not the respondent said he would go back into fishing if he had his life to live over (JSM1), a measure cited as the best single indicator of job satisfaction (Robinson et al. 1969). Interestingly enough, for the total sample the High Level Needs Factor is the strongest predictor of this satisfaction measure, indicating that self-actualization is a very important facet of job satisfaction among New England fishermen. This finding, at least as it relates to New England fishermen, contradicts Yadov and Kissel (1977) who claim that USSR workers, in contrast to U.S. workers, obtain job satisfaction from higher level motives. They write that motivation such as job security and wages are more important for U.S. workers (part of the content of our Basic Needs Factor). Among New England fishermen, the Basic Needs Factor is the weakest predictor of JSM1. Nevertheless, the Basic Needs Factor is the strongest predictor of whether or not one would advise a young man to go into fishing (JSM2). This can probably be explained by the fact that the first criterion to be considered when setting a young man off on his career would be satisfaction of basic needs--the higher level needs can be satisfied later (cf. Maslow 1954). It could also reflect other motivations of fishermen such as desire to limit entry of younger competition into the labor force.

The within port analysis of the relationships between the three factors and the two other job satisfaction measures (JSM1 and JSM2) indicates that the strongest within-port relationships are found in New Bedford. This finding

can probably be attributed to the fact that most New Bedford fishermen are offshore fishermen who fish extended amounts of time in relatively rough water. The conditions are so harsh, especially in winter, that a person has to be satisfied with the various occupational characteristics in order to rationally state that he would go back into fishing if he had his life to live over (JSM1) or to advise a young man to enter the occupation. This suggestion is supported by the fact that within fishing type analysis demonstrated that the strongest relationships between factors and JSM1 and JSM2, with a pattern similar to that of New Bedford, was found among offshore fishermen. This leads us to conclude that the occupational characteristics investigated are much more salient in determining overall job satisfaction among offshore fishermen.

An analysis of the inter-group differences with respect to the various satisfaction measures demonstrated that, overall, the strongest differences are across the ports. The patterning of the differences on each measure reflects the relative frequency of different types of fishing in each port (e.g., Maine primarily inshore, New Bedford offshore, and Point Judith, a mixture). Nevertheless, the strength of the across port differences leads one to suggest that some additional factors associated with the ports account for some of the variance in satisfaction levels.

An examination of the directions of the inter-group differences shows that fishermen from New Bedford, as well as the offshore fishermen in general, manifest mean scores indicating that they are the least satisfied with respect to the Middle and High Level Needs Factors and JSM1. Dissatisfaction on the Middle Level Needs Factor can probably be explained by the fact that these fishermen spend long periods of time at sea, and many of the items on the Middle Level Needs Factor are related to time away. Additionally, many of the fishermen in New Bedford are workers on large vessels that do not belong to them;

thus, they do not have the freedom to come and go as they please or perceive much of an opportunity to be their own boss in such a highly capitalized fleet (also related to items on Factor I).

The New Bedford and offshore fishermen's relatively low level of satisfaction with respect to the High Level Needs Factor is quite striking. Perhaps these fishermen have too much exposure to the items associated with this factor. Perhaps they are out on the water and outdoors too much in the cold, rough North Atlantic. Perhaps the challenge and adventure becomes a little too much to bear when one's life is at stake (cf. Poggie, Pollnac and Gersuny 1976). Additionally, since the crew to captain ratio on the large vessels is greater, the preponderance of crew members who are not in control of the situation, thus less likely to feel self-actualized in applying their own skills in dealing with the problems of production and the elements, would have a tendency to lower the mean score on these items. This suggestion is supported by the fact that owner-skipper status is positively related to satisfaction on the High Level Needs Factor in New Bedford (see Table 7).

The Maine fishermen as well as the inshore fishermen are by far the least satisfied on the Basic Needs Factor. When all inshore lobstermen are separated out, they manifest an even lower level of satisfaction on this factor. Most of these lobstermen are from Maine where both the predictability and level of earnings, on the average, do not match that of fishermen closer to urban markets (two items on the Basic Needs Factor). Additionally, the smallness of their vessels which are mostly open to the weather, in combination with the cold, turbulent Maine coastline and less mechanized nature of their job probably leads them to be less satisfied with the physical fatigue, safety, and healthfulness occupation characteristics, which are also on this factor.

Finally with respect to inter-group differences, we find that New Bedford fishermen are less likely to say that they would become fishermen if they had their life to live over (JSM1) and Maine fishermen are less likely to advise a young man to become a fisherman (JSM2). The relatively low score for New Bedford on JSM1 can probably be attributed to their relatively low level of satisfaction on the Middle and High Level Needs Factors as described above. The low score of the Maine fishermen on JSM2 is probably due to the fact that the Maine lobstermen perceive the lobster grounds as a "limited good" and have a tendency to try to control access through the institution of harbor gangs which sometimes use violent means to restrict access to specific lobster grounds (cf. Acheson 1975).

Stepwise multiple regression was used to determine the relative influence that a range of sociocultural variables have on job satisfaction. With respect to the total sample, being foreign-born (ethnicity), beginning to fish before 21 years of age (early entry), and being other than an inshore lobsterman are the strongest predictors of the various job satisfaction measures.

Foreign-born fishermen are less likely to be satisfied with respect to items on the Middle and High Level Needs Factors and less likely to say that they would become fishermen if they had their lives to live over again. Fishermen who entered the occupation early, however, tend to be relatively satisfied with items on all three factors and to respond that they would both become fishermen if they had their lives to live over and that they would advise a young man to enter the occupation. Fishermen other than inshore lobstermen are less likely to be satisfied on the Middle Level Needs Factor and more likely to be satisfied on the Basic Needs Factor and to advise a young man to enter the occupation.

There are several possible explanations for the relatively low level of job satisfaction among foreign-born fishermen. First, most of the foreign-born fishermen are from New Bedford and are Portuguese immigrants who come to the United States with relatively high expectations and with day or short-trip fishing experience. Although their income in the United States is relatively high, becoming a crewman on a long-trip vessel in the North Atlantic is probably a rude shock for many. Interviews indicate a great deal of dissatisfaction with respect to the effects of long-trip fishing on family life among these immigrants. One even states that this type of fishing "... is not a job for a man." The immigrant fisherman apparently comes ill-prepared for trip fishing, and with high expectations which are not fulfilled; thus, he reports dissatisfaction with his job--the higher the expectations, the lower the chances of achieving satisfaction (cf. Kulpinska 1977). It is also possible that since most of the foreign-born fishermen in the sample are offshore fishermen, the results parallel what we would expect on the basis of offshore fishermen's attitudes toward their occupation. The crewmen aboard the large New Bedford vessels are more like factory workers than fishermen in smaller vessels who are either independent entrepreneurs or individuals who have some hope of owning the means of production themselves someday. From this perspective, the New Bedford immigrant fisherman can be grouped with other workers who do not own the means of production and have little control over their own labor (Stoked 1978). The fact that there is an active union at New Bedford reinforces this view. Kalleberg and Griffin (1978) suggest that workers who have less control over the product and process of their labor obtain fewer job rewards than others, thus, providing a possible alternative explanation for the finding of low job satisfaction among immigrant fishermen. Nevertheless, the relatively high correlations with ethnicity

suggest that some factor associated with being foreign-born also influences relative job satisfaction.

The general finding that fishermen who enter the occupation early are more likely to express satisfaction on all measures suggests that early socialization into the occupation of fishing results in greater overall satisfaction. This finding may also be due to the possibility that early entrants have had little opportunity to compare fishing with other occupations. The positive relationship between age and satisfaction with respect to the Middle Level Needs Factor is in keeping with other research which reports a positive correlation between age and job satisfaction (cf. Robinson et al. 1969; Glenn et al. 1977). Finally, the finding that fishermen other than inshore lobstermen are more likely to be dissatisfied on the Middle Level Needs Factor and satisfied on the Basic Needs Factor can probably be explained by the fact that the Middle Level Needs Factor is composed primarily of items associated with separation from loved ones, and offshore fishermen feel this separation more acutely. Further, their relative satisfaction with the Basic Needs Factor is probably the result of the dissatisfaction of Maine lobstermen on this factor as discussed above. The Maine lobstermen comprise most of the inshore lobstermen in the sample, thus, influencing the reported relationship.

The intraport analysis of the sociocultural correlates of job satisfaction resulted in findings suggesting that situational variables play a large role in these relationships. In some ports none of the sociocultural variables were related to specific job satisfaction measures; in other ports many were, and in one instance, opposing relationships were found in different ports.

With respect to the Basic Needs Factor, number of dependents is the strongest predictor in Point Judith. We have no serious explanation for this relationship at the present time. A tongue-in-cheek explanation is that fishermen with large families feel less mental pressure and physical fatigue on board the boat than at home. After the effects of number of dependents is controlled, however, owner-skipper status manifests a strong negative correlation with this factor. There are a number of possible explanations for this finding. First, owner-skippers are probably more critical with respect to their income since they have so much capital invested in productive equipment. Further, owner-skippers are responsible for many of the basic needs of the crew (e.g., safety, healthfulness, etc.); thus, these items on the Basic Needs Factor would be more salient to them. Perhaps the more important a given aspect of job satisfaction is to an individual, the more likely he will express dissatisfaction with it. This finding is paralleled by Kalleberg and Griffin (1978) who report that the more highly one values intrinsic job rewards, the less likely one is to be satisfied with the level of such rewards. The Basic Level Needs Factor is composed primarily of items one would classify as "extrinsic," but perhaps the same principle applies. Early entry is also entered into the equation for Point Judith, and the explanation for this relationship is similar to that offered above-- those who are socialized into the occupation at an earlier age are probably better adapted and have not had the opportunity to contrast fishing with other occupations.

In New Bedford the strongest correlate of satisfaction on the Basic Needs Factor is having a father who was also a fisherman. This finding suggests that in New Bedford, where the conditions are overall harshest with respect to exposure to the rough, open ocean and physical separation from land,

having a father who was a fisherman probably "preadapts" a fisherman to the difficult nature of the job (e.g., through having a supportive family context and early socialization by a successful fisherman role model) (cf. Poggie, Pollnac, and Gersuny 1976), thus, resulting in greater overall satisfaction with the items on the Basic Needs Factor. The negative partial correlation with years of formal education suggests that those with more education tend to be more critical with respect to items on the Basic Needs Factor. Perhaps formal education leads one to have higher expectations with respect to these items, hence lessening the chances for satisfaction. Finally, none of the sociocultural variables are significantly related to the Basic Needs Factor in Maine.

Turning to the Middle Level Needs Factor, we find significant relationships only in Maine. There, age is positively correlated with satisfaction on this factor, suggesting that as one becomes older, the high expectations of youth are abandoned, thus increasing the likelihood of satisfaction. The relationship between level of expectations and job satisfaction is discussed above. Finally, fishermen other than inshore lobstermen tend to be dissatisfied on this factor just as we found for the total sample, and the explanation is similar--most items on the factor deal with separation from land-based society, and offshore are separated more.

The High Level Needs Factor manifests the largest number of statistically significant relationships with the sociocultural variables in the intra-port analyses. Among Point Judith fishermen, only early entry into the occupation is significantly related to level of satisfaction on this factor. In Maine we also find early entry as a correlate of satisfaction on the High Level Needs Factor. In both cases early socialization and reduced chances for comparison with other jobs probably play a significant role in enhancing

satisfaction with respect to the items on this factor. Years fishing experience is negatively related to satisfaction on the High Level Needs Factor in Maine. Here we might argue that facing the turbulent Maine coastline with a small lobster boat becomes too exciting, challenging, and adventurous as the fisherman becomes exposed to it more and more over the years and the initial attraction to the items on the High Level Needs Factor wears off. It is interesting to note that the exact opposite relationship holds in New Bedford. It can be argued that in New Bedford, after an initial dissatisfaction with the High Level Needs Factor because of high expectations that do not match reality, as discussed above, the fisherman becomes more realistic, and we consequently find an increase in job satisfaction with increasing time in the occupation. The strongest predictor of satisfaction with the High Level Needs Factor in New Bedford is having a father who was not a fisherman. This is probably due to the fact that individuals from fishing families are taking the path of least resistance to obtain a job through their father's contacts or on their father's boat. They are probably not entering the occupation because they are attracted to it; thus, it would be perceived more as a job fulfilling basic needs--an interpretation supported by the significant correlation between the Basic Needs Factor and father fisherman.

Turning to the question concerning whether or not a fisherman would advise a young man to enter the occupation, we find significant relationships only among the New Bedford fishermen. There we find that early entry into the occupation, owner-skipper status, years of formal education, and number of relatives fishing are all positively related to a positive response to this question. With respect to JSML (whether or not an individual would become a fisherman again if he had his life to live over), married fishermen

and those who entered the occupation early are the ones most likely to respond positively in Point Judith. In New Bedford, years fishing experience and owner-skipper status are positively related to positive responses to this question, while number of dependents and being foreign-born are negatively related. The positive relationship between years fishing and job satisfaction in New Bedford has been discussed above. Owner-skipper status is more likely to be related to job satisfaction in New Bedford because on the larger vessels, which predominate there, owner-skippers have more control over their labor, a factor positively related to job satisfaction (cf. Kallenberg and Griffin 1978). The negative relationship between ethnicity and job satisfaction in New Bedford is probably related to the higher expectations of immigrants coming to the United States, as discussed above. Finally, number of dependents is negatively related to job satisfaction in New Bedford due to the fact that the more dependents one has, the more difficult it is to be at sea for the long periods of time which characterize this port. The wife is probably less satisfied due to the fact that she must manage a larger household; thus the departures and returns are probably more stressful. As one New Bedford long-trip fisherman said, "I've eleven children, I go home and I confuse their names--some father I am."

In sum, we have seen that the structure of job satisfaction among New England fishermen is related to a number of items potentially affected by management such as fishing style, time at sea, freedom to come and go as one pleases, and so on. Fisheries management schemes which impact these facets of the occupation would also affect job satisfaction, which in turn is related to a large number of variables impacting society ranging from longevity to family violence and worker productivity. We have also seen that the interrelationships between job satisfaction and relative satisfaction regarding

various facets of the structure of the occupation is complexly related to other sociocultural variables. Further, many of these interrelationships are conditioned by situational variables which vary from port to port. Hence, fisheries management plans can differentially affect job satisfaction among different categories of people and in different ports. The complexity of the interrelationships between these numerous variables suggest that extreme caution be taken if the goal of minimizing the negative social impact of fishery management schemes is to be realized.

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* in this volume

PRUNING THE FAMILY TREE: KINSHIP AND COMMUNITY
IN COASTAL MAINE

Toby F. Lazarowitz

James M. Acheson

Introduction

In the folklore of American life, the Maine fisherman holds a special place. Even short-term visitors to Maine coastal communities are quickly made to feel the difference between themselves and the people who live there. Some have commented on the coldness and standoffishness of Maine people; others have pointed out that they felt like aliens, not guests. People who have moved into these communities from outside come to realize that there is a way of life going on all around them in which they will never be able to participate fully. They may be physically present in these communities, but not a part of them. Some of these "summer people" tend to explain their alienation in terms of not having been born in the community: as one ex-New Jerseyite said, "there is virtue sitting in one place for 200 years." While such statements are often said jokingly, they reveal a truth about Maine communities--namely, that kinship and community are strongly linked, and that without kinship ties, it is difficult to be considered anything but an outsider.

Kinship certainly is important in these towns, and it is relatively easy to obtain data on it. However, an analysis of the role of kinship in Maine coastal communities proved far more elusive than one might expect. There is a large body of literature on kinship in English-speaking communities. Among the most prominent are Parsons' studies of the conjugal unit (1949); Schneider's work on kinship ideology (1955, 1970); Litwak's articles on kinship as a cognitive unit (1960 a,b,c); and the work of Osterreich (1965) on kinship and geographical mobility.

While all of these points of view illuminated certain aspects of the data, they proved remarkably unsatisfactory in explaining many facets of kinship in

these towns. We found Parsons' nuclear families, but also found large extended kinship units. Kinship here has an ideological component, but kinship ties are also manipulated with practical ends in mind. Most important, we found that some kinsmen do move and maintain contact, but we also found that most people in these towns do not move, and when they do, they quickly lose contact.

Although we have found all of the theoretical approaches mentioned above useful, the work of these authors proved inadequate to explain certain aspects of our data—particularly the clear importance of residence. Our data from Maine suggest certain ways that the theoretical approaches used in studying American kinship could be modified and extended to better account for the phenomena encountered. Our concerns will become apparent after we have presented the ethnography on these communities.

In this article, we will first describe the relationships between kinship and community from the point of view of those who are already accepted members. Then we will describe the boundaries around such communities, emphasizing the ways in which an outsider can enter. Hopefully, our insights about Maine, and the theoretical focus forced on us by our data, will prove useful for others working in other parts of the English speaking world.

The Area

All of the interviews on which this paper is based were obtained from informants who lived in small, coastal communities in the mid coast region of Maine.¹ All of these towns are between Penobscot Bay and Casco Bay, and are located at the ends of the long peninsulas that jut out into the Gulf of Maine in this section of the coast. All have populations of

under 3000 permanent residents, and some are far smaller than this. They have little industry and maintain a rural character. The people in these towns obtain services of all kinds and do most of their shopping in the small cities along U. S. 1, the main transportation artery along the coast of Maine. Many people from these coastal towns find employment there as well. Generally these cities (i.e. Bath, Brunswick, Rockland, Bucksport, Camden, Damariscotta) are within an easy half-hour drive from these peninsula towns.

All of these towns were established permanently by 1750, and several were inhabited long before that. Virtually all of the permanent residents are Anglo-Saxon Protestants, whose families have lived in the area for generations. Unlike the inland areas of Maine, this coastal region has no French Canadians nor any other kind of ethnic enclave.

This region of Maine has long been a mecca for tourists. The population of coastal towns expands dramatically in the summer as migratory tourists flock in, along with large numbers of people who own summer cottages and who live here for months on end. The town of Bristol in 1970, for example, had a permanent population of 1720 people, which swells to an estimated 5000 people in July and August. Until recently, there was a sharp break between the long-settled permanent residents and the "summer people." Recently, however, increasing numbers of people, many retirees, from "outside the area" have been settling in these towns permanently.

The two most important sources of employment in these towns are fishing and service industries (e.g. stores, carpenters, plumbers); the latter cater mainly to the so-called "summer trade."

The population in most coastal towns is relatively dispersed. The shores

are lined with "summer cottages." All of these towns have between two and eight small, nucleated hamlets. The permanent residents live either in these small hamlets or along the main paved roads.

The towns are mainly run by selectmen who are elected for a one to three year term; a few also have town managers. All major decisions, including all decisions concerning appropriations, are made by majority vote at the annual town meeting. Most of the tax money is spent on schools and roads. Few of these towns have police departments, and most have volunteer fire departments. Ordinarily, any attempts to expand governmental functions or bureaucracy beyond these elementary institutions are resoundingly defeated.

For the permanent residents, the most important institutions are kinship, community, and voluntary associations. While all three are related, kinship is the most important.

Kinship: The Recollections of Long-Term Residents

What is critical in the study of kinship is not the objective genealogical facts, but the interpretation and use of that kinship system by the people involved in it. After all, the facts about procreation are the same everywhere in the world. Any given person has two parents, four grandparents, eight great grandparents, and so on. Theoretically, any person can trace genealogical ties to any other person who has ever lived. We don't do so for obvious reasons. Forgetting kinsmen is a practical necessity. Thus, some of the crucial questions we need to ask in the study of kinship are: Which people are recalled as kinsmen? Which people are forgotten? What principles are behind the process of selecting kinsmen? Underlying these concerns is the realization that we pick our kinsmen to a larger degree than most of us would care to admit. We create our kinship past with certain contemporary aims in

mind. It is the way that kinship is used in Maine communities that is of interest to us.

In studying the kinship system of long-term residents, we obtained complete genealogies from 44 people. Information was obtained on every single affinal and consanguinal kinsman recalled by each informant. We obtained information on where each relative was born, where their spouse(s) were born, their current residence, number and residence of children, occupations, and whether they were living or dead. All of this information was obtained via open-ended interviews. We did not attempt to press informants for information on categories of kinsmen whom they thought were too unimportant to remember.

No attempt was made to select a random sample of informants. Some of the information obtained is very sensitive. People were obviously reluctant to talk about divorces, people incarcerated in jails or state hospitals, first cousin marriages, illegitimacy, or factors like alcoholism which made it difficult to hold a job, and so on. Under these conditions we felt it was preferable to obtain accurate information from a few people who trusted us, rather than inaccurate or selectively edited information from a more scientific sample.

Moreover, a random sample could not have increased our coverage. Since families in Maine communities are very large, one did not have to obtain too many interviews to obtain the names of almost everyone in the community several times over. We are reasonably certain that the families selected are representative, but we cannot be positive of this.

All of our 44 informants presented information on their families in a remarkably similar way, so that important aspects of their genealogies look very similar. It is important to distinguish between what informants said and the

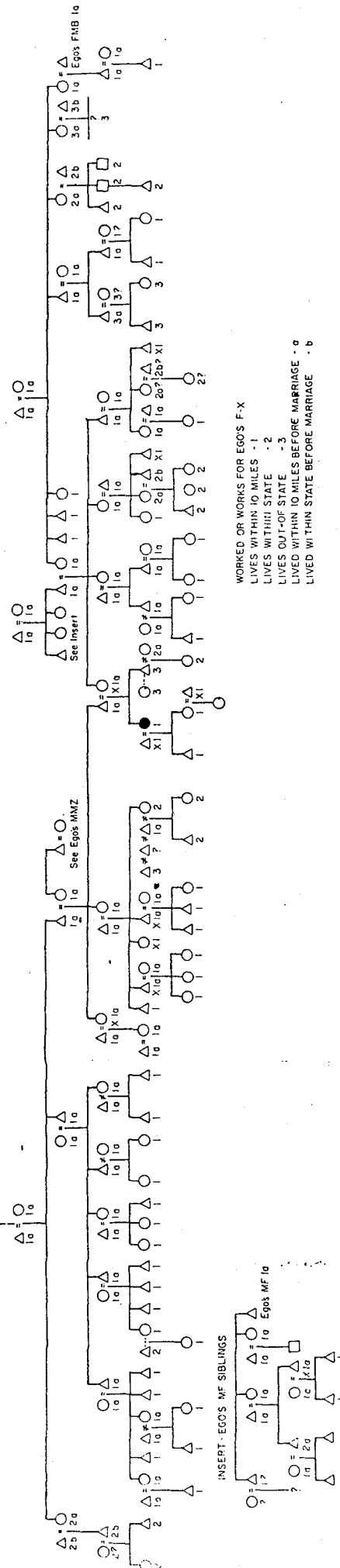
hard facts about these genealogies from our analysis of them. To this end, we will first present the facts informants gave us concerning their families. The latter sections of the paper will be devoted to interpreting these data.

While we cannot present all 44 genealogical charts, one is shown here to illuminate several points about the way our informants perceived and presented the facts of kinship.

The chart we have selected to present (see Figure 1 below) is by no means the largest obtained, nor is it unusual in any respect. This information was obtained from a bright, college-educated woman who currently lives in a town near Penobscot Bay where her family and that of her spouse have long been established.

Figure 1. Genealogy of an Established Maine Family

NINE GENERATIONS BACK TO MAYFLOW



There are a number of points that need to be made concerning the data in this chart, and its general applicability to the other genealogies collected.

First, most of the kinship charts collected from members of established families in this area exhibited two forms of kinship memory. The first is a thin thread of kinship links into the distant past. The second is a bilateral network of contemporary kin which extended at most five generations in total.

The informant who presented the data in Figure 1 ultimately traced her ancestry back to a person who was born just after the Mayflower arrived in the New World. She cannot trace the exact set of linkages between herself and this "mythical ancestor," but this is not important. As a matter of fact, by her third ascending generation, this informant had already forgotten the names of her relatives. It is critical to note that while she could not give the names of her great-grandparents, she was positive that they were born and resided after marriage in town. This is a typical pattern. Most of our informants harkened back to a "mythical ancestor" who lived in the area or in the American colonies--not to England or any other European countries. In all cases, they could hardly recall anyone further back than their great-grandparents. Merely knowing you have that kind of connection into the past is what is critical. The exact family history is beside the point. When people could recall their great-grandparents or someone further in the past, they could also recall the spouses and places where they lived. They often could not recall collateral relatives (i.e. siblings). The emphasis in all cases was on locality--not lineality.

At the end of these thin threads into the past is a fat, very elaborated unit of more contemporary kin. Our informant recalled her own sibling group (brothers, sisters, their spouses, their children), as well as the sibling

group of her husband and her parents. She also recalled first cousins and second cousins bilaterally. She recalled most of the people in her grandparents' generation (brothers, sisters, spouses). There is no tendency to emphasize males or females as links. Most important, she recalls every person in these above categories who is resident in the town of her ancestors. Again this is very typical. Virtually all of our informants could recall all of the relatives out to second cousins--if they resided in the community with the informant.³ They could not recall linkages to third cousins, which would mean remembering one's great-grandparents' generation in detail. In some cases, people never knew the names of these kinsmen; in other cases they knew who they were but forgot to include them. Whether people knew or did not know those kinsmen is beside the point. What is important is that in either case these people were deleted from the category of "relatives."

People who had the same last name, but who were beyond the second cousin range, were identified as "relatives." Informants knew there was a link somewhere in the past, but couldn't specify what it was and didn't care. It should be stressed that any member of the nuclear family is not forgotten by other members regardless of how far away he might move. People maintain ties with sons and daughters in New York and Alaska. However, these migrants would quickly cease to be important to their first cousins and might not be recalled as relatives by them.

Second, among our informant's kin there was a very high degree of endogamy within the community. In the entire genealogy (see Figure 1), there are a total of 38 marriages (including living and dead relatives and divorces). In 30 of these marriages (78.9 percent of the cases) both spouses came from the same town or towns within 10 miles. This again is a pattern that emerges in all of our interviews. In our sample as a whole,

which included 1454 marriages, both husband and wife came from within 10 miles of each other in 72 percent of the cases. The same tendency toward endogamy has been noted in a very large number of societies (Fortes 1969: 123).

Third, people are recalled as kinsmen if they live right in the local community or very nearby. There is no instance where our informant could not name a kinsman who lived in her local community. When kinsmen moved away, however, they were quickly forgotten. For example, our informant could not name the woman who was going to marry her brother in New Jersey. She did not know her first cousin's husband's name--even though the family lives in Bangor, Maine about an hour and a half away. She could not recall her mother's mother's sister's husband, their children, or anyone who came out of this whole line, despite the fact this whole family resides an hour away. Again, this is a pattern we saw repeatedly. It was very common for informants to recall every single relative--including very small children--who lived in the same town or adjacent towns within a half hour ride, and they knew a tremendous amount about these people. Beyond that range, things got vague.

Fourth, our informants reported very few cases of migration. Of the 51 nuclear households identified in Figure 1, 42 (82.3 percent) lived in the town or within 10 miles of it. Only two of these households were located outside Maine and seven more were in Maine but outside the local area. We do not know how to interpret these facts. There certainly appears to be a strong tendency to remain in one's ancestral town. However, we know there has been a massive migration out of the state of Maine. In the 1860's Maine had a total population in excess of three million people; for the past several decades, it has had about one million. As Lord Beaverbrook has pointed out in the case of nearby New Brunswick: "Its finest export is men." The same is true for Maine. We know objectively that many of these coastal towns

came to their population height in the middle of the last century and have been losing population ever since. Yet the genealogies we have collected give little hint of this process. Of the thousands of people who have moved from Maine towns in the last century to places like Ohio, Colorado and California, virtually none show up as kinsmen on our charts.

Of the 44 genealogies we recorded, only two informants mentioned whole "parts of their family" whose members resided out of state. Whether the absence of recorded migrations is due to a tendency to stay home or a tendency to forget is debatable. We believe that migration has occurred. Given the population statistics on out-migration, it is very unlikely that all members of these families stayed in their home towns. Our interpretation is that in the selective memory of Maine people, we clearly have a process by which migrating kinsmen "vanish." Those who remain and make it to the genealogical chart are those who live in the ancestral community.

Fifth, occupational choice is clearly influenced by kinship ties. As can be seen from Figure 1, eleven kinsmen worked for the informant's father in a business providing services to local households. There is no person in this community providing this service who is not part of this family. The informant's husband originally worked for her father, and has now gone on to start his own business of the same kind. In our sample as a whole, a very high percentage of children picked up the occupation of one or the other parent.

Interpreting the Data

These kinship data raise three kinds of issues for the anthropologist. First, the way that relatives are recalled in Maine coastal communities makes it difficult to identify kinship units which have analytical meaning for

anthropologists. When informants talk about "relatives" they are identifying nuclear families at certain times, lineage-like units at other times and kindreds under other circumstances. All three are called "my family." The nuclear family units cause no problem. They are families of orientation and procreation. However, when informants recall a thin thread of kinship ties into the past--their patrimony--the units they are identifying have some of the traits of lineages. That is, kinsmen are being identified as all those who stemmed from some distant ancestor. The difference is that unlike most lineage units in the literature, Maine people swap between female and male relatives in creating the lineal chain. The "family" which consists of the fat units of contemporary local kinsmen has many of the traits associated with kindreds. Here, one's kinsmen are identified in relationship to ego. Despite the confusion of the local terminology, all of these three kinds of units are experienced and used by Maine people under certain circumstances. They must be clearly distinguished in the analysis to follow.

It should be noted that all three of these different kinds of "family" units involve different levels of corporateness. The nuclear families have all of the traits associated with corporate groups. The boundaries are very clear. It is very clear if one is a member of a nuclear family or not. The unit has structural continuity over time. And there are rules for behavior within that group. The other two units also exhibit these features, but to a lesser degree. The boundaries of kindreds are very diffuse, and political control does not clearly reside in any single individual, but rather shifts depending on the task. Moreover, the norms defining relationships between members of a kindred are not as well defined.

Second, there is the ambiguous position of women in Maine kinship. As we have said, Maine people will not hesitate to use women in forging the links to form lineage-like structures. At the same time, women are not full members of these lineage units. They are clearly members of the nuclear family into which they were born and the lineage composed of their father and siblings until they get married. But at marriage, the status of women becomes vague. At times, women will identify with the "family" into which they were born. As time goes on, they tend to identify and are identified with the "family" of their husband. This means that older married women will tend to be cut out of critical decisions and inheritance of the lineage into which they were born. After all, they have someone "to take care of them," and may have even left the local area.

Third, there is the link between kinship and locality. Given our data on small coastal towns, it is obvious that the operating kinship units are composed of kinsmen who live in the same local area. Kinsmen and the networks between them are the most important units in the lives of these people. To a large extent, a person's feeling of worth, his identity, and his place in the social fabric is tied up with this group of local kinsmen. As we have seen, any kinsman who moves outside the local area is no longer a part of the everyday social network, and quickly becomes unimportant. While the relationship between kinship and locality is important in understanding the ethnography of the area, the relationship is not obvious and deserves extensive analysis. The remaining part of this paper will be devoted to this issue. First, we will discuss the relationship between members of so-called "old established families" and the locality. Second, we will discuss "newcomers," who are also resident in these towns.

Kinship and Locality: The "Old Established Families"

The Real Assets of Kinship

While Maine people, especially men, have a good deal of trouble expressing their feelings, it is very apparent that a great deal of what gives life its meaning is tied up with their local area.⁴ This shows in a number of ways, perhaps most obviously in the answers we received to two questions on an instrument administered to 190 captains of fin-fishing boats in Maine and New Hampshire.

When we asked "Why do you stay in ----(hometown)," the three most common answers were: (1) "My family is here" (57 respondents); (2) "I don't like cities" (24 respondents); (3) "I like this area" (54 respondents). There were a total of 55 answers which fall into no easily defined class. More important, when we asked: "If the fishing industry in Maine failed completely, where would you go and what would you do?", an overwhelming percentage of the men said they would stay in their local area and find another job. We were shocked that only 6 out of the 190 said they would leave the state and go fishing elsewhere. Clearly, these men have far more commitment to the area than to the occupation. Unlike middle-class people who tend to move with the requirements of their jobs, these men were tied to the locality.

Our in-depth interviews make us quite certain that there are several factors behind this strong attachment. People cannot conceive any place better than their ancestral town. The coast of Maine is a beautiful place in all seasons. In addition, local people know how they treat outsiders. Anywhere else they would go, they would be the outsiders.

Most important, most of one's kinsmen are located in the local area. From any number of perspectives, they are the most important people in one's life. Kinsmen interact a great deal in these communities. One not only meets kin on the job, but there are regular daily visits back and forth. Large groups of kinsmen often eat Sunday dinner together and spend the afternoon talking and relaxing. Of course, in any given year, there are always funerals, weddings, baptisms and other rituals which bring family members together. In fact, it is sometimes difficult to avoid interacting with kinsmen. This situation was brought home forceably by a long-established resident who was asked to be a judge of a grammar school art contest. She said, "I probably should have disqualified myself since I am related to almost every child here" (in the contest).

However, membership in large established families gives far more than recreational opportunities and psychological support. The ties represented in the genealogical charts are not frozen social models; they are assets which the individual can manipulate and maneuver to give him an edge in the struggle for survival. In other words, these kinship units are not only cocoons which buffer the individual psychologically against the vagaries of fate, they also convey real assets which help to insure that the fates will be kept at bay. It is these beneficial aspects of kinship ties to "established families" which we would like to stress here.

There are three different sets of assets to which individuals can gain access through the use of kinship ties: capital assets, jobs and business information, and political legitimacy and support. Access to these different kinds of assets depends on the ability to manipulate the appropriate kinds of kinship ties properly. The nuclear family, lineage, and kindred each has its own use and can be recalled at the appropriate moment. What this means

is that the control over valuable assets is very much tied up with the complex way people recall kinship in Maine coastal towns. We will discuss each set of assets and the kind of kinship ties giving access to them.

Looking first at capital assets, we note that all of the land in the townships was once in the hands of "established families," and in their view, all of it still should be. Whenever possible, houses, land, and family businesses are passed on to kinsmen. Every town has innumerable people who have held on to land, old farms, homesteads--often at great financial sacrifice--long after they have ceased to have any utilitarian purpose. To be sure, in the past 50 years, farms have been sold to tourists, coastal property has been broken up and sold for cottage lots, and family businesses are no longer held by family members. But sales to outsiders are always done with a feeling of regret--as if one is selling one's birthright.

What this means is that such "established families" have very valuable capital assets, which they have preserved for their members. This is not to say that all members of such units have a higher than average income or automatically inherit valuable resources. It is to say that they have differential access to such assets, and can possibly inherit them if they manipulate kinship ties properly. The use of kinship ties to gain capital assets of all kinds through inheritance has been discussed in some detail in another paper (Acheson and Lazarowitz 1980). It should be noted that the rules operate in such a way that men, especially men who can use the asset or business, are more likely to inherit than women, men in other businesses or professions, or kinsmen who move to another area. Moreover, it is the lineage or nuclear family which, ordinarily, is the unit involved when inheritance is at issue.

Second, kinship ties are put to use in several different ways in the local business community. Local people openly admit that jobs--especially high paying jobs requiring skill--are reserved for "family." For example,

the father of the woman who gave the genealogy in Figure 1 ran a service business in which all 11 employees were close family members. (The people who work in this business are circled. See Figure 1.) In the area as a whole, almost all businesses (fishing boats, stores, carpentry businesses, shops, gas stations, etc.) are manned by a core of kinsmen. The hiring of kinsmen is based on a feeling of responsibility for providing for "family members," and to ensure that the family enterprise continues. When the owner of a large herring stop seine operation was asked why he hired only his sons and sons-in-law, he said, "It is my responsibility to make sure that these jobs will go to people who are going to feed members of my family" (i.e. his married daughters and their children). In several other cases, people said they hired kin, who would eventually own the business, because they didn't want to see something they had worked for all their life "fall into the hands of strangers." The matter of skill also plays a role. As one carpenter phrased it: "It takes me six months to train an apprentice before he is useful. Why should I spend that time on someone else?" (He hired his son.)

Members of long-established families also have fishing rights denied to others. According to the law of the State of Maine, anyone can go lobster fishing who has a license. In actuality, one must not only have a license, but must also be accepted by the men fishing out of one harbor; and once one has gained admission to a "harbor gang," one is ordinarily allowed to go fishing only in the traditional territory of that harbor. Interlopers are met with strong sanctions, sometimes merely verbal, but more often involving the destruction of lobster gear. This entire territorial system is the result of political competition between groups of fishermen. It exists only because

of tacit agreements between fishermen. It has no legal or jural elements (Acheson 1972, 1975, 1980). What this system of fishing rights amounts to is the pre-emption of ownership rights over part of the Atlantic ocean. A "tourist" may own a piece of shorefront property, but he has only limited rights to go fishing in the water in front of his cottage.

Entry into "harbor gangs" is influenced by a number of factors. It is most important for our purposes to note that men whose fathers, uncles, grandfathers or other lineage members are currently fishing from a harbor are automatically accepted. Usually, boys from long-established families have no "trouble" when they want to "go fishing," even though their kinsmen are not lobster fishermen. However, it is virtually impossible for a "tourist" to put in more than a few traps, and short-term residents can become full-time fishermen, if at all, only after a long initiation period. In every town, there are people who have attempted to go lobster fishing and have lost their gear.

Moreover, kinsmen in the same town obtain from each other loans, information on innovations, data on employees and customers. There is also a strong tendency for kinsmen to form partnerships.

It should be pointed out that different kinship ties and units are involved in these different economic spheres. The kindred is the important unit used in obtaining business information, jobs, and access to fishing rights. The nuclear family or close lineage ties are used for obtaining loans. It is also such close family or lineage members who form partnerships.

Whereas ties between living lineage or kindred members are of primary use in the economic sphere, it is long-dead kinsmen--one's mythical ancestors--who are of most use in the political realm. (For a more complete explanation see Acheson and Lazarowitz 1980.)

Long-term residents assume that all political offices and all important

offices in associations will be held by people from long-established "families." Most of them are. In the town of Bristol, for example, all of the selectmen, as far back as anyone can remember, have been so-called "local" people. It is simply assumed that competence in political offices is inextricably tied up to long-term residence. Knowing everyone, and knowing "local ways" is considered far more critical for success in these offices than any kind of technical skill or experience an "outsider" might have to offer. In a recent election for selectman in one town, a personable, college-educated man was roundly defeated by a man whose family had lived in town for generations. He never stood a chance. As one elderly woman put it, "How could he do the job? He has only been here for seven years."

An urban sophisticate might find it quaint and rustic that political jobs are reserved for "established people." What surprises "local" people is the fact that anyone who had lived in the township under a decade would even have the brass to run for high office.

It is critical to note that members of these "established families" have a clear edge on others. It is not only that they are "eligible" to run for political office; their large kin network will deliver the votes. It is not only that they feel they should have the land; they usually do. It is not only that they have an obligation to hire kinsmen; they actually give the jobs and training to close kin. As a result, it is axiomatic in these communities that a successful person is one from an old "established family," and those from old families will be successful. Everyone knows they have the advantage. Here there is virtue in staying in the same place for centuries. It does lead to something. As one fisherman phrased it: "The secret of success around here is to have an old family and a big boat." One is merely the expression of the other.

The equation between longevity and economic and political success has some odd twists. If a group of kinsmen is successful in business, it is simply assumed that "the family" must have been around for a long while. Sometimes this simply is not true. In one town, two very successful businesses are owned by sets of kinsmen who are assumed to have been in the area for a long time. In fact, both came around the turn of the century. On the other hand, old "established families" whose members have not done well are considered to anomalous. In these cases, people feel something needs to be explained.

It is important to note that while kinship ties can be manipulated to give differential access to real assets, such advantages can only be realized in the local area. There is no reason why people from "old families" could not inherit land or businesses if they move to Iowa, or why family network ties could not operate to give valuable information on jobs, credit, innovations, etc beyond a 30 mile radius. However, this does not occur. Since kin ties can be manipulated to give assets only locally, it is only local kinsmen who are valuable. The way various kinds of kin ties are used to obtain distinct sets of assets is the subject of another paper by the authors (see Acheson and Lazarowitz 1980).

The Symbolic Assets of Kinship

Not only does being a member of an "established family" convey some tangible rewards which increase one's chances for survival, it also makes one a member of a community, which confers more subtle, but not less important rewards. Being a member of a community fixes one in a predictable social universe, and it provides a set of categories by which that universe can be interpreted.

The relation between kinship and community cannot be approached without entering the sphere of ideology, for the "web of kinship" is congruent with the web of meaning surrounding community membership.

People do not inherit membership in a community the way they inherit a piece of land. Membership in the community is a moral statement. People are members of a community because they have accepted the yardstick by which acceptable behavior is judged. They judge other people by these standards, and are willing to be judged by them.

People from "established families" are automatically members of the community. Their acceptance of the community's values has been tested through time. All people who are members of old established families are considered to be equally part of the community. It does not make any difference whether they have a good reputation or a bad reputation. It is the fact of having a reputation that is critical. A person from one of these kin groupings is a known quantity--for better or for worse--in the eyes of the community. His behavior is predictable. He is not like an outsider, whose actions can never be fully understood or put in any meaningful context. As one fisherman phrased it: "Christ, you never know what they [tourists] are going to do." Clearly, knowing what to expect--even if it is bad--is very important.

To a large extent, the reputation of any individual in the community is determined by the extended family from which he comes. Sometimes people will talk about "good families" and "bad families," but usually the stereotypes about a "family" are far more specific. Most of them are phrased in terms of "blood" or inherited traits which are thought to characterize whole family lines. These family stereotypes are usually brought up in conversation as a means of explaining the behavior of an individual. Several examples are in order. When a new clerk in a local store would not cash one of the author's

checks (even though he had been doing business in the store for five years), a friend explained that the clerk was a --- (name of large family), and everyone knows they are a "little stubborn and boneheaded." Another family is known to "have a nose for fish" (all good fishermen), while still a third is described as a bunch of "badlanders," meaning that everyone from the great grandfather to the sons have had trouble with the law and have a reputation for heavy drinking.

It should be noted that these traits are thought to be transmitted biologically, so that there is seemingly nothing an individual can do to escape his ancestral past. This ideology about "family characteristics" is a way of locking people into the past and explaining their present. The idiom of "blood" is often used in explaining success and failure. The fact that some old established families have not been "successful" is normally explained in terms of some inherited weakness. "Their father's father never had much sense, so you know where they all got it from."

When an individual from an "unsuccessful" kin grouping obviously succeeds, the stereotype of "the family" is rarely changed. He is merely an exception to the "rule." This is not to say that sets of kinsmen cannot rise or fall in the esteem of their fellow townsmen, but it takes time, and no single act of an individual will alter the total family reputation.

The reputation of a "family"--whether it is "good" or "bad"--is judged according to a yardstick accepted by everyone in the community. Behind this yardstick guiding the way conduct is judged is a whole value system. While a complete description of this value system cannot be given here, the core features are not unfamiliar to those acquainted with the rural parts of North America (Bennett 1969). A few peculiar features of the Maine scene might be emphasized, however. People in these communities believe in reward

for honest effort. People who take welfare, or earn their living by manipulating others ("a fast talker") are scorned. Independence, and the ability to control one's own time, is highly valued. The male ideal is to own one's own business. Conversely, being in a position where one has to take orders is considered shameful. For this reason, employers and boat captains never give orders, they merely suggest. A Maine coastal person is never hired, he is merely "helping out." While one is expected to be "independent," one is also expected to be helpful and cooperative in time of need. People strive for "success," which is defined in economic and political terms. Overriding many of these values is an emphasis on equality and fair play. It is axiomatic that all individuals are created equal, and should be treated equally as long as their membership in the local community is established.

While all people in coastal communities accept the same standards for judging behavior, some live up to them better than others. There are a variety of valued goals. Length of time in the area and so-called "proper behavior" are very important, along with economic and political success. Since these things tend to stack up within specific kin lines, there is a whole hierarchy of extended families in any given community. It should be noted that these are extended families, not nuclear families. There are only two to four families at the pinnacle of the hierarchy in any town. While there is no agreed-upon term for these units, every school child knows who they are. Sometimes they are called the "look up to families." Ordinarily, most of the prominent members of these kin units are owners of independent businesses, although a few members might be in professions (for example, teachers or lawyers). Their economic success is usually manifested in nice homes and good automobiles, duly noted in the town, although they do not live opulently

by any means. On the bottom of the hierarchy are a few so-called "poor families," who live in poor quality housing; they may not have any steady source of income, and may even be taking welfare. More important, members of these "poor families" may have criminal records, be involved in well-advertised drinking bouts, have illegitimate children, and so on. It should be noted that the earmarks of "successful families" are material goods; failure is defined primarily in terms of immoral behavior. The majority of the family groupings lie somewhere in between. There are also a large number of "summer people," and "newcomers" in these towns, but of course, they scarcely exist in the social universe.

The community and "established families" are mirror images of each other. Community values are reflected in the kinds of reputations families own. Families own these reputations because they are part of the community. "Family" and community in Maine coastal towns are part of a tightly knit whole, and cannot be extricated from each other. These are the people who visit together, swap help and information, work together, feel an obligation to hire each other. It is also these local kinsmen who strongly influence one's reputation in the local community. A kinsman who lives an hour or more away is irrelevant. He cannot help you; you do not interact with him much; and whatever he does—for better or worse—has no influence on one's own standing in the unit that counts—the town. It is not surprising that a lot of these people do not make it to the genealogical chart.

In Maine coastal towns, kinship and communities have two sets of linkages. First, people are members of the community when they and their kinsmen accept the local value system. It is this standard of conduct—not what an individual does—that is critical in marking him as a member of the community. This is not to indicate that membership in a community is solely a matter of having

the right attitudes. The second criterion for membership is long-term residence and interaction. It is conceivable that a "summer" person or a newcomer might have the exact set of values as local people. But such a person does not join the same associations and is not a part of a set of kin units that interact within a communal framework. In short, their values have never been tested. In actuality, most summer people neither have the "right" values nor do they interact. They have violated both criteria for community membership. Every coastal town has innumerable "summer people" whose families have owned cottages for generations. They are physically present in the town, but they are black holes in the social universe. Members of "established families," by way of contrast, have a wide network of social ties, as well as the proper values. For these people, community membership is almost conferred at birth. Here again, they have an advantage.

Community Members and Newcomers: The Issue of Boundary

Given the fact that membership in these Maine communities is tied up with membership in long established "families," such communities should be hermetically sealed against all outsiders. After all, one cannot change the facts of one's birth, and one does not easily marry into an "old" family, due to the strong tendency for members of kin lines to marry each other. The way Maine people talk about their communities and outsiders would lead one to think this were true. It is not.

Community members do not have any universally accepted term by which they call themselves. Sometimes they will speak of "local people," but more usually just "us." Summer visitors again have a variety of names for themselves: "tourists," "cottage owners," "summer people." The names the groups use to describe each other are far less complementary. Community

members speak of "summer complaints," "touraest" (slurred and sarcastic),
"New Yorkers," "the money people" (to be fleeced, of course), "outsiders,"
"foreigners," "people from away." Summer visitors talk about "the yokels,"
"locals," "townies," "town dummies." All these common usages suggests a
hard and sharp split between "community members" and other forms of outside
life such as summer residents. Communication between these two groups is
certainly at a minimum. Most communication takes place when members of these
two groups interact superficially in stores or the post office or when local
people provide services for "cottage owners." Cottage owners never entertain
members of the other group, and only a few cases (somewhat scandalous) of
intermarriage take place. Summer families can own cottages for generations
and know only one or two local people. The hostility between the two social
categories is sometimes palpable. One t-shirt slogan seen around the Maine
coast in the summer of 1979 read: "I am not a tourist. I live here, and
I don't answer any questions," a slogan that clearly does not offer the hand
of friendship. Another t-shirt, much in favor with younger tourists, read
"Where the hell is Damariscotta," which makes fun of the tendency of Maine
people to assume that everyone is familiar and impressed with the most
important residential unit in his life--his hometown. (In fairness, it
sould be noted that some local young people were also seen sporting this
latter shirt.)

Despite the terminology used and the attitudes behind them, we have
found the boundary of these Maine communities relatively permeable. In fact,
in any town, there are a whole series of people in the process of being
accepted into the community. The way people can gain entry into these
communities and the nature of the boundary around them deserves careful
analysis.

There is no hard, fixed boundary around Maine communities as is suggested by the terms "insider" "outsider." However, entry into these communities takes place over a long period of time. There is nothing a newcomer to a small Maine town can do which will bring him into the community immediately. There are certain steps which can be taken, however, to allow a newcomer to attain some semblance of community membership. While such a person can never achieve the same degree of community membership a member of an established family inherits automatically, the children or grandchildren can. Moreover, people who have taken steps toward assimilation experience far less hostility than real outsiders. In fact, they can live very comfortably in these small Maine towns, even though they are not part of the community in a very real sense.

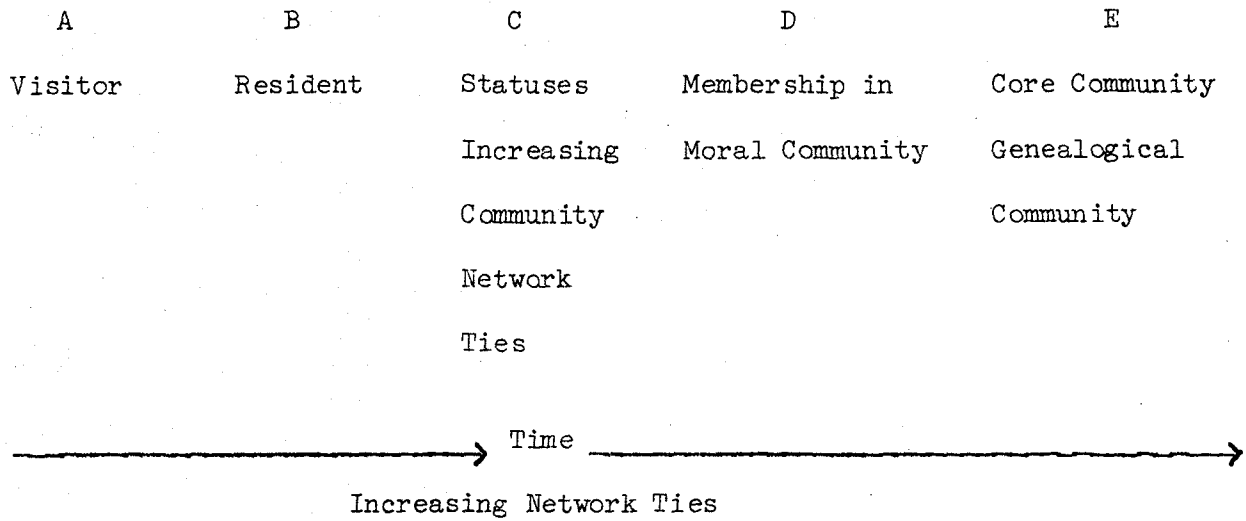
This continuum of entry contains four or five statuses, ranging from complete outsider to member of the community's core. These statuses and their position on this entry continuum are shown in Figure 2 below.

Visitors are, of course, those people who visit the community or live there only seasonally. People who live in summer cottages are almost as much "outsiders" as the casual visitor, or the person who has never been in town. They do not know anyone, and are completely unknown by the community itself. The Residents are people who live in the town all year round, but may interact very little. People who move into town and take steps to increase network ties are in another category (i.e. status C.).

Three kinds of activities greatly increase the number of ties possible: (1) having "a family," (used here to indicate nuclear family) which allows one to become known at school and gives one's children access to peer group ties; (2) having a job in town, and (3) participating actively in one of the many clubs, associations, political organizations, or churches. Membership

FIGURE 2

Community Membership Continuum



in the Moral Community occurs when a person has consistently exhibited many of the values we have previously described (e.g. political conservatism; emphasis on fair play and "independence") and interacts intensively over a long period. Last, membership in the "Core" of the community is held only by members of "long-established families," which has been discussed previously.

Figure 2 not only gives an outline of the various statuses vis-à-vis entry into the community; it also describes the stages one has to go through to gain complete, unequivocal membership. In order to start on the road to community membership, one has to move into the town. None of the other steps are possible unless you are a full-time resident.

People who have families and jobs, and who participate in many community associations and affairs, have come much further on the road to acceptance. These people not only have greatly increased network ties so that they are known in the community; they also have demonstrated a concern for the community and a commitment to it. Rather than being an outside observer of the community, one has now become an active participant in it. This fact is known, and one's willingness to help is usually appreciated. However, since these people have not internalized the community's moral yardstick, or are thought not to have internalized it, their efforts to "help" are frequently considered as meddling.

Those people who are members of the Moral Community not only have achieved widespread network ties, but measure other people and their own behavior by what are considered acceptable community standards. No longer are one's actions unpredictable and one's motives suspect. The community and what goes on in it are the focal points of these people's lives.

The members of the Core Community are, of course, members of the "old established families," whom we have discussed in preceding sections. They

automatically have all of the attributes others along the continuum must achieve: long residence, widespread network ties, commitment to the community, and proper values.

Exactly where the boundary is depends on the status one holds along this continuum. To the casual tourist, everyone looks like a "townie," save for some of the people who live in cottages or other people who he knows have just moved into town. For this type of person, the boundary exists between statuses A and B in Figure 2. For him, the critical earmark of community membership is permanent residence alone. Members of the Core Community are equally unable to make distinctions concerning the other end of the continuum. From their perspective, even people who are residents in town and who have involved themselves in many different community activities are "Visitors" In fact, from their perspective, the people in Status C are the most annoying kind of outsider. They do not have the inner "compass" of the true community member, but have so many network ties that their meddling can be very dangerous. These people are really defining community membership in terms of a genealogical community, which, as we have shown, includes all of the other attributes defining full community membership.

The amount of time it takes to go from "Visitor" to "Core Community member" varies considerably. One merely has to move into the community to become a Resident (B), and one can join enough clubs, political groups, etc. to have a large number of network ties in two to five years. If one can create a large enough set of network ties in a short length of time, one can demonstrate proper values in a short length of time. Thus, one could conceivably move from Visitor (A) to a member of the Moral Community (D) within five years. In fact, many people have moved from Visitor to (C) (Statuses Increasing Network Ties) in this length of time. It is more

difficult to move to (D) in such a short time, because becoming a member of the Moral Community means a change in perception--a turning inward on the community which now has become the focal point of one's life. In the lifetime of a single person, one can never move from (A) Visitor to (E) Member of the Core Community. All people in the "Core Community" have been born into it. Even a person who married into the "Core Community" is not part of that community. His children, however, will be. If they stay in town, they will emphasize genealogical ties to members of the Core Community, rather than ties through the parent who was the Visitor. By simply staying in the town and emphasizing the correct side of his genealogical chart, this child has faced inwards on the community. This child has forgotten kin who are **non-resident**--a common pattern we have seen.

People in small Maine towns are not only aware that Visitors can move into their communities; they think they know exactly how it can be done. When we asked one informant "What should I do if I wanted to become part of this community?" we got a seven step primer of activities one should undertake which would result in Moral Community membership in a matter of a few years. The strategy, according to this informant, is as follows:

1. "Move into the area."
2. "The place you move must be on the main road."
3. "Be married, preferably with children."
4. "Get a job in or around the community."
5. "Join local organizations."
6. "Be involved in community affairs."
7. "Don't rock the boat by injecting your alien attitudes into the community."

This informant stated openly that no Visitor could ever become a true part of "us"--the inner core. She was fully aware that membership in the

Core Community could be attained only by birth.

It should be noted that this primer contains all of the factors mentioned in Figure 2, although they are expressed in different words. "Move into the area" is synonymous with residence. Numbers 3, 4, 5 and 6 in this primer all increase community network ties. The comment about "don't rock the boat" is a comment about the moral community and acknowledgement that if one cannot really join the moral community, it is wisest not to advertise the fact if one wants to be accepted on even a minimal level.

Exit from these communities is relatively easy and happens all the time. One merely has to move away and one will quickly be forgotten. However, one can lose rights even if one stays in town. We have already mentioned that those who have learned a set of values at odds with those defining the "Moral Community" can have a good deal of difficulty. It is for this reason that higher education is considered so dangerous.

Members of "established families" whose values are changed through education or working outside the community may also be beyond the pale. They may be made to feel so uncomfortable that they are forced to migrate. Others live on the margin of acceptability. One school teacher from a very old family said she was almost an "outcaste." She was in favor of such things as "art classes" and "kindergarten," which local lore has branded ridiculous. She also took other unpopular stands on issues, which demonstrated that she really does not share the local values.

One can lose rights by ceasing to interact. Several informants from "established families" mentioned cousins, uncles, and others who were physically present in the town, but "stuck to themselves" for one reason or another, or were so "odd" that others would not interact with them.

Ordinarily a person who has achieved membership in the Core of the

community can move away from town, and return and reclaim full rights again. Many individuals join the military for 20 years, or work out of town for decades. When they return, it is a relatively easy matter for them to pick up where they left off. There are exceptions to this rule, however. If the interim time between periods when one has lived in the town is too great, one will lose certain rights. This is particularly true if one has not lived in the town during those years when one would normally attend school in the town (i.e. grade school, high school). While the number of cases we have is too small for statistical reliability, we have noted instances where people have lost fishing rights. One man's family left a coastal town where they had been one of the established families for some 200 years. When he left, he was 9 years old and when he returned he was about 30. He was not permitted to go lobster fishing when he returned. Everyone admits that he could have "gone fishing" if he had established himself as a fisherman in his teens and early 20's or if another "close family member" was an established fisherman.

People who have moved into these communities react to being outside the community in a variety of ways. Middle class individuals (professionals, business people, etc.) often move to a "C" status (See Figure 2) and are content to stay there. They have a lot of friends, and are active in many different kinds of social groups. However, they do not want to take on the values which would make them members of the "moral core" of the community, and have such broad horizons that the town cannot be the focal point of their lives. Their circle of close friends--professional and business people--are also in the "C" category. If the truth were known, they would not want to become members of the Community even if they could (which they cannot). The intense interaction characteristic of "established families," along with the lack of privacy, would be bothersome, and they reject the yardstick used

to judge "proper behaviour and attitudes." They are perfectly comfortable living in such towns, but appreciate the partial anonymity that goes with marginal acceptance.⁹

Lower-middle-class people who move into these towns from other communities clearly feel like second-class citizens. They would like to join the Core Community, but cannot by virtue of birth. They have often lived in the town for decades, have all the values required, and often have a good many friends and acquaintances. Despite all these facts, they are often doomed to live on the margins of the local community. Their sense of dissatisfaction sometimes finds voice. One popular fisherman who had lived in a Maine town for close to 40 years, said "regardless of what I do or how much I achieve, I can never be fully accepted in this town. Some people are always going to look down on me--I was born in Massachusetts. They were born here. That's all that counts."

Conclusion

There has been a great deal of anthropological work emphasizing that--contrary to popular opinion--extended kinship units play an important role in American life, e.g. Litwak (1960, a,b,c), Piddington (1965) and Osterreich (1965). We agree. However, all of these authors have worked in industrial, urbanized areas and have found that extended kinship ties are maintained over long distances and over extended periods of time. Our data from non-industrialized, non-urban Maine coastal communities does not support those findings. Quite the contrary. Here the operating kinship group is a local unit, and kinsmen who move away are quickly forgotten or are pruned from the family tree because they have no function in the unit that counts.

We found two sets of linkages between kinship and residence in Maine coastal towns. First, kinship ties in these communities can be manipulated to give members of so called "established families" differential access to resources. We found that the term "family" in Maine embodied three separate kinds of kinship units--the nuclear family, lineage, and kindred--each of which could be conjured up at any given time depending on the problem at hand. Some ties to living relatives were manipulated with inheritance in mind; others with practical immediate economic advantages in the forefront. Even the ancestors were not ignored. One's long history in the area is especially useful in the political arena. It is important to note that use of various kinds of kinship ties to obtain differential access to these different kinds of assets only operates on the local level.

Second, membership in so called "established families" makes one automatically a member of the community. Despite the fact that community membership is conferred only through birth, these communities are not hermetically sealed. As we have noted, there are activities which can be undertaken by new residents to gain them a high degree of acceptance, and ensure that their children will be full members of the community. It should be noted that this linkage between kinship and locality is more complicated than situations reported in other parts of the world. Leach, among others, has certainly emphasized the importance of local residence in kinship in his Burmese and Ceylonese material (Leach 1954, 1961). Moreover, the way that kinship ties are used to gain control over local assets is the focus of Fortes' concept of the "family estate" (1949, 1969). What is unusual in the Maine situation is the fact that these various kinds of kinship ties can be manipulated to one's advantage only in a very restricted area. We

are not convinced we have found any kind of extraordinary case in Maine. We believe that the operating units in which people in many cultures live are fat kindred-like units which dangle from a mythical ancestor. In most societies, people manipulate kinship and define ancestors with practical survival strategies in mind, just as they do in Maine (Keesing 1966). In the English-speaking world, everyone forgets kinsmen, as the current boom in the genealogy industry indicates.

We are certain that it is common in many other parts of the world to slough off kinsmen for whom there is no immediate (either real or ideological) use. The world would be unmanageable without this kind of selectivity. The Maine situation may be distinguished only by the extreme importance placed on the local kin unit, and the speed with which kinsmen outside an hour's drive are forgotten.

As any gardener knows, one prunes away the weak branches so that what remains will be stronger and more vital. The family tree in Maine is sturdy as an oak even though it does not extend beyond a half hour's drive. All the weak branches in California and New York are "gone."

NOTES

1. Socially and economically, the coast of Maine is a continuum. The western coastal region, near the New Hampshire border, is very heavily populated, industrial, and urbanized. Some towns in this region are only an hour from the middle of Boston. The eastern part of the coast, near the Canadian border, is very sparsely populated, rural, and has little industry of any kind. It is one of the poorest regions of the United States. The mid-coast region of Maine is midway between these two extremes in all respects. There, towns are neither very wealthy nor very impoverished, neither urban, nor very isolated.

2. While we have used the word "cousin" our informants rarely did. They tended to talk about relatives in surprisingly anthropological terms. A second cousin, for example, would be referred to as my father's father's brother's son's son. The same system for calculating kinsmen has been noted among Scandinavians (Murdock 1949:98).

3. It should be noted that these communities geographically are very small. When an informant says that someone lives "here" he means in this town, or perhaps even in a particular hamlet in the town. The town adjacent is always regarded as a different place, even though he may know a good many people there and maintain kin ties.

4. In this respect, Maine people certainly feel the "diffuse enduring solidarity" that Schneider has commented on (Schneider 1979: 166-167).

5. Membership in such families has substantial costs as well. People from those families--especially affines--stress the limited horizons, the strong expectations with regard to invitations and visiting, the constant gossip, the "bullying" they sometimes receive from older family members, and the competition between siblings for the very assets we are discussing in this paper.

6. One of the authors is a New Yorker and is deeply stung by this. The other is from Maine, and resents the fact that anyone "from away" would call him a yokel.

7. All the terms on this continuum are ours. Locals would not use these terms, although they recognize the distinctions made.

8. We have seen what happens to members of established families when they are not community residents. A newcomer who does not live in the town doesn't even establish enough ties to be forgotten.

9. Few professionals besides teachers actually live in these communities.

Those few people from "established families" who do become doctors, lawyers, teachers, accountants, etc. who live in these coastal towns often practice in nearby cities. There is more than economics involved. Professionals are forced to treat their clients universalistically, with professional standards in mind. Those professionals from "established families" who live and practice in their ancestral towns are constantly faced with a conflict of allegiances. We have noted several instances where teachers admit they would much prefer to get jobs in towns other than their natal community. This is true even if they are living "at home." We have noted cases where this conflict is so severe that the professional either has to move out of town or give up the profession. One key informant gave up the profession of law to go lobster fishing for just this reason.

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USING THE FAMILY JEWELS:
THE FAMILY ESTATE IN COASTAL MAINE

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Introduction

There is increasing evidence that kinship ties are often manipulated for personal ends. In many cultures, people pick kinsmen for their own purposes. There is a wide variation in the freedom of choice and the rights and duties kinsmen owe each other in these different parts of the world, but the idea that kinship--especially extended kinship units--are flexible and manipulable has gained widespread acceptance (Bailey 1961; Spiro 1968; Marshall 1960; Keesing 1966; Goodenough 1951; Fox 1967; Bourdieu 1977). In this paper, we would like to focus on extended kinship in Maine coastal communities, and particularly on the ways such ties are manipulated.

In studies of kinship in the United States, emphasis has been placed on the nuclear family. This is apparent in work such as Parsons' on the "conjugal family" and in the writings of people such as Schneider and Homans who focus on the role of the nuclear family in socialization (Parsons 1949; Schneider and Homans 1955). Historians, novelists, and others have noted that extended kinship units were important in certain parts of the English-speaking world (for example, Faulkner in the American south, and Lundberg for the Eastern elite in the United States 1937), but the topic has been almost ignored by anthropologists. When social scientists mention extended kinship units in the English-speaking world at all, it is ancillary to another topic.

In areas of the Maine coast, extended kinship units are extremely important. Here, kinship ties are assets which can be used to make a variety of exchanges useful in the struggle for survival.

In this paper, it is argued that there are three different kinds of kinship units in Maine coastal towns: nuclear families, lineages, and kindreds. Ties to each of these units are evoked at the appropriate time,

depending on the assets the individual wishes to gain. There is, thus, a "match between the kind of kinship ties manipulated and the goals people seek. First, we will give a brief description of the Maine coast, and then discuss the way local people recall kinship to evoke these three units at will. Then, we will discuss three different types of goals individuals seek--namely, capital goods, jobs and business information, and political influence--stressing the kinds of kinship ties one uses to attain each asset and the exchanges made to obtain these goals. In discussing the strategies used to attain each kind of asset, special emphasis will be placed on explaining the reasons kinship ties may be manipulated only within a local area. The practical use to which local kinsmen can be put, as we shall see, has important implications for the social structure of these communities. These implications will be discussed in the conclusion.

It should be noted that we are concerned only with the ways various kinds of local kinship ties can be used to attain specific ends. Which strategies any given individual picks, and the kinds of exchanges he is able to make are fascinating, but beyond the scope of this paper. It should be also stressed that our analysis applies only to the long-established residents of the area--not tourists or recent arrivals who are physically located in these towns but not a part of them.

The Area

All of the interviews on which this paper is based were obtained from informants who lived in four small coastal communities in the mid-coast region of Maine. These towns are between Penobscot Bay and the Sheepscot River, on the ends of the long peninsulas that jut out into the Gulf of Maine in this section of the coast. By water, these towns are no more than sixty-two miles from each other, although it takes over four hours to drive

from the eastern-most town to the most western. All of these towns have a population under 3,000 permanent residents. They have little industry and maintain a rural character. The residents obtain services of all kinds and do most of their shopping in the small cities along U.S. 1, the main transportation artery along the coast of Maine. Generally, these towns and cities (i.e., Bucksport, Bath, Brunswick, Rockland, Damariscotta) are within an easy half-hour commute from these peninsula towns. Many of the people who live in the small peninsula towns work in the small cities. The two most important local sources of employment are fishing and service industries (for example, stores, carpentry, plumbing), which cater mainly to the so-called "summer trade."

Virtually all of the permanent residents of these towns are Anglo-Saxon Protestants, whose families have lived in the area since at least 1800. Unlike the inland areas of Maine, this coastal region has no French Canadians, nor any other kind of ethnic enclave.

Until recently, there was a sharp break between the long-settled permanent residents and the "summer people." During the latter part of the 1970s, however, increasing numbers of people, many retirees, from "outside the area" have been settling in these towns permanently so that the distinction between "tourist" and "community member" has been blurred somewhat.

The population of these four towns is relatively dispersed. All of them have between two and eight small, nucleated hamlets where most of the permanent residents live. The shore is also lined with "cottages" occupied by summer people, many of whom have returned to the area for decades.

The towns are run by selectmen who are elected for one to three year terms. All major decisions, including those concerning appropriations, are

made by majority vote at the annual town meeting. Most of the tax money is spent on schools and roads. Few of these towns have police departments, and most have volunteer fire departments. Ordinarily any attempts to expand governmental functions or bureaucracy beyond these elementary institutions are resoundingly defeated.

Local Recollections of Kin

The facts of procreation are the same anywhere. Everyone has two parents, four grandparents, eight great-grandparents, and so on. Recalling all people to whom kin ties could possibly be traced is not feasible. Forgetting kinsmen is a practical necessity. What is important in the study of kinship is who is recalled as a kinsman and the structural relationships between various categories of kin. In this area, our informants exhibited three kinds of kinship memory. First, they identified their nuclear family. Second, they would harken back to some almost mythical ancestor. The "ancestor" was often a Revolutionary war hero, a person who came over on the Mayflower, or simply one of the founders of the "town." People typically could not trace their ancestry to this ancestor, and often did not know even how many generations had passed. Exact family history, with all that entails for knowing about intermediate generations, is not important. What is critical is to be able to tie one's history to the past in such a way as to make one eligible for certain privileges in the present. Third, they would recall shallow but broad units of contemporary kinsmen only five generations in depth at the most. Our informants recalled their own sibling groups (brothers, sister, their spouses and their children), as well as the sibling groups of their own spouse and their parents. They also recalled most of the people of their grandparents' generation (brothers, sisters, spouses),

and could name their first and second cousins bilaterally. There was no tendency to emphasize males or females as links. Most important, they recalled every person in these above categories who is resident in the town of their ancestors. Thus, this second kind of kinship memory (ancestor) results in units that look like lineages; the third (contemporary kin) in groupings that resemble kindreds.

Local people make no clear distinction among these three units. All kinds of kinship units and ties are referred to in terms of "family." Although people recognize that there are important differences, the lack of any refined terminology makes it very difficult for them to make essential distinctions in talking about their kin. At times, the terminological problems lead to some mystifying conversations. One man, for example, told one of the authors that "my family is very large, but my own family is very small. Only my mother is living and my only brother has no children." The first family in this statement refers to what we call the kindred; the second to his close lineage. The informant certainly understood the distinction, but the term "family" was all he had to work with.

Recalling kinsmen in this complex way gives members of long-established families several kinds of advantages in the struggle for survival that recent immigrants into these towns do not have. First, members of kin units who can trace their ancestry to one of the founding fathers are automatically members of the core of the community. Such "core families" are not equal by any means, but they do share a common ideology and a yardstick by which acceptable behavior is to be judged. These "families" are known; their behavior is at least predictable as opposed to that of "outsiders." All members of these "established families" are equally members of the community. It does not matter whether their reputation is good or bad, it is having a reputation at all that counts. The symbolic line between kinship

and community has been discussed extensively in another paper (see Lazarowitz and Acheson 1980). Second, all three kinship units give members of established families a large number of ties to contemporary kinsmen. In addition, the lineage-like units give people ties to the ancestors. All these forms of kinship can be used in different ways to obtain real economic and political advantages. These advantages do not come automatically, however. A person must know how to manipulate and maneuver these different kinds of kin-based assets to achieve his ends. The kinds of assets stemming from ties to these local kin units and the strategies that can be used to take advantage of them demand considerable analysis. As we shall see, these assets are transmitted through generations. They are a kind of family estate, although a different one than Fortes has described.

Kin Ties and Their Uses

We will discuss three of the most important spheres where the assets of kinship may be manipulated for personal gain: inheritance, access to immediate business assets, and politics. While the options in these spheres involve different considerations, there are some underlying principles behind the use of kinship in the study area. In this section, we will discuss these three spheres of activity and the ways kinship is variously manipulated in each. In the conclusion, we will discuss the fundamental principles governing the strategies in all realms, and the wider significance for anthropological theory.

Inheritance

In small Maine coastal towns, a very large proportion of the assets owned by members of established families are inherited. This includes land,

other natural resources, and established family businesses. In this respect, such people differ from members of the American middle class whose most valuable assets might be houses in suburbia and cars for which they themselves paid. Since access to these valuable capital assets is obtained through inheritance, the norms governing the transmission of property, and the ways they can be used, are critical to understand since so much turns on them.

In studying the strategies surrounding inheritance, we will present a case study of a family-owned island and the established lobster fishing area around it. Not only are "family fishing areas" interesting in and of themselves, but virtually every important principle governing inheritance can be seen in this case.

The island in question has about one hundred acres and lies several miles from the mainland in the central coastal region of Maine. The land has been in private hands since the 1850s, and was permanently occupied until the 1920s. Since that time, the owners have all lived on the mainland, although one or another of the owners might stay on the island for a few days in the summer. Until the 1920s, the island was farmed, and its major asset was agricultural land. In recent decades, sheep have been raised there, but the major asset has been the established lobster fishing area around the island. This fishing area is exploited only by members of the owning family.

In order to understand the uses made of this island, one needs to know something about the social organization of the lobster industry. Lobster fishing rights in all areas of the Maine coast are, for all practical purposes, owned by local groups. These ownership rights are not jural, and certainly are not recognized by the state. According to the laws of Maine,

anyone can go fishing is he or she has a license. In actuality, one must not only have a license, but one must be a member of a "harbor gang"--the group of people fishing from a particular harbor--and once one has gained admission into such a group, one can only go fishing in the traditional territory of that "gang." Encroachment on the fishing territory of another gang meets with no set response. Sometimes an interloper will be warned verbally, but more usually he will be driven from the area by the surreptitious destruction of some of his lobster traps.

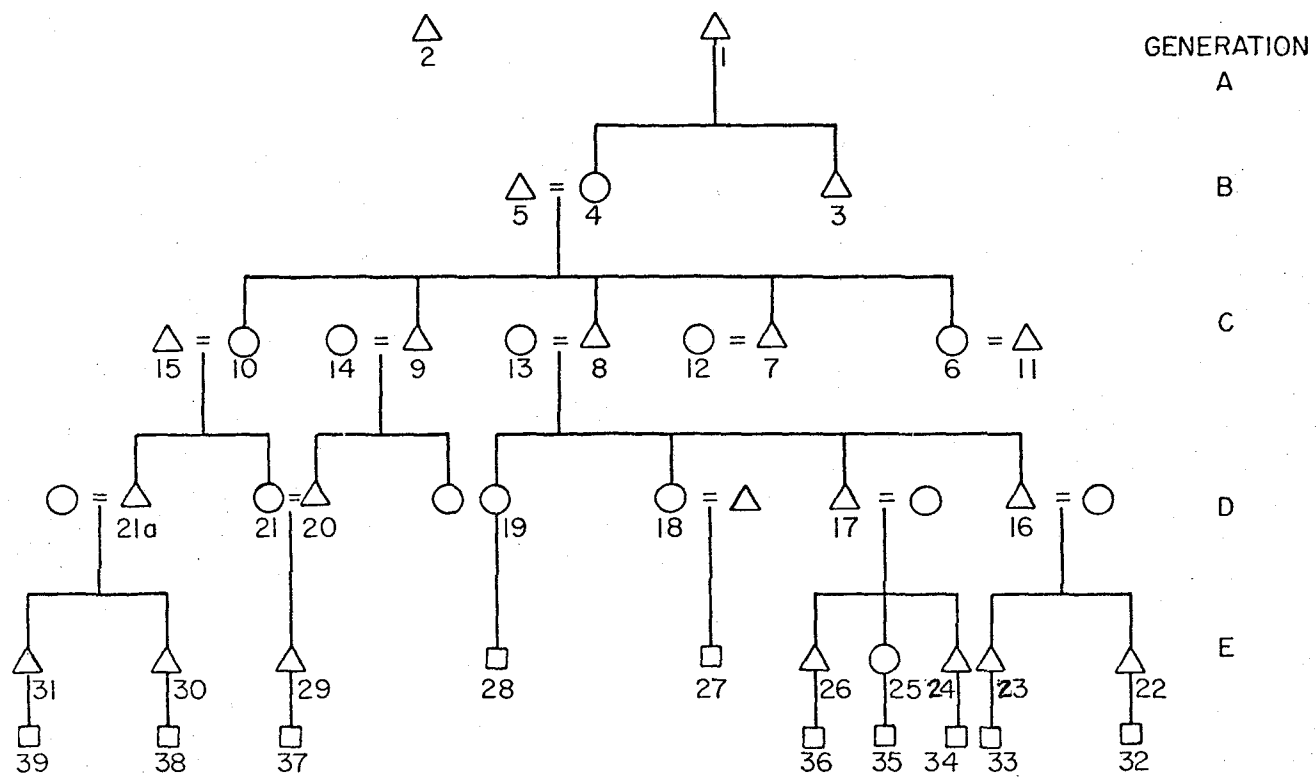
A number of factors influence entry into "harbor gangs" along most of the coast. Ordinarily, anyone from an established family is "allowed to go fishing" if he is willing to abide by the local norms; a short term resident will usually meet with opposition (Acheson 1972).

In the case of family-owned islands--and there are several along the Maine coast--the situation is exactly the same save for the fact that fishing rights are reserved for family members or people they specifically designate (Acheson 1975). In the case of the family-owned island under discussion, all fishing rights are reserved exclusively for family members, but not all people in the family are allowed to fish here either. In order to understand the factors influencing fishing rights, we need to trace the family's ownership rights over this island. The genealogy of this family is outlined in Figure 1.

In the first generation, the island was divided in half, and each half was owned by members of two separate families, person (1) and (2). Some time in the 1890s, person (5) in generation B bought the eastern half of the island from (2). He married the daughter of the person who owned the western half, but she (the daughter) did not own any island land. Her family's half of the island passed to her brother (3).

Figure 1

Genealogy of a Maine Island Family



In generation C (early 1900s), the eastern half of the island was equally divided among the three sons of persons (4) and (5). Persons (6) and (10), the daughters, were maneuvered out of the will by their brothers. Although their brothers (persons 7,8, and 9) ostensibly paid something for this part of the island, their sisters were very bitter, and a family feud ensued. Regardless, the descendants of these two sisters (i.e., 6 and 10) had no ownership or fishing rights from that time forward. In this period, person (7) purchased all rights to the western half of the island from person (3) by using the ruse of intermediaries. Thus, person (7) owned the western half of the island plus one-third of the eastern half. By the 1930s, the three brothers (7,8, and 9) had died, and a good deal of the island land was concentrated in the hands of person (13), the wife of person (8). Two factors were involved in (13)'s success in getting title to a lion's share of the island. First, person (7) had no children. Second, person (9) was a poor fisherman, and neither he nor his surviving spouse had an interest in expanding his holdings on the island. By way of contrast, person (8) had sons who were very active in the fishing industry. At any rate, by the 1940s, person (8) had bought or inherited all but one-third of one-half of the island. The remaining small fraction was owned by person (14) (the widow of 9).

In generation D, all of the land rights accumulated by person (13) got transmitted to her sons, persons (16) and (17). Her daughters (18 and 19) ended up with no island land in the final settlement of their parents' wills. Both (18) and (19) married men who lived in nearby towns. The small piece of land owned by (14) passed to her son, person (20) who had married (10)'s daughter (his patrilineal cross-cousin).

In generation E (the ethnographic present), ownership rights to most of the island held by (16) and (17) passed to their children (22, 23, 24, 25, 26). Persons (22), (23), and (26) are active fishermen using the island area. Persons (24) and (25) are in other occupations in other towns. Although they technically own part of the island, their share is actually administered by their brother (26), who is a fisherman. Sibling groups (27) and (28) have no ownership and fishing rights. While sibling group (29) owns a small share of the island, they do not participate in fishing at all. Most are in other occupations in other states. The fishing rights owned by person (20) have fallen into the hands of (30) and (31). Their claim was inherited through their aunt (21) who had married person (20).

In the future, generation F, all of the males in four sibling groups (32, 33, 34, 35, 36; 37; 38; and 39) will have fishing rights under certain conditions. First, they will actually have to inherit a part of the island from their parents. Which of this large number of children will inherit island land (for all of them cannot) will depend primarily on whether they stay in the area, and, more importantly, if they choose fishing as an occupation. As person (26) phrases the situation, any child who "moves to California and becomes a doctor will be knocked out [of the competition for inheritance of island land]."

There are certain general statements one can make about the people who gain preference in inheritance.

(1) Fishing rights are conferred by legal title to the island land. There is no instance where a person was allowed to fish unless he or a parent actually owned a portion of the island. There are several instances in the chart where whole family lines have lost fishing rights because their parents were excluded from legal title (for example, 27 and 28, the descendants of 6). However, it should be pointed out that fishing rights

are not proportional to land rights. Persons (30) and (31) own only a fraction of the land on the island, and yet have full fishing rights in the waters off the island.

(2) Those who have an interest in the island land and depend on it to make a living gain preference in inheritance.

(3) Those with children gain preference as well. The second and third rule can be seen best in generation C. Person (7) had accumulated some 60 percent of the island's land, but had no children. This land went completely to person (8), who was a good fisherman, who depended on the island fishing area, and who had children who also were interested in the island and the fishing industry. None of (7)'s land ended up in the hands of (9) or his descendants. Person (9) was a poor fisherman, and neither he, his surviving widow, nor their children had much interest in expanding their control over the island's land.

(4) Sons have clear preference over daughters in inheritance of family land. We have seen in the cases of (6), (10), (18), and (19) that women (and their descendants) somehow manage to be excluded from ownership--even in cases where they preferred "ownership rights" to a monetary settlement.

(5) The whole bundle of ownership rights accrues only to those choosing to activate them. People may inherit legal title, but unless those rights are exercised repeatedly, they tend to atrophy. This can be seen most clearly in the case of persons (24), (25), and (26). All three siblings have equal legal ownership rights, but (26) is the only active fisherman while the other two live out of state. This (26) not only manages the whole family's share of the island, but acts as spokesman for the whole sibling group. In reality, he has taken over many of the rights that should accrue to his siblings.

Behind these statistical tendencies, there are three general principles governing the inheritance of this island and other capital assets.

First, people usually have to actively maneuver to inherit legal title. At times, one has to make bargains with parents and relatives involving outright purchase of the land; in other cases the ploy used is taking care of aged relatives; in still other instances potential rivals can be slandered into disfavor and one's own relative standing enhanced by well-placed propaganda. In all cases, one has to have an interest in the land and be willing to sacrifice for it. Moreover, being present helps. Success in maneuvering can rarely be done from a long distance. This was especially true in the past before the advent of modern communication and transportation facilities.

Second, a value placed on equity and utility lies behind many decisions concerning inheritance. There is a presumption that all family members should have an adequate income if possible. Conversely, people should have no more than their share. There is a closely connected principle that assets should be productive, and should not be held in storage by people who can make no use of them. In short, there is a feeling that people who need the asset and can use it should get it. For this reason, in the case of our island, there are two instances where professional men did not receive the same consideration in inheritance in comparison with fishermen who could make good use of the island's fishing area.

Third, it is lineage ties that are important in inheritance--not ties to nuclear family or kindred. Except in the most unusual instances, one inherits from one's parents, grandparents, father's brother, or another consanguinal kinsman of an older generation. The role of the lineage in inheritance is often phrased in terms of "keeping land in the hands of

family members." As one man phrased the situation, "It is a hell of a thing to see something you have worked for all your life go to outsiders." Maine families, including the one that owns this island, take care to make sure this does not happen any more than in necessary. This is usually interpreted to mean that ownership rights should reside in people who have the "family name." It should be noted that the status of women vis a vis lineages causes problems. Women who are born into a family are clearly lineage members until they marry. After marriage their status becomes vague. In time, a married woman identifies and becomes more associated with the lineage of her husband. What this means is that women born into a lineage are at a clear disadvantage where inheritance is concerned. Persons (6), (10), (18), and (19) and their children did not have the family name so that any land they would inherit would be "passed to outsiders eventually. In addition, they resided postmaritally with their husbands, which means they and their offspring cannot use the land, and also that they are hampered strategically in the intrafamily competition for ownership rights. On the other hand, women in our island example who married into the lineage ended up "owning" a good deal of the island's land. At one time, person (13), as we have seen, controlled most of the land on the island. However, it must be stressed that women like (13) are merely "conveyances" through which family land passed from one generation in the lineage to another. She would not have been able to gain ownership to such a large portion of the island if (7) had had any children and she had not been able to use the argument that her share was destined for (16) and (17), her sons.

It should be noted--and this we would like to stress--that the same patterns that can be observed in analyzing the transmission of this family's island land can be seen in every other genealogy studied. The same

generalizations can be made whether the assets inherited are houses, farms, stores, factories, or fishing boats.

In great part, the competition between family members for inheritance of land and businesses stems from the fact that they are valuable economic assets. People who have ownership rights to assets such as this island own a permanent income stream. A loss of ownership rights means not only a loss of immediate income, but a permanent loss for all of one's descendants. Such ownership rights are a kind of insurance. Should all else fail, one can depend on it.

However, people will hang onto family homesteads, farms, and land long after their usefulness has passed. At times, these assets are maintained at great financial loss. This underlines the fact that there is an important symbolic tie between kinsmen and the land and businesses they own. Ownership of such land locks one into the past; it confers legitimacy; and it is tangible evidence of one's ancient roots. A single individual does not have to own family land or businesses to have such benefit conferred to him. The fact that someone in the family owns such land establishes one's heritage both within the family and in the community. It not only gives an individual a reference point for defining himself; it also located that individual and his "family" in the community. It is for this reason that people are often very angry when "family property" is sold.

The family member who sells a piece of property is often treated with hostility, while the purchaser is often ostracized. If the land is sold to someone outside the community, the purchaser does have full rights over the property he buys, but those are sometimes not enforceable. Not only is the land symbolically "owned" by the original family; sometimes members of the community act as if it had not been sold at all. One family sold their "farm," but continued to cut wood on it. Another family used their pasture

for a golf course, after they ceased farming. They continued to play golf there ten years after the place had been sold. A woman from New Jersey foolishly bought a piece of shorefront land which the owners, who were lobstermen, had long used as a landing site. They continued using it after she built a cottage. When she objected, they still painted their boats on her land; but it got to be known around town that she "went sunbathing naked," and her chimney was used several times for target practice.

Inheritance of family businesses is especially valued. Not only do such businesses give income, they also have symbolic value.

In these towns, a good deal of the meaning of life and the respect of others comes from actively participating in the business of one's forefathers, and using and preserving long held family assets. Sometimes these small businesses are hardly known outside the local area, but within a restricted region, they confer prestige.

Immediate Business Assets

A person can maneuver ties between contemporary kinsmen to obtain access to three different kinds of immediate business assets: jobs and skills; capital; and information.

Jobs and Skills

Family members clearly have preference when openings become available in skilled occupations or local businesses. The hiring of kinsmen is based on a feeling of responsibility to provide for family members and to ensure that the family enterprise continues. When the owner of a large herring stop seine operation was asked why he hired only his sons and his sons-in-law, he answered, "It is my responsibility to make sure that these jobs go to the people who are going to feed the members of my family" (i.e., his

daughters, and grandchildren). In several other cases, people said they hired kin because, again, they did not want the family business to fall into the hands of strangers.

Moreover, hiring kinsmen solves some more immediate problems. Skills are costly to transmit, and if men are going to go through the expense of training a "new man," they would rather spend the money and time on a relative. As one carpenter phrased it, "It takes me six months to train an apprentice before he is useful, and in all that time I have to pay at least minimum wage. Why should I spend that on someone else?" He hired his son to join him and his son-in-law in the family business. In addition, heads of family firms feel they can count on kinsmen to keep certain trade secrets. Secrecy is particularly important in family fishing firms, because news of good catches and locations immediately results in competition. But the same principle holds true in virtually all businesses. There are certain things about the business--its methods and problems--that owners would rather keep confidential. There is a higher probability that kinsmen can be trusted to keep such secrets than non-kinsmen.

Finally, kinsmen are exploitable. The nature of the transactions between kinsmen is such that one can expect them to work longer hours; help out in an emergency; and even forfeit their wages on occasion. The numbers of wives and children who literally work for nothing is legion. It is standard practice in the fishing industry for wives to do a large number of essential tasks with no compensation, such as answering the phone, dealing with lawyers and accountants, doing the books, making deals concerning marketing and maintenance, and so on. The same kind of services are provided by kinsmen for owners of other "family" businesses. In fact, if some of these businessmen had to pay the going wage for the services they receive from kinsmen, they would not survive economically.

Several different kinds of kinsmen work for family firms, and the kind of compensation expected depends on their relation with the owner of the firm. Wives and children of heads of family firms might be paid no wages, but then they are obtaining payment in the form of housing, clothing, food, and so on. Any kinsman living in another household always must be paid, but he may be willing to do far more for the firm than an employee who is a non-kinsman. This willingness stems from several factors. Such kinsmen know they have secure job, in that they are apt to be the last fired in bad times. They are apt to receive preference in jobs demanding special training skills. In addition, a distant kinsman who is a long-time employee can often arrange to inherit the firm, or at least become a partner in it. In several cases observed, kinsmen have deferred part of their pay with the understanding that they will be made owners of the business or partners in a specified period of time. Something more subtle is involved as well. Kinsmen who work for family firms clearly feel a sense of pride in being a part of something that bears their name. They are not just working for pay--although the money is important--they are contributing to a family heritage.

As a result of this strong preference for hiring kinsmen, almost all businesses (stores, carpentry shops, gas stations, restaurants, fishing boats, and others) are manned by a core of relatives. There are firms where every one of the ten to fifteen employees is a close family member. While such firms might be the exception rather than the rule, it is very rare that one can find a firm hiring more than three people who have no kin ties at all. In one town studied intensively for a period of many months, there are a total of 79 shore-based firms employing more than one person. In a study of 50 of these firms selected by a random sample, 37 (or 74 percent) had at least one employee who was closely related to the

owner of the firm. In this town there were a total of 22 fishing boats which had crews of two or more people. The crews of 15 (or 68 percent) of these boats involved at least one pair of kinsmen.

The strong preference for hiring kin leads to concentrations of kinsmen in the same occupation. As a result, certain family names are associated with specific occupations. People with some family names are known to be boat builders; others are known to be fishermen, and so on. Indeed, a very high percentage of the males in these lineages are actually in the so-called "family occupation." In some cases, that percentage is very high. In one boat building family, for example, 66 percent of all the men in the past five generations were boat builders. The vast majority of those men had been trained by close relatives and worked--at least part of their lives--for firms owned by family members. On one peninsula, which has some seven towns, every single plumber was closely related to the others, and all had been trained in the same family shop. Situations of this type are not unusual.

Amassing Business Capital

Like businessmen anywhere else, people in these towns borrow much of the capital for long-term investment projects from banks. However, the use of kin ties to gain access to large amounts of capital is far more frequent here than it is in other parts of the United States. In many cases, kinsmen will simply borrow from each other; in other instances, silent partnerships are formed.

While we believe such loans are relatively common in small Maine towns, their frequency is difficult to ascertain with any accuracy. "Money deals" of this kind are usually kept very quiet. Although we do not have statistical data concerning the frequency of such loans, we do have case study

information to see certain general patterns. Most of the patterns observed come into focus in the following two cases.

Case 1: Two brothers who are both fishermen decided to set up a lobster storage and marketing business. Both put up an equal amount of initial capital and labor into the business, and both sold the lobsters they caught through it. They were initially agreed on the way the business should be operated. After many months, the first brother began to agitate to operate the business in a very different way. After several arguments, the second brother slowly discovered the fact that his brother had borrowed the money he had put in their business from a politically powerful friend, who also employed the first brother's wife. The friend-politician was currently pressing for rapid repayment of the loan, or to take over either share in the partnership completely. After several months of increasing bitterness, the brothers were finally able to agree that the second brother would buy out the first brother's share of the business. Even after the partnership had broken up, the second brother was especially bitter that his brother had "made deals behind his back," and sided with someone outside the family to his detriment.

Case 2: A fisherman, who wanted to purchase a much a much larger boat to enter a new kind of fishing, approached the bank for a loan, but was turned down. He then asked his first cousin (father's brother's son), a local fisherman, to loan him the several hundred thousand dollars necessary. His cousin originally refused on the grounds that he did not have the money. The two finally came to an agreement that they would form a partnership, which would own the boat. The partners then would approach a distant urban bank for a loan, using a large parcel of very valuable coastal land owned by the cousin as collateral. While this land was initially purchased for a modest price, its value had greatly appreciated in

the past twenty years so that the bank could count on getting its money back in case of default. To give himself some security, the cousin had his lawyer draw up a contract which provided that if the fishing business went broke, the fisherman would give his home and a piece of shoreside family land he inherited to his cousin. The partnership has worked out well. The fisherman got his boat, and his silent partner, his cousin, has reasonable security. If the partnership failed, the cousin would lose his coastal land to the bank, but would gain a piece of "family land," which is not worth as much in monetary terms, but has great sentimental value. Nevertheless, both of these men were very nervous about the deal, knowing that failure would mean one kin foreclosing on another, and an irreparable breach.

Several general patterns stand out clearly in these two cases.

People are expected to help themselves where raising capital is concerned, and many are reluctant to borrow from kinsmen, preferring the anonymity and impartiality of a bank. However, people will ask kinsmen for large amounts of money for investments under certain circumstances.

Although there are a few instances of loans between distant kindred members, most involve members of a nuclear household or lineage members. The exact nature of the agreements depends, however, on the kinsmen involved. Loans between members of nuclear families often involve no formal contract and no security. In many cases of this type, interest is not even charged. Loans between parents and children are frequently made with no interest being charged, and sometimes with no expectation of repayment. Such loans have all the earmarks of a patrimony being passed on. Many parents give their children such loans to ensure that the family benefits from work and savings rather than the Federal government through inheritance taxes.

Loans and partnerships between more distant kinsmen usually require both collateral and a contract, as in Case 2. People outside the close range of kinship feel no obligation to loan money, and certainly will require collateral and formal agreements if any sizeable amounts of money are involved as in Case 2. In all these cases, interest is charged, since the object of the loan is not only to help a kinsman, but to make money.

Most important, in cases involving both nuclear family members and lineage members, people who have money invested want some control over the business. Sometimes this is done through partnerships (Case 1); at other times through a silent partnership as in Case 2. Sometimes a lender will merely ask to see the books occasionally. In all cases, active participation in a business can scarcely be done from a distance. People who live in the local area--particularly lineage members--are more likely to be used by individuals seeking to amass capital for a business enterprise.

People feel ambivalent about obtaining large amounts of cash from kinsmen. There is the recognition that if such loans or partnerships can be advantageous, they can also be very dangerous. Some people said they "only trust family [i.e., kinsmen] and not all family at that." The other side of that same coin showed in the axiom that "one should never do business with family." In this regard, it is important to note that there is a distinction to be made between working for a kinsman and being in business with him. Working for a kinsman is occupational; a loan or partnership involves risk and decision making. The first is acceptable; the second gives cause for thought. Business arrangements between all kinds of kinsmen are in one sense more secure since there is more trust involved. A person may not be friends with a kinsman, but at least he can be reasonably sure that he will not be purposely cheated.

In addition, most loans are made between kinsmen who interact a great deal and live near each other. Automatically, lenders have the kind of portrait of their loan applicants which bank officers and credit companies would have to spend a great deal of money to get.

The disadvantages stem from the fact that business failure, with all that means in terms of foreclosures and non-payment of loans, can not only cause a breach between the principals involved but can also put a large number of other family members in a situation of conflicting allegiances. The situation is far worse if business failure is associated with a breach of trust. As we have seen in Case 1, not presenting one's kinsmen with the facts and siding with "outsiders" can cause far more bitterness than is attendant in cases of business failure and deceptions involving non-kinsmen.

Information

There is increasing evidence from several social sciences that the key to long-term business success is access to reliable sources of information, which allows businessmen to adapt successfully to changing circumstances (Bennett 1976: 847-852; Wunderlich 1974: 81-90). We have already seen that people tend to hire kinsmen so that particular occupational skills are concentrated in certain family lines. At times, all of the kinsmen in a particular occupation are employed in the same established business. More often, however, an individual tends to receive training working for a kinsman in his business and then open an independent business of his own. Thus, it is very common in such towns to have two or three or more businesses of the same kind operated by kinsmen (for example, fishermen, plumbers, mechanics, or whatever). Businessmen in all industries tend to withhold information from their competitors and yet have enough contact so that they are each other's best source of information. The fact that many people in

the same occupation are kinsmen increases intrafamily competition; it also operates to increase this flow of essential information.

There are five different kinds of information that are often passed between people in the same industry--particularly if they are kinsmen.

First, they give each other information about employees. One person who had been fired from a business for pilfering from her employer found that she could not obtain work in any other business of a similar type in the entire region. Second, information about sources of credit is often shared between people in the same industry, along with information on customers who are bad credit risks. Third, business is often referred to kinsmen. Fourth, kinsmen in the same industry will talk about changes in business practices--new technical innovations, accounting practices, marketing, and so on. Fifth, they cooperate in lobbying local and state officials for changes in the legal environment favorable to their industry.

On the whole, it is very difficult to ascertain how much the information received through kinship ties contributes to the success of a business. Certainly people with close kinsmen in the same business have an advantage, and often use those ties for all they are worth, but whether they would succeed without such ties is impossible to say.

The exact way that kinship ties are used differs substantially from industry to industry. In the construction industry, for example, kinship is often used as a means of referring business and obtaining jobs. In one of the towns studied, one older carpenter makes a habit of steering jobs he cannot handle to his son, son-in-law, and nephew, all of whom he trained. Conversely, kinsmen also inform each other about potential jobs. One of the authors has had the experience of getting an estimate from a local carpenter, and within three hours receiving phone calls from two of the

carpenter's relatives offering to provide ancillary services. Kinsmen in this industry may not always get the jobs, but they clearly know about them first.

In the fishing industry there is some solid evidence that having kinship ties goes a long way toward ensuring business success. Fishermen are notoriously secretive. It is an industry where deception and outright lying are traditional. Since fish are owned by no one and may be taken by anyone, the essence of fishing as Anderson has noted is "hunt and deceive" (1972: 120 ff.). In this industry where deception is the rule, a lot of information is obtained through direct observation: fishermen watch each other like hawks. There is only one group of people one can trust: close kinsmen. Fathers and uncles will often directly tell their sons and nephews where to fish, and will give a good deal of advice on net configuration and similar technical matters. Kinsmen exchange information on markets. In addition, they obtain information on new innovations from each other. Before one invests in new kinds of gear, one wants to try it out if possible.

As one fisherman pointed out, "There is only one person who will train you to compete with him--your father." For this reason, men with close relatives in fishing are more likely to adopt expensive fishing gear of particular types than men who do not have close kinsmen in the business.

In a study we recently completed on technical change in the New England groundfishing industry, we attempted to explain the social and economic factors influencing the adoption of 18 innovations, using a multiple stepwise linear regression technique. We discovered that different sets of factors explained the adoption of different innovations in this one industry. In fact, there was no independent variable which was positively or negatively associated with the adoption of all the innovations (Acheson and Reidman 1980). However, some independent variables were related to

the adoption of a lot more innovations than others. One of the most important was "number of kinsmen in the home port." Specifically, this analysis showed that fishermen who had large numbers of kinsmen in fishing in their home port were more likely to adopt scanning sonar, radar, VHF radio, Loran A, and Loran C than men who had few kinsmen in fishing in their home port. Most of these are expensive pieces of electronic gear which take a good deal of skill to be able to use effectively in finding fish. Our regression analysis strongly buttresses something we have observed time and again--namely that close kinsmen in the fishing business help relatives to obtain the prerequisite skill and experience.

While it is difficult to obtain quantitative information on the relation between kinship, information flow, and fishing success, it should be noted that some 62 percent of the "highline" (outstanding) fishermen in our sample of 122 reported they had "a lot of kinsmen in fishing" in their home port, while only 37 percent of the "Dub" (poor) fishermen made this claim.¹ While these figures establish a link between economic success in fishing and numbers of kin, they give no hint about the nature of that linkage. From our long-term observation of fishermen it is clear that the primary link between kinship and success is information--not credit, political leverage, etc.

In summary, where immediate business assets (i.e., jobs, capital, information) are concerned, Sahlins' "hierarchy of exchanges" appears to be relevant. Within nuclear families "generalized reciprocity" appears to be the rule. There is no expectation that exchanges here will be equal, and little need for security is felt. Between close lineage mates, most exchanges conform to the rule of "balanced reciprocity." Here equivalent value must be exchanged, security or collateral is needed, and the exchange

must take place within a relatively short time frame. "Negative reciprocity" becomes the rule when one is dealing with distant kin, non-kinsmen, and sometimes in cases where very large amounts of money are involved. Here people are suspicious of each other, and have their own best interest foremost in mind. In these cases, security is often obtained through legal contracts.

Politics

Political success in small Maine towns requires an actual power base and a legitimate right to authority. Both power and legitimacy are obtained through the manipulation of kin ties. However, the maneuvers one goes through to gain political support are vastly different from the strategies used to clothe oneself in legitimacy. Real power in the form of votes is obtained through private exchanges with kinsmen, friends, and acquaintances. The primary way one gains legitimacy is through a public and symbolic manipulation of genealogical links into the far past.

According to Maine law, any person over the age of 21 has a right to run for local political office. However, in most small coastal towns, one must come from an established "family" or lineage or one might as well not bother to run. In a recent election for selectman in one of the towns under study, a personable, college-educated man was soundly defeated by a man whose family had lived in town for generations. The newcomer never stood a chance. As one elderly woman phrased it, "How could he do the job; he has only been here for seven years?" An urban sophisticate might find it quaint that political jobs are reserved for "established people." What surprises "local people" is that anyone who had lived in the township under a decade would even have the brass to run for high office.

Eligibility to run for public office is ordinarily established in such towns by recounting one's personal history and experience, and most important, one's genealogical links to the far past. Normally, when candidates for political office publish their credentials, the emphasis is not on their education or the program they would enact if elected. Most of the advertising space is taken up by detailed accounts of family history in the community. The further back one can go and the more illustrious relatives one can name, the stronger are one's claims to legitimacy. In the school board elections in one town, there were some nine candidates. In the newspaper accounts concerning the election, almost none of the candidates directly stated their views of the several controversial issues currently facing the community's school. What was notable were the numbers of Revolutionary War heroes, Civil War dead, town founders, famous ship captains, and references to the 17th and 18th centuries that abounded. The only exception to this rule were the statements of "newcomers" who were forced to stress such irrelevancies as whether they favored abolishing a kindergarten or not.

These ground rules put newcomers at a distinct disadvantage. If they are going to run with any hope of getting elected, they must use a good deal of ingenuity. One woman, who was running for school board, had no kinsmen who had ever lived year-round in the town for at least 300 years. She was a newcomer in every sense of the word. She emphasized to the newspaper reporter interviewing her she "would have a grandchild in the school" when her son and daughter-in-law moved into town, and that one of her relatives was on a ship which sunk in nearby waters in the early 1600s on its way from England to Virginia. She was also forced to mention specific school policies. She won in an upset. However, she along among the candidates used her own car to transport a lot of the elderly voters.

There are several different reasons why genealogical linkages with the past give political legitimacy in the present. People who stress their genealogical ties with the past are making a moral statement. They are stressing that they are members of the core of the community and have accepted the yardstick by which behavior is judged (Lazarowitz and Acheson 1980). Such political advertisements are a shorthand way of saying that they can be counted upon to make political decisions in line with acceptable values and attitudes. They also demonstrate long-term interest and commitment to the town. Such a person is not like the "newcomer" whose actions can never be fully understood or put into any meaningful context. Where one can only take the word of a "newcomer" that he will not impose "some crazy thing" on the community if elected, a person with a long genealogical history is inviting the public to look at the record--one presumably showing not only constancy and predictability in his generation, but further in the past. Such a person is gaining political capital not only from his own actions, but from the activities of his ancestors as well. When persons running for political office evoke their ancestors, they are entering the symbolic realm where no real exchange must take place. All the talk about ancestry is a shorthand method signalling something about commitment to the town, and a value placed on stability. What is promised here is the exchange of a vote for the status quo. Outsiders have a difficult time being elected. They have no way of symbolically making such implied promises.

In coastal Maine communities, there is a strong emphasis on equality, and when power is allocated differentially, it should be done on a first come, first served basis. There is a feeling that one must wait one's turn where political office is concerned--even if it takes a century or

more. The same feeling that one should not butt into the middle of a line at an airline ticket counter is operating in the political realm here. Newcomers should not attempt to gain office out of turn.

Finally, it is assumed that competence in political office is inextricably tied up with long-term residence. Knowing everyone and knowing "local ways" is considered far more critical for success in these offices than any kind of technical skill or experience an "outsider" might have to offer. Candidates who know people and their reputation, it is felt, are better able to come up with practical solutions to political problems than someone not versed in local ways.

It is not just that people from these established families are eligible to run for political office; they also have an edge in getting the votes. Virtually every person from these families has such a widespread network of kin that many can be propelled into political office on the votes of kindred alone. This is not a decisive factor when the opposing candidates are both from "established families," but it certainly plays a significant role in cases where candidates come from different sized kindreds with different genealogical depths in the community.

It is important to note that candidates for political office cannot take the votes of their kinsmen for granted. The most serious candidates make a habit of calling their relatives and asking for their vote as they would any other prospective voter. They also ask kinsmen to help "spread the word" and help with other aspects of the campaign. Good politicians from old families are very adept at using both genealogical links to advertise their legitimacy, and real ties with kindred to gain votes.

In many of these towns it is not only that political offices are supposed to be held by members of old families; virtually all of them are. In

one town whose political history was studied, virtually all important town officers since 1840 were from families whose name appeared on the tax rolls for at least 50 years.²

Conclusion

In the small coastal communities of Maine, kinship ties can be manipulated in a variety of ways to attain three kinds of tangible goals: land and other capital assets; immediate business assets (jobs, information, working capital); and political support and legitimacy. The fact that kinship ties can be used to obtain tangible assets has been noted by a number of anthropologists. Fortes has done as much as any anthropologist in analyzing the relationship between kinship and the world of practical affairs. In his analysis of Ashanti, the primary asset that groups of kinsmen own is real property, agricultural land, which is under the control of a senior kinsman (Fortes 1969).

There are, however, three important differences between the Ashanti family estate, as noted by Fortes, and the Maine example. First, in Ashanti the estate consisted of agricultural land, which was under the control of a few related people who passed down those rights to selected kinsmen with certain rules in mind. In Maine some family firms and land are inherited in ways reminiscent of Fortes' example. Here, however, there are other advantages accruing to members of old families above and beyond the real estate they may own in common. Most of these advantages stem from the fact that such people are part of a dense local network of kinsmen. Membership in such a network itself is an intangible asset--a kind of family estate, although one not envisioned by Fortes. In Maine, such networks may be as important a kind of estate as any real property one might inherit.

Secondly, in both the Ashanti and Maine case, the fundamental principle operating is that valued assets are reserved for kinsmen. However, these advantages are not given out automatically to all family members. One must actively maneuver to get them. The main difference is that in Fortes' case one is operating with one set kinship form which offers the individual little room for maneuvering. In Maine, the kind of kinship ties that are evoked depend on the goals the individual is seeking. One recalls one set of kin ties for one purpose, and another kinship unit is conjured up for another purpose. The opportunistic nature of this manipulation needs to be stressed. A person feels no compunctions about calling one kinsman for one thing, and maintaining ties with another to get something else. Unlike Ashanti and some other cognatic systems in the literature, one is not forced to pick one set of kinsmen and depend on them exclusively for everything. However, the selection of kin ties is not random. The kin ties are carefully matched to the goals sought.

Where the inheritance of land and family business is concerned, the critical unit is the lineage or nuclear family. In the political realm, the kindred is used as means to get votes, while the lineal ancestors are recalled as a means of establishing political legitimacy. All three kinds of kinship ties are used to gain access to jobs, loans, and business information. However, the obligations between kinsmen engaged in such transactions differ depending on their degree of genealogical proximity. Kinsmen give each other preference in obtaining jobs; close kin may not be paid; distant kinsmen always are. Kinsmen use a variety of ties to amass capital. But nuclear kin may not demand a contract, interest payments, or even repayment of the principal. Loans and partnerships between more distant lineage mates are on a business basis, and formal contracts are commonly used

to protect one's interests. Non-sensitive information is exchanged among kindred and non-kinsmen; more essential information is kept within the confines of the nuclear family or close lineage.

In most of these cases, manipulation takes the form of making exchanges with contemporary kinsmen in private. For example, the success a fisherman would have in approaching a kinsman for a loan would depend on the relationship between himself and that kinsman, and probably practical considerations involving contracts and collateral. He would have not reason to invoke the most ancient ancestors he could conjure up. In establishing political legitimacy, however, genealogical ties are used in a symbolic manner. Here, we are entering a public arena, and the audience is kinsmen and non-kinsmen alike. In a political campaign, ancient ancestors can do far more to establish the right to run for office than any other contemporary kinsman.

Third, in Fortes' case, kinship ties extended over a wide geographical area. In Maine, the kinsmen who count are from the local area; "relatives" who move away are quickly forgotten (Lazarowitz and Acheson 1980).

The last point raises a critical issue: why is there such a strong emphasis on locality in Maine kinship? The answer, we believe, lies in the fact that it is only local kinsmen who are useful. Kinsmen who move away are forgotten because they are irrelevant. The uses to which local kinsmen can be put differ substantially in the three different realms studied. However, in all cases kinsmen who are nearby are of much more use than those who live even an hour or so away. In inheritance, we have seen, preference is given to those who can use the asset, demonstrate interest in it, and who are willing to sacrifice and maneuver to gain that asset. It is vastly more difficult to use and fight for an asset if one is days away. In politics, local kinsmen are of far more importance than distant kinsmen.

In an election, it does little good to harken back to an ancestor in California, or to call a cousin in New York for a vote. The first does nothing to establish one's permanence in the community or attest to one's stability; the second isn't registered.

In the economic sphere, distant kinsmen are equally useless. The information they have about employees, customers, credit ratings, or innovations are irrelevant for the local situation. Even if such kin offered a job—and they are not likely to—one could not take it without making a painful move. Finally, one can scarcely borrow money from geographically distant relatives or form a partnership with them—particularly if they insist on having some managerial control of the business which may involve a weekly inspection of the books. We would like to argue that it is lack of utility for distant relatives that makes it unnecessary to keep up ties with them. As Blau has noted: "When people are thrown together, and before common norms or role expectations have crystallized among them, the advantages to be gained from entering into exchange relationships furnish incentives for social interaction..." (Blau 1964: 92). Conversely, we would argue that when there is no advantage to be gained, social interaction is cut off. In Maine, we believe the emphasis is on local kinsmen because of the advantages that can be gained from the appropriate use of various kinds of kinship ties.

Notes

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1. Chi Square test demonstrated that these figures were highly significant statistically. The value of the Chi Square was 7.81 which is significant at the .05 level. These figures indicate that it is very unlikely that the link between fishing success and number of kinsmen could have occurred by chance.
2. The situation in many of these towns is changing rapidly as immigration has occurred rapidly. In the near future, many more "outsiders" will elect each other to public office.

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THE FISHERMEN'S WIVES ASSOCIATION

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Introduction

Industrial groupings are scarcely new in the United States. In the past hundred years, virtually every industry has formed a number of associations to look out for the welfare of cooperating businesses. Everyone in the U.S. has heard of the Chamber of Commerce, the Hotel Association, the Good Roads Association, National Association of Manufacturers, and others. Their functions range from disseminating information, to propaganda, to outright lobbying. Until very recently, the fishing industry in New England was one of the last holdouts--with every fisherman preferring to go his own way and deal with buyers, legislators, and the government on his own. In the past few years, however, even the fishing industry has begun to organize, and a large number of organizations and associations have come into being to promote the fishing business. Most of these groupings, as in most industries, are organized and run largely by men, with women playing a very subordinate role, if any at all. However, in several ports, the wives of fishermen have organized, and have become more and more skilled in representing the fishing industry. In several places, most notably Gloucester and New Bedford, Massachusetts, and southern Maine, local fishermen's wives groups have become a political power to be reckoned with. They have become increasingly effective in gathering information about changes in regulation and plans of the bureaucracy and in pressuring public officials as well. Several officials of the National Marine Fisheries Service have been overheard to say that they would rather face a group of fishermen at open meetings than the fishermen's wives. Fishermen's wives deserve some attention, not only because of the power they have recently attained, but because they are one of the very few

instances where women have formed industrial groups to represent their husband's and family's businesses. Has anyone ever heard of the "bankers' wives", or "grocers' wives" stalking a legislature?

History

The fishermen's wives group in Portland was formed in 1977, essentially through the work of Mary Ann Bradford, the wife of a Portland gillnet fisherman. Mrs. Bradford had heard about the fishermen's wives in Gloucester and their work, and she talked to her husband about starting some kind of group in the Portland area. She was strongly encouraged by Robin Alden Peters, an extension agent from the University of Maine Sea Grant Program, who provided her with a list of names of interested women and suggested ways a fishermen's wives group could be effective. Mrs. Bradford also thought the time was ripe for such a group. The FCMA (Fisheries Conservation and Management Act) had gone into effect in March of 1977, which placed the fishing industry under strong Federal control for the first time. The New England Regional Council was beginning to enforce regulations on ground-fishing. The first cod closure came in July of 1977 to the consternation and bewilderment of a large number of groundfishermen. The president of the Maine Draggerman's Association had just died, so that group was temporarily inactive at the very time that information and action on the changes sweeping the industry was most needed. In a very real sense, the Fishermen's Wives Association was formed in response to Federal efforts to manage the ground-fishery.

Mrs. Bradford said she phoned all the fishermen's wives she knew, and all those on the list provided by Mrs. Peters. She only got about 1/5th of the turnout she had hoped for at the first meeting--a total of about 10. While the numbers in attendance were a disappointment, the Fishermen's

Wives Association of Maine was in operation. For a time it was the only active group representing the groundfishermen of Maine in a period when so many changes were sweeping the industry.

Membership

Although there are 40 women who have attended meetings in the Maine Fishermen's Wives Association, only 20 can be considered to be active and there are only 18 women who paid their dues in 1979. Monthly meetings are usually attended by 10 to 12 women, although the number may go as high as 20 on occasion. There are, however, seven or eight women who come regularly to virtually all the meetings, and who constitute the core or nucleus of the Association. They are the ones who volunteer to serve as officers, who offer their homes for meetings, and who do the great preponderance of the work for the Association.

Although membership in the Association is open to women from all over the state, the vast majority come from the Portland area. Two persons come from Biddeford, twenty miles to the south; another six come from Harpswell four miles to the east; and two from Freeport, which is about 10 miles from Portland. The remainder come from Portland and its suburbs, including the Casco Bay islands.

Virtually all of the women in the Association are the wives of skipper/owners of finfish boats and a large number of these women are wives of highliners. Despite the fact that lobstering is the largest fishing industry in the state by far, only one member is the wife of a man who fishes exclusively for lobster. Only two women are wives of crewmembers on a finfish boat, and they have only come to a few meetings. Portland is the largest port in Maine, and dragging and gillnetting for finfish are the mainstays of its fishing economy. Nevertheless, it cannot be overlooked that the

Association had not attracted the wives of the hundreds of lobstermen in southern Maine or the wives of the many draggers in the small ports in other areas of the state. In large part, proximity to Portland plays a great role in affecting membership. Women who live over an hour or so away would have a very difficult time attending meetings. The wives of lobstermen and herring fishermen who live in Portland have very little motivation to join either. After all, the Association sprang into being in response to the passage of regulations concerning the groundfishery. The interest of many members is focused on what the Federal and state government are planning vis á vis groundfish species. Lobsters and herring are not under Federal management, and wives of men in those industries are not yet concerned enough to join a political action group. In addition, although the Association's officers have tried very hard to attract the wives of crewmen on finfish boats, none of these women are active in the organization. Only two wives of crewmen have attended any meetings, even though a goodly number of such women have been invited. Two factors appear to explain the lack of interest on the part of wives of crewmen. First, many crewmen are young, single men. Second, even those who are married think of themselves as employees. They and their wives appear to be content to leave problems of management and politics to the owner of the boat. As a result, the Association is dominated by the wives of highline finfishermen in the Portland area.

All of the women in the Association are between 28 and 45, the vast majority being between 35 and 40. They are clearly the wives of men who are in their prime earning years. They are not the wives of young men who are not fully committed to fishing, nor the wives of men who are on the

verge of retirement. The husbands of women in the Association have a great deal to gain or lose by fisheries management efforts.

Only five of Portland's 35 draggers are owned by so-called Italian families but a very large number of the active members of the Fishermen's Wives Association are in those few families. In fact, about four of the eight most active and dedicated members of the association are married into one large extended "Italian" family. While the numbers are not high enough for statistical reliability, this fact suggests that women from "Italian families" may have far more interest in the Association than the wives of so-called "Yankee families." Certainly, the Association as a whole does not have an "Italian flavor" since these Italians are very well acculturated and have lived in Portland for generations. But the Italian skippers in the Portland fleet are notably successful, and have been involved in the fishing industry for years. Their commitment to the industry appears to be reflected in their wives' strong interest in the Association.

Formal Organization

While the Fishermen's Wives Association is not a legally registered Association it does have a formal set of by-laws which were written by a group of the members; according to the by-laws, the purposes and aims of the organization are: "To promote the general welfare and conservation of the fishing industry in the North Atlantic area; to appear before committees and administrative agencies for the purpose of aiding the enactment of sound laws and management regulations pertaining to or affecting the fishing industry, and by all legitimate means, to oppose enactment of unsound laws and regulations that might tend to burden the industry."

Membership is open to "all fishermen's wives or widows," and also to any person who maintains an interest in the fishing industry. The annual dues are \$25.00. The by-laws state that there shall be four officers: President, Vice-President, Secretary, and Treasurer. The by-laws also call for the election of eleven members to serve as board directors. They state that meetings shall be held once a month, and outline an order of business to be followed, stating that 15 percent of members in good standing are needed for a quorum. The by-laws do not specify any relations with any men's groups, nor any principles or political goals.

In some respects, the operation of the Association follows the by-laws closely. The officers are elected, elections are held according to the rules, the dues paid, the meetings held on schedule, and the order of business during meetings is adhered to closely. However, the management of the Association is in the hands of the officers--most important, the President. The Board of Directors, which is supposed to have general control over the Association, has never been a functioning entity, due primarily to the fact that general attendance is so low that it has been impossible to recruit an eleven member board.

Meetings

At first, monthly meetings were held in the Public Safety building in Portland, but soon the Association began meeting in the homes of their members. The public meeting room was considered too large for the size of the group, and the group thought that private homes were more conducive to discussion, were more comfortable, and made it easier to bring along children should that be necessary. As a result, meetings are held in private homes on a revolving basis. While any member can volunteer to hold a

meeting in her home, meetings to date have been held in one of four houses in either Portland or Freeport. Three of these four volunteered houses are homes of officers of the Association.

Usually there are between 10 and 12 people at most meetings. However, several factors influence the number in attendance. When meetings are held in the house of one Portland member, who is very popular and "loves to entertain," usually about twenty women attend. Moreover, attendance varies seasonally. In the summers when children are home from school, and men are fishing their hardest, attendance is very low. It is much better in the colder months of the year. No meeting is held in December since everyone agreed "they were too busy" with Christmas and children's vacation.

Meetings are held at 10:00 a.m. on the third Tuesday of every month. Usually women begin to gather about 9:45 and there is a general open discussion for up to a half hour. Topics of discussion rarely focus on personal gossip, general community affairs, or children, but rather always pertain to the industry. In these pre-meeting discussions there might be discussions of: catch; upcoming political meetings; fishermen who have made the news; the boycott of Canadian fish; the availability of certain species; whose husbands are in or out; where they are fishing and whether they are catching anything; progress in the construction of new boats; and other general waterfront news. After everyone who is expected has arrived, the meeting is called to order. Everyone sits around the dining room table or around the living room, and the meeting begins. First, the President introduces anyone new, and then delivers announcements of upcoming events. Then, minutes of previous meetings are read, along with the Treasurer's report, which is followed by the report of officers and committees. Most of the meeting is then devoted to unfinished business,

followed by new business. Through the meeting people get up and get doughnuts or coffee and quickly return to discussions. Ordinarily the group, as a whole, is involved in one discussion. Sometimes little side discussions spring up. However, when any person or sub-group gets too badly off the point, someone, usually the President, will refocus the attention of the group back on the topic. Usually the meetings adjourn by 12:00 p.m.

What is most noticeable about these meetings is the fact that the women focus on important issues facing the fishing industry--particularly factors pertaining to management, regulations, and political factors affecting the industry. Much less time is devoted to understanding technical and economic factors. This is not a social club or coffee klatch. The aim of these women is to learn as much as possible about the political and bureaucratic forces affecting the family fishing business so that they may advance their interests. They are quite single-minded in pursuit of this end.

Concerns and Activities

In the period since the Maine's Fishermen's Wives Association has been in existence, it has been involved in innumerable activities and has taken an interest in a wide variety of events influencing the fishing industry. On certain issues the members of the Association could agree on a position. Where other issues were concerned, they could not. Both of these kinds of issues are of interest.

There can be no question that the most vital concern has been the regulations promulgated by the New England Fisheries Management Council, particularly the rulings prohibiting fishing for cod and haddock during

certain specified times. The first, and perhaps the most important activities of the Association took place in the summer of 1977 when the Federal Government ordered all groundfishing stopped after July 1 on the grounds that the Optimum Sustainable Yield of those species had already been taken for the year. If this ruling had been maintained in effect, it would have prevented fishing for these critically important species for the remainder of the year. This would unquestionably have caused untold hardship in fishing families. The initial response of groundfishermen to these "closures" ranged from bewilderment to ferocious anger. Unfortunately, it culminated in nothing more than a lot of talk on the ends of docks. Little of substance was communicated to the officials responsible, beyond the fact that fishermen were very unhappy.

In this situation, the Fishermen's Wives Association acted. They quickly found out that the fisheries were supposed to be managed for Optimum Sustainable Yield, which means simply that the regulations are not merely to be promulgated with conservation of the stock exclusively in mind, but the social and economic factors affecting the industry in mind as well. It was very obvious to all concerned that the National Marine Fisheries Service and the New England Regional Council did not even have any social or economic data on the industry, much less have taken such factors into account in formulating the closure regulations. The Association reacted by gathering data to demonstrate that the closure was not Optimal--at least not for the fishermen involved. Specifically, they gathered up hard data on costs and revenues, which demonstrated that a very large number of fishermen would be badly hurt financially by the closure, and some put out of business completely. This information was sent to the Regional Director

of the National Marine Fisheries Service and copies went to U.S. Senators Hathaway and Magnusen, Representative Emery, The Executive Director of the New England Fisheries Management Council and the Secretary of Commerce. The New England Congressional delegation and fishermen's groups from Mass. and R.I. joined in this fight. In August of 1977, one month after the fishery was supposed to be closed for one year, the groundfishery was reopened.

For months the Fishermen's Wives Association, along with the rest of the industry, has been vitally interested in the stock assessment program of the Federal Government. Their concern in this technical subject stemmed from (1) the knowledge that fishing is allowed or prohibited depending on Federal scientists' assessment of how many fish of any given species exist, and how many have been taken in any given year and (2) a strong suspicion that there were a lot more fish available than Federal scientists stated. During all of 1977 and into 1978, the National Marine Fisheries Service Laboratory at Woods Hole was asserting with great authority that the groundfish stocks had been badly overexploited, and that allowable quotas would have to be very low if complete failure of the fishery were to be averted. At the same time, fishermen claimed that there were then a lot more haddock than had been in evidence in the early 1970's, and more cod than anyone had ever seen in many years. The NMFS countered with the statement that all the cod were in one "year class," and that this class would have to be preserved from annihilation if the stocks were to be revived. The fishermen still said they had never seen so many fish. Among themselves, they admitted that the so-called "200 mile limit" bill had been a mixed blessing. If management meant the Federal Government mixing

in their business, it also meant a sharp reduction in the number of foreign vessels allowed in U.S. waters, which, they speculated, might be responsible for the large numbers of groundfish available to them. But one thing they were certain of: there were a lot of fish, and they knew a lot more about the state of the stocks than the so-called "scientific experts."

At every public meeting sponsored by the New England Fisheries Management Council during 1977 and the early part of 1978, there were questions concerning the stock assessment program of the Federal Government, and statements to the effect that the scientists didn't know what they were doing. Members of the Fishermen's Wives Association went to these public meetings, and shared the concerns of their husbands about the adequacy of the government's information which was being used in ways that had such an influence on their lives. During the winter and spring of 1978, there were long discussions of the stock assessment problem and closures at almost every meeting of the Fishermen's Wives Association. In August of 1978, Norman Olsen, the Executive Director of the Maine Fisherman's Cooperative Association, spoke on the problem at a monthly meeting. The women had so many questions concerning stock assessment that they began to plan a trip to Woods Hole so they could confront the scientists directly. The trip was eventually planned for November 1978. Unfortunately, it never materialized due to a snowstorm. More important, Federal scientists were finally allowed to release information, which they had had for some months, which substantiated the fishermen's claims that there were a large number of fish to be had. Moreover, it became widely known that the Federal groundfish plan was due for radical changes. With these events, the

need to go to Woods Hole seemed less acute, since it was obvious that no one was happy with the current groundfish plan and the stock assessment program on which it was based.

Since the passage of the Fisheries Conservation and Management Act in 1976, Federal officials concerned with fisheries have wanted fishermen to keep log books, primarily to obtain accurate catch and effort data. To the biologists, this seems like a reasonable requirement, given the problems they have estimating stock sizes, and so on. The fishermen are greatly against the whole idea of having to report catches and other data to the government, on a daily basis. The whole issue of log books was brought up repeatedly in the meetings of the Fishermen's Wives Association in the fall of 1978, when it became apparent that the Federal government was making plans to implement this requirement. The commentary was completely negative. No one saw any virtue in the log book idea. On the whole, the fishermen's wives had three major objections: (1) The log books, they said, were unnecessary duplication of information, since the Federal government already had access to the blue sheets, which give prices, and slips on every sale of fish made in New England. (2) Keeping the logs would involve a good deal of unpaid labor on the part of fishermen and their wives. (3) They objected to the fact that there would be no adequate enforcement of the program, so that it would quickly turn into a "farce." It should be noted that the objections to the log book program are far more violent than these comments would seem to indicate. As one woman phrased it, no fisherman is going to cooperate with this program. "They will have to take every man's license." And there were more comments during some of the meetings about everyone going to jail. While no one mentioned the fact overtly, there is strong

reason to suspect that much of the objection to the log book program stems from fact that it promises to violate some very basic norms in the industry. Fishermen are loath to talk about catches, because the ocean is a common property resource, and one does not want to arm the competition with any more information about the locations of fish stocks than necessary. Such knowledge is a fisherman's primary stock in trade. The whole object of the log book program is not only to get information on the numbers of fish of various species caught, but where they were caught and how long it took to catch them. If such information were made public, it would destroy much of the advantage highliners currently enjoy.

Second, it is widely know that fishermen have special relationships with dealers with whom they have done business for a long time. Men who have these ties not only have a guaranteed outlet for fish, but often receive a preferential price "under the table." Such deals not only make it possible for captains to underreport income for tax purposes, but also can be used to withhold money from the crew, who are paid on a shares basis. While most captains do not often take advantage of their crews and the government, log books would force people to divulge some very sensitive information.

In the fall of 1978, the Fishermen's Wives became concerned with the so-called "discard problem," which has raised the hackles of fishermen for many months. Basically, the groundfish plan currently in operation makes it illegal to discard any fish caught. This means that fishermen have to bring in fish whether they can be sold or not. At the same time, the current groundfish management plan calls for periodic closures of fishing for certain species which have been overexploited during a specific quarter. It may be legal to fish for hake, pollock and whiting, but illegal to fish for cod and haddock. This situation actually occurred in the spring, summer,

and fall of 1978. The problem is that an otter trawl catches any species that gets in the way. Since all groundfish are interspersed, a net which brings up legal species (e.g. hake) will inevitably bring up other species which may be illegal (e.g. haddock). Since one cannot throw any fish overboard and one cannot help but catch certain prohibited species, a fisherman is bound to violate at least one of these rulings. It is not only that fishermen and their wives see these contradictory rulings as silly, but they also do not like the idea of being forced to violate one law or another. As one woman states it, "they are making thieves of the fishermen."

On some other very important issues there has been less consensus, and therefore no obvious course of action for the Fishermen's Wives Association.

For the past several years, limited entry proposals have been under constant discussion in both bureaucratic and industry circles. On the whole, people in the industry feel ambivalent about limiting fishing licenses. They recognize that such rules would probably operate to conserve the fish stocks and would guarantee a reasonably high income to men who were allowed to fish. But limited entry proposals are disquieting, and virtually everyone in the industry has a number of reservations about them. The President of the Fishermen's Wives Association specifically mentioned several aspects of limited entry proposals, and the way they might operate in the New England groundfishery, which made her very uneasy. She was most concerned that it would "take away the initiative from fishermen." That is, by cutting down on the competition, a great deal of the motivation to work hard and maximize output would be gone. She was also afraid that a slackening in competition would remove the necessity to build new,

efficient boats, and would "slow down the upgrading of the fleet." This, in turn, might make it impossible for the U.S. fleet to adequately exploit certain offshore stocks so that, in the future, they might again be allocated to foreigners. In essence, she fears that limited entry would produce a safe sinecure for U.S. fishermen, a slowdown in diffusion of new technology, a lower rate of investment, and ultimately stagnation, with the foreign fleets gaining the benefits. Finally, she and many other people fear that limited entry would make it impossible for their sons to enter fishing.

Many other fishermen's wives are ambivalent about limited entry proposals for still other reasons. As a result, the Fishermen's Wives Association supports no definite policy concerning limited entry, although they know it is an issue that must be addressed. This ambivalence does not stem from a lack of understanding of the issues involved. There have been many discussions about limited entry and one person who attended a conference on limited entry in Denver was invited to speak at a meeting of the fishermen's wives.

When the Fisheries Conservation and Management Act was passed in 1976, it was expected that the major obstacle to successful implementation would be the Russians. Instead, it has been the Canadians who have posed the most serious problems.

In 1977 and 1978, the New England fishing community became very concerned with the "Canadian problem," and this set of concerns was repeatedly reflected in the discussions held at the Fishermen's Wives meetings. Basically the fishermen's wives, who are reflecting feelings of the industry as a whole, see the New England fleet as being at a great disadvantage compared to the Canadian fleet with which they have to compete. The

Canadian fleet, these women are aware, is heavily subsidized by the Canadian government, and a very high percentage of the fish caught in the Atlantic provinces enters the United States tariff-free, and is sold in the same markets where Maine fishermen are selling. As a result, Canadian fishermen can undersell U.S. fishermen in American markets. To add insult to injury, the Canadian government has allowed its fishermen to catch species at times when the New England Regional Council has forbidden U.S. fishermen from catching them. As a result, fishermen in 1978 have stood by and watched Canadian boats take fish Americans could not land in U.S. waters, with the certain knowledge that those same fish would be trucked into U.S. markets from Canada to deflate the price the Americans were receiving. There was a great deal of indignant talk about the Canadians and the unwillingness of the U.S. government to protect the interests of U.S. fishermen. In January 1979, fishermen in Portland forceably prevented Canadian fish trucks from being unloaded from the Portland-Yarmouth, Nova Scotia ferry. While the Fishermen's Wives Association as a unit did not take any formal stand, the women certainly supported the men in this activity. Some of them stood in the picket line to stop the trucks from landing, and several called local politicians to get their support. The women were very disappointed when none of the politicians who had been contacted publically supported the boycott. On the whole, the Fishermen's Wives Association would support countervailing duties on Canadian fish, which would raise the price of these exported fish to the point where U.S. fishermen could compete with them in our own markets.

The vast majority of the people in the industry would also clearly support this policy. The Association, however, has no clear-cut policy

concerning the Canadian treaty to establish a line between U.S. and Canadian waters. Some men in the industry argue that the U.S. should have a treaty establishing a boundaryline with the Canadians because any treaty is better than no treaty--especially when such a treaty might allow U.S. fishermen to pursue swordfish, tuna, and perhaps other species in the Canadian zone. Other men are violently against established a line by treaty if that would mean giving away historic fishing grounds. Most of the wives do not take a hard position one way or another on this issue. As one woman phrased it, I have "been bombarded with too much information."

Ordinarily, the fishermen's wives do not take such violent actions to achieve their goals. (The January, 1979 boycott was an exception.) Usually they seek to learn as much as possible about the issues by attending meetings, carefully reading all bulletins of the Regional Council and NMFS pertaining to management efforts in New England, and by inviting speakers to their own meetings. Then they discuss the issues and attempt to influence public policy by presenting their views at public meetings and writing letters to important officials.

For example, in 1978, they sent a letter to the Director of the National Marine Fisheries Service, stressing their opposition to the log book proposal and their contempt for the discard policy. In July of 1978, they responded to a request by the Maine Commercial Fisherman (newspaper) to present questions regarding the fisheries to the candidates running for political office in the fall elections.

In July of 1978 they also sent a letter to the two U.S. Senators from Maine, the Secretary of Commerce and the Director of the National Marine Fisheries Service stating: their opposition to the new groundfish quotas,

which had recently been announced, their support of the nomination of a local fisherman for membership on the Regional Council, and their concern about limited entry proposals.

In September of 1978, the President of the Maine Fishermen's Wives Association and the Executive Director of the Maine Fisherman's Cooperative Association both read statements to a panel of Federal Fisheries Officials at a public meeting in Portland. These speeches stressed the industry's opposition to annual quotas and the unique situation in Maine. They pointed out that an annual quota gave an automatic advantage to the southern New England states, since they could begin groundfishing in January, while there were no groundfish in Maine until March. By the time Maine had fish to catch, most of the annual quota had been caught up by Massachusetts fishermen.

In addition, they questioned the Federal policy of promoting underutilized species, since the price on such species was so low that no one could make a living catching them at present. In essence, they argued that a shift to underutilized species was desirable, but that for the foreseeable future, fishermen would have to depend largely on cod, haddock, and other groundfish for which an established market already existed.

While political concerns dominate the activities of the Fishermen's Wives Association, they have been involved in several minor activities as well. Periodically, they have assisted the Maine Fisherman's Cooperative Association in keeping its books. They have sold t-shirts with the slogan "let ME FISH" on the front. To promote underutilized species, they sold pollock burgers and baked squid at the Old Port Exchange Festival in Portland and at the Rockland Seafood Festival. (Both were in the summer of

1978.) They have encouraged fishermen to fill out questionnaires designed to gather information needed to assess the need for a fish pier in Portland and a fuel and ice cooperative.

In 1977, the fishermen's wives spent a great deal of time and energy promoting the need for fish piers along the coast and a fish auction and pier at Portland. They kept in constant contact with the Govermental Committee for Coastal Development and Conservation and one official in the State Planning Office, who was primarily concerned with this issue. They have also supported family participation in the Maine Fishermen's Forum (held in Rockland) and the Fisherman's Exposition (usually held in Boston, Seattle, or other major cities).

Men and Women

One of the topics that concerns the fishermen's wives most is their own role. At virtually every meeting there is a discussion of ways they can be more effective and what their role should be. They are constantly torn between wanting to act as independent advocates for the welfare of the fishing industry, and feeling they should be an auxilliary group, whose primary role is to aid and buttress activities men or groups of men have initiated. The women know they are capable of success as an independent entity. They know they have acted effectively on a number of occasions when their men have done nothing but complain to each other on the dock, hoping that the Federal government's managerial authority will magically cease to exist. Yet the feeling persists that they should take a more subordinate role. They are constantly pulled between voicing their own ideas directly, and programming their husbands in the hopes they will speak out.

The men have acted in ways to increase this feeling of ambivalence. Some men have been supportive. Many others gave the Wives Association "no credit at all," and were even opposed to their public activities. In the words of one woman, "I got the impression they [the men] felt we should stay home and take care of the house. The men acted as if it would be all right to attend public meetings as long as we sat in the back of the room and didn't open our mouths." Some women are quick to urge direct action, and have few qualms about presenting their own points of view. Other women have openly wondered if they should not disband the Fishermen's Wives Association and attend the meetings of the men's associations.

At the present, this has been handled by having the Wives Association remain an independent entity, but trying to coordinate with the Fishermen's Cooperative Association whenever possible. For example, when the Executive Director of the Maine Fisherman's Cooperative Association could not get a group of men together to write up an alternative fisheries management plan to present to the Regional Council, the Fishermen's Wives Association offered to help him write one.

While the management plan never came to fruition, the close cooperation between the two groups needs to be emphasized. In fact, the Fishermen's Wives Association cooperates with the Executive Director of the Maine Fisherman's Cooperative Association almost as though they were a separate committee within that organization. While the Fishermen's Wives Association and the Maine Fisherman's Cooperative Association, in which most of their husbands are members, now work together in relative harmony, this was not always the case. The Fisherman's Wives Association was organized and

active before the Maine Fisherman's Cooperative Association. Yet when the men organized their group, the President of the wives group noted that "it took a good deal of wind out of our sails, because, like it or not, the wives are secondary."

For months thereafter, the relationship between the Fishermen's Wives Association and the men's Maine Fisherman's Cooperative Association was, as one woman put it, "strange, and not very open." Norm Olsen, who was hired as Executive Director of the men's Association, did a good deal to ease the strain between the two groups. He openly cooperated with the Wives Association, and let them know their help was much appreciated. With Olsen's support, the women turned their attention to matters of substance. But nevertheless, the women still wonder, at times, how far they can go, in the phraseology of one member, "without stepping on the men's toes."

This struggle between subordination and independent action parallels a great deal that goes on in the households of fishermen. The wives of many groundfishermen must be capable of operating autonomously much of the time. When their men are at sea, they must run the entire household. They cannot leave many problems to their husbands since they are rarely sure exactly when they will be home. In addition, they are usually partners in the fishing business. Many of the wives are legally co-owners of the boat. Virtually all the wives pay the bills, do all the book-keeping, and handle many other routine details of the business, including obtaining prices on fish, etc. Yet for all the responsibility they have, the husband is still the primary operator of the family business, and must be accommodated when he is home. In short, the wife of a fisherman must handle the whole household at times and be capable of acting in a subordinate

role at other times. Most of them seem well adapted to this cyclical change in roles and come to prefer it. They like their husbands home, but not for too long. When fishermen have been ashore for long periods, their wives will openly hope for good fishing weather so they can "get something done."

One critical question remains: why are fishermen's wives able and willing to organize such effective industry groups, whereas the wives of men in other lines of work do not? Many of the factors bearing on this question have already been mentioned. First, the wives of fishermen have an unusual interest in the businesses of their husbands. Many are legal partners in the business, and virtually all of them do the books and are actively involved in the day-to-day operations. Some of these wives operate as full time office managers while their husbands are at sea. In short, they are one half of an ongoing family business.

Moreover, the wives have fairly regular schedules. They can plan on being at meetings concerning fisheries management, and be reasonably certain they will be able to attend. In this respect, they are very much unlike their husbands, whose schedules are so dictated by weather, fish prices, and so on, that they can never be certain they can attend anything regardless of how important a meeting may be. When the boat goes, they go. A meeting with officials simply has to be a secondary consideration.

In addition, very few fishermen's wives are unusually shy or reticent. Since they work in the fishing industry and feel reasonably comfortable in it, they are not easily intimidated. Any woman who is used to dealing with fish buyers can hold her ground with a bunch of politicians--particularly when the subject concerns fishing.

It is not just that wives of fishermen take an interest in the politics of fisheries management, along with their husbands; they often take the lead role. The women are willing to go to meetings; the men are not. Repeatedly, the Executive Director of the Maine Fisherman's Cooperative Association has been so desperate for people to attend public hearings of critical management plans that he has resorted to calling the fishermen's wives to find out whose husband is in so he can commandeer them. In part, the reluctance of men to attend meetings stems from the fact that they have a very demanding job and are very tired when they get home. But there is more to the problem than can be explained by exhaustion alone. We feel that two additional sets of social and cultural factors are operating to make the women equally as effective in the political realm as their husbands, if not more so.

First, the wives of fishermen, we believe, have learned to maneuver in the modern social world better than their husbands. It is not just that they are used to keeping the books and dealing with buyers, accountants, and others. They also deal every day with a wide variety of social organizations: school teachers, the P.T.A., church organizations, clubs, organizations for children, etc. Their husbands, when they attend such meetings at all, are dragged along by their wives. The men feel much more at home in small cliques of fishermen talking about machinery, the weather, fish, and personalities in their restricted world. Many of these men have homes and families on land, but their minds and hearts are never far from Jeffrey's, or Cashe's, or Georges Banks. It is not just that men have more experience with matters concerning fishing while their wives have wider social contacts. The two sexes appear adapted to two different worlds.

The women have learned to negotiate with a variety of people in a variety of different roles. Their husbands have not. The women, for example, have all had the experience of dealing with school teachers, who are operating with a set of standards mothers not only disapprove of, but have a difficult time understanding. Their husbands, on the whole, have been very happy to leave such jobs to the women. Indeed, they seem to hate dealing with people who are very different from themselves--especially if those people obviously have more education, and dress in ways that symbolize the upper middle class. The men have incredible competence in technical matters, but are maddened and mystified with marketing and bureaucratic rulings. It's all a "bunch of bullshit," more than one fisherman has been heard to say. From his perspective, with its background of icy, wild water, the deliberately obfuscated mouthings of bureaucrats do seem like nonsense. His impulse is to curse and ignore it. Many of the fishermen's wives, given their experiences in their social world, know such bureaucratic matters cannot be ignored. They are aware that P194-265 (the 200 Mile Limit Law) means permanent change. They are prepared to coexist with it--however reluctantly. Repeatedly in meetings of fishermen's wives, the women have expressed frustration with their husbands. The wives have remarked many times that their husbands do not seem to be able to cope with Federal intervention in the fisheries. One woman, expressing the feelings of the group, said: "the men think the Federal government will go away if they ignore it." While the wives may not like dealing with Federal officials, such dealings pose no insuperable obstacles to them. After all, they are used to dealing with other capricious inflexible people: their husbands, buyers, teachers, ministers, and so on.

Second, effective political action means that fishermen must cooperate closely. Unfortunately, fishermen are far more used to competing than cooperating with each other. Fishermen fish for money, but they also fish to beat other men in their home harbors. At times, competition to be highline fisherman provides more motivation than money ever could. In this respect, fishing is a team sport. Success in the game not only means more income, but income quickly translates into prestige and influence. Moreover, some of the competition between fishermen is scarcely regulated by the Marquis of Queensbury rules. Deception and under the table deals are common. No fisherman will admit to catching a large amount of fish, much less help anyone else. Much of the problem the Maine Fisherman's Cooperative Association has in getting support stems from the habit of competition. Men who make a living by competing at sea every day, with all the strong feelings that engenders, have a difficult time fusing in the face of a common enemy. Sometimes they can, but usually fission is the rule.

Given these factors, the reason fishermen's wives play such an important role in lobbying for the industry is relatively clear. Women have a strong interest in the family fishing business, and the willingness to learn about the bureaucracy. They see the necessity for dealing with Federal regulations, and are independent, patient, and persistent enough to see the job through. For them, maneuvering around Federal and state bureaucrats has many of the same features as dealing with people in other statuses they are used to. Many of the men cannot attend public meetings, and do not have the patience to be effective if they could attend. This is not to say that the fishermen do not have an interest in regaining their

freedom from Federal controls, but sustained negotiations with a powerful, capricious, obtuse bureaucracy is not in their realm of competence. In this realm, many wives seem more capable than many husbands.

The history of all industries in the U.S. coming under Federal control is one of conflict. No businessman likes regulations--at least initially. Gradually, industries learn to adapt to the Federal government, and then to take advantage of regulatory mechanisms. No doubt the fishing industry will as well. But it will clearly take a while. If present trends are any guide, the fishermen's wives may help to lead the way.

SECTION II

STUDIES OF INNOVATION AND IMPACT OF EXTENDED JURISDICTION

METAL TRAPS: A KEY INNOVATION IN THE MAINE LOBSTER INDUSTRY

James M. Acheson

Introduction

One of the theses that runs through the literature on fishing communities concerns the conservative nature of fishermen, their unwillingness to change, and their inability to accept new ideas. Certainly this stereotypic view of fishermen as traditional rustics who do not quite live in the 20th century is a highly inaccurate caricature. In the past 70 years, the entire fishing industry has undergone tremendous modernization and mechanization. In Maine, the fishing industry has gone literally from sail boats powered by nothing but wind and the muscle of men to a highly mechanized fleet where advanced electronic gear is in everyday use. This is not to suggest that fishermen do not resist change, and have not rejected innovations many times. But it does underline the fact that we know very little about the process of modernization and the factors affecting social, cultural, and economic change even in modern fishing communities. The object of this paper is to isolate the social, economic, and cultural factors affecting acceptance of one key innovation, in the single most important fishery in Maine. By extension, a discussion of the factors affecting the acceptance of this one innovation will hopefully shed light on the process of modernization and change in fishing communities in New England, and perhaps even further afield.

Over the course of the past few decades, many technical changes have occurred in the lobster industry. Diesel engines have begun to be used in large numbers, and the hydraulic trap hauler has become almost universal, along with electronic depth finders and recorders and radios. Boats have become larger, and hull designs have undergone great changes. In addition, the use of synthetic rope, twine, and buoys has greatly changed the type of gear in use. But these changes have already occurred, and studying them affords limited chances for research.

At present, one great change is currently taking place--namely, the switch from wood to metal traps. Since the change is taking place very rapidly, and involves a large number of fishermen and a great deal of money, a study of the diffusion of metal traps affords an unusual opportunity to study the factors promoting and inhibiting change in a major U.S. fishing industry.

We first began to look seriously at the phenomenon of metal traps in the spring of 1977. Three facts quickly became apparent. First, the diffusion of metal traps was very spotty along the Maine coast. There were a large number in use in the Portland area, in the towns on Muscongus Bay, and in the Stonington area. In many other harbors along the Maine coast, none were used. However, there were enough traps in use and the process had gone on long enough so that we were certain this change indicated a major innovation--not a small scale experiment which soon would be dropped. Second, the acceptance of metal traps was highly differential--with some men in any particular harbor accepting them relatively rapidly; some men lagging behind; others not accepting them at all. Third, even in communities where metal traps were in the process of being accepted, there was a good deal of debate on their effectiveness and the wisdom of purchasing them. Some very experienced fishermen stated flatly that they were "a good thing," and said they planned to buy a lot of them. Other equally bright fishermen stated flatly that metal traps fished no better than wooden traps and would do a good deal of damage to the lobster resource; they doubted the sanity of anyone who believed otherwise.

In studying the diffusion of this innovation, we had two specific research objectives: first, we gathered a good deal of quantitative information on lobster catches, trap types, and related factors, to discover which type of trap objectively fished best. This information was obtained from fishermen in the Muscongus Bay region of Maine. We thought that if we could discover which type

of trap really caught more lobsters for any given unit of fishing effort, we would have gone a long way towards uncovering many of the critical factors involved in the acceptance or rejection of metal traps. This was based on the naive assumption that one set of lobstermen really knew a great deal more than the other set about the efficiency of metal traps vs. wooden traps. Second, we gathered a good deal of information on social and cultural variables from a large sample of lobster fishermen in four harbors. Before one can assess the type of data we sought, and the kinds of controls we needed to demonstrate our hypotheses, some general information is needed about the Muscongus Bay region as a whole, and the lobster fishing industry in that area.

General Features of Lobster Fishing in the Muscongus

Bay Region: 1978

The Study Area

This study was conducted in several small fishing communities on or near the Pemaquid peninsula in Lincoln County, Maine. The peninsula lies some 15 miles west of Penobscot Bay, and about 45 miles east of Portland, in what is known as the mid-coast region of Maine. The entire region is very rural. The closest cities are about 35 miles away. Most of the male population is employed either in the fishing industry, in service industries (stores, gas stations, and so on), or in businesses connected with tourism, which is probably the single largest industry in the region. Very few farms have survived to the present day. The permanent population of the townships numbers between 600 and 3,000, and each contains two or more hamlets. In July and August, the entire population more than doubles as hundreds of "out-of-staters" move into cottages along the ocean for the summer season. Bristol, for example, which is a relatively large town, has 1721 permanent residents, who live in some 6

major hamlets in 46.7 square miles of land area. In the summer the population exceeds 5,000.

The data for this study were collected in the hamlets of Pemaquid Harbor (town of Bristol) which has 39 boats; New Harbor (town of Bristol) with 50 boats; Bremen (town of Bremen) which has 42 boats; and Friendship (town of Friendship) with some 120 boats. Virtually all of the boats in Pemaquid, Bremen, and Friendship are lobster boats. New Harbor has both lobster boats and fin-fishing boats.

Technology

The American lobster (Homarus americanus) is found in the waters off the Atlantic coast of North America from Newfoundland to Virginia. However, Maine consistently produces far more lobsters than any other state.

The technology employed by lobstermen along the entire length of the Maine coast is relatively uniform. Until recently, lobsters were caught in traps, or "pots," about three or four feet long, made of oak frames covered with hardwood lathes. Lathes are spaced far enough apart to allow circulation of sea water while retaining the large, legal-sized lobsters. The open end of the trap is fitted with a funnel-shaped nylon net, or "head," which lets lobsters climb in easily, but makes it difficult for them to get out. Inside the trap are one or two other heads, so that the trap is divided into two or three sections, called parlors. The traps are attached to a small styrofoam buoy via a "warp" (polyethylene or hemp rope). The buoys belonging to each lobsterman are marked with distinctive sets of colors, registered with the state. These traps are baited with fish remnants obtained from nearby processing plants. The most important types of bait used in the study area are redfish frames or herring remnants. The traps are usually placed in the water "in strings," or

long rows, so that a man can see from one buoy to another in the fog.

Most lobstermen in the Muscongus Bay area fish alone from gasoline or diesel-powered boats 28 to 34 feet long, equipped with a depth sounder, hydraulic "pot" hauler, ship-to-shore radio, and compass. The boats of full-time lobstermen are designed specifically for lobstering. They have high bows, making them seaworthy when headed into the wind, and low sterns and sides in back of the cabin area to facilitate the handling of lobster traps and to minimize wind action when the boat is broadside. In 1977 it cost between \$17,000 and \$25,000 to have such a boat constructed. In addition, such a fisherman may have from \$8,000 to \$15,000 invested in traps and fishing equipment, a pickup truck, dock, and some kind of workshop. Replacement values for all capital equipment often run over \$50,000.

There is a great deal of variation in the size and scale of fishing operations in the Pemaquid area and in Maine as a whole. A few local men go lobster fishing from boats as large as 42 feet and run over 900 lobster traps; and in every harbor there are a number of part-time fishermen--usually older men or boys--who go fishing only in the warm months of the year with an outboard-powered skiff and a few dozen traps

Seasonal Round

A lobsterman's activities vary greatly from season to season. The mid-winter months are unquestionably the slowest time of the year. During January, February, and March, when men fish three to ten miles offshore, lobstering is generally more dangerous and unprofitable. Catches are very small, and bad weather and high winds increase trap losses and make the work more difficult. Some men stay ashore during this period to build lobster traps, while others use their boats for scalloping. Those who persist in lobstering during the

winter may pull their traps no more than six or seven times a month. Spring (April 15 to June 15) and fall (August 15 to November 15) are unquestionably the busiest months of the year, when men have a maximum number of traps in the water and pull them every chance they get. During the three or four week molting season (June 15 to August 15, depending on the area) traps are typically placed very close to shore---literally feet away from the breaking surf. During this period, catches are so small that men bring many of their traps ashore and do maintenance work on their boats. In the fall, lobstermen begin to move their equipment into deeper water again. In October and November, usually the most profitable months of the year, traps are placed between 10 and 35 fathoms. Since the weather can be very rough at this time of the year, this fall fishery is the domain of well-equipped, full-time fishermen with large inboard-powered boats.

Throughout the year, lobstermen pull and rebait their traps when the sea is calm. When the sea is rough, they have difficulty finding their buoys and operating their hydraulic trap haulers. Moreover, the chances for serious accidents are vastly increased.

Skill

Skill plays a large role in the success of fishermen. There can be great variation in the catches and incomes of fishermen from the same harbor, fishing with the same gear, and putting in approximately the same effort. Experienced fishermen say that the most important skill is knowing exactly where to place traps, given the bottom conditions and the time of year. The amateur looking at the ocean sees nothing but waves, birds, and weather; the highly skilled fisherman sees "bottom" of incredible varieties. He is thinking of mud, rocks, "holes," "humps," "ridges," "edges," (where mud meets rocks), channels, "the 12

fathom lines," and other features. When an experienced man places a trap, he is taking into account not only all of these factors affecting habitat of lobsters, but also the wind, tide, location of other men's gear, depth, and type of bait used.¹ Increasingly, he is becoming concerned with the type of trap being used.

Marketing

Any sizeable harbor has at least one dealer or cooperative which buys from local lobstermen and sells to tourists or to one of the three or four large wholesale firms distributing lobsters in Maine and the nation. Typically, a lobster fisherman maintains a long-standing relationship with only one dealer or cooperative, and sells his catch exclusively to that outfit. The dealer or coop provides the lobsterman with dock space, and sells him fuel, bait, paint, gloves, and other supplies at low rates of profit. Marketing arrangements differ radically throughout the area. In Bremen, Friendship, and Round Pond, fishermen sell their lobster to private dealers; in New Harbor and Pemaquid, virtually all of the fishermen sell to cooperatives established in those harbors.

Territoriality

From the legal view, anyone who has a license can go lobster fishing anywhere. In reality, far more is required. To go lobster fishing at all, one needs to be accepted by the men fishing out of one harbor, and once one has gained admission to a "harbor gang," one is ordinarily allowed to go fishing only in the traditional territory of that harbor. Interlopers are strongly sanctioned, sometimes verbally, but more often by the destruction of lobstering gear. This territorial system is entirely the result of political competition between groups of lobstermen. It contains no "legal" elements (Acheson 1977).

Violations of territorial boundaries meets with no set response. An older, well-established man from a large family might infringe upon the territorial rights of others almost indefinitely, whereas a new man or a "part-timer" would quickly lose a lot of fishing gear. Ordinarily, trap cutting involves only one or two men from competing areas. But perhaps once a decade, a series of small incidents will escalate into a full-fledged "lobster war," involving dozens of men and resulting in widespread destruction of lobstering gear. However, all conflicts are kept very quiet, since trap cutting is illegal, and silence reduces the chances for a victim to retaliate. As a result, the public knows very little about the territorial system, or the political mechanisms that maintain it.

In the area around Pemaquid and Muscongus Bay, lobster fishing territories are nucleated.² Fishermen maintain exclusive fishing rights to the area within a mile or two from the mouth of a harbor. This sense of ownership grows progressively weaker the further away from the harbor one goes, and more "mixed fishing" is allowed. The middle of Muscongus Bay, for example, is exploited by men from New Harbor, Round Pond, Bremen, Friendship, Port Clyde, and Pleasant Point. When men are fishing 10 miles from shore, there is no sense of territorial ownership at all.

While the territorial system is relatively weak in the study area, it is important to note that fishermen cannot set traps in every area where they know fishing is good. In the winter, when the Bremen fishermen are exploiting deep waters between Pemaquid Point, Monhegan, and the Georges Islands, they cannot come within two miles of New Harbor. Conversely, in the summer the headwaters of the Medomak River are the exclusive preserve of the Bremen fishermen; men from New Harbor, or other harbors, are not allowed to fish there.

Harbor Gangs

The men who fish out of one harbor have far more in common than ownership of a common fishing territory. They are informal groups of great importance. Fishermen themselves recognize the importance of such groupings and have a variety of terms for them. They speak of vague entities such as "the Monhegan boys" or the "Pemaquid Harbor bunch," or "New Harbor gang." Some of these groups have rather unique names. The men from South Bristol are referred to as "cunners" (a type of fish). We refer to these groupings as "harbor gangs," although this term is rarely used by the fishermen themselves.

Harbor gang membership strongly influences many aspects of a person's professional career. Friendships are formed on the basis of harbor gang membership. The men who fish from one harbor talk to each other on the radio and swap information with each other. It is the men from one harbor gang on whom a man can count in time of emergency. Members of a gang will often get together to perform certain tasks, such as building traps, painting boats, and so on. Moreover, they generally share a common set of norms, attitudes, and techniques that mark them off as slightly different from the men of other harbors.

Perhaps most important, harbor gangs are reference groups. They provide a yardstick for a man to use in measuring his success and skill. They are the primary people with whom a lobster fisherman competes; they are the people that count in the game of lobstering. Such gangs look inward on themselves. They are the most important unit in a lobsterman's life beyond his family.

The rules defining success within a harbor gang conflict. This has been discussed at some length in a previous article (see Acheson 1977). On one hand, a great deal of prestige accrues to "highliners"--good fishermen who catch a lot of "fish" and earn high incomes. The most prestige goes to the man who lets

it be known in quiet ways that he earns a high income by skillfully working a small or moderate number of traps. Such a man is often elected to town office, his advice is sought by other fishermen, and he is very apt to serve as spokesman for the harbor gang in dealing with outsiders of all kinds. The prestige accorded such a man will increase as he gets older, but even a young man who is a "good fisherman" will be greatly admired and respected in a coastal town.

On the other hand, the prestige accorded a "highliner" may not completely negate the feeling that his success is at someone else's expense. Men who fish huge "gangs" of traps or who fish when the weather is bad are often considered to be taking advantage of others, indeed, to be "taking the food out of someone else's mouth." Such "pigs" or "hogs" can stir up a good deal of antagonism. Feeling against such a man may run particularly high if he is a braggart and his high income is due more to effort and capital equipment than skill.

Most fishermen attempt to escape from this double bind by being very secretive about the number of traps they have, their catches, and their income. Of course, other men can see where a man has traps, but they have no way of knowing how much he is catching from them. This is information that fishermen rarely talk about.

The strong cleavage between members of different harbor gangs has a significant influence on transmission of information. Fishermen rarely know very much about harbors 15 or 20 miles away. In New Harbor, for example, it is rare for a lobsterman to be able to name more than ten men who fish from Bremen--only 9 miles away. Highline fishermen are the exception to this rule. The highline fishermen from New Harbor or Bremen know the names of the four or five most successful fishermen of most harbors within about a 20 mile radius. They are, in turn, known by the highline fishermen within roughly the same radius.

At times, such men will exchange information, and even form friendship ties. The highline fisherman is in a highly influential position in a harbor gang because of his position of prestige and because of his relatively greater knowledge of the activities of other groups of fishermen. When new techniques and innovations are transmitted between harbor gangs, usually the network ties between "highline fishermen" are involved.

Metal vs. Wooden Traps

Trap and Catch Data

In order to obtain the data necessary to test hypotheses concerning the relative efficiency of metal vs. wooden traps, members of the research team rode lobster boats owned by some 18 fishermen from four Muscongus Bay towns and recorded a great deal of data on catches, trap style, and related variables on some 10,000 lobster traps that were pulled in while team members were on board.

A very large number of factors affect the catch a lobster fisherman obtains. His catch varies dramatically with the season. Even within any season, catches vary with the number of traps in use, the length of time the traps are left in the water, the way the traps are made, the specific fishing territory being exploited, and most important of all, the skill of the lobsterman. An intimate knowledge of the bottom and the ability to pinpoint placement of traps in areas where lobsters can be caught has a strong influence on income. If the fishermen were correct, one of the most critical factors influencing catches and income was the material out of which the traps were made (i.e., metal vs. wood).

Given the large number of variables involved, we had to gather a great deal of information to establish the connection between catch and type of lobster

trap. Moreover, we had to gather it in such a way that we could control for certain crucial variables. In this regard, some factors need to be mentioned.

(1) In order to control for skill, we gathered data only from men who were known as "highliners." The men we chose had been in the lobster business full-time for at least five years.

(2) We chose only fishermen who were using both metal and wooden traps. This allowed us to compare catches from metal vs. wooden traps taken by the same man in the same day.

(3) Some fishermen stated with great vehemence that there would be a strong variation in the performance of wooden and metal traps with the season. Such a hypothesis was generally phrased in terms of predicting that either wood or metal traps would fish better at different times of the year. In order to obtain information on such factors, we gathered data at three times of the year: just after shedding in July and August, 1977; in the middle of the productive fall fishery (November and December, 1977); and again during the spring fishing season (May 1978).

(4) There is a good deal of evidence to suggest that lobstermen from some harbors generally do better than men from other harbors due to differences in concentrations of lobsters, variation in fishing effort along the coast, and other ecological factors not understood (Acheson 1977). As a result, we limited our investigation only to fishermen from towns in Muscongus Bay, namely New Harbor, Bremen, Friendship, and Pemaquid Harbor. Even this attempt at control proved inadequate. For reasons that are not well understood, the Bremen lobstermen have been doing very well the last few summers, when they are fishing the headwaters of Muscongus Bay and the Medomak River, while highline lobstermen from Round Pond and New Harbor further down the Bay were catching far fewer lobsters during the summer season. For this reason, it is impossible to compare

data on catches during the summer without controlling for the territory (known by the town name) where the fisherman placed his traps. That is, we cannot compare catches of wooden traps from New Harbor with catches from metal traps from Bremen. No fishermen experience any advantage in the fall and winter since they are all fishing together in deep water, in the middle of Muscongus Bay or Johns Bay.

(5) Lobstermen believe that the type and style of trap used strongly influence catch. The vast majority build their own traps and rig them out. They are constantly making minor changes in design. Thus, it is not only that traps used by one man can differ in certain respects from those used by another, but a single fisherman might have several different types of traps, which differ, at least in his mind, in important respects. At Davidson's trap factory, in Round Pond, Maine lobstermen can choose between some 40 different models.

Controlling for type of trap is not as difficult as it might at first seem, since virtually all of the fishermen in the area under study use traps which are very similar in essential respects--three or four foot traps, with either three or four heads. All of the wooden traps are of the round type, while all the metal traps are rectangular in shape. All heads are knitted of nylon or other synthetic twine. In the study area, only two styles of head are in use: the so-called "hake mouth head" (heads made completely from twine, which have a very narrow opening for lobsters to pass through) and the "hog ring heads" (heads with round metal rings about 5 inches in diameter). In order to control for type of trap, we selected lobstermen who used either three or four foot traps, and used only "hake mouth heads" and/or "hog ring heads." If men were using very different kinds of traps, we excluded them from the sample.

(6) Two kinds of metal traps are used in the study area: traps made of aluminized wire, a large percentage of which are produced by a factory in the southern part of the state of Maine, and traps made of vinyl-covered wire. Some of these vinyl-coated wire traps are made in a small factory in Lincoln County, but the vast majority are made by fishermen in their own home workshops. We studied the effectiveness of both types.

(7) Since fishermen are presently paid for the number of pounds of lobster they catch within the legal size range, it is critical to assess the effectiveness of traps in terms of the pounds of legal lobsters they catch. Since there is a very simple formula to convert length of lobsters measured in millimeters to weight measured in grams, while we were on the boats we recorded the length of lobsters measured on the carapace by using a standard scientific caliper. We made no attempt to weigh any of the lobsters.

The weight of the lobsters alone gives no sure assessment of the effectiveness of a trap. One must also take into account the working time of the bait. Two traps which produce 1.5 lbs. of lobsters each on a given morning are not equally effective if one has been in the water one day and the other five. In other words, to assess the productivity of a trap one must combine data on the weight of lobsters caught, with data on the length of the time since the trap was previously pulled. For this reason, we will use the number of grams/trap/lay-over day throughout this paper in comparing the productivity of various kinds of traps.

(8) During periods when we were doing our trap sample, we would normally wait until the evening news to get the weather and then call fishermen to ask permission to accompany them in the morning. My assistants and I would get up between 3:00 A.M. and 6:00 A.M., depending on the season, and meet the lobstermen at some designated place—normally the dock of the dealer where the

the fisherman sells his lobsters. We would then spend the day recording data on every trap that was pulled that day. Lobster traps are generally laid in clusters or strings. One set of data was recorded for every string pulled: the name of the lobsterman, the date, the string position, the type of bottom, the depth of the string, the harbor, the type of bait being used, the number of lay-over days, and the relation of that string to those of other fishermen. When a trap in that string was pulled, we measured the lobsters and recorded for each trap the length of lobsters (measured in millimeters), whether it was a metal or wooden trap, the number of notched-tailed lobsters, ³ if any, caught, and the specific details about the trap (i.e., metal or wood, type of heads, length, and so on). All of this information was recorded for every trap pulled during the day. Ordinarily there was ample time to record the data, since fishermen would pull between 150 and 350 traps maximum in a day (one perhaps every one to three minutes on the average). Normally, we would finish between 2:00 P.M. and 3:00 P.M. and be home by 3:00 P.M. to 4:00 P.M. On certain highline boats, however, one might leave the dock at 5:00 A.M. on a cold December morning, with a 30 mile an hour wind and a temperature at 28 or 30 all day and return to dock at 5:30 P.M., well after dark.

Analysis of Trap Data

While it took four researchers (and some 18 lobstermen) weeks to collect the relevant data, the results can be expressed in very few tables. For the sake of simplicity, let us take a look at the data during the summer of 1977 first.

Table 1

Grams/Trap/L.O.D. for Metal and Wooden Traps, July-August 1977

	Grams/trap/lay-over day	
Aluminized Traps	405.3	(N680)
Vinyl	166.7	(N369)
Wood	167.0	(N1682)
Total Traps	2975	

N = no. of traps

If we were to take a look at the tables summarizing all the data on catch per trap per lay-over day for wooden and metal traps obtained during the summer of 1977, we would have to conclude that wooden traps and vinyl-covered wire traps do far worse than traps covered by aluminized wire. We obtained data on 2975 traps pulled late in July and early in August 1977. The aluminized traps took an average of 405.3 grams/trap/lay-over day, while the vinyl and wooden caught 166.7 grams/trap/lay-over day, and 167.0 grams/lay-over day respectively. The differences in the means are highly significant statistically. If we were to conclude that aluminized wire traps are significantly more productive than either vinyl traps or wooden traps, we would be correct, but unfortunately these figures are highly misleading in several significant areas. A large proportion of the aluminized fishing gear is used by the Bremen men in our sample, and summer catches have been very high (probably due to ecological factors) in that area. Given the figures in Table 1, there is no way of separating out exactly how much of the apparent success of aluminized traps is due to territoriality and how much to the innate characteristics of the trap itself.

A far better picture can be obtained by looking at Table 2 which breaks down the summer 1977 data on grams/trap/lay-over day by both type of trap and fishing area. Several factors should be noted about this information.

Table 2

Grams/Trap/L.O.D. for Metal and Wooden Traps by Harbor, July-August 1977

	Bremen	New Harbor	Friendship	Pemaquid Harbor
Wood	146.3 (N400)	179.7 (N900)	90.1 (N172)	229.2 (N210)
Vinyl	135. (N124)	123.1 (N288)	68.9 (N23)	219.4 (N204)
Aluminized	415.4 (N502)	236.6 (N154)	236.6 (N24)	
Mean all traps	305.5 (N743)	176.0 (N195)	87.6 (N195)	224.6 (N254)

New Harbor fishermen did not fare as well, as one can see by comparing the figures on catches produced by various kinds of traps in these two fishing areas. Aluminized traps in Bremen waters in August produced 415.4 grams/trap/lay-over day. The differences between what a particular type of trap in Bremen produced in comparison with the output of a similar trap from New Harbor are again very significant statistically. (For example, when the mean output of aluminized traps pulled in Bremen waters was compared with those pulled in New Harbor, the value of the t was 5.6 [$p = .01$]. These figures verify the fishermen's claim that fishing in Bremen waters during the summer is better than further down the Bay.)

More important, if we compare the catch figures on various types of traps we have automatically controlled for ecological differences. That is, if we compare the output of various types of traps for any given area (say Bremen or New Harbor), we are comparing figures from traps placed in the same area and operating under the same conditions. Such comparisons demonstrate with great clarity that aluminized metal traps undoubtedly catch more lobsters than either vinyl or wood. Wooden traps in Bremen produced an average of 146.3 grams/trap/lay-over day, while aluminized traps pulled during this same period by the same men from this town yielded 415.4 grams/trap/lay-over day. The difference in means is highly significant.

The value of the t is 24.7, so the results are significant in excess of the .01 level. Vinyl traps, by way of contrast, in Bremen produced 135.0 grams/trap/lay-over day. The difference between this mean figure and that for aluminized traps pulled in the same area is also statistically significant (value of the t is 41.2, $p = .01$).

There is also a significant difference between the mean catches produced by various kinds of traps in New Harbor during the summer of 1977. In July and August 1977, wooden traps in New Harbor produced 179.7 grams/trap/lay-over day, while aluminized traps pulled by the same men produced 236.6 grams/trap/lay-over day (value of the t was 21.9, $p = .01$). The same kind of significant difference can be seen in a comparison of mean catches of aluminized vs. vinyl traps in New Harbor during these months. Vinyl traps produced 123 grams/trap/lay-over day, while aluminized traps produced 236.6 grams/trap/lay-over day. In this case the value of the t produced by a standard t -test was 25.9 ($p = .01$).

These figures taken from the data gathered during the summer of 1977 show the general superiority of the aluminized traps. There is, however, a great deal of variation in trap catches over the course of the year so that the total picture is quite complicated. The data from the winter and spring show that most men continue to do well with aluminized traps, but some men with vinyl or wooden traps outfish those with aluminized gear. All of our data from the summer, spring, and fall were analyzed with a multiple stepwise regression program. The results strongly reinforce the conclusion that over the course of the entire year aluminized traps are generally superior to vinyl traps, and that both vinyl and aluminized traps are superior to wood. The data from the regression analysis on the variables connected to trap construction material are summarized in Table 3. In this regression equation, the dependent variable was pounds per trap. There were 110 indep-

endent variables, including variables on season, bait used, trap length, number of heads, position, depth, and the skill of the man involved. Only the data directly relating to trap construction material have been included, since a complete description of all of the results of these regression results is irrelevant for our purposes.

Table 3

Regression Analysis Results on Trap Construction Material

<u>Variable</u>	<u>B</u>	<u>BETA</u>	<u>Standard Error of B</u>	<u>f</u>	<u>Level of Significance</u>
Vinyl Traps	Baseline	Variable			
Wooden Traps	-0.2767	-0.09448	0.07508	13.584	.001
Aluminized Traps	0.1546	0.04821	0.07886	3.848	.05

As we can see from the data in this table, wooden traps and aluminized traps are being compared to vinyl traps, which served as the baseline variable. The B figures (regression coefficient) indicated that wooden traps catch .27 lbs/trap haul less than vinyl traps, while the aluminized traps get .154 lbs/trap haul more. Even though these differences in poundage caught are quite small, the difference in catches are significant over the .05 level so that we can be reasonably certain that these results did not happen by accident.

The signs of the B and BETA figures are very significant. The fact that the sign for the figures on wooden traps is negative indicates that as the number of wooden traps in the mix increases, the pounds per trap decreases. The opposite is true with aluminized traps. An increase in these traps brings about an increase in catch.

This analysis also demonstrated that other factors were far more important in influencing lobster catches than the trap construction material. This can be done by comparing BETA figures. First in importance were factors connected with season (BETA .295); next was length of trap (BETA .190); third was skill of the fisherman (BETA .10); and then came bait used (BETAs ranging from .138 to .880). Near the bottom of the list was trap construction material. As we can see from Table 3, the BETA figure for aluminized traps was only .048, while that for wooden traps was -.094. (See Acheson in press.)

Given all of these results, there can be no question that aluminized traps produce significantly more lobsters per unit of effort than either vinyl or wooden traps.

Frankly, we did not expect these results, although certain fishermen did tell us that aluminized traps did better. In the summer of 1977, two very good fishermen said that it really did not make any difference what kind of material was on the outside of a trap. What counted was the bait and where the trap was placed (i.e. the skill of the fisherman). For months we were prepared to believe this hypothesis, which seemed sensible in every respect. These data demonstrate beyond all doubt that what is on the outside of a trap does make a substantial difference. (See: Acheson [in press] for a complete analysis of all these data.)

Why should aluminized traps fish so much better than traps with wooden lathes or traps covered with vinyl-covered wire? There is no certain answer at this point. Two hypotheses have been advanced by certain fishermen. Many say metal traps, since they have no tendency to float, stay on the bottom better, while wooden traps, even weighted, have a tendency to float and thus move somewhat due to wave action, wind, tide, and so on.⁴ Lobsters, so the story goes, prefer to crawl into traps which are more stationary.

One fisherman explained this tendency of lobsters in the following words. "Of course they don't like it if the trap moves. Would you like to go into a house that was jumping all over the lot? It's the same thing." Maybe so. Second, some fishermen believe that lobsters are repelled by the smell emanating from the vinyl-covered wire. At least one scientist believes that they are correct (Bowles 1978).

Economic Issues

From the point of view of the fisherman, the critical question concerns whether or not it is advisable to invest in metal or wooden traps. Unfortunately, there is no way this question can be answered by looking at the figures on relative physical productivity for a month or two. Several factors complicate the issue. First, metal traps are far more expensive than wooden traps, and do not last as long. The four foot aluminized traps, for example, cost \$27.50 during the summer of 1977 so that a pair of these equipped with warp line, toggles, and buoy ran about \$65. A single 3 foot oak trap could be bought for \$12, and a pair of them fully rigged cost about \$35. Moreover, a wooden trap, it is estimated, lasts about five to seven years, while an aluminized trap lasts about three or four. Most important, investment in lobster traps lasts over a period of years, so that the discount rate or the time value of money must be taken into account.⁵ More specifically, metal and wooden traps produce different income streams over a different number of years. Last, the physical output of a trap varies dramatically over the course of a year, along with the price the fisherman receives for lobsters. (Supply and price usually vary inversely.) There is no way the physical output, or the Net Revenue, a fisherman receives from a trap can be estimated from the figures on physical productivity gathered during July and August 1977.

Businessmen and bankers are faced with making decisions involving all of these variables constantly, and they have developed a whole set of accounting techniques to handle such problems. The techniques most widely used by accountants and businessmen for evaluating investment options is to compare the Net Present Values of the investment in question. The formula for the Net Present Value of an investment is as follows:

$$NPV = \sum_{T=1}^N \frac{NCF_t}{(1+i)^t} - C$$

Here, NCF is the Net Cash Flow; i is the interest rate or the marginal cost of capital; C is the initial cost of the project; and N is the expected life of the project.

In order to obtain information on the NPV of an investment in wooden vs. aluminized traps, detailed information on costs, interest rates, catches, and revenues for 10 metal and 10 wooden traps from June 15, 1977 to April 1, 1978 was obtained from one local fisherman. The following is assumed:

- (1) That the interest rate is 8.75 percent. (This was the rate he was actually charged in the summer of 1977 on a secured loan to buy traps.)
- (2) That an aluminized trap cost about \$32.50 and a wooden trap cost \$17.50 (fully rigged). These are the actual costs he paid during the spring of 1977.
- (3) That a metal trap will last four years and a wooden trap will last six years. After four years a metal trap will be completely depreciated, while a wooden traps will have a salvage value of \$5.00.
- (4) That the Net Cash Flows will remain constant over the course of the investment.
- (5) That the project will terminate in four years. This short time horizon will be used to minimize the effect of inflation, changes in the

Table 4

Revenue From a Sample of Aluminized and Wooden Traps

<u>Month</u>	<u>Price received (15th of the month)</u>	<u>lbs. (total lobsters caught in wooden traps)(10)</u>	<u>lbs. (total lobsters caught in aluminized traps)(10)</u>	<u>Total Revenue (wooden traps)</u>	<u>Total Revenue (aluminized traps)</u>
Jun 1977	\$1.90 lb.	26	40	\$ 49.40	\$ 76.00
Jul 1977	\$1.30 lb. (soft) \$2.30 lb. (hard)	6	37	\$ 9.33	\$ 61.10
Aug 1977	\$1.40 lb. (soft) \$2.00 lb. (hard)	55	86	\$ 86.40	\$155.00
Sep 1977	\$1.40 lb.	83	129	\$116.20	\$180.60
Oct 1977	\$1.50 lb.	96	155	\$144.00	\$232.50
Nov 1977	\$1.80 lb.	104	171	\$187.20	\$307.80
Dec 1977	\$2.40 lb.	62	85	\$148.80	\$204.00
Jan 1978	\$2.75 lb.	28	33	\$ 77.00	\$ 90.75
Feb 1978	\$3.00 lb.	19	30	\$ 57.00	\$ 90.00
Mar 1978	\$3.00 lb.	24	33	\$ 72.00	\$ 99.00
Apr 1978	\$3.60 lb.	?	?	?	?
Totals		502 lbs.	799 lbs.	\$947.13	\$1476.75

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Totals		502 lbs.	799 lbs.	\$947.13	\$1476.75

costs of materials, changes in prices for lobsters, and so on.

(6) That a fisherman already has a boat, dock, pick-up truck, workshop. The only decision he is currently making concerns the traps themselves.

In order to obtain Net Present Value figures for investments in wooden vs. aluminized traps, we need to have data on New Cash Flows—the gross revenue minus cash costs associated with each type of trap. In order to obtain this information, information on prices paid for lobster was obtained from the New Harbor Co-op from June 1977 to the present, along with data on pounds of lobsters caught by a local fisherman in ten of his wooden traps and ten aluminized traps. The results are summarized in Table 4.

There are, of course, enormous costs involved in the lobster business. This particular fisherman (see Table 4) pays about \$5200 for bait during the year and another \$3200 for gas, and it costs him another \$500 cash (to say nothing of his time) to maintain the traps he already has. Since he has 500 traps, and his variable costs are \$8900, his cost per trap is \$17.80.

If 10 wooden traps yield \$947.13, the gross revenue for one trap per year is about \$94.71. Since 10 aluminized traps yield \$1476, one trap produces a gross revenue of \$147.60. If variable costs per trap are \$17.60, then the Net Cash Flow for a wooden trap is \$76.90 yearly, and for an aluminized trap \$129 yearly.

If the Net Cash Flow for a year per aluminized trap is \$129, with an interest rate of 8.75 percent, the project lasting for four years, and the initial cost of the investment being \$35.50, then the NPV is as follows.⁶

$$\begin{aligned}
 NPV &= \sum_{T=1}^N \frac{NCF_t}{(1+i)^t} - C \\
 &= \frac{129}{(1+8.75)^1} + \frac{129}{(1+8.75)^2} + \frac{129}{(1+8.75)^3} + \frac{129}{(1+8.75)^4} - \$32.50
 \end{aligned}$$

$$\begin{aligned}
&= \text{Present Value of } \$129.00 \text{ received for 4 years minus } \$32.50 \\
&= \$420.22 - \$32.50 \\
&= \$387.72
\end{aligned}$$

Calculating the NPV of a wooden trap is slightly more complicated, since the trap lasts for six years and the project will be over in four. After four years the traps will not be completely depreciated and may be sold for "salvage value." Let us assume that this salvage value is \$5 per trap.

If the Net Cash Flow for a wooden trap is \$76.90 per year, with an interest rate of 8.75 percent, the project lasting 4 years, and initial cost of \$17.50, and a salvage of \$5:

$$\begin{aligned}
NPV &= \sum \frac{NCF}{(1+i)^t} - C \\
&= \frac{76.9}{(1+8.75)^1} + \frac{76.9}{(1+i)^2} + \frac{76.9}{(1+i)^3} + \frac{76.9}{(1+i)^4}
\end{aligned}$$

$$\begin{aligned}
&\text{Present Value of } \$5.00 \text{ in 4 years} - \$17.50 \text{ initial cost} \\
&= \$250.00 + \$3.57 - \$17.50 \\
&= \$236.25
\end{aligned}$$

The figures on the Net Present Value of aluminized vs. wooden traps certainly demonstrate the superiority of the aluminized lobster traps. The NPV for these aluminized traps is \$387.72, while the NPV of wooden traps is only \$236.25. This comparison takes into account the differences in: physical productivity, the life of the traps, and the initial costs.

Certainly the NPV for wooden and aluminized traps in Maine as a whole are not this high. The lobsterman who volunteered these figures is one of the very best I have ever seen. It is not only that he is highly skilled; he works hard. This man pulls traps about 160 days a year, so that each trap is pulled about 80 times over the course of the annual cycle. The

average lobster fisherman works perhaps 110 to 130 days per year.

In this regard, it should be noted that this man's catch per trap is not especially high. From the wooden trap, he is obtaining only .625 lbs. every time the trap is pulled (50.2 lbs. per trap per 80 hauls). Thus, this man earns a very high income, but his success is due not only to skill, but to an enormous amount of effort.

Adoption and Rejection of Metal Traps: Social Factors

General Observations

Given the obvious advantage of aluminized lobster traps, why is there such confusion and debate concerning the relative efficiency of such traps? Certainly many of the lobstermen who continue to favor wooden traps are bright and enterprising people who are very competitive and interested in raising their incomes.

The answer is that most fishermen do not have the information necessary to accurately judge trap efficiency. When they finally obtain accurate information, a large number of them quickly begin to invest in large numbers of metal traps.

There are two factors which make it difficult, if not impossible, for most fishermen to estimate the efficiency of wooden and various kinds of metal traps. First, there are so many variables involved that even if the individual acquires a few traps to test, and keeps records on them, he will not be able to conclusively determine if the investment is justifiable. As we have seen, one has to take into account not only all of the factors influencing physical output of the different types of traps (bottom, season, depth, heads, number of lobsters caught, trap type, location, proximity of gear, bait, type of bottom, and so on), but also the factors influencing

revenues and cost over the long run (i.e. cost of traps, maintenance costs, discount rates, ex-vessel prices for lobsters, and related variables). No human mind can adequately handle and sort out such a welter of information.

Second, it is very difficult to obtain information from other lobstermen. One cannot observe what others are doing. One might be able to see some of the catches they bring in, and observe where some of their traps are, but it is impossible to tell with any accuracy what they are catching.

Given the competitive nature of lobstering and the importance of knowledge in determining success, one can scarcely hope to obtain much information from other lobstermen. Men from adjacent harbor gangs are thought of as "enemies," and are often treated with open hostility. They are, after all, men who can and have intruded on your fishing territory and destroyed fishing gear of men in your harbor gang, if not your own traps. This basic distrust manifests itself in derogatory stereotypes of men from these other harbors, and an unwillingness to share accurate information with them. Fellow members of a harbor gang are not conceptually enemies, but they are competitors. Providing fellow harbor gang members with information which would help them compete for a finite supply of lobsters is not in the individual's advantage. Fishermen will often volunteer general information with close friends or relatives. But even in these cases, the flow of information is clearly restricted. Evasion is the rule, and deliberate lies are common. The stories about the ways lobster fishermen misinform each other are legion. Some men have used "decoy traps" (buoys attached to rocks or concrete blocks) to suggest that lobsters are in certain unproductive areas. Others stretch the truth about the advantages or disadvantages of certain kinds of lobster gear. Many men, when they find a "sweet spot," will hide its existence from competitors by avoiding the

area except when they can pull those traps without being observed.

With regard to metal traps, a variety of misleading stories are being told. In 1977, one heard that there was no difference in catches. The only reason that people ostensibly adopted them was to avoid the worm problem (marine worms can destroy wooden traps), and to ease the work load, since they are lighter and easier to handle out of water. These are both perfectly valid reasons for accepting metal traps, but it should not be overlooked that these obvious advantages have been used to mask the fact that many of the owners of metal traps suspect they fish better. In the fall of 1978, those in know have persisted in talking about the advantages of "metal traps." The sociolinguistics is interesting. It pretends that there is no difference between aluminized and vinyl traps (which are both called metal). Some of the perpetrators of the "metal trap" myth know better or strongly suspect the truth.

Given the confusion and misinformation, etc. the critical question is: how do fishermen decide to accept or reject aluminized (and/or vinyl) traps?

Two preliminary observations were made that had an enormous influence on the way we went about answering this question.

First, it was noted that the response to metal traps came far later in some harbors than in others. In Bremen, for example, metal traps gained rapid and widespread adoption between 1974 and 1975. In New Harbor, such traps are just now gaining wide acceptance (winter of 1978). In Round Pond and Pemaquid, only a very small number of men have begun to experiment with metal traps of any kind. This set of observations suggested that responsiveness to this innovation was linked somehow with harbor gangs, with all that indicated about competition, restricted flow of information, etc.

Second, it quickly became apparent that within a harbor gang the response to metal traps is highly differential, with some men accepting such traps very early, others lagging behind, and others not adopting them at all.⁷ Thus, a good deal of emphasis was placed on attempting to define the characteristics of early, middle, and late adopters of metal lobstering gear.

In order to sort out factors affecting the differential responsiveness between and within groups of fishermen, we obtained data on virtually every lobster fisherman in New Harbor, Round Pond, and Pemaquid Harbor in the months of November and December 1977, and a large sample from Bremen. In addition to collecting information on age, education, work experiences, fishing experience, and other basic personal data, during the survey each fisherman was asked about his source of information on metal traps, his opinion of them, the number of metal traps he owned, his plans for the future vis-à-vis investment in traps, and his attitudes toward fishing. This information was heavily supplemented by extensive open-ended interviews and participant observation which took place over the course of several months. Even though the open-ended interviews are not amenable to statistical analysis, they did provide a good deal of insight into the patterns of response, and resulted in many insights that are impossible to obtain via quantitative methods.

Quantitative Differences Between Early and Late Adopters

Our survey turned up five critical sets of factors which are related to the rate of adoption of metal lobster traps. These quantitative differences between the men who adopted traps early and those who adopted them later give enormous insight into the factors which influence the decision of fishermen to accept or reject these traps.

Table 5

Age By Adopter Category*

	Under 25	25-40	40-55	55-70	Over 70	Totals
Early		10	2	3		15
Late	11	13	14	15	3	56

Early adopters were defined for purposes of this analysis as men who had at least 25 metal traps before June 1977. Middle range adopters had at least this number of traps by January 1, 1978. Late adopters had no metal traps by January 1978.

*The results of a Chi Square test on age distribution for early adopters of metal traps appears below. The observed frequencies are obtained from Table 5; since there are 15, the theoretical distribution in each cell is 3.

	Under 25	25-40	40-55	55-70	Over 70
f_E	0	10	2	3	0
F_E	3	3	3	3	3

$$X = \sum_{i=1}^k \frac{(f_i - F)^2}{F} = \frac{3^2}{3} + \frac{7^2}{3} + \frac{1^2}{3} + \frac{0^2}{3} + \frac{3^2}{3}$$

$$= 3 + 16.3 + .333 + 0 + 3$$

$$= 22.633 \quad DF = 4$$

$$P > .001$$

Therefore, reject the hypothesis that there is no difference in the observed and expected frequencies.

First, there is a substantial difference in the age distribution of early adopters, as opposed to middle and late adopters of metal traps. As can be seen in Table 5, all of the men who adopted metal traps early are clustered in what lobstermen think of as their "prime fishing years." No early adopters were under 25 years old, and none was over 70. Most important, 11 of the 15 men (or 66 percent) in this early adopter category were between 25 and 40. A Chi Square test was run on the age distribution of early adopters. As can be seen in the note for Table 5, we can safely reject the null hypothesis since the Chi Square statistic is significant at the .001 level. This means that there is under one chance in one thousand that this clustering in ages in the early adopter category could have occurred by chance.

The age distribution of late adopters is far more evenly distributed. Eleven of the late adopters (or 20 percent) were under 25, and 18 (or 32 percent) were over the age of 55; three were over 70. In short, a very high percentage of the late adopters were either very young or relatively old. Only 13 (or 23 percent) of these late adopters were between 25 and 40.

Table 6
Some Social and Economic Characteristics of Early, Middle and Late Adopters
of Metal Lobster Traps: July - August 1977

	<u>Age</u> (years)	<u>Education</u> (years)	<u># of traps</u>	<u>Age of Boat</u> (years)	<u>Length of Boat</u> (in feet)
<u>Early</u> <u>Adopters</u> N = 16	$\bar{x} = 41.3$	$\bar{x} = 12.37$	$\bar{x} = 389.3$	$\bar{x} = 9.9$	$\bar{x} = 31.68$
<u>Middle</u> <u>Adopters</u> N = 4	$\bar{x} = 52.2$	$\bar{x} = 12.50$	$\bar{x} = 307.0$	$\bar{x} = 11.75$	$\bar{x} = 28.8$
<u>Late</u> <u>Adopters</u> N = 56	$\bar{x} = 43.2$	$\bar{x} = 11.01$	$\bar{x} = 305.0$	$\bar{x} = 11.5$	$\bar{x} = 28.8$

Second, the early adopters of metal lobster gear have a great deal more invested in their business than the late adopters. This is indicated in any number of ways which are amenable to statistical analysis (see Table 6).

A. Late adopters have smaller boats, which are naturally less expensive. Late adopters have boats averaging 28.8 feet, while early adopters have boats with a mean length of 31.6. (This difference in means is almost certainly statistically significant according to the results of our t test. The value of the t is 1.82 [$p = .07$].)

B. They have far fewer traps than the early adopters. The early adopters reported an average of 389.3 lobster traps, while the late adopters have a reported average of 305.4 traps each. This difference in means is highly significant statistically. (A standard t test produced a t value of 29.07, an unbelievably high figure [$p > .001$]. This means that there is less than a one in a thousand chance of these results occurring by chance.)

C. The lobster boats used by late adopters are, on the average, older than those used by early adopters. The boats of the later adopters are 11.5 years old on the average, while those used by the early adopters are 9.9 years old. The difference in these two means is highly significant statistically as well (value of the t = 2.05; $p > .05$ level).

The difference between the amounts invested by early adopters and late adopters is greater than one might think by looking at these figures alone. A boat that is a few feet bigger and a few years newer costs several thousand dollars more than a smaller, older boat. Traps are very expensive; and metal traps are much more expensive than wooden ones. Although we have no solid, systematically gathered evidence to buttress the assertion, there is no question that the amount of ancillary gear owned

by early adopters in greater than that of later adopters. All these factors mean that early adopters may have two or three times the amounts invested as later adopters.

We were able to tabulate total investment for a few individuals with great accuracy. One well-established, highline fisherman had over \$85,000 invested in his boat, mooring, traps (half of them metal), dock, pickup truck, and workshop. A young man with only two years experience had only \$9500 invested in his boat and wooden traps. (He had no truck, dock, or workshop.) While these two individuals are at the ends of the continuum, such differences in investment are by no means rare.

Third, as can be seen in Table 6, there is no statistically significant difference between early adopters of metal traps and late adopters with regard to educational level attained. As is indicated by Table 6, late adopters had a mean educational level of 11.0 years, while the early adopters went to school for an average of 12.3 years. The difference in means is not significant. (Value of the $t = .685$; $p > .40$.) These findings fly in the face of a good many studies which indicate that people with a higher educational level are more apt to take on new innovations as opposed to people with lower educational levels (e.g. Rogers and Shoemaker 1971: 186,354).

Most fishermen themselves would not be particularly surprised by these results. They have long maintained that it is years of experience in the industry, and not years of formal education that make a "good fisherman," with all this term indicates about the ability to identify successful innovations. However, there is no solid evidence that years of formal education do not translate into lobstering skills. The hypothesis is untestable given the small sample at hand. Most lobster fishermen, at present, enter the occupation after high school; and a few might complete one or two years

of technical school in programs designed to prepare them for a career other than fishing. Thus, most fishermen entering the occupation have between 10 and 13 years of education. Most men who have college degrees or graduate education leave the area, and certainly do not enter fishing. There are, however, a few men with bachelor's degrees who have become fishermen. Generally they do very well, along with men with one or more years of technical training. Many of these men have been among the earliest adopters of metal lobstering gear. Their numbers are too small to make any definite statements however.

Table 7

Rate of Adoption of Metal Traps and Fishing Success*

Fishing Success

Speed of Adoption		Highliner	Middle	Low	Totals
Speed of Adoption	Early and Middle	9	9	4	22
	Late	13	16	25	54
	Totals:	22	25	29	76

*Log-Likelihood Ratio for contingency table on fishing success and rate of adoption of metal traps.

$$G = 4.60517 \left(\sum \sum f_{ij} - \sum \log f_{ij} - \sum R_i \log R_i - \sum C_j \log C_j + \log n \right)$$

$$G = 4.60517 (9 \log 9 + 9 \log 9 + 4 \log 4 + 13 \log 13 + 16 \log 16 + 25 \log 25 - 22 \log 22 - 54 \log 54 - 22 \log 22 - 25 \log 25 - 29 \log 29 + 76 \log 76)$$

$$G = (4.60517) (1.239)$$

$$G = 5.705 \quad DF = 2 \quad P > .06$$

Fourth, and perhaps most important, a very high proportion of early adopters are identified as highline fishermen; and, correspondingly, a very high proportion of those who adopted metal traps late were rated "low," or

not very successful in fishing. As can be seen in Table 7, nine out of 22 highline fishermen (or 41 percent) adopted metal traps early. Only four of the "low" success (or 13 percent) adopted metal traps early.

A Log-Likelihood Ratio for this contingency table was run (see note for Table 7). The results demonstrate that there is a low probability that these differences could have occurred by chance. In other words, there is strong evidence linking fishing success with speed of adoption of this innovation; and conversely "low" success in fishing is associated with "late" rate of adoption.

Fifth, there is some evidence that the early adopters of metal traps are more strongly committed to the fishing industry than late adopters. Commitment, like all attitudes and values, is very difficult to measure objectively. We had two open-ended questions in our interview schedule designed to assess the interest and commitment to lobster fishing. These questions were:

- (a) "Would you advise a young man to go into fishing at the present?"
- (b) "If the fishing industry in Maine went completely broke, where would you go and what would you do?"

The results of these two questions by adopter category are summarized in Table 8

As can be seen from Table 8, 10 out of 15 (or 66 percent) of the early adopters said they would advise a young man to go fishing, whereas only 12 of 37 (or 32 percent) of the late adopters answered this question positively. The results of the Chi Square analysis indicate that this difference in response between early and late adopters is statistically significant. We would like to argue that this set of responses is indicative of a greater level of interest and commitment on the part of the early adopters.

Table 8

Adopter Category by Commitment Indicators

(a) Responses to question: "Would you advise a young man to go fishing now?"

	Early Adopters	Late Adopters	Totals
"yes"	10	12	22
"no"	5	25	30
Totals:	15	37	52

Results of Analysis of Contingency Table 8a:

Chi Square = 3.81

Degrees of Freedom = 1

$p > .05$

Therefore: Do not reject H_0

(b) Responses to question: "If the fishing industry in Maine went completely broke, where would you go and what would you do?"

	Early Adopters	Late Adopters	Totals
Stay in fishing, but move to another area	2	4	6
Get other job or retire in area	11	30	41
Totals:	13	34	47

Results of Analysis of Contingency Table 8b:

Chi Square = 3.818

Degrees of Freedom = 1

$p < .05$

Therefore: Do not reject H_0

During the interviewing process, we received the very strong impression that the men who were experimenting and adopting metal traps were more enthusiastic about fishing. They talked about it more, and spent hours analyzing fishing trends and other topics. They have done well in fishing. They

enjoy it. And they would have few reservations about enjoining someone else to try the same thing--providing that young man did not go fishing in the same area and thus compete with them.

The responses to Question (b) tell something equally important about the nature of commitment in the fishing industry. When we asked these fishermen what they would do if the industry in Maine went broke, only 12 percent indicated they would stay in fishing and move to some other area. The vast majority (some 87 percent) indicated that they would get another job in the area outside fishing or would retire in the area. This was true of both early adopters and late adopters. (The analysis of this contingency table again revealed that the results are significant at the .05 level.) In short, the large number of men who said they would stay in the area is scarcely an accident. We believe that this set of responses reinforces another observation--namely, that lobster fishermen are committed to the area more than they are to fishing. This is not to say they are not interested in fishing. Fishing is strongly preferred as an occupation, but more important than occupation is interest in staying in a locale where one has important kinship and community ties. The responses to this question probably tell more about critical features of the social structure than they do about responses to innovation.

All of these figures suggest a great deal about the characteristics of men who adopted metal lobster traps. On the whole, the early adopters are at the height of their lobstering careers. Most are between 25 and 40--an age bracket fishermen think of as their prime years. Lobstering for them is an all-encompassing occupation, not a hobby. They are not young enough to think of getting into some other occupation, nor are they old enough to think of retiring. They are serious fishermen. They are in an occupation

in which they have a good deal of interest and have a good deal of success. Virtually all of the men in the early adopter category have been in the business long enough to build up a substantial number of traps, and have earned enough to have a large, well-equipped boat. The late adopters of metal traps are spread relatively evenly in every age category; they have far less invested; very few of them are highline fishermen; and there is substantial reason to think that they have less interest in fishing. All of these factors interrelate with each other in a variety of ways which influence the decision to purchase or not purchase metal lobster traps. In general, they can be classified as: (1) economic factors, (2) factors related to the structure of harbor gangs.

Economic Factors

A great deal of the willingness to invest in metal traps can be explained simply in terms of the ability to invest. Many of the late adopters are either very young men or very old. Neither is apt to have a lot of money to invest in expensive new fishing gear. The older fishermen, like older people everywhere, are apt to be hard pressed. Fishing is a young man's game, and older fishermen are apt to be well past the years when they can afford a few thousand dollars to invest in experimental gear. Many are in the process of retracting their fishing operations, and are looking forward to retirement. They want to depreciate the gear they have, and get out of the business. Other men are already retired, and do a little lobstering to supplement their income from social security. Since they cannot earn too much at lobstering without jeopardizing their social security payments, they clearly have minimal interest in investing heavily in gear which promises to raise both costs and income. In addition, all these older fishermen, in the back of their minds, appear to be thinking

in terms of investing only in those things which will result in an immediate cash flow from which they would benefit. One 76-year-old fisherman put it very well when he said:

"I ain't going to invest in no metal traps. I'll be damned if I'll put a lot of money in gear that is going to outlast me. Besides, it would be a form of welfare. If I bought a gang of metal traps, chances are that [his nephew] would inherit them to use. He already gets enough welfare off the State without any help from me."

The very young men are hard pressed for still other reasons. They typically have had to spend every dime they saved and could borrow to get a used boat and enough gear to begin fishing on the most minimal level. Moreover, most of these men are generally interested in buying standard wooden traps which they consider less risky. Some are having trouble enough making a living with what they consider to be proven fishing gear. In addition, the price of the wooden traps makes them very attractive. After all, a man who is new to the business wants to build up the number of traps he has as quickly as possible. By investing in wooden rather than metal traps, he can get far more traps for his money. Many of them are not interested in metal traps for still another reason--they are not completely certain they will be able to survive in the competitive game of lobstering. Some of them will undoubtedly fail. A good many of the younger men are clearly wondering if they would not be better off in some other occupation. Some of them are just lobstering temporarily. More than a few are thinking of leaving lobstering permanently. As one nineteen year old fisherman phrased it: "Maybe I'll stay in fishing, but maybe I'll go to college. In the meantime, I'm not going to put a lot of money into fishing. I don't really know if that is what I'm going to stick with."

However, many of the late adopters are neither young nor old. In fact, 27 (or 48 percent) are between 25 and 55. Many of these men, even though

they are in what are considered their prime earning-years, also have great difficulty raising funds for new investment. As one man phrased it, "This business is just like any other. If you haven't got any savings, you can't buy anything big on your own, and the dealers and banks don't want to lend it to you either. The only time you can get a lot of money for new fishing gear is when you don't need it."

By way of contrast, Table 7 demonstrates that a very high percentage of the early adopters of metal traps were also highline fishermen. Many of these men either had the money to purchase metal traps, or had the collateral and history of success so that it was relatively easy to obtain loans from dealers, banks, or other sources of capital.

Harbor Gang Structure

In many respects, the "highline fisherman" from any harbor and his less successful competitors inhabit the same social field. They are, after all, members of the same harbor gang--the primary unit of identification for fishermen, and the single most important reference group. However, there are some important differences among men within harbor gangs which are linked in important ways to the adoption of metal traps.

First, staying ahead of the competition is the primary goal for highline fishermen. Fishing, for these men, is not only a way to make a living. It is also a team sport in which one strives to "beat other men" and avoid being beaten by them. A great deal of the competition for lobsters stems not only from a desire to increase income, but from a knowledge that having greater catches means greater influence and higher social standing as well. Men playing the "highline" game put in the most hours. They are the ones who leave before dawn on most days, and return after dark. They are the men who have the largest boats and the most fishing equipment. In this

competition, they are constantly making changes to ensure that they have the best equipment available. If you do not compete in equipment or techniques, your competition will outfish you. And with the competition hot on their heels, these men are constantly looking for and experimenting with new techniques and types of gear.

Some of the less successful fishermen are clearly not as competitive. Some scarcely seem to be fully able to understand their more successful colleagues. As one man put it: "If one of them goes out at 5:00 A.M., someone else will start at 4:30 and let him [the first man] know it. If they think another kind of trap will help them better, they'll go buy a whole gang of them, and give the others away. They are just crazy." This misses the point completely. The behavior of these highliners is highly normative, given the success orientation they share with most other middle-class Americans. To be sure, some highline fishermen take competition to an extreme, but what is equally puzzling is the lack of drive and ambition which one can observe in some of the less successful fishermen--particularly less successful fishermen in their prime years.

Second, there is a distinct difference in the way highline fishermen and average fishermen obtain information about new techniques, new equipment, and so on. The highline fishermen--and most early adopters are highliners--are linked into some wide-ranging networks. They are vitally interested in the industry, and make an effort to reach out to other men who are doing things of significance in their world. They know more people in other harbors, and are better known by them than the average fisherman. These ties play a great role in the diffusion of innovations. For example, virtually all of the early adopters in New Harbor, Round Pond, and Pemaquid Harbor obtained the information on metal traps via direct links with men in Friendship or Bremen.

Perhaps more important, these highline fishermen (i.e. early adopters) are constantly experimenting on their own. Every year they change the type of heads they use; try out new kinds of bait; experiment with new fishing areas. Experimentation and routine innovation is a way of life with these men, and it is a constant source of entertainment and conversation. In this respect, they are living up to the standards of a highly technical-utilitarian culture--one in which machinery is highly appreciated, and inventiveness is highly valued. They also watch each other like hawks. It is not surprising that they would be the ones to try metal traps when they first appeared, and to appreciate their merits. Given the competition within and between harbor gangs, it is not surprising that they are very quiet about what they have observed.

The average fisherman obtains information via a very different set of processes. He may do some experimentation, but on the whole, the information he has comes directly from watching other fishermen in his harbor gang. He emulates the kind of behavior that appears to bring success. He certainly does not have the wide-ranging ties highliners have. When we asked fishermen from Bristol (New Harbor, Pemaquid, and Round Pond) where they heard about metal traps and what convinced them to buy them, the late adopters answered that they had heard about them from other men in the hamlet in which they lived. They were far less specific than the early adopters about the virtues and problems of converting to metal traps.

In summary, the reasons that early adopters and late adopters take on metal lobster gear differ dramatically. The early adopters, by and large, have both the motivation and means to accept new fishing gear. Most of the early adopters are highliners in their prime years who will take on any new type of gear, including new types of traps, which promises to increase

their fishing effectiveness and their incomes, and help them maintain their position as highliners. They take on innovations to stay ahead of other fishermen. Moreover, they are able to obtain such traps in that they have access to money that can be used for investment. They are also better able to assess the effectiveness of such new gear because their ties to other highline fishermen give them access to a large pool of knowledge concerning new techniques. This picture does not apply to middle and late adopters.

Most of the middle and late adopters say they would prefer to stay with wooden traps. They are beginning to switch to metal traps out of a sense of self preservation. They are not making the change in an attempt to become highline fishermen or to "beat others." Rather, they are coming to recognize that wooden traps cannot compete with metal traps. They are beginning to see that when the two types of traps appear in the same small area, the metal traps will take the most lobsters. They are not happy about making the change to more expensive, less sturdy fishing gear, but many are starting to feel they have no choice as long as many fishermen who exploit the same waters are switching to such traps in large numbers. In the future, if and when the adoption of metal traps has become a thing of the past, I think it will be possible to see their spread not in terms of a market pull argument, but in terms of factor push. These arguments do not appear to hold true for the early adopters, but factor push arguments certainly appear to explain much of the behavior of middle and late adopters.

Long-Term Effects

As the general effectiveness of metal lobster traps becomes more widely known, more fishermen will undoubtedly adopt them. There is a possibility that they might become standard equipment throughout the lobster fishing industry. If this occurs, the effects on the lobster industry might be very marked. Their adoption may, in part, lead to the same kinds of problems that can now be observed in other fisheries.

It is generally conceded that most of the major fisheries in the U.S. have been greatly overexploited for too long by too many fishermen. The result is depletion of fish stocks, underutilization of capital resources (sometimes called "overcapitalization"), destruction of fish breeding stocks, and where opportunity costs are low, the acceptance of low incomes (Acheson 1975: 205; Crutchfield 1964: 212).

While a good many Maine fishermen believe that the lobster fishery of Maine is essentially sound, the consensus among the most experience state and Federal biologists is that the lobster fishery is poised on the brink of disaster (Anthony 1978; Morrissey 1978; Thomas 1978). They argue that fishing effort and the number of traps in the water have increased to the extent that only 6 percent of the lobsters which molt into legal size ever survive to extrude eggs even once (Acheson 1975: 200; Krouse 1973: 170-171; Thomas 1973: 47). In their opinion, there are not enough eggs in the water to maintain the stock. The small size of the breeding population, in combination with a general cooling of water temperatures, they believe will bring about ecological disaster. They predict that the 1980's will see declining catches, decreasing incomes for fishermen, and perhaps widespread unemployment. The widespread adoption of metal traps may exacerbate this situation. Since metal traps are more efficient, their adoption may

result in more lobsters being caught per year, which would further reduce the numbers that survive to breed, and hasten oncoming disaster.

Even if the increased use of metal traps, by some good fortune, should not further harm the breeding stock, it will certainly lower the efficiency of the fishermen. Metal traps are more expensive than wood. Since the industry as a whole will probably not be able to take more lobsters in the long run than it is currently harvesting, the return to investment will probably be lowered. Some lobstermen see this situation very clearly. One New Harbor fisherman expressed it well when he said:

"Everyone ought to stay with wooden traps. We'd be a lot better off if they did. The men who are now going to metal traps are better off. But they won't be for long. Soon everybody will have the damn things. When that occurs, we'll all be catching the same amount of lobsters. It will just cost us a lot more for gear."

In this regard, it should be noted that a similar kind of trap escalation occurred in the Casco Bay region in the early 1960's. Some men bought very large boats, hired one or two helpers, and greatly increased the numbers of traps fished. They were better off until other people also began to expand the number of traps they owned. Since there are only a finite number of lobsters that can be caught, many men are presently catching the same number of pounds they were previously. (Many are catching less.) The only difference is that now they must maintain, bait, and pull 1800 to 2400 traps where they formerly had to tend only 400 to 600. Most men in Casco Bay favor a trap limit which would force everyone at the same time to lower drastically the number traps they fish.

If the experiences of the Casco Bay fishermen are any guide, the fishermen who are now adopting metal traps in the Muscongus Bay region of Maine may wish, in a few years, they they had retained the less expensive wooden traps.

On the other hand, a general move to metal lobster traps might ease fishing pressure--particularly if fishermen move to adopt the aluminized traps. These traps are expensive now, and they are made by only one firm in the nation. If many men moved to adopt them, the price might well increase drastically. If aluminized traps became standard, and increased in price, the entry costs into the industry would undoubtedly increase greatly. Since it is already very difficult for a young man to obtain the \$20,000 or so needed to start lobstering on a scale that promises success, a drastic increase in the cost of entry might greatly lower the number of men who enter the lobster fishery. This, in turn, could operate to lower the number of traps in the water and generally decrease fishing effort. Given the state of the lobster stock, that might be a desirable state of affairs.

Exactly what will occur in the future is, of course, impossible to predict with any certainty. There probably will be vastly more metal lobster traps in use. There are those who fear that their general adoption may prove to be a situation where technological advance may help speed biological disaster.

Notes

1. The importance of skill has been described at length in another article. (See Acheson 1977.)
2. In another article, I have distinguished between nucleated territories and perimeter-defended territories. (See Acheson 1975.)
3. Maine law formerly specified that when a female lobster with eggs is caught, a v-shaped notch must be cut out of one of her tail flippers. Such "notched lobsters" cannot be legally taken by anyone again since they are proven breeding stock.
4. During storms, the pressure of wind and tide is so strong on trap, warp and buoy, that they can be dragged for miles.
5. The idea of a discount rate is a standard concept in economics and accounting. Basically the idea is that money received now is worth more than money to be received in the future since money at present can be invested and made to earn interest. The value of money to be received in the future must be discounted in ways to take into account the interest rate and the length of time involved. If the interest rate is 5 percent annually, then \$1000 to be received in a year is worth \$950 today. It is not worth \$1000 since its value must be discounted to take into account the interest lost.
6. One can go through all of the calculations to obtain the answer or else treat the \$129 received for four years as an annuity, and use the Present Value Interest Formula for an annuity.
7. There is nothing particularly unusual about this situation. There is a large literature demonstrating that the adoption of technical innovations is ordinarily differential and takes place over a span of time (Rogers and Shoemaker 1971: 176-191).

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PATTERNS OF GEAR CHANGES IN THE NORTHERN
NEW ENGLAND FISHING INDUSTRY

James M. Acheson¹

Many fishermen regularly switch the species they fish. Some fishermen regularly fish for different species with different kinds of gear over the annual cycle. It is a very rare fisherman who has not had experience fishing for several different species over the course of his career. Indeed, the difference between financial success and failure in many cases is closely connected with the ability to change species fished as prices or the availability of various fish stocks change. For this reason, fishermen spend literally days and weeks discussing the advisability of changing gear and species. Despite the importance of changing gear and species, the phenomenon is not clearly understood. Fisheries managers think in terms of managing single species, as if the men who are being regulated fish for only one kind of fish. Indeed, the fact that fishermen regularly switch gear and species is obscured by the very language used in describing fishermen. One speaks of "herring fishermen" or "lobstermen" or "scallopers" as if the men exploiting these species have done nothing else throughout their lives. Some men have focused on one species throughout their careers and do, in fact, have operations which would make it difficult to do anything else. The vast majority are not, however, in this position.

For those concerned with the management of marine resources, it is critical to understand the factors promoting or inhibiting changes in fishing gear. After all, the object of regulations is to change fishing patterns, with conservation of over-exploited species in mind. In many cases, this involves promoting a change from one species to another or restrictions on the use of certain kinds of gear. In some cases, management means nothing more than shifting fishing effort from one species to another. In other cases, it means putting people out of business, with all that indicates for social and economic dislocation. In all cases, exactly what will happen depends in large measure on the ability and willingness of fishermen to change gear and species sought. For this reason, an understanding of the factors governing shifting between fisheries is

essential for effective and equitable management regulations to be promulgated.

In this paper, we will first analyze the patterns of gear changes that have occurred in the fisheries of northern New England between 1973 and 1978 and present quantitative data to identify the factors associated with these patterns of permanent changes. Second, data on fishermen's experience, their annual round and career pattern will be presented in an attempt to bring out some of the fundamental features--the deep structure so to speak--behind all gear changes. Third, we will analyze the implications for management of the patterns of gear changes observed.

In New England, studies of gear changes are inhibited by the lack of economic information. Fishermen fish for money, and the primary reason they change from one gear to another is to increase profits or avoid losses. Unfortunately, it is impossible to obtain accurate information on revenues, costs, and returns² to investment on various kinds of boats and gear configurations at present. However, it was relatively easy to obtain information on the gear changes that were actually made and on the social and cultural characteristics of the fishermen making those changes. From these data we can elucidate not only patterns of gear changes, but also factors explaining those changes. In short, while it was impossible to obtain the cost and revenue figures behind the gear change decisions of individual fishermen, the aggregate patterns are clear enough.

Methodology

In the summer of 1978, three social scientists from the University of Maine gathered information from captains of 190 fishing boats in Maine and New Hampshire concerning the history of their fishing operations. This sample represents approximately 65 percent of all year-round fin-fishing boats in the two state

area, but only a small percentage of the lobster fishermen. This information was collected by personal interviews on the boats and docks where the interviewers could observe the boats, equipment and crew. Two kinds of information were recorded on the interview forms: (1) information on the individual and his personal history in fishing (age, education, experience, kinsmen in fishing, and related factors), (2) information on fishing operations and fishing equipment. Special attention was paid to shifts in gear and in species sought over the annual round as well as permanent, long-run changes in boats, electronic gear, and fishing gear (for example, longlines, nets, traps). Regarding permanent changes, informants were asked to describe their boat, gear and fishing operations at the present (1978); five years in the past (1973); and their plans for the near future (1980 to 1981). The average interview took about an hour and a half, the longest about eight hours. Thus, this study provided a great deal of information on the kinds of changes occurring in the industry and the characteristics of the men who were making them.

The data from this study were coded by the interviewers who collected the information, and keypunched and analyzed at the University of Maine computer center. Several different statistical techniques were used. In studying changes in boat length, versatility, and patterns of changes in gear, simple cross tabulations were used primarily. In order to explain certain relationships between social and economic characteristics and adoption of certain kinds of fishing gear, primary reliance was placed on regression analysis.

Permanent Gear Changes in the New England Fishing Fleet

At present, there can be little question that total investment in the fishing fleet of northern New England is expanding. First, there has been some increase in the number of boats. In 1974, the Maine Department of Marine Resources listed

104 "Commercial Trawlers, Purse Seiners, Gill Netters and Sardine Carriers Operating from Maine Ports" (Anonymous 1974). In 1978, our University of Maine interviewers turned up about 234 such boats. While there are differences in the enumeration techniques used by the State of Maine and our own study, we are convinced that there has been an increase in fin-fishing in the past few years. This increase has clearly occurred in New England as a whole. In 1977 there were 1200 Federal groundfish licenses issued for New England; in 1979, the numbers had grown to 2191 (not all of these boats have home ports in New England, however) (Grice 1980).

Not only are there more boats; they are clearly larger and better-equipped. In addition, they have more versatile fishing gear. As can be seen in Table 1, in 1978 there were 60 fishermen in our sample of 190 who had boats more than six feet longer than the boats they owned in 1973. Only 16 fishermen had boats six feet shorter. The information on present boat and planned boat indicates that the strong trend to larger vessels will continue in the future. In our sample there were 61 fishermen who had ordered larger boats or were planning to do so in the near future. Of these, 43 men had ordered a boat at least six feet longer, while none were planning to build a boat six feet shorter than the one they had at present. For the men in our sample, the average boat owned in 1978 was 4.2 feet longer than the average boat they owned in 1973. In the near future, these men had ordered or planned to build fishing boats that averaged 7.44 feet longer than the boats they currently owned. In both cases, t-tests indicated that both these differences in means were highly significant statistically. 4

Table 1

Changes in Boat Length in Fishing Boats of Maine and New Hampshire

(a) Change in Boat Length - Past to Present Boat

less than -6 ft.	-6 ft. to +6 ft.	greater than +6 ft.	Total*
16	77	60	153

(b) Change in Boat Length - Present to Planned Boat

less than -6 ft.	-6 ft. to +6 ft.	greater than +6 ft.	Total
0	18	43	61**

* Of the 190 men in our sample, we obtained information on only 153. The other 37 men did not own a boat five years ago or had the same boat.

** Only 61 of the 190 men interviewed had ordered a boat or planned to do so in the next three years.

Although versatility is more difficult to measure, there is little question that the fishing fleet in northern New England is becoming more versatile as well. In general, a fishing operation was judged to be more versatile if the data indicated there had been changes in the size of the boat, electronic gear, or fishing gear which would allow the owner to exploit different fishing grounds or more species over the annual round. As can be seen in Table 2 below, between 1973 and 1978, 56 percent of the men in our sample had increased the versatility of their fishing operations, while only 8 percent had become more specialized and inflexible. The trend toward increased versatility will continue. In the next three years, (i.e. 1978 - 1981), 62 percent of the fishermen in this sample will have fishing operations that are still more versatile than those they now own; while only five percent plan less versatile operations.

Table 2

Changes in Versatility in Fishing Boats of Maine and New Hampshire

a) Change in Gear Versatility---Past Five Years.

Less Versatile	No Change	More Versatile	Total*
8 (6%)	53 (38%)	78 (56%)	139

(b) Expected Change in Gear Versatility---Next Three Years.

Less Versatile	No Change	More Versatile	Total**
7 (5%)	48 (34%)	88 (62%)	143

* Of the 190 men in the total sample, we obtained information on only 139. Some of the other 51 were not fishing five years ago. In the vast majority of cases we did not have adequate information to determine whether the fishing operations were more or less versatile

** We had sufficient information to make a judgement about future gear versatility in 143 out of the total of 190 cases.

The shift to bigger and more versatile boats means that the fishing fleet of northern New England has a greatly increased fishing capacity. The critical question is "How is that increased fishing capability going to be used?" Are some species slated for a great deal more exploitive effort than they receive at present? Is the pressure going to ease up on others? Answers to these can be obtained only by looking at the kinds of gear that fishermen are adopting and abandoning since gear is selected with certain target species in mind.

In order to understand the kinds of gear changes taking place, some basic technical knowledge is required. Some gear changes are relatively easily made since the new gear type can be put on the same boat, and used in the same area to fish for the same species. Other gear changes require different sized boats, different skills, and different levels of investment. They mean, in short,

a whole change in fishing strategy. The situation is complicated by the fact that the same gear can sometimes be used to catch a variety of different species, and can be used on a whole range of different sized boats involving different levels of investment. Thus, an analysis of changes in fishing gear can only take place against a background knowledge of each gear type, the required level of skill, and the other assets congruent with each gear type.

Fishing success is greatly influenced by several kinds of skills. For our purposes, it is important to know how long it takes a person to learn to use a different type of fishing gear, as opposed to skills in maintenance, navigation, crew management, and so on. In assessing the time it takes to use various kinds of fishing gear, we will assume a person has had five years experience in lobstering. Such people have a basic knowledge of navigation, seamanship, maintenance, and related skills. We will describe separately each gear type and the assets (skills, investment) necessary to use it.

Lobstering. Lobsters are caught in 3 to 4 foot wooden or wire mesh traps baited with fish remnants. These traps are pulled either by hand or with the aid of a hydraulic trap hauler. Lobster fishing operations vary greatly in size. Many school boys and part-time fishermen go lobstering in the summer with a few traps which they tend from outboard-powered skiffs. At the other extreme are men who own over 2500 traps which they tend with a large inboard-powered boat over 40 feet long, aided by a three man crew. The average fisherman has between 400 and 500 traps which he tends by himself or with a one man crew in a boat about 34 to 36 feet long. Such a fisherman may have a total investment of \$40,000.00 in boat, traps, and other essential gear. While lobster fishing is not an unskilled occupation, it is relatively easy to enter. Some men have entered lobstering from non-fishing occupations and have done reasonably well in as little as two years.

Bottom Trawling. Bottom trawling or dragging is a major technique used in northern New England to catch all species of groundfish (i.e. cod, haddock, hake, pollock, flat fish, etc.). Bottom trawlers operate by dragging a cone-shaped net (otter trawl) through the water, large end first. The mouth of the net, usually 60 to 100 feet wide, is held open by means of heavy "doors" attached to the sides of the net. Bottom trawling can only be done with relatively large boats ranging from 45 to 110 feet long. In 1978, a medium-sized bottom trawler was about 65 feet long and cost in the range of \$300,000.00, new and fully-equipped. Dragging is relatively difficult to learn since one has to learn the tows, or smooth places on the bottom where the net can be used without tearing up, along with learning to use a good deal of electronic gear. A man with five years in lobster fishing needs at least two to three years to learn dragging; some men never learn.

Gillnetting. Gillnetting is generally done in intermediate-sized boats, between 36 and 60 feet long. The average gillnetter would be about 42 feet long and cost about \$135,000.00 fully equipped, although many smaller lobster boats are also rigged for gillnetting part of the year. Gillnets are a type of fixed gear. They hang vertically in the water with floats on the top and weights on the bottom. They catch groundfish such as haddock, cod and pollock which swim off the bottom, but not true bottom dwellers such as flat fish. Gillnetting is relatively easy to learn. A man with five years in lobstering can put gillnetting gear on his boat and be reasonably successful with six months experience.

Dredging. Scallops and mussels are caught by dragging a steel dredge along the bottom. The dredge is hauled aboard by steel cable attached to a winch. Dredging is done from a variety of different-sized boats. Many lobstermen rig their boats with boom and winch and go scalloping in the winter inshore with a two man crew. At the other extreme are boats ranging up to 100 feet long carrying

11 to 13 man crews, which take long trips throughout the Gulf of Maine. Such boats can cost up to half a million dollars or more. These large scallop boats are used for off-shore scalloping throughout the year, since scalloping demands permanent changes in the hull (i.e. shucking house), which make it expensive to convert a scallop vessel to any other kind of fishing.

Weirs. Weirs are used in eastern and central Maine to catch herring. They are constructed out of poles driven into the ocean floor, between which are strung netting or brush to make the walls. Weirs are set in coves and bays known to be frequented by schools of herring. In 1978 it cost about \$25,000.00 to construct a weir. The primary skill in weir fishing is knowing where to build the weir. Once constructed, weirs are relatively easy to learn to use. An experienced lobster fisherman can learn weir fishing in one season--two to six months.

Stop Seines. These seines are used to trap schools of herring as they enter coves or bays. After the fish have entered, the stop seine net is drawn across the mouth of the bay, using dories. To enter stop seining, one needs a net between 50 and 300 fathoms long, "twine dories" to hold the net, and a boat equipped with a hydraulic net hauler. The equipment for an average stop seine operation might be obtained for about \$15,000.00 to \$18,000.00. Stop seining is a relatively easy technique to learn. A lobsterman with five years experience can become proficient in two or three months.

Purse Seines. A purse seine is a very long, deep net which is set around a school of fish (usually herrring) by one or two boats. When the circle is complete, the bottom is drawn up or "pursed" to close the net. Purse seine operations often use small planes to aid in locating herring schools. In addition, a good deal of electronic gear is increasingly being used to spot fish. The average purse seiner is perhaps 55 feet long and costs in the range

of \$300,00.00 equipped with electronics, net, and seine dory. Purse seining is one of the most difficult techniques to learn. An experienced lobsterman would require at least two to three years to become reasonably proficient.

Pair Trawling. This technique is used to capture adult herring and other schooling species inshore or offshore by having two large boats tow a big net between them. Since two large boats with a lot of electronic gear (e.g. scanning sonar, Loran C plotters, etc.) are involved, pair trawling is one of the most expensive techniques to utilize. One set of Maine pair trawlers is valued at over \$1,500,000 for the two vessels. It is also one of the more difficult techniques to learn, since one must coordinate two boats, as well as learn to maneuver a huge net which sometimes catches up to 200,000 lbs. of fish in one tow. A lobsterman would need at least two to three years to learn to become a proficient pair trawler.

Longlines. Longlines, as the names suggests, are long ropes from which baited hooks are suspended. They are used in two distinct fisheries. Small longlines, called tub trawls, are set along the bottom to catch groundfish. Such lines are only a few hundred feet long and are generally pulled with a small hydraulic winch and baited by hand. Tub trawling is generally done by lobstermen during the spring. Longlines are also used by three large offshore vessels, which dock part of the year in Maine, to catch swordfish far out in the Gulf of Maine. These boats carry crews of five or six men and range from Newfoundland to Florida. Tub trawling is relatively easy to learn and enter, longlining for swordfish requires at least two years to learn and a boat worth at least \$200,000.

Harpoons are used primarily in the summer tuna fishery. Most of the men involved in this fishery go for lobster through most of the year. Thus, it is essentially a small boat, inshore fishery.

Handlining. In eastern Maine, there are a number of men who catch groundfish from very small boats and skiffs with lines on which a few baited hooks are attached. This is a summer fishery engaged in by part-time fishermen. Entry into handlining involves only two or three thousand dollars investment. It is very easily learned as well.

Scottish Seine. These seines are very long nets placed in a circle around a promising piece of groundfish bottom and slowly winched into the boat. They are an experimental groundfish gear in Maine; only one is in current use. Their use necessitates a boat at least 45 feet long and costing over \$120,000 fully equipped.

Herring Carriers are large wooden boats owned by herring processing firms to bring the herring from seines, weirs, etc. to the plant. Some double as purse seiners.

Midwater Trawls are used on very large vessels to catch fish in the water column. The nets in use are essentially the same as those used on pair trawlers, save for the fact they are smaller and towed by one boat. Midwater trawlers are a minimum of 65 feet long and cost in excess of \$250,000 fully rigged.

At present, a great deal of gear change is occurring. There are some general patterns in the changes being made, however. These are summarized in Tables 3 and 4 which follow.

Table 3

Gear Types Dropped By Northern New England Fishing Operations Upon the Purchase of a New Boat

New Boat Gear Types	Bottom Trawl	Midwater Trawl	Pair Trawl	Old Boat Gear Types - Dropped upon purchase of new boat					Clams	Weir	Stop Seine	Handline	Herring Carrier	Harpoon
				Scottish Seine	Longline	Purse Seine	Dredge	Gillnet						
Bottom Trawl*	0	0	0	0	0	0	1	4	9	1	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Pair Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scottish Seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Longline	1	0	0	0	0	0	1	0	3	0	0	0	0	0
Purse Seine	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Dredge	0	0	0	0	0	0	0	1	1	0	0	1	0	0
Gillnet	2	0	0	0	2	0	1	0	8	1	1	0	0	0
Lobster Trap	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Clams	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weir	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Stop Seine	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Handline	1	0	0	0	0	0	1	0	1	0	0	0	0	0
Herring Carrier	0	0	0	0	1	1	1	0	1	0	0	0	0	0
Harpoon	1	0	0	0	0	0	0	0	1	0	0	0	0	0

* Bottom trawls are a type of otter trawl, and the term "otter trawl" is frequently used in the industry for this type of gear.

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Table 3
Gear Types Dropped By Northern New England Fishing Operations Upon the Purchase of a New Boat

New Boat Gear Types	Bottom Trawl	Midwater Trawl	Pair Trawl	Old Boat Gear Types - Dropped upon purchase of new boat				Dropped upon purchase of new boat				Stop Seine	Handline	Herring Carrier	Harpoon
				Scottish Seine	Longline	Purse Seine	Dredge	Gillnet	Lobster Traps	Clams	Weir				
Bottom Trawl*	0	0	0	0	0	0	1	4	9	1	0	0	0	0	0
Midwater Trawl	0	-	0	0	0	0	0	0	1	0	0	0	0	0	0
Pair Trawl	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
Scottish Seine	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0
Longline	1	0	0	0	-	0	1	0	3	0	0	0	0	0	0
Purse Seine	0	0	0	0	0	-	0	0	1	0	0	0	0	0	0
Dredge	0	0	0	0	0	0	-	1	1	0	1	0	1	0	0
Gillnet	2	0	0	0	2	0	1	-	8	1	0	1	0	0	0
Lobster Trap	1	1	0	0	0	0	0	0	-	0	0	0	0	0	0
Clams	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0
Weir	0	0	0	0	0	0	0	0	0	0	-	0	0	1	0
Stop Seine	0	0	0	0	0	0	0	0	1	0	0	-	0	0	0
Handline	1	0	0	0	0	0	1	0	1	0	0	0	-	0	0
Herring Carrier	0	0	0	0	1	1	1	0	1	0	0	0	0	-	0
Harpoon	1	0	0	0	0	0	0	0	1	0	0	0	0	0	-

* Bottom trawls are a type of otter trawl, and the term "otter trawl" is frequently used in the industry for this type of gear.

Table 3 cross tabulates the gear 190 Maine and New Hampshire fishermen dropped when they purchased a new boat by the gear on the new boat they bought. It may be read either vertically or horizontally. In the first line, for example, of the men in our sample who adopted bottom trawls as the primary gear on their new boat, one man dropped a dredge, four dropped gillnets, nine dropped lobster traps, and one dropped clamming or quahogging. Of the men who adopted midwater trawls on their new boat, one dropped lobster traps, and so on. None of the men who adopted pair trawls as a primary gear dropped any other kind of gear in the process. It should be stressed that Table 3 indicates the directions of gear change. It tells nothing definitive about what any single fishermen did. The same man, for example, who dropped a dredge in favor of a bottom trawl may also have been one of the men who dropped gillnets to take on bottom trawls.

There are two very important conclusions that can be drawn on the basis of the information in Table 3. First, very little gear is being dropped completely. This is indicated by the large number of zeros in the chart. When fishermen buy new boats and change gear types, the gear they had on their older boat is retained as a secondary or tertiary type of gear. These data certainly substantiate the notion that the fleet is becoming more versatile.

Second, the gear most commonly dropped was lobster traps. In fact, Table 3 demonstrates that there were 54 fishing operations in which one type of fishing gear or another was dropped. In 27, or 50 percent of the cases, lobster was being dropped.

Gear Added By Northern New England Fishing Operations Upon the Purchase of a New Boat

New Boat Gear Types	Old Boat Gear Types										Herring Carrier	Harpoon		
	Bottom Trawl	Midwater Trawl	Pair Trawl	Scottish Seine	Longline	Purse Seine	Dredge	Gillnet	Lobster Traps	Clams			Weir	Stop Seine
Bottom Trawl	<u>68</u>	-	-	-	2	1	8	9	24	1	0	1	0	0
Midwater Trawl	3	0	0	-	1	1	1	0	3	-	-	-	-	0
Pair Trawl	2	0	<u>1</u>	-	0	0	0	0	0	0	0	0	0	0
Scottish Seine	0	0	0	<u>0</u>	0	0	0	1	0	0	0	0	0	0
Longline	5	0	0	-	<u>22</u>	0	4	4	7	0	0	0	1	0
Purse Seine	1	0	0	-	0	<u>8</u>	0	1	3	0	1	0	0	0
Dredge	3	0	0	-	3	1	<u>22</u>	2	6	1	1	1	2	0
Gillnet	5	0	0	-	5	2	7	<u>34</u>	20	2	0	2	2	0
Lobster Traps	2	1	0	-	0	0	0	0	<u>63</u>	0	0	0	0	0
Clams	0	0	0	-	0	0	0	0	1	<u>6</u>	0	0	1	0
Weir	0	0	0	-	0	1	0	0	2	1	<u>3</u>	0	0	1
Stop Seine	1	0	0	-	0	0	0	0	4	1	1	<u>8</u>	0	0
Handline	1	0	0	-	3	0	1	3	1	0	0	0	<u>5</u>	0
Herring Carrier	0	0	0	-	1	3	1	0	1	0	0	0	0	<u>0</u>
Harpoon	2	0	0	-	0	0	0	1	1	0	0	0	0	0

$$N = 190$$

Underlined numbers on the diagonal lines show number of fishermen using a gear type on both old and new boat

Table 4

Gear Added By Northern New England Fishing Operations Upon the Purchase of a New Boat

New Boat Gear Types	Bottom Trawl	Midwater Trawl	Pair Trawl	Scottish Seine	Old Boat Gear Types					Weir	Stop Seine	Handline	Herring Carrier	Harpoon
					Purse Seine	Dredge	Gillnet	Lobster Traps	Clams					
Bottom Trawl	<u>68</u>	-	-	-	2	1	8	24	1	0	1	0	0	0
Midwater Trawl	3	0	0	-	1	1	1	3	-	-	-	-	-	0
Pair Trawl	2	0	<u>1</u>	-	0	0	0	0	0	0	0	0	0	0
Scottish Seine	0	0	0	<u>0</u>	0	0	1	0	0	0	0	0	0	0
Longline	5	0	0	-	<u>22</u>	4	4	7	0	0	0	1	0	0
Purse Seine	1	0	0	-	0	0	1	3	0	1	0	0	0	0
Dredge	3	0	0	-	3	<u>22</u>	2	6	1	1	1	2	0	0
Gillnet	5	0	0	-	5	7	<u>34</u>	20	2	0	2	2	0	0
Lobster Traps	2	1	0	-	0	0	0	<u>63</u>	0	0	0	0	0	0
Clams	0	0	0	-	0	0	0	1	<u>6</u>	0	0	1	0	0
Weir	0	0	0	-	0	1	0	2	<u>1</u>	<u>3</u>	0	0	1	0
Stop Seine	1	0	0	-	0	0	0	4	1	1	<u>8</u>	0	0	0
Handline	1	0	0	-	3	1	3	1	0	0	0	<u>2</u>	0	0
Herring Carrier	0	0	0	-	1	1	0	1	0	0	0	0	<u>0</u>	0
Harpoon	2	0	0	-	0	0	1	1	0	0	0	0	0	0

N = 190

Underlined numbers on the diagonal lines show number of fishermen using a gear type on both old and new boat

Table 4 gives a cross tabulation of old boat gear types by newly adopted gear types to present information on gear added when owners of fishing operations purchased a new boat. The chart may be read either vertically or horizontally. For example, of the men who had a bottom trawl on their old boat, 68 still have bottom trawls as their primary gear, three now have midwater trawls, five have purchased longlines, two have added lobstering gear, one has purchased a stop seine, one a handline and two have purchased harpoons. Again, it is important to note that Table 4 tells nothing about the kind of gear added by a single fisherman. To return to our example, there were three men who now have a midwater trawl who used to have a bottom trawl as their primary gear. These men may still have added gillnets as well.

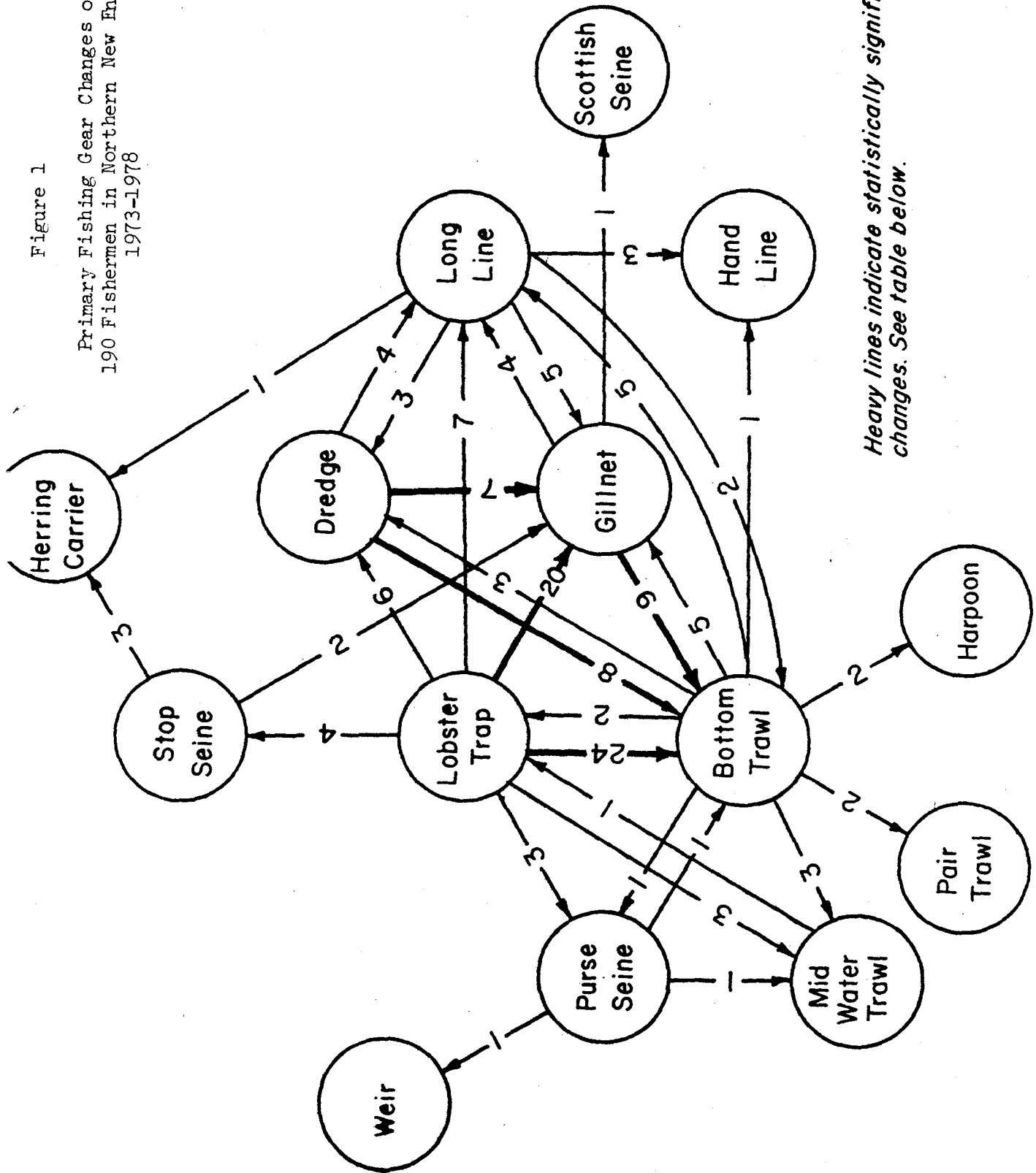
There are a large number of zeros in Table 4, indicating that a large number of possible gear changes have not occurred in our sample. However, by comparing Table 3 and Table 4, it is obvious that a good many more different kinds of gear have been added in the fleet than dropped. The major kinds of changes that have occurred as gear was added are summarized in Figure 1. It should be made clear that Figure 1 contains the same information on gear additions as is contained in Table 4, expressed in the form of a flow chart.

One critical question is: Which of the kinds of changes indicated in Figure 1 are statistically significant, and which might have occurred by accident, given the number of fishing boats represented in our sample? Accordingly, a test of significance was done on the ratio of the people switching between two gear types, and the results are reported in the supplement to Figure 1. In this supplement, three different kinds of figures are listed for every gear change in Figure 1: the numbers of fishing operations which changed between a pair of gear types (in both directions); the proportion of people capable of making the change who actually did so; and the level of

significance of these two ratios, indicating the direction of gear change. If we consider, for example, the change from dredge to bottom trawl, there were eight fishing operations in which a change was made from dredges to bottom trawls, and only three cases where men changed from bottom trawls to lobster traps. The figure .35 indicates that 35 percent of all of the men in our sample who could have changed from dredges to bottom trawls did so; while only 8 percent of those who could have changed the other way actually did so. The level of significance of this ratio (i.e. $8/3$) is .01 so that there is only 1 chance in 100 that these results could have occurred by chance alone. These figures indicate that where these two gears are concerned, there is a strong tendency to change from dredges to bottom trawls.

Figure 1

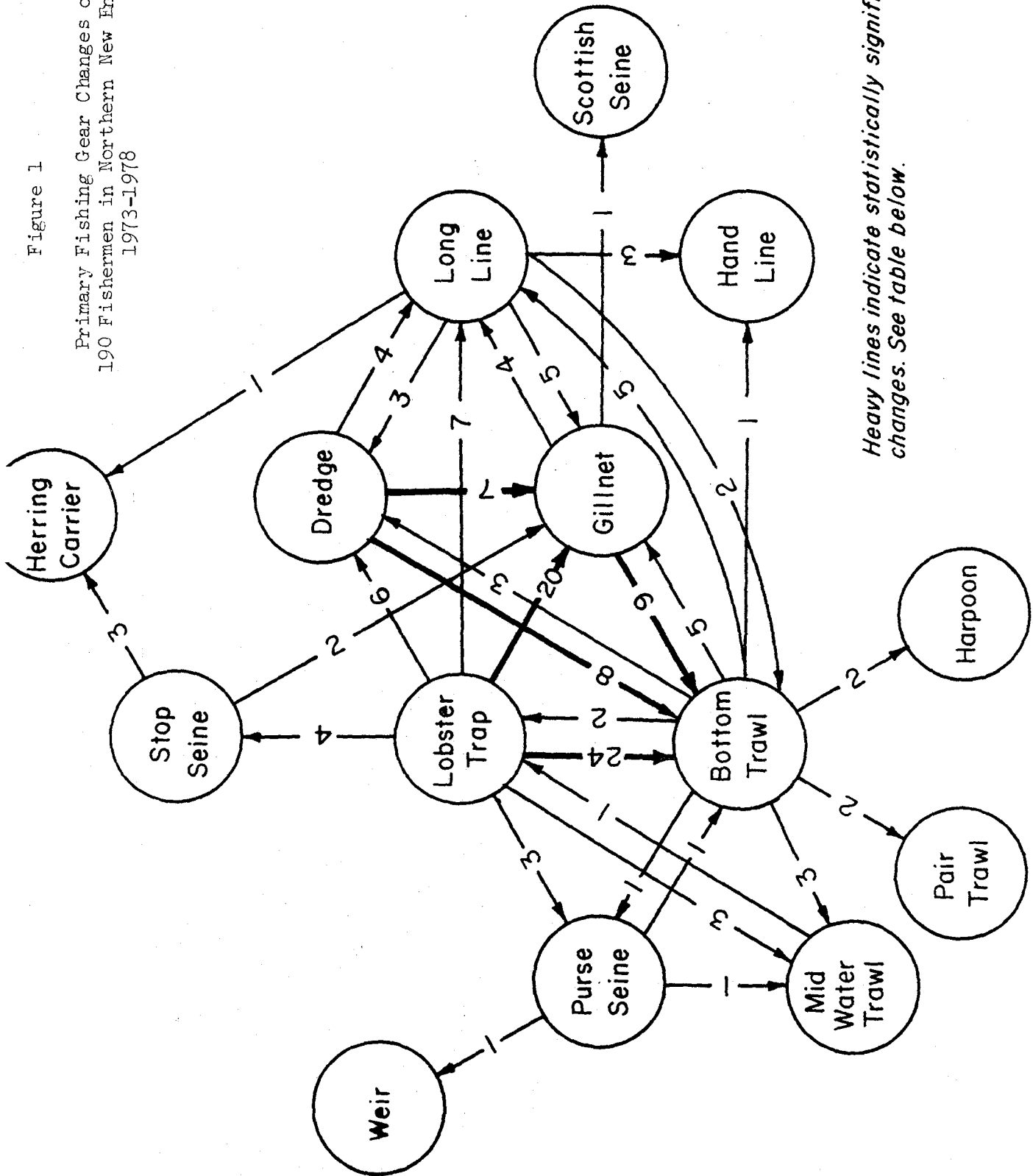
Primary Fishing Gear Changes of
190 Fishermen in Northern New England:
1973-1978



Heavy lines indicate statistically significant changes. See table below.

Figure 1

Primary Fishing Gear Changes of
190 Fishermen in Northern New England:
1973-1978



Heavy lines indicate statistically significant changes. See table below.

Supplement to Figure 1.

Lobster---- Bottom Trawl

24/2
.39/.05
.00001

Bottom Trawls---- Midwater Trawls

3/0
.04/-

Lobster---- Gillnets

20/0
.30/-

Bottom Trawls---- Dredge

8/3
.35/.06
.01

Lobster---- Longlines

7/0
.08/-

Bottom Trawls---- Gillnets

9/5
.30/.08
.02

Lobster---- Dredge

6/0
.08/-

Bottom Trawls---- Longlines

2/5
.10/.08
.70

Lobster---- Stop Seine

4/0
.04/-

Dredge---- Longlines

3/4
.15/.20
.70

Lobster---- Purse Seine

3/0
.03/-

Dredge---- Gillnet

7/2
.35/.01
.01

Lobster---- Midwater Trawls

3/1
.33/.03
.40

Longline---- Handline

3/1
.14/.5
.50

While there are a good many different kinds of changes recorded in Figure 1, most of them involve so few fishing operations that they are statistically insignificant. In these cases, nothing certain can be said about general trends, given our data base.

However, the data do show several different significant gear change trends. There is unquestionably a shift from lobster fishing to other fisheries. Some 24 men changed from lobstering to bottom trawling, while only two switched the other way. The results are significant at the .00001 level, so that there is only 1 chance in 10,000 that these results could have occurred by accident. There were 20 men who changed from lobster fishing to gillnetting and none who went the other way. Smaller numbers of lobster fishermen went to longlines, dredges, and stop seines; even smaller numbers changed to purse seines and midwater trawls. While the numbers involved in these gear switches are very small, it should be noted that in every case the shift was completely out of lobster fishing; none of the longliners, dredge fishermen, seiners, or midwater trawlers switched into lobstering. There was a significant shift from dredge fishing to bottom trawls and gillnets. And there was a shift from gillnets to bottom trawls that was significant at the .02 level.

While it does not show in this figure, it is also critical to note that there was no instance in our sample where men switched from a non-fishing job to become captains of boats whose primary gear was a bottom trawl, pair trawl, midwater trawl, or purse seine. Very few men have entered such fisheries from lobstering either.

In this whole data set, there are five critical questions:

(1) Why haven't men entered pair trawling, purse seining, or bottom trawling from non-fishing occupations? In a similar vein, why have so few men

entered such fisheries from lobstering?

(2) What factors have caused the general switch out of lobstering to virtually every other kind of fishing—especially groundfishing?

(3) What is the difference between fishermen who have shifted out of lobstering to bottom trawling as opposed to gillnetting?

(4) Why is there a general shift from dredging to bottom trawling?

(5) Why are groundfishermen shifting from gillnets to bottom trawls?

The answer to the first question is relatively clear. The reason that one cannot enter pair trawling, purse seining, midwater trawling, etc. from a non-fishing job relates to the investment and amount of experience required. One can have a viable lobster fishing business with only a moderate investment and a few months of experience. To enter fisheries where bottom trawls, pair trawls, or similar gear are the primary gear requires a boat worth a minimum of \$100,000 and several years of experience. A person usually enters these fisheries by working on a large fin-fishing boat for a period of years and then buying his own boat or by first entering lobster fishing and then gradually entering other large scale fisheries.

The second and third questions are more difficult to answer, but the reasons that men have shifted out of lobstering to gillnetting and bottom trawling deserve careful consideration, since they involve the most fishermen in our sample and the clearest trends in the whole data set.

The reason fishermen have been leaving lobstering in large numbers is related to current economic conditions in the fishery. Revenue to lobster fishermen as a whole has been fairly stable while their costs have increased dramatically. At the same time, net revenues to groundfishermen have increased, making this a far more attractive option.

Table 5

Landings and Value of Lobster and Groundfish in Maine: 1974-1978

	Lobster Catch*	Value of Lobster Catch**	Groundfish Catch* ***	Value of Groundfish Catch**
1974	16,457,666	23,212,808	12,381,807	1,375,985
1975	17,017,411	27,478,773	18,090,472	2,467,671
1976	19,001,053	29,238,371	22,315,606	4,094,865
1977	18,487,138	32,101,423	30,470,482	5,968,749
1978	19,130,459	33,878,376	38,629,123	7,216,539

* in millions of lbs. landed

** in millions of dollars

*** these figures represent the catch for cod, haddock, white hake, pollock, blackback flounder and grey sole

Source: Maine Landings: 1974 to 1978, NOAA, Washington, D.C.

As can be seen in Table 5, the lobster catch remained fairly stable between 1976 and 1979. In 1976 the catch was 19.0 million pounds and in 1979 22.1 million pounds. In the future, the catch will, in all probability, stay about the same or even drop. The biologists most familiar with the lobster industry are relatively certain that all of the lobsters that can be caught are already being caught. In fact, over 90 percent of the lobsters that molt into the legal size range are caught within a year (Thomas 1973: 47). There are fears that an increase in fishing effort may result in stock failure. At the same time, the prices paid for lobster have risen, but relatively slowly. Since both catches and prices have remained relatively stable during this time, the total value of the lobster catch has increased relatively slowly. As Table 5 demonstrates, in 1974 the total value of Maine lobster landings was 23.2 million dollars;

in 1978 the value was 33.8 million dollars, an increase of 45 percent. Despite this increase, costs to fishermen for bait, fuel and boats have gone up so fast that many fishermen state they are experiencing real financial difficulties. From the little solid financial data we were able to collect, it appears that many lobster fishermen have no more purchasing power than they had in 1974. Some are clearly experiencing a decline in real income.

At the same time, there was a very large substantial increase in the catch and value of groundfish. In 1974, the total landed value of six common groundfish species was 1.3 million dollars; in 1978, it had increased to 7.2 million dollars, a phenomenal 453 percent rise.⁶

The reason that lobster fishermen are switching to groundfishing in large numbers is relatively apparent. However, the factors impelling some of these men to catch groundfish with gillnetting equipment as opposed to bottom trawls are far more difficult to ascertain--particularly since fishermen themselves are not able to give any clear consensus about the factors influencing the choice of groundfishing gear. In studying the social and economic factors related to the adoption of gillnetting equipment as opposed to bottom trawls, we did some elementary cross tabulations to obtain information on boat size and on age, educational levels, and so on, of men who adopted each of these kinds of gear. These efforts were not notably successful. Two interesting facts did emerge from these descriptive statistics. The men who adopted bottom trawls were younger than the men who adopted gillnets, and they purchased much larger boats than the men who had moved from lobstering to gillnetting. As can be seen in Table 6, the men who adopted bottom trawls averaged 32.7 years old while those men who adopted gillnets had a mean age of 38.3 years. The men who adopted bottom trawls purchased boats which averaged 10.8 feet longer than the boats they had five years previously. The gillnetters had boats

Table 6

Differences in Mean Ages and Boat Lengths of Men Who Moved from Lobstering to Gillnetting and Bottom Trawling

	Mean Age	Mean Change in Boat Length	% Change in Boat Length
Adopted Bottom Trawlers	32.7 (N=24)	10.8 (N=22)	41.7
Adopted Gillnets	38.3 (N=20)	6.4 (N=17)	21.3

t-tests were run to discover whether these differences in means were statistically significant or not. In comparing the mean age of men who adopted bottom trawls with men who adopted gillnets, the value of the t was 10.2 which was significant over the .001 level. The difference in mean changes in boat lengths was also highly significant. The value of the t was 2.52, which is significant at the .01 level.

which were far smaller. The results of the t-tests indicate both these differences in means are highly significant statistically.

These facts alone tell very little about the reasons men adopted gillnets as opposed to bottom trawls. However, we constructed a very elaborate linear model in which information on the adoption of these two kinds of fishing gear was regressed on a subset of 39 independent variables. The results of these regressions in combination with the descriptive statistics summarized in Table 6 reveal some very interesting patterns concerning the choice of gear type.

Some of the independent variables used in our regression analysis are standard in studies of technical change; others were selected to test specific hypotheses concerning the reasons men might have selected one kind of ground-fishing gear over the other. In general we studied the relationship between innovation and such factors as age, education, size of the firm, fishing success, wife's employment, variables measuring access to information, expectations of future opportunities, fishing experience, major species sought, geographic

region, marketing outlets and a set of variables on possession of complicated gear. The exact set of independent variables used in studying the adoption of these two kinds of gear, and the results of these two regression equations are contained in Table 7.

Table 7

Regression Results for the Adoption of Bottom Trawls and Gillnets:
Regression Coefficient Signs and Level of Significance*

<u>Dependent Variable</u>	<u>Adopted Gill Nets After Having Lobster Traps</u>	<u>Adopted Bottom Trawl After Having Lobster Traps</u>
R-Square	0.24170	.85587
Adj. R-Square	0.06793	.72327
Std. Error	1.094	.972
F Statistic	1.391	6.454
Regress. DF	11	23
Resid. DF	45	21
<u>Independent Variable</u>		
1. Fisherman's Age	+0.04	.14
2. Fisherman's Age Squared		.18
3. Years Education	-0.45	.29
4. Special Education in Fishing		.33
5. Over \$1,000,000 in Assets		
6. \$150,000 to \$1,000,000 in Assets		+.01
7. \$30,000 to \$150,000 in Assets	+0.3	
8. Over \$30,000 in Assets		
9. Highly successful fisherman	0.47	.11
10. Average fishing success		-.03
11. High or average fishing success		
12. Wife has steady, secure, well-paying job		.17
13. Number of ports visited	0.29	

Table 7 (cont.)

<u>Independent Variable</u>	<u>Adopted Gill Nets After Having Lobster Traps</u>	<u>Adopted Bottom Trawl After Having Lobster Traps</u>
14. Member of Fisher- man's Coop.		.26
15. Member of Fisher- man's political organization		+.0005
16. Attended Fishing Exposition	0.56	.65
17. Total Number of Kinsmen Fishing		.26
18. Number of Kinsmen Fishing in Home port		-.02
19. Optimistic about Opportunities Now	0.64	.34
20. Optimistic about Opportunities 5 Years in Future		
21. Part-time Fishermen		1.0
22. Fishing 0 to 5 Years	0.17	.32
23. Fishing 6 to 15 Years		.45
24. Fishing 16 to 25 Years	0.21	.15
25. Other Industry		
26. Groundfish Industry	-0.07	.41
27. Herring Industry		
28. West of Penobscot Bay	-0.008	.46
29. East of Penobscot Bay		.36
30. Groundfish Dealer etc. in Home port	+0.07	.97
32. Fisherman has no Herring or Ground- fish Gear		
33. Loran C or Loran C Plotter on Past Boat		
34. Loran C or Loran C Plotter on Present Boat		

* Two Tailed Test

In the standard regression equation concerning the factors explaining the adoption of bottom trawls after having lobster traps, the adjusted R^2 is a very high .72, which means that we are able to explain 72 percent of the total variance. The results for the equation concerning the adoption of gillnets after

having lobster traps are not as good. Here, the adjusted R^2 is only .06. This indicates that some of the critical variables connected to the adoption of this kind of gear were not included in the equation. Nevertheless, in both equations, some of the independent variables entered were significantly related to the adoption of these two types of gear. In this discussion, we will consider only variables which were significant below the .10 level since results above this level are generally considered to be insignificant statistically. While there were very few variables which proved to be associated with the adoption of these two types of fishing gear, there are some interesting differences in the sets of variables which proved to be significant in each case.

The adoption of gillnets after having had lobster traps is positively associated with the age variable, with medium-sized firms, and with having a groundfish dealer in one's home port. It was negatively associated with having groundfish as the primary target species and with the western part of the coast. Bottom trawls, by way of contrast, are linked to intermediate-size firms and membership in a fisherman's political lobbying organization. The adoption of this gear is negatively associated with the intermediate skill variable and with having a large number of kinsmen in fishing in one's home port, which means that men are more likely to adopt bottom trawls if they are less experienced in fishing and have few relatives in fishing.

There is a pattern in these facts but one that only becomes clear against a knowledge of the ethnography of the fishery. Gillnets are an intermediary gear. They can be used on relatively small boats (in the 35 foot range), and a person with such a boat can get into gillnetting with as little as \$10,000 additional investment. Many of the men who adopt them want to switch out of the failing lobster industry for part or all of the year, but cannot or are not

willing to switch completely into other fisheries requiring far more capital and skill. These people are primarily lobster fishermen, and as the species variable indicates, do not have groundfish as their major species over the annual cycle. They want to keep their lobster boats so they can switch into that fishery in the late summer and fall. Many of these men are older fishermen--in their late 40's or 50's--who are past their prime and who want to fish inshore so they can be home every night.

Bottom trawling ordinarily requires a larger investment and a much larger boat than gillnetting. One cannot do bottom trawling for groundfish with a boat that was made essentially for lobstering. One usually requires a boat at least 45 feet long--some 10 feet longer than a typical lobster boat. Thus, bottom trawling involves a much higher investment--a minimum of \$100,000-- and a far more serious commitment. The men who switch to bottom trawling from lobstering are apt to be younger men in the prime years of their career. If they have a relatively low level of experience and skill in the industry (as is indicated by the skill variable), they have the drive and ambition to make a major change in fishing technique and assume a much larger financial burden, with all that indicates for having to put in much longer hours and spend much more time away from home. In this regard, it should be noted that such men have few kinsmen in fishing and do not have the strong ties to a large network of local kinsmen and their local community (Lazarowitz and Acheson 1980). The commitment these men have to fin-fishing is indicated by the fact that adoption of bottom trawls is related to membership in a political organization. The most important political group is the Maine Fishermen's Cooperative Association based in Portland, whose members have donated both time and money to foster a political and legal environment which will ensure the continued success of their industry. The members of this organization are not marginal fishermen or older men thinking of retiring (Acheson and Lello 1980).

It should be noted that men picking gillnets or combining gillnets and lobstering are essentially placing a relatively low ceiling on the income they can earn. After all, one can only pull some 25 standard gillnets in a long day, and perhaps some 250 lobster traps. Since the number of nets and traps that can be pulled is strictly limited, the amount of income that can be earned is limited as well. If bottom trawling gear demands larger boats and longer periods of time spent away from home, such businesses are capable of absorbing much more capital, and generating much more revenue.

While not many boats are involved, there is also a statistically significant shift from dredges to both bottom trawls and gillnets (See Figure 1). Virtually all of the boats using dredges are owned by men from the eastern part of Maine who used to fish primarily for lobster. In recent years, these men fished for lobster in the late summer and fall and then for scallops from November to April, the legal scallop season. In short, these men went scalloping primarily as a means of augmenting the income they received from the failing lobster fishery. Scallops, however, proved to be a very unstable source of income for these men. Since 1977, the price for scallops has been very high, but the scallop beds are being depleted. In fact, some men experienced with the scallop industry predict the next few years will be very difficult (Dow 1980). As a result, these men found themselves shifting between the lobster industry, which was not doing very well, to scallops which were becoming scarcer as well. Thus, these men are changing from scallop dredging to groundfishing as a means of entering a more stable and profitable fishery. In short, the reason that these men entered groundfishing from scallop dredging is precisely the same as the reasons men left lobstering to enter groundfishing.

Why did some of these ex-scallop fishermen choose gillnets as opposed to bottom trawls? Again the situation concerning the change from lobstering is instructive. The evidence suggests that the exact same factors impelling men to shift from lobstering to gillnetting as opposed to bottom trawling are influencing the choice of groundfishing gear for those men who left scallop dredging. In this regard, we note that the average age of the men who switched from scallop dredging to bottom trawling was only 34.7, while the average age of the ex-scallopers who adopted gillnets was 39.7.⁷ Here again, gillnetting, which can easily be combined with inshore lobster fishing, was more appealing to the older men. The younger men preferred to enter dragging (bottom trawling), which clearly is a technique with more potential for a man thinking of getting a much bigger boat and expanding his business. Interestingly enough, while the men who entered bottom trawling from scallop dredging all said they planned to purchase much larger boats, there was no statistically significant difference in the length of boats they purchased as compared with those of men who left scalloping for gillnetting. Both sets of men purchased boats that were between 6 and 6.5 feet longer than the boats they had when scalloping.

The fourth question concerns the men who switched from groundfishing with gillnets to bottom trawls. In this case, the overall pattern is very clear. All nine of the men who made this switch began their careers in lobster fishing and then began to do some gillnetting. By 1973, gillnets had become the major type of gear these men used, although most of them were still involved in lobster fishing at some time in the annual cycle. By 1978, these men had become full-time groundfishermen and had taken on larger boats equipped with bottom trawls. Between 1973 and 1978, when these men changed to bottom trawls, the boats they purchased increased an average of 9.57 feet or some 32.7 percent. Like the men who switched to bottom trawls from other gear types,

the men changing to this gear type from gillnetting were relatively young. Their average age was 32.1. Again these are men who want to increase their incomes from fishing. For them, bottom trawls are the ultimate gear. If bottom trawls require large boats and an enormous investment, they are capable of catching very large amounts of fish and producing large revenues as well.

The Effect of Annual Round and Career Stage

Permanent changes in fishing gear are related to three sets of processes which should be made explicit. Each of these processes show in both the case study material and in our statistical data. First, permanent changes in gear type do not occur suddenly. Skill and experience play such a critical role in fishing success (Acheson 1975) that men do not suddenly throw over a gear with which they are familiar to take on one with which they have no experience or familiarity. Virtually all of the men who made changes in primary fishing gear have had some experience with that gear. In many cases, changes in primary gear occur as an outcome of changes in the annual round. That is, men will first use a new gear for a few weeks or months at some season of the year, and gradually increase the percentage of time that gear is used until it has become the primary gear. In the process they might drop their old primary gear completely, or they might continue to use it for part of the annual cycle as a secondary gear. In studying present, past, and future primary fishing gear of the 190 fin-fishermen in our sample, the role of experience is very obvious. These data are summarized in Table 8. Of captains of fishing boats who switched to a new primary gear in the past five years, only 7, or 7 percent, of the 99 men on whom we have information had no experience with that gear before using it on their present boat. The other 93 percent did. Much the same pattern

Table 8

Fishing Experience and Primary Gear Type on Past, Present, and Future Boat

. Source of Experience		No.	Total
Same Gear on Past and Present Boat		80	80
New Primary Gear in Past Five Years	Used gear during part of annual cycle on own boat	58	
	Used gear while working on other man's boat	34	110
	No experience	7	
	No information on source of experience	11	
Planned New Primary Gear	Experience with gear during some part of annual round on own boat	27	
	Experience with gear while working on other boat	16	59*
	No information on experience	6	
	No experience with gear.	2	

*Of the total 190 men in the sample, only 59 definitely planned to switch primary gear types in the near future.

can be observed among the men who have ordered or have definite plans to order new primary gear in the near future. Forty three of the 53 men (or 81 percent) on whom we have information have had experience with the new primary gear they plan to add. Only two men, or 4 percent, have ordered a new type of primary gear with which they had had no personal experience. It should be noted in Table 8 that most of these fishermen got their experience with a new primary gear type by using it during some part of the annual cycle on their own boat. This underlines the fact that in the fin-fishery of northern New England, gear changes over the annual round are often precursors of permanent changes in fishing gear.

Second, there is a marked direction in the pattern of gear changes. On the whole, there is a tendency to switch out of lobster fishing, which is troubled economically, into various kinds of fin-fishing, which have been much more lucrative recently. This set of changes is paralleled by an increase in both the size and versatility of the boats. Often, fishermen do not make only one switch over the course of a lifetime, but several.

However, there is another factor strongly influencing selection of boats and types of fishing gear--namely one's age and total career pattern. The vast majority of fishermen in Maine and New Hampshire begin their fishing careers by going lobster fishing in skiffs as teenagers. In their early 20's most of these boys buy inboard-powered fishing boats and begin to build up large "gangs" of lobster traps. A few of these men decide to enter various kinds of fin-fishing--usually in their twenties or early thirties. (Very few fishermen change from lobster fishing to fin-fishing late in life.) Whether these men choose fin-fishing or lobster fishing, their operation is at its maximum size when they are in their thirties and early forties. By their late forties and early fifties, these fishermen typically begin to reduce their

effort and scale of operations. Older lobster fishermen begin to pull fewer traps. Fin-fishermen tend to reduce the number of days they fish; they might also purchase a smaller boat—one which will allow them to go day-tripping and avoid long stays away from home. Late in life, all of these fishermen might have only a small string of lobster traps which they fish from a skiff as they did when they were boys.

We have already noted the effect of age on the decision to enter various types of groundfishing from lobster fishing or dredging. Gillnets can easily be combined with lobster fishing in that one can put gillnets on any boat over 35 feet with less than \$10,000.00 investment. It is thus favored by men who wish to remain essentially in lobster fishing and do not want to make a heavy investment in a large boat and gear, especially since this would necessitate spending large amounts of time away from home.

Men who decide to switch from lobstering or a combination of lobster fishing and dredging when they are in their twenties or early thirties ordinarily choose to catch groundfish with bottom trawls. It should be noted that virtually all the men in Figure 1 going back to lobstering from various kinds of fin-fishing are older men who are essentially retiring.

Third, there is a marked gear hierarchy that is apparent in the kinds of changes the men in our sample made. If fishermen are going to change gears, there are certain paths they must take. Some gear types require little investment or skill, e.g. lobstering, stop seining, etc. Others, such as pair trawling and purse seining, require a great many assets to enter. As a result, men tend to first enter lobstering; and many go no further. Some go on to use intermediate gear types, such as gillnets, stop seines, or scallop dredges. In many cases these are combined with lobster fishing at some time during the annual round. A very few men enter fisheries such as pair trawling and purse

seining. Most of those who made this type of move have had experience in using some intermediate type of gear or in bottom trawling. These "ultimate" gear types require very large boats and a large investment. Very little can be said about the characteristics of the men who entered these high investment fisheries, since there are so few cases that statistical reliability is impossible. However, our case study data indicate that these men have relatively high incomes, and a great deal of prestige in the fishing community.

At present, large numbers of lobster fishermen are switching into other fisheries, especially groundfish. . It was not always so. The vast majority of lobster fishermen have always had lobster as their major target species. They have, however, been more than willing to switch in large numbers into other fisheries at times of year when alternate species were abundant and lobster fishing was poor. From 1968 to 1973, large numbers of these men fished for lobster during the spring, summer and fall, and then for shrimp in the winter months. After 1974, the shrimp stocks declined precipitously. From 1974 to the present, many of these fishermen, especially in the eastern part of Maine, have combined scalloping in the winter with lobstering. Since 1974, especially in the western part of Maine, fishermen have gone lobster fishing in the summer and fall and then groundfishing in the spring. Since the lobster industry is the largest in the area, this means that there are a very large number of fishermen who have had experience with a variety of different kinds of fishing gear--particularly shrimp nets, scallop dredges, and gillnets. In the past, at least, these men have had the gear and the boats to fish for these species. Many of these men undoubtedly could switch onto these species again in a short time.

Gear Changes and Issues of Management

While the trend away from lobstering and scalloping to groundfishing could be reversed if conditions changed, it needs to be noted that this is clearly a very strong trend under present conditions, and one that poses problems for those who would manage the fisheries.

For fisheries managers, some of the most critical issues concern fishing effort. In great part, future effort will be determined by the numbers of fishermen who are able to switch to a given species or a set of species and the conditions under which they will do so. With regard to the pattern of gear changes observed currently in northern New England, there are several crucial questions. First, how many men are apt to enter groundfishing? Second, how many men are apt to enter bottom trawling, a type of fishing business that potentially can be greatly expanded, as opposed to gillnetting, which is essentially a small boat fishery? How many men are able to leave lobstering and scalloping to enter these more lucrative fisheries?

We have no model which will allow us to predict the conditions under which men will enter or leave a given fishery. However, we have information on the characteristics of fishermen who are prone to enter groundfishing, as well as information on the total number of fishermen exploiting various combinations of species over the annual round in Maine and New Hampshire. While these data will not allow us to make any predictions about the numbers of men who could possibly enter any given fishery in the long run, they give some idea of the numbers of men who currently have the equipment, skill, boats, and gear to throw their effort on one or another of these species (lobster, groundfish, scallops) in the short run.

First, we will present information on the total numbers of people exploiting various species over the annual round. This isolates a class of men we know

have the assets to move into various fisheries quickly. Given the fact that changes in the annual round often presage permanent gear changes, such information also gives us some estimate of the number of people that can make permanent changes. This information will then be combined with the data on the propensity to take on groundfish gear so that certain predictions can be made about changes in effort.

Table 9 lists the major species caught in Maine and New Hampshire and the total number of men from these two states who earn the largest share of their income from each species.

Table 9

Major Species by Number of Fishermen in Maine and New Hampshire*

<u>Species:</u>	Lobster	Scallops	Groundfish	Redfish	Herring
Number of fishermen primarily dependent on each species	2246	100	579	95	210

* These data were collected by a team of three interviewers who obtained information on each port in Maine and New Hampshire from key informants

Source: Acheson et al. 1980: Table 8

As Table 9 indicates, lobstering is far and away the largest fishery in the region. In addition to the 2246 men who are full-time lobster fishermen, there are at least 1719 men who fish for lobster on a part-time basis. In addition, virtually all the boats involved in these fisheries in Table 9 are small inshore boats. The exceptions are eleven redfish boats (between 80 and 110 feet), six large pair trawlers (75 to 90 feet) and four large scallop boats (90 foot range).

Those who are pursuing groundfish as their major fishery do not do much switching to other species over the annual round. As can be seen in Table 10, in 1978, only some 80 men out of 579 (13.8 percent) went after other species, almost half of them for herring. Most of those who did herring fishing went purse seining, using the same boats they did for groundfishing. Only a few used stop seines and let their larger boats remain idle. However, it would be wrong to conclude that most groundfishermen are unable to switch to some other species relatively quickly. The vast majority of the groundfishermen have experience with other types of gear, and many have retained their old gear type. However, most groundfishermen are not using any secondary type of fishing gear. In a few years, when the secondary gear and the skills needed to use them have atrophied, increasing numbers of groundfishermen may become relatively inflexible and overly dependent on groundfishing.

Table 10

Fishery Switching (from Groundfish), 1978

<u>Into:</u>	<u>Number Switching out of Groundfish</u>
Herring	32 (40%)
Lobster	19 (23.9%)
Tuna or Swordfish	15 (18.7%)
Scallops/Mussels	11 (13.7%)
Combination*	<u>3 (3.8%)</u>
Total	80 (100%)

*Lobster, herring, scallops

Source: Acheson et al. 1980: Table 10.

While a large number of lobstermen in Maine do switch out of lobstering, the majority do not; no New Hampshire full-time lobstermen at the time of our 1978 port survey did anything but lobstering year round.

Table 11

Fishery Switching, From Lobster, 1978 (Maine Totals)

<u>Into:</u>	<u>Number of People Switching Out of Lobstering</u>
Scallops	277 (51.2%)
Groundfish	156 (28.8%)
Herring	70 (12.9%)
Tuna, Swordfish	24 (4.4%)
Clams	13 (2.4%)
Combined Fisheries	<u>1 (.02%)</u>
<u>Total Switching</u>	541 (Total Full-Timers: 2205)

Source: Acheson et al. 1980: Table 13.

As can be seen in Table 11, 541, or 25 percent, of the total 2205 full-time lobster fishermen in Maine switch into some other fishery some part of the annual round. Of those 541 men who switch fisheries, 51.2 percent went scalloping part of the year; another 156, or 28 percent, went groundfishing; and 70, or 12.9 percent, went fishing for herring.

Moreover, the lobster fishermen who are presently involved in other fisheries over the annual round are concentrated in the eastern part of the coast. As Table 12 demonstrates, only a very small percentage of the lobster fishermen in New Hampshire and southern Maine switch into any other fishery during the annual cycle. Most of the men exploiting lobster and another species over the annual cycle are in the eastern part of Maine (i.e. Knox, Hancock, and Washington counties).

Table 12

Percentage of Full-Time Lobstermen Engaging in Other Fisheries,
By County (1978)

<u>County</u>	<u>Total "Switchers"</u>	<u>Total Lobstermen</u>	<u>% Switching</u>
York	3	134	2.2
Cumberland	38	281	13.5
Sagadahoc	4	43	9.3
Lincoln	55	444	12.4
Knox	123	392	31.3
Waldo	3	20	15
Hancock	189	672	28.1
Washington	<u>126</u>	<u>231</u>	<u>54.5</u>
<u>Total</u>	541	2205	24.5

Source: Acheson et al. 1980: Table 12.

The reason for this pattern is relatively clear. Most fishermen who do exploit multiple species over the annual cycle switch into scallops, herring or groundfish. There are no large stocks of herring or scallops in this western part of the coast. Moreover, most of the groundfishing in this area takes place on banks at least 30 miles offshore, where small lobster boats cannot go except in unusually good weather.

Thus, few lobstermen in the western part of Maine and New Hampshire could quickly move out of lobstering. Their only real option is to buy a large vessel capable of groundfishing offshore. If a rapid switch from lobstering is to occur at all, it will likely occur in the eastern or mid-coast part of Maine where men already have the equipment and experience in fishing for something other than lobster.

If the ability to change permanently into groundfishing is linked with some experience in groundfishing over the annual cycle, we can only conclude that there are very few people who have the assets to make a rapid switch to permanent groundfishing.

Table 13

Fishery Switching (Into Groundfish), 1978

<u>From:</u>	<u>Number of Men Switching into Groundfishing</u>
Herring	26
Lobster	146
Scallops	4
Redfish	95
Combined Fisheries*	<u>11</u>
<u>Total</u>	282

*Lobster, herring, etc.

Source: Acheson et al. 1980: Table 9.

As can be seen in Table 13, there are only 282 fishermen in Maine and New Hampshire, who are primarily dependent on lobster, herring, or other species, who do some groundfishing over the annual round. However, of the 282 who have experience over the annual round in groundfishing, only 169 are owners or skippers; the remainder are crewmen.

Moreover, as we have seen, the willingness to switch to bottom trawling for groundfish, which involves a relatively large boat, is strongly linked to age. Of the 169 men who are in some other fishery, but who have had experience as skippers of boats in the groundfishery over the annual round, only 57 are

between 25 and 38--the primary age bracket where men are likely to make a substantial investment. All 282 men who are involved with groundfishing over some part of the annual round are prime candidates to move into groundfishing on a full-time basis. The vast majority of these men, as can be seen from Table 13, are lobstermen who do a little dragging or gillnetting from their small boats in the spring. However, only the 57 of these men between 25 and 38 who have been skippers are likely to make the significant investment necessary to go into bottom trawling. The remainder, we would predict, will stay with seasonal groundfishing in the near future or else enter gillnetting using the small boats they currently own.

In addition, there are very few boats in northern New England that could be converted to groundfishing that are not already devoted to that fishery.

Table 14

Number of Maine and New Hampshire Boats, By Species Exploited

	Lobster			Groundfish			Herring			Scallops			Redfish	
	under 25'	25'-45'	over 45'	under 25'	25'-45'	over 45'	under 25'	25'-45'	over 45'	under 25'	25'-45'	over 45'	over 45'	
Total	1201	1950	2	44	186	113	119	37	45	0	202	11	11	

Source: Acheson et al. 1980: Table 4.

It needs to be pointed out that the figures in Table 14 include all boats which fish for a given species at any time in the annual round. The 11 redfish boats, for example, are included among the 113 boats over 45 feet fishing for groundfish since they exploit some groundfish already. The same is true of the two lobster boats over 45 feet. In fact, of all of the boats over 45 feet listed for Maine and New Hampshire, only the 11 scallop boats and 13 purse seiners are not fishing for groundfish over some part of the annual cycle. If these

boats were converted to groundfishing, the total number of big groundfish boats in northern New England would increase from 113 to 137.

There are however, a large number of boats in the 25 to 45 foot class which could be converted to groundfishing, although they would not be ideal for this purpose. None of them could fish off-shore. Moreover, they are really only suitable for gillnetting, and many of the small boats (i.e. under 33 feet) could not even be used for this. From these figures it is safe to conclude that there are very few boats already in Maine and New Hampshire which could quickly be converted to off-shore draggers (i.e. bottom trawlers).

The numbers of boats in various categories really tell little definitive information about the potential limits to growth of the groundfishery of northern New England. A man with skill and capital can always buy a used boat in another area and bring it to Maine or New Hampshire or have a new boat built. The information on the number of men with current experience in the groundfishery is far more instructive in this regard.⁸ These figures indicate that there are substantial limits to the potential growth of the groundfishery in the short run. (This, of course, assumes that large numbers of groundfish boat skippers will not be moving in from outside the region.) Over the course of 20 years many hundreds of men could gain the experience and capital equipment necessary to enter groundfishing. But it is clear that no large number of men from the region can enter that fishery on a large scale in the near future.

Summary and Conclusion

Seven basic points have been made about gear changes in the fisheries of northern New England in this paper.

First, boats are becoming larger and more versatile. In our sample of 190 fishermen, there were 60 men who had boats more than six feet longer than the ones

they owned in 1973. Only 16 men had boats six feet shorter. In addition, 56 percent of the men interviewed said their boats were "more versatile;" only 8 percent said they were "less versatile."

Second, very little fishing gear is being dropped by fishermen in the region. A comparison of Tables 3 and 4 indicates that a great deal more gear is being added to the fleet than is being dropped.

Third, most of the gear changes observed involve so few men that not much can be said about possible trends. The data do show a few statistically significant changes in fishing gear. These data indicate a marked trend out of lobstering into gillnetting and bottom trawling. There is no instance of men entering groundfishing from non-fishing jobs. The men who are entering these fisheries have experience in lobster fishing or a combination of lobstering and scallop dredging.

Fourth, fishermen are leaving lobster fishing for economic reasons. Many fishermen experienced a decline in their real purchasing power as gross revenues stayed approximately constant, while their costs skyrocketed due to inflation. In the same period, revenues of groundfishermen increased (Table 5).

Fifth, there were marked differences in the characteristics of the ex-lobster fishermen who chose to fish for groundfish with gillnets as opposed to bottom trawls. The men choosing gillnetting were generally older men, past their prime fishing years, who were not willing or able to switch into fisheries requiring a great deal of capital investment and time spent away from home. The men entering bottom trawling were younger, were committed to fishing, and their primary interest was in expanding their fishing businesses to increase their income.

The men who changed from dredging and gillnetting to bottom trawling were also relatively young men whose primary goal was to expand their fishing businesses. All this underlines the fact that, while men left lobstering for economic reasons, their choice of groundfishing gear was strongly influenced by age and career patterns.

Sixth, experience and skill play such an important role in fishing that men do not suddenly switch primary gears. Men who made permanent changes in fishing gear of all types had experience with that gear either on someone else's boat or by using that gear during some part of the annual round on their own boat (Table 8). Using a gear type during the annual round is often a precursor of a permanent gear change.

Seventh, a marked hierarchy of gear types—a set of possible paths—can be observed in the gear changes made. The pattern of changes reflects the level of investment and skill necessary to use various types of gear effectively. Men usually enter fishing in this area by going lobstering. If they change gears, they tend to go gillnetting, or to one of the other intermediate gear types. Bottom trawling, purse seining, and pair trawling currently represent a "last stage" in the gear hierarchy. One does not begin one's fishing career as the owner of a set of pair trawlers.

Eighth, only a limited number of lobster fishermen are apt to be able to switch out of lobstering in the near future and most of those are in eastern Maine. Only 24.5 percent of the lobster fishermen in the two state region are currently exploiting other species over the annual round, and very few of these men are in New Hampshire or the western coastal areas of Maine (Acheson et al. 1980: Table 11). Moreover, there is not likely to be a massive switch into groundfishing. Only 282 men, who are not already in groundfishing on a year-round basis, have experience with groundfishing over the annual cycle. Only 57 of them are captains of fishing boats and are in the age bracket where men are most willing to take on a new investment.

Fisheries managers have a marked tendency to try to manage each species independently. The fact that fishermen can and do switch between species over the

annual round and completely change gear permanently points out that single species management has inherent flaws. After all, the amount of fishing effort put on a given species depends in great part on what is happening in other fisheries. These findings have some major implications for management. The fact that very little gear is being dropped and a lot added to present fishing boats in northern New England means that a large number of fishermen can potentially fish for a lot more species than they did in the past. From the point of view of fisheries managers, this means that there is an increasing number of men who could possibly innovate their way around regulations designed to protect certain species by switching to others. Fishermen, however, are not increasing their exploitation of all species. Rather, in Maine and New Hampshire, there is a marked tendency to change from lobstering and scalloping to groundfishing. In the short run, then, it is these species that are of concern.

Given this fact, our findings have bearing on two major issues currently facing managers. In recent months, biologists and others concerned with groundfish management have voiced concern that the effort on species like haddock, cod, hake, and pollock will increase astronomically unless limits are placed on entry into those fisheries. There is reason to question this assumption. There are no men entering groundfishing from non-fishing occupations. The men from Maine and New Hampshire who are entering these fisheries have all had experience in lobstering and/or scalloping. What this suggests is that entry into groundfishing is not dependent on what is happening in the shoreside occupations of northern New England, but rather what is happening in the lobster industry. Although the lobster industry is very large and is increasingly troubled, there is a clear limit on the number of lobstermen who have the equipment and skill to enter groundfishing. Certainly entry into groundfishing will grow if current trends continue, but there is not apt to be a sudden quantum jump in fishing effort. Since entry

into groundfishing is already limited by social and economic factors, is there any reason to suspect that failure to enact limited entry legislation will automatically mean a great increase in the groundfishing fleet?

In addition, managers concerned with the lobster fishery have come to agree that some restriction on effort is needed. Many have hoped that fishing effort on the lobster would decrease--perhaps suddenly--as large numbers of lobstermen left the business. This does not seem to be in the offing either. Virtually three quarters of the lobster fishermen in the region are not now fishing for any other species at any part of the annual round.

In the literature on New England fishing, it is assumed that lobstering and groundfishing are very separate fisheries which have little bearing on each other. Certainly the animals are very different biologically, and the scale of the fisheries, their marketing, organization, and so on are very distinct. However, our data suggest that what happens in the lobstering industry is from one point of view the most critical factor for everything that occurs in the region's fisheries.

Lobster fishing is the biggest industry in the region, and more importantly, it is the training ground for most of those who will ultimately enter other fisheries. The amount of effort thrown on all other species in the area, we suspect, depends greatly on what is happening to the lobstermen. The fact that this huge industry is so troubled currently should give pause to everyone concerned with the management of all species in the area.

NOTES

1. James M. Acheson is Associate Professor of Anthropology at the University of Maine, Orono, Maine. The data on which this paper is based was collected as part of a project entitled "University of Rhode Island, University of Maine Study of Social and Cultural Aspects of Fisheries Management in New England Under Extended Jurisdiction." (N.S.F. Project Number: AER77006018.) The author is much indebted to the 190 fishermen interviewed for this project. Special thanks are due to Robert Reidman who did all the data processing and computer work necessary to construct the tables in this article; and to Josephine Church, Bert Witham, Doug Anderson, and Phil Davis who provided information on costs, gear, and seasonal cycles. In addition, the author would like to thank Frank Grice of the National Marine Fisheries Service and David Dow of the Sea Grant Extension Service for providing information on aspects of the groundfish and scallop fisheries, respectively.
2. From 1973 to 1975, the Internal Revenue Service audited the income tax returns of a very large number of fishermen--particularly in Maine and New Hampshire. Many were fined, and some brought to court on criminal charges. From that time, anyone asking questions on economic matters has been very suspect.
3. Specifically, linear models using Goldberg's weighted last squares regression procedure.
4. In both instances these t-tests indicated that the difference in boat lengths was statistically significant above the .01 level.
5. The reasons the ex-vessel price of lobster has not risen as fast as the general level of prices is clearly due to income elasticity. The income elasticity of demand for lobster is a very high .86 (Acheson and Reidman 1980). What this means is that if real income falls, lobster prices will fall also. Of course, given the general level of inflation in the past few years, real income of most American families has fallen. Under these conditions, it is not surprising that the price of lobster has not kept pace. Exactly what underlies this phenomenon is not completely clear. Many people connected with the lobster industry and restaurant business guess that lobster is treated as a luxury item--one that consumers can do without in periods when they feel their budgets tightening.
6. It is clear now that these increases in catches were due more to an increase in the stock of fish rather than to increases in total fishing effort. The increase in the supply of fish did not bring a corresponding decline in price. Quite the contrary. The price of fish remained very high throughout this period, due primarily to the fact that prices of beef, pork and other substitutable good were at an all time high. As a result of good catches and high prices, gross revenues to fishermen were very high as well.
7. These differences in mean ages is highly significant statistically. The value of the t was 4.77, which is significant above the .001 level.
8. It has been well-established that labor is relatively immobile. This is particularly true in New England.

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TECHNOLOGICAL INNOVATIONS AND ORGANIZATIONAL IMPLICATIONS:
THE CASE OF PAIR TRAWLING IN NEW ENGLAND'S FISHING INDUSTRY

John R. Bort¹



Pair trawling is a fishing technique in which two boats are employed to tow a single net. The technique has a history in Europe dating to the 1930's and 1940's, with major developmental work occurring in Ireland. Gear and techniques evolved through the 1950's and 1960's and is now well established (Taber 1972).

Some experimentation with the technique has been underway in New England since 1969 with the major successful efforts beginning in 1972. In that year four boats from Point Judith, Rhode Island, with the aid of the University of Rhode Island Marine Advisory Service, undertook systematic experiments with the technique under the guidance of an expert from Ireland (Taber 1972). The results of this work are being profitably applied to the herring fishery today.²

The basic capture principle is very similar to conventional otter trawling. A conical net (the otter trawl) is pulled through the water with the large end of the cone facing the direction in which the boat travels. In both the conventional and pair trawling configurations the mouth of the net is held open vertically with a system of floats and weights attached to its perimeter. The major difference between the two configurations is the manner in which the net mouth is held open horizontally. Conventionally the net is held open by a pair of "doors" or otter boards (devices vaguely resembling doors) which are towed along the sea floor and rigged in a manner which holds the net mouth open. In pair trawling, this function is performed by the two boats, each controlling one side of the net, traveling a parallel course.

Although pair trawling is not a radical departure from single boat configurations, it does have definite advantages. By eliminating the need for heavy, power-consuming "doors," a larger net can be towed with a given amount of power than would be possible if doors were used.³ This means more area

can be fished in a given period of time. The arrangement also allows the net to be deployed as a midwater trawl, meaning that it can be deployed through most of the water column from very near the bottom to very close to the surface.⁴ The ability to deploy the net at virtually any desired level is a tremendous advantage when pursuing schools of fish which may be found at various distances above bottom.

In addition to directly enhancing fishing capacity, pair trawling presents some added advantages over other techniques. A different net than used in other types of fishing is required, but very little other additional equipment is needed, although additional navigation and fish detection equipment is normally added. The boats do not require costly or time-consuming modifications nor is a large amount of costly specialized auxiliary equipment needed. Since two relatively small boats are used, a degree of versatility is attained which cannot be realized with a single larger craft with the same fishing capacity. When conditions warrant, the boats can work together (at times three boats have combined operations). In large schools of fish the efficiency of a much larger single craft is achieved. This is done at a relatively low capital cost since the cost of boats increases disproportionately as size increases.⁵ Since the boats retain their individual fishing abilities, they can separate and profitably pursue smaller concentrations of fish by other techniques, when fishing conditions do not warrant combined efforts. This is obviously not an option shared by a single larger craft.

A final consideration making pair trawling attractive is the applicability of the technique during the winter fishing season. The alternative to pair trawling for sea herring during the winter is offshore dragging for groundfish. This involves extended trips offshore during often rough winter weather conditions. During the winter, sea herring are near shore but winter

weather conditions make purse seining, the usual summer capture technique, difficult.⁶ Pair trawling techniques can be used very effectively under the rougher winter weather conditions. The potential applicability of pair trawling to winter was, in fact, a major factor prompting early experimentation.

The technique has proven very effective for sea herring which often form into large ribbon-like schools at various levels in the water column during the winter. Pair trawlers can literally follow the contour of the school, taking huge numbers of fish. The vast majority of pair trawling efforts have been devoted to the highly profitable pursuit of sea herring, although the method has been very successfully used to capture cod and other groundfish on occasion.⁷

In sum, pair trawling is an effective fishing technique requiring minimal equipment modification, permitting the use of existing craft. It has low entrance costs, yet provides markedly enhanced fishing capacities. This enhanced capacity is attained without sacrificing the ability of the individual boats to pursue other fishing activities at other times of the year. It can also be easily fitted into existing annual fishing patterns.

Given the adaptability of the technique, the modest entrance costs, and its profitability, the rapid adoption of pair trawling by New England's fishermen might be expected. This has not occurred. The number of boats presently engaging in pair trawling is very small compared to the number which could potentially undertake it.⁸ This reluctance to adopt the technique, or apparent indifference toward it, cannot be easily attributed to technological difficulties or cost factors.⁹ Nor can it be attributed to lack of remunerative incentive since virtually all of those currently involved indicate very substantial incomes from their efforts. In short, technological and economic impediments, based on the information available for present pair trawling

operations, can be ruled out as the factors inhibiting more widespread adoption.¹⁰

With technological, financial and remunerative considerations discounted as probable cause, the question of why pair trawling has not been more widely adopted still remains. What are the impediments and disincentives to more widespread adoption of the technique? To approach these questions, information of the fishermen involved in pair trawling in the form of case histories and open-ended interviews was developed.¹¹ These materials suggest a range of possible inhibitory considerations. They also indicate some striking similarities among pair trawlers, similarities suggesting factors important to the initiation and success of pair trawling operations. The significance of these features appears only when viewed in light of information compiled on larger samples of fishermen.

The first set of possible factors considered were the technical components of the technique. Comments by fishermen in response to inquiries about what they liked and disliked about pair trawling methods and equipment revealed no outstanding features. The most frequent views were that fishing with a pair trawl was less work than using other methods and that it permitted fishing inshore during the rough winter weather. The remainder of both positive and negative points noted covered an extreme range, suggesting idiosyncratic rather than grouped responses which would have been indicative of particularly influential factors. For example, one fisherman is not particularly fond of fishing at night (a requisite of virtually all herring fishing); another prefers working with seine rather than trawl gear; still another trawling to seining.

Inquiry was then directed toward the possible influence of infrastructural situations. Handling and marketing arrangements between fishermen and

processors take several forms but were viewed as satisfactory by the fishermen involved. It was pointed out that landing fish in some ports could be a problem because of poor wharf facilities or in one case union influence over fish handling activities.

Infrastructural difficulties have probably tended to significantly restrict the number of ports where pair trawlers land herring. Impact on actual fishing efforts is far less certain. Processors routinely arrange to transport fish to their plants from virtually anywhere along the coast. Many of those currently involved in pair trawling operate from locations conveniently close to fish stocks. These are frequently not their home ports.

Almost as a response to the obvious question about the influence of periods away from home, many of the captains indicated that they were able to avoid offshore dragging during the winter by going pair trawling. Both activities involve time away from home. Time away from home was of less concern than rough weather.

Concern over weather conditions involves both safety and comfort considerations. Working offshore during the winter does entail an increased level of danger because conditions can change rapidly for the worse in the notorious North Atlantic. Rough weather conditions are also uncomfortable. A stern trawler can become a downright punishing vessel. Fishermen become accustomed to the pitching and pounding of a vessel in rough seas, but their resignation does not mean they ever enjoy it.

These findings would tend to support the view that the positive attraction of being able to avoid rough weather conditions probably offsets the negative connotations of being away from home. Rough weather turns up in other studies as a feature of concern and dislike more often than time away from home (Poggie and Gersuny 1974:62, Gersuny et al. 1975:18).

Organizational and ideological features were the final and most complex areas to be considered. Organizationally, the one outstanding feature of pair trawling combinations is the high proportion of related captains. In a sample of nine pairs (19 boats), three father-son and two brother-brother combinations were identified.¹² Also, with two exceptions, the captains of the craft involved in pair trawling have reputations in their home ports of being "highline" (consistently very successful) fishermen. Most have also had at least some experience with herring fishing before starting pair trawling.

The significance of previous experience with herring fishing is easily appreciated. Capture success depends on knowledge of the species being pursued as well as the ability to operate the capture gear. It is not as significant a feature in the adoption of pair trawling as it is to success at herring fishing. Unfortunately, no precise figures are available, but the number of fishermen who have fished for herring is relatively large. This suggests that if experience at herring fishing was the crucial consideration the number involved in pair trawling would be greater.

The high incidence of very close kin ties between pair trawling captains and the status of most as "highline" fishermen suggest critical considerations when viewed in light of previous research. Previous work indicates that "independence" and income rank near the top if not at the top of the list of things valued by fishermen.¹³

The domination of pair trawling by highline captains suggests that the high level of remuneration involved tends to attract the most capable. A frequently made point was that pair trawling for herring yields higher incomes than could be gained from other winter fishing activities. Profitability has attracted highline fishermen, but the lure of high profits should be a strong

attraction to other fishermen as well. Again, as for the attraction of relatively comfortable fishing conditions, profitability should be a positive stimulus to a wide cross-section of fishermen.

A matching of abilities among pairs of captains may be of significance as an organizational consideration. In one case where the captain on a company-owned boat was replaced, the remaining captain felt that the dismissed captain, "just did not carry his end of the operation," meaning that he was not a very capable fisherman. The resulting tension in the crew and between the captains was viewed as a major factor in the captain's replacement. High-line pairs would tend to match up better in terms of fishing abilities. In the two cases noted where captains are not considered highline fishermen, they are teamed up with their fathers. They are, in effect, relying on their father's superior knowledge to augment their own abilities. In both cases other fishermen from the harbors involved pointed out that the sons were "still learning" but were coming along under their fathers' tutelage. In both cases the situation is one of paternal leadership and understanding with an accompanying relaxation of sharp concepts of balance in contribution to the fishing effort.

The facilitation of working arrangements, in the two instances noted, hints at the possible significance of close kin ties among pair trawling captains. Such ties promote cooperation. The high value placed on "independence" by fishermen and the close coordination of effort required make this a very important consideration.

The crew of a boat spends a great deal of time together working as a highly coordinated unit under hazardous conditions. Its members must function well together. Serious injury or death can be the consequence if it fails to do so.

Because the crew literally lives together for days at a time, month after month, it effectively becomes a social unit in which the various members' personalities must be compatible if harmonious relationships are to be maintained. This typically means that by a trial and error process, crew members compatible with the captain, the central figure of a boat's complement, are selected. As one fisherman aptly expressed it, "A captain picks guys he can get along with. If he can't they won't be on the boat very long." When considered in terms of individual cases, this means a balance among the quirks and idiosyncracies of a particular captain and crew. Each boat to some extent has a unique, individual pattern.

This uniqueness becomes a critical consideration in pair trawling. The technique requires coordinated effort between boats as well as among crew members on the individual boats. It does not allow the trial and error selection of the members of the work unit as on the individual craft. The two halves of the work group are already independent functioning units. Adjustments in either to accommodate the other would be difficult to effect. Some modification of the crew composition would be possible and does indeed occur in some cases. For the captains, personnel accommodations are obviously not possible in New England's owner-operator dominated fleet. The captains either work well together or they do not. In short, the success of a pair trawling operation hinges on the ability of two captains to work together on a sustained basis.

Given the high value fishermen place on independence, the significance of the very high incidence of closely related captains in pair trawling becomes apparent. Father-son or brother-brother combinations are far more likely to be "preadapted" to joint fishing efforts than other potential pairs. The familiarity of close relatives, based on literally lifetimes of shared

backgrounds, would tend to reduce the number of possible areas of contention between them, or at the very least increase the inclination to make allowances for idiosyncracies.

In addition to increasing the probability of harmonious relationship between captains, close kin ties would also tend to increase the durability of the relationship. When things are not going well, for whatever reasons, the multiplicity of ties inherent in close kinship bonds would tend to hold the relationship together. Among unrelated captains basing their associations solely on fishing, ties are potentially very fragile.¹⁴ Both captains control their own boats and have alternate fishing opportunities available to them. They are not constrained by highly valued multistranded kinship relationships to each other. If they go their separate ways some hard feelings and possibly lost time are the major consequences. They do not risk a major rift in family relationships.

The findings of this examination are not surprising when the organizational requirements of pair trawling are viewed in light of existing ideological and organizational patterns found in the New England fishing fleet. Coordinated multiple boat effort is an alien practice which is counter to existing values. Autonomous fishing effort by independent craft is the established pattern. A high value is placed on it by fishermen. It was possible to introduce the technology, making multiple boat operation feasible, very quickly. However, attitudes, values and organizational concepts cannot be altered as easily or as rapidly. Those fishermen who were best able to take advantage of the new technology were those who were, in effect, pre-adapted to its organizational requirements. Close kin ties provided the pre-existing basis on which the necessary close cooperative effort was developed.

The implications of findings on pair trawling extend to any efforts to introduce new technologies or modify existing exploitation patterns in New England's fisheries. Pair trawling was introduced with the goal of upgrading herring capture techniques. In this respect, the introduction has been a remarkable success. It is a very effective technique. What was not anticipated was the consequence of the new organizational patterns necessitated by it. The result has been a highly selective benefit pattern. Those preadapted to the technique have achieved a substantial remunerative advantage from its introduction. Others have not.

In effect, by introducing a specific technique an unintended de facto pattern of differential access to a common property resource is being created. Further consideration of this point is beyond the scope of this presentation but this example does make one fact very clear. Fisheries technology, like any technology, is not neutral. Any introduction has the potential of favoring specific subsegments of the industry and by the same token being detrimental to others. Thus far, pair trawling has not had obviously deleterious influences. The reason it has not is more luck than design. Future ramifications may not be as benign.

Notes

1. John Bort was employed as a Research Associate on this project from November, 1977 to January, 1979. From February, 1979 to the present he has been a member of the Department of Sociology and Anthropology at East Carolina University.
2. Taber (1972) discusses the technical details of the experimentation and the findings plus presenting an evaluation of the techniques potential. Thomson (1978) provides additional information on the technical aspects of the technique.
3. Two craft rigged for pair trawling gain between 25 and 40 percent in the size of the net which can be employed over a single boat of the same horsepower which must use otter boards for midwater trawling (Johnson 1978).
4. Midwater trawling using appropriately designed otter boards to hold the net open horizontally is possible but is not a technique commonly used in New England. It requires more power than the engines of most craft in New England's fleet can generate (Johnson 1978).
5. The capital cost of two smaller craft with a combined horsepower equivalent to a single larger craft is roughly 65 percent of the larger craft (Johnson 1978).
6. The major advantages of pair trawling and purse seining can be summarized as follows:

Pair Trawling

- a) Better in rough weather.
- b) Very effectively handles fish formed into long thin bands, a common winter phenomenon.
- c) Can be used in shoal waters where a seine cannot be set.
- d) Can be set at any desired depth.
- e) There is less equipment to worry about than with seining.

Purse Seining

- a) When formed into compactly formed schools, fish can be more efficiently captured (more at one time).
- b) The boat can stay with a school (in pair trawling the craft have to move away to deploy gear and risk losing track of the fish).
- c) Fish in excess of the amount which can be carried can be released unharmed (they are killed in pair trawling).

7. The present market for large herring is very good (\$130.00 per ton) in part because of restrictions on capture in the North Sea and continuing high European demand for the large sizes of herring.

8. The exact number of boats along the New England coast (Maine to Connecticut) which will be pair trawling during the 1978-1979 season will probably be about 25 (12 pairs and one 3 boat combination). The exact number may vary slightly contingent on the circumstances of fishermen. The number of craft capable of pair trawling without significant equipment modification easily exceeds 100 (conservatively a potential in excess of 50 pairs).
9. Technically pair trawling is now a well-established technique. By the end of 1972 the technique had been demonstrated to be effective and profitable. Remunerative and technical uncertainties which could have posed barriers to adoption were thus removed very soon after its introduction. Very explicit technical literature is available, as is advice and information from the Marine Advisory Service of the University of Rhode Island. Financial expenditures are relatively modest considering the level of capitalization involved in the larger craft. A typical net would cost around \$10,000.00 and an equal amount would be spent on electronic equipment. Potential revenues from pair trawling could reimburse this sum in a very short period of time.
10. Pair trawling is not practical for all craft in the New England fleet. Because of the shock wave created by the perimeter of the net opening moving through the water, a net with a minimum mouth opening of 10 by 12 fathoms appears to be the minimal practical size. (A shock wave fringe of approximately one fathom--six feet-- immediately inside the perimeter of the net affects fish sufficiently to divert them from the net. In other words, a net two fathoms by two fathoms would not capture any fish because the shock wave would affect the entire mouth opening.)

Horsepower requirements to effectively operate a 10 by 12 fathom net at all times of the year is approximately 300 horsepower per craft. Smaller engines (150-175 horsepower) can be and have been employed when fish are lethargic (during the winter) but are less than ideal. Most craft currently pair trawling have engines developing 375 horsepower or more. Optimum engine size is probably about 600 horsepower (Johnson 1978).

11. The sample involved is too small to warrant statistical examination of response patterns.
12. One additional father-son combination would probably exist except for a chance occurrence when pair trawling was first introduced. Two unrelated men formed an effective working relationship and have continued operating together ever since. One of these men's sons has since entered pair trawling in combination with an unrelated individual. If the father's association with his existing partner had not been so highly satisfactory it is quite probable he would have paired up with his son.

In addition to the father-son and brother-brother captaincies, one additional pair of boats is owned by a corporation which hires captains and crews to man the craft. This situation allows the direction of both craft as a single operative unit. One of the father-son combinations is in the same situation because the father owns both craft.

One pair trawling team includes three boats.

13. Work by Marshall (1973), Poggie and Gersuny (1974), and Gersuny et al. (1975) with fishermen from the same areas as some of the pair trawlers live (in some cases the same men) indicates independence and income to be major considerations to a very wide range of fishermen. Work in progress covering an even wider range of fishermen suggests this to be true for fishermen all along the New England coast (preliminary examination of data from the University of Rhode Island, University of Maine fisheries study).
14. The potentially fragile nature of relationships between the captains working as pair trawling teams is suggested by a number of organizational practices which minimize the potential for conflict in possible delicate situations. Patterns of control over the manipulation of equipment are agreed upon well in advance of the actual time of gear deployment. For example, the captain of the boat which locates the school of fish generally also deploys the net and directs the movement of both craft during the capture operation. In a couple of cases this is not the situation, but equally well-established practices have been prearranged. Expedients such as these eliminate or at least reduce the number of possible areas of disagreement under actual fishing conditions. The value of such tension reducers can only fully be appreciated after a long period on the water with little sleep, particularly if fishing conditions have been bad. Everyone is irritable and on edge. Ambiguity is definitely not needed.

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TECHNICAL INNOVATION IN THE NEW ENGLAND FIN-FISHING INDUSTRY:

AN EXAMINATION OF THE DOWNS AND MOHR HYPOTHESIS

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Introduction¹

The study of innovation has long held a fascination for large numbers of American social scientists. In fact, it is one of the few topics that has been studied by sociologists, social psychologists, economists, political scientists, anthropologists, and specialists in education and business administration (Dewalt 1979:134). Over the course of the past 40 years, enormous resources have been devoted to studying innovation and closely related topics. A large body of literature has resulted, along with a bewildering array of hypotheses. Recently, an increasing number of social scientists have come to admit that the field is in a state of chaos, and that existing models are able to explain little more of the phenomena now than they were 20 years ago. The key problem is that conclusions drawn from one set of studies are almost always contradicted by those stemming from others done by equally competent investigators. As a result, few generalizations hold in even a moderate number of cases, and none are universally applicable. Rather than being able to explain more and more of the phenomena, by developing an integrated theory, social scientists are generating studies with highly contradictory results. This situation is underlined most forcefully by Rogers and Shoemaker who have done the most complete review of the literature and hypotheses on innovation yet compiled. Rogers and Shoemaker have been able to cite studies both supporting and rejecting virtually every hypothesis concerning innovation (1971: 347-385). This situation suggests that the fundamental problem can be traced to the intellectual concepts used to explain innovation, methodological differences in the studies, or perhaps to the concept of innovation itself.

While this impasse is widely recognized, very few new approaches to the study of innovation have been suggested. One exception is the work done by Downs and Mohr, two political scientists, who have suggested a new research strategy (Downs and Mohr 1976:700-714).

Downs and Mohr point out that there are several implicit assumptions behind all the past work on innovation. Past researchers have assumed that there are two sets of factors involved in the diffusion of innovation: the adopters of innovations and the innovations themselves. In one set of studies it is assumed that the basic problem is to identify the personal, social, and economic characteristics that cause key decision makers to innovate. In this regard, a large body of literature has developed based on the idea that some individuals are more likely to adopt innovations (i.e., early adopters), while others have a predilection to follow behind (i.e., middle and late adopters.) (Rogers and Shoemaker 1971:176-191; Rogers and Burdge 1972:357-360). In these studies, the innovation being adopted is taken as a given. It makes no difference whether it is technological, economic, institutional, or ideational (Foster 1973; Rogers and Shoemaker 1971: 2-38). The emphasis is on the adopters. In addition, value is placed on innovativeness itself. Innovation is highly valued; being a "laggard" is somehow undesirable. There is a smaller body of literature on the traits of innovations which influence the speed with which they are adopted. Here it is assumed that the innovations which are "advantageous," "uncomplicated," "triable," "observable," will be adopted at a faster rate than those which do not have those characteristics (Rogers and Burdge 1972: 353-354). In both cases, it is assumed that innovators and innovations can be studied independently. In addition, it is assumed that the adoption of innovations is a relatively uncomplicated phenomenon and one that is easily measurable.

Downs and Mohr challenge all these assumptions. They suggest that the term "innovation" is a generic one used to describe several fundamentally different types of phenomena (Downs and Mohr 1976: 701-706). In addition, they argue that the adoption of innovations does not depend on the traits of the potential adopter alone or the characteristics of the specific innovation but on the match between the two. The adoption of an innovation, they suggest, will depend primarily on its suitability given the specific circumstances under which the adopter is operating. Downs and Mohr, in short, are shifting attention from the adopter as separate from the innovation to the relationship between the two. The literature on innovation establishes beyond a doubt that different individuals in the same culture can react to the same innovation in different ways. Downs and Mohr would not disagree. They would add, however, that the same individual can react differently to a single innovation if his circumstances change, and he will almost certainly react very differently to different innovations. In short, it may be "rational" for an individual to be an "early adopter"; under other circumstances, it may be "rational" for him to be a laggard. The situation is complicated by the fact that different kinds of innovations are perceived differently and call forth different assessment processes -- even in the same organization. In addition, they point out that the way that innovativeness is defined by different research projects will produce different research results. For example, the factors which explain the adoption of an innovation may be very different from the factors influencing the speed of adoption. In essence, they are challenging the idea that there are certain individuals who are unusually prone to adopt innovations; the assumption that the characteristics of innovations are clear-cut and the same for everyone; the idea that adoption of innovations is desirable for all users and the axiom that the definition of innovation and the way it is measured are irrelevant.

Downs and Mohr analyze the similarities and differences in innovations in terms of "primary" and "secondary" attributes. Primary attributes are intrinsic properties of the innovation. They are so obvious that all potential adopters will agree that innovations with the same primary attributes are similar. Secondary attributes depend on the perception of the observer. Where secondary attributes are concerned, two innovations might be classified as the same by one individual or organization; and as two innovations by another.

There are four reasons Downs and Mohr state that studies of the diffusion of innovation produce such contradictory results. (1) The innovations are objectively different (i.e., the primary characteristics differ). (2) The innovations differ in secondary characteristics which are not recognized by the researcher. Thus, the researcher is treating an innovation as if it were one type, while the potential adopters are treating it as if it were two or more innovations (Downs and Mohr 1976:704). In such cases, the researcher fails to understand why an innovation will match the needs of one adopter and be adopted, and fails to solve problems for another. (3) Next is the ecological fallacy. That is, contradictory results can result from the improper grouping of innovations in models designed to explain adoption of multiple innovations. Since the innovations are fundamentally different, the factors explaining their adoption are mixed or suppressed entirely by the statistical techniques employed. (4) Researchers are using a large variety of measures of innovativeness and the adoption of innovation (e.g. speed of adoption or extensiveness of use). Even though they recognize the differences, they try to generalize anyway -- usually with indifferent results.

While Downs and Mohr have done a great deal in developing new concepts about the process of innovation, they are scarcely alone. A few other

researchers have not only been highly critical of the "traditional" research strategies on innovation, but have developed conceptual tools which parallel those of Downs and Mohr. Everett Rogers is certainly in the forefront of this group (Radnor, Fellner and Rogers 1978).

In 1978 the authors carried out a study of technical innovation among fin-fishermen in New England. The results support many of the basic ideas of Downs and Mohr. In fact, much of the data from this study make little sense in any other context. However, an analysis of this body of information suggests that the kinds of innovation studies Downs and Mohr are proposing have built-in problems of their own.

Innovation in the Fin-Fishery of Northern New England

General Features of the Industry

During the period our study took place, the fin-fishing industry of New England was and continues to be in a period of flux. The most important source of change is the passage of the Fisheries Conservation and Management Act of 1976, which extends the fishing jurisdiction of the United States out to 200 miles. The so-called "200 mile limit" provides for Federal regulation of all marine fisheries. The first New England species to be regulated were the depleted cod and haddock stocks. More recently, regulations have been promulgated for herring and redfish, and a management plan for the lobster industry is currently being developed. The total effect of Federal intervention is not yet clear. Before the law was passed, it was widely assumed that Federal regulation would result in increased fish stocks and a reduction in the foreign fleet, so that economic opportunities for American fishermen would be vastly increased. It was expected that fishermen would respond to these opportunities so that ulti-

mately the fleet would be modernized and expanded. However, enforcement of initial management plans created a good deal of uncertainty in the minds of fishermen. Not only did fishermen have to contend with rapid and unpredictable changes in regulations, but in addition, the primary managerial tool used was a quota system which required boats to cease fishing when a predetermined amount of fish had been caught. One day it would be legal to fish for a given species, the next day one either had to tie up the boat or fish for something else. During the time our study was being conducted a good many fishermen were complaining that the Federal Government was trying to drive them out of business. Many said they were very uncertain about the future of their industry.

At present, the vast majority of the boats involved in fin-fishing are relatively small and make daily fishing trips within a few miles of shore. In 1977 there were a total of 1,200 boats licensed to go fishing in New England. In Maine and New Hampshire there were a total of 452 boats that fish for fin-fish.

There are a few lobstermen who do some groundfishing during part of the annual cycle in boats under 35 feet, and a few boats over 90 feet, but the vast majority are in the intermediate size range -- between 45 and 65 feet long. Most of these boats carry crews of two to four men. The largest offshore vessels, however, have up to 12 men in their crews. Virtually all of the boats involved in fin-fishing in Maine and New Hampshire are owned by individual fishermen. The fish they catch is sold mainly in fresh fish markets of Boston and New York (Wilson 1980). There are also eleven large boats owned by two vertically-integrated firms which catch redfish far out in the Gulf of Maine and six or eight boats owned by herring packing plants. The fishermen we studied are involved in two different fisheries: herring and groundfishing. Herring are small fish which are found in very large schools. They are

caught in several ways: in weirs or stop seines placed across the mouths of coves; by boats equipped with large purse seines, nets which encircle schools of fish; or by pair trawlers -- two large boats towing a net between them. The primary groundfish species in northern New England are cod, haddock, hake, pollock and redfish. They are caught mainly by dragging (towing an otter trawl net along the bottom), or by gillnets, a type of net anchored on the ocean bottom.

The vast majority of boats involved in fin-fishing are located in some 19 ports along the entire coast of Maine and New Hampshire. There are regional differences, however. In the western part of the region, the boats are relatively large and a high proportion do nothing but groundfishing throughout the year. Adjacent to the Canadian border, in the eastern counties of Maine, herring fishing is much more important than groundfishing, the boats are smaller on the average, and a large proportion change target species and techniques over the annual round.

The Data Base

In the summer of 1978, three social scientists from the University of Maine gathered information from the captains of 190 fin-fishing boats in Maine and New Hampshire. This sample represents approximately 65 per-year-round cent of all fin-fishing boats in the two state area. Information was collected by personal interviews on the boats and docks where the interviewers could observe the boat, equipment and crew. Two kinds of information were recorded on the interview forms: (1) information on the individual and his personal history in fishing (age, education, kinsmen in fishing, etc.), and (2) information on fishing operations and fishing equipment. Special attention was paid to changes in boats, electronic gear, and fishing gear (e.g., nets, longlines). The average interview took about an hour and a

half, the longest lasted eight hours. The study thus provided a great deal of information on the kinds of changes occurring in the industry and the characteristics of the men who were making them.

There were many innovations of primary interest to us. We were interested in factors influencing the purchase of a "significantly larger boat," which we defined as one at least seven feet longer than the boat a man previously owned. We also studied the adoption of certain kinds of electronic gear: depth finders, depth recorders, scanning sonar, radar, C. B. Radio, VHF Radio (Very High Frequency), auto pilot, Loran A, Loran C and Loran C Plotter. Basically these innovations fall into three broad functional categories. The C. B. Radio and the VHF Radio are obviously used for communication. The radar, auto pilot, Loran A and Loran C are aids to navigation.² Depth finders, depth recorders, scanning sonar are fundamentally used to locate fish. In all these cases sound waves are projected outward from the boat. The bottom of the ocean or schools of fish register as flashes of light on cathode ray tubes, in the case of depth finders and scanning sonar, and as graphs drawn on paper in the case of depth recorders. Loran is also used as a fish finding tool in that it can be used to locate spots where fish have been caught in the past.

Last, we were interested in the adoption of new fishing gear. Although a number of new gear types were studied, the two analyzed in this paper are: adoption of gill nets, and the adoption of bottom trawls.

The Statistical Analysis

The data from this study were coded by the interviewers who collected the information, keypunched, and analyzed at the University of Maine computer center. Several different statistical techniques were used, depending on the

hypothesis to be tested. First, we wanted to know if the adopters of one innovation tended to be the adopters of others. To test this hypothesis we constructed simple cross tabulation tables on several pairs of innovations and calculated the number of individuals adopting the pair as opposed to the numbers adopting each separately.

We then framed a series of hypotheses concerning the adoption of these innovations and used standard statistical techniques to analyze them. There were two general types of hypotheses. First, we wanted to examine the relationship among the innovations adopted. To test hypotheses on this subject, we used cross tabulations and factor analysis. Second, we wanted to test hypotheses about the relationship between the specific innovations and the personal characteristics of the people who adopted them. To test these hypotheses, primary reliance was placed on linear probability models using Goldberger's weighted least squares regression procedure. We used some simple chi square tests as well.

In our view, the analysis of Downs and Mohr implies three critical questions regarding innovation. First, is there a more innovative class of people defined by some unique set of characteristics? More specifically, is there a group of people (i.e., "early adopters") who always adopt innovations earlier than others, regardless of the type of innovation?

Second, are the economic and social factors related to the adoption of one innovation in an industry the same as those explaining the adoption of others in that industry?

Third, is the research strategy posed by Downs and Mohr capable of reducing the instability of research results noted in the literature on innovation? In other words, if all studies of innovation were conducted as Downs and Mohr suggest (i.e., realizing all innovations are not the same, etc.), would the results of different research projects still be highly contradictory?

We will use our data from the fishing industry in New England to answer each of these questions in order.

Question 1: Early Adopters?

Much of the traditional literature on innovation suggests that the key factors explaining the adoption or non-adoption of innovations are the economic and social characteristics of the individual adopters. In this literature, it is assumed the innovations to be adopted are somehow homogenous. That is, there is a class of people in an industry who consistently adopt new innovations earlier than others.

If this view is correct, we would expect that when a pair of innovations is introduced in an industry at the same time, early adopters of one innovation are likely to be early adopters of the other. Conversely, people who are late adopters of one innovation should not be early adopters of another. In the early stages of the diffusion of a pair of innovations, we should expect to see few instances where individuals adopted only one innovation and rejected the other.

In order to investigate this question, we analyzed data on fishermen who adopted four innovations: Loran C, C. B. Radio, Scanning Sonar, and VHF Radio. All of these innovations became commonly available to fin-fishermen in northern New England after 1973. They are all, from this point of view, new innovations. In addition, these are separate innovations having entirely different functions. Purchasing one does not influence the purchase of another. A C. B. Radio can be purchased for under \$100.00 while a Scanning Sonar and Loran C cost a minimum of \$3,500.00 for the cheapest sets. C. B. Radio and VHF Radio are obviously communication devices which are relatively easy to operate. The difference is that VHF Radio operates over long ranges. Loran and Scanning Sonar, by way of contrast, are used primarily in connection with finding fish, and it requires far more skill and experience to operate them effectively.

TABLE 1

Numbers of Inshore Maine and New Hampshire Fin Fishermen
Adopting Pairs of New Innovations

<u>Pair of Innovations</u>	<u>Number of Fishermen Adopting Both Innovations^a</u>	<u>Number of Fishermen Adopting One of the Pair of Innovations</u>	<u>Number of Fishermen Adopting Neither Innovation</u>
A - VHF	42	84	53
B - Loran C	27	52	100
C - C. B.	49	108	22
A - C - VHF	53	72	56
B - VHF	112	54	15
A - C - C. B.	55	106	20

The new innovations were adopted between 1973 and mid 1978.

Table 1 presents the results of this aspect of the study. There were six possible pairs of new innovations that the fin-fishermen in our sample could have adopted. All of these combinations are listed as "Pairs of Innovations." The data in this table strongly reinforce the conclusion that there is no unique class of perennial "early adopters" as far as these innovations are concerned. This is indicated in two ways. First, and most important, in the case of five of the six pairs of innovations, there were many more people who adopted one innovation than adopted both. Generally there are twice as many people who adopted one innovation as adopted both. The single exception is the adoption of CB radio and VHF radio. Here 112 people in the total sample adopted both. There was still a large number of people (i.e., 54) who adopted either a C. B. Radio or VHF alone. From this it is clear that people who took on one of the four innovations were not necessarily likely to adopt another. Second, by looking at the number of people who adopted both innovations in a pair, it is clear that different numbers of individuals adopted different pairs. Only 27 people adopted both Scanning Sonar and C. B. Radio, while 112 people adopted both C. B. Radio and VHF radio. If there is a group of early adopters, it can be no larger than 27 individuals. In addition, it should be noted that if a set of perennial early adopters existed, we would expect to find that the numbers of individuals who adopted each pair of innovations would far exceed the number who adopted one of the pair. This is not what we find -- these four new innovations were being adopted by different people.

This analysis is very consistent with the thesis advanced by Downs and

Mohr. They suggest that different people will adopt different innovations to solve different problems. If Downs and Mohr are correct, there is no "innovative" set of people who adopt all innovations simply because they are new. Downs and Mohr predict that such different innovations are likely to be adopted by different men and this is exactly what we find.

Question 2: The Factors Explaining the Adoption of Different Innovations

In the traditional literature, it is assumed that there are some people who have a high propensity to adopt innovations regardless of type. This assumes that the process of adopting innovations is similar in all cases. The propensity of a person to adopt innovations should be predictable if we know his social and economic characteristics. If the traditional literature is correct, in a linear probability model certain variables should be significant in explaining a large number of innovations and the signs should be similar. However, if Downs and Mohr's view is correct, innovations should be accepted if they are matched to the needs of the potential adopters. If this view is indeed accurate, in a linear probability model, social and economic variables of the adopter should not be consistently associated with the adoption of a large number of innovations. However, variables which measure the strength of the match between an innovation and the adopter's needs should explain the adoption or non-adoption of a large number of innovations.

Our data generally support Downs and Mohr: in our regression analysis, we found very few variables which were consistently linked to the adoption of a large number of innovations. This indicates that the traditional theory needs modification. More important, by viewing our statistical results against the ethnography of the fishery, we were able to see the way in which a large

number of innovations adopted were matched to the needs of the people who adopted them. This suggests that the Downs and Mohr research strategy provides a better framework for interpreting the data on the adoption of these innovations.

However, our analysis of the factors explaining the adoption of different innovations do not unambiguously support every aspect of the Downs and Mohr hypothesis. Two problems were encountered. First, we could find no single variable or set of variables which measured the match between innovations and the adopters or non-adopters of those innovations. Second, there were certain variables on the personal characteristics of fishermen which were linked to the adoption of a large number of innovations. While there were only a few such variables, this phenomenon does tend to support the traditional view of innovation.

First we will analyze the data generally supporting the Downs and Mohr hypothesis, and then the data in support of the more traditional view of the adoption of innovation.

In studying the social and economic factors related to the adoption of innovation in the fin-fishing industry in Maine and New Hampshire, we attempted to account for 18 dependent variables, which measured innovation, by regressing each definition of innovation on a subset of 39 independent variables. Three different kinds of dependent variables were used in this study: (1) those representing the adoption or non-adoption of a single gear type (e.g., Loran C, a large boat), (2) more complex definitions of innovation involving the adoption or non-adoption of any innovation out of a group of innovations (e.g., making any major change in primary fishing gear, and (3) the number of types of major changes in gear or technique

the fisherman made. It should be noted that 14 of the 18 dependent variables involve the most elementary definitions of innovations available -- namely the adoption or non-adoption of a single type of gear. The remaining four involved complex definitions of innovation.

Some of the independent variables investigated are standard in studies of innovation; others were selected to test hypotheses concerning unique features of the fishing industry. In general, we studied the relationships between innovation and the following factors: age, education, size of firm, fishing success, wife's employment, variables measuring access to information, expectations of future opportunities, fishing experience, major species sought, geographic region, marketing outlets, and a set of variables on possession of complicated gear. Men who adopt complicated gear have no need to adopt simple gear, since it is less effective and does the same job.

The exact set of dependent variables used in this study is listed in Table 2, the independent variables in Table 3.

While all of the captains interviewed operated inshore boats which fished for fin-fish all or part of the time in the Gulf of Maine, there are enough differences in the assets these men have and the circumstances they are working under so that their response to all these innovations was highly differential. These variations show up clearly in the fact that social and economic factors influencing the adoption of any one of these innovations are distinct from those influencing the adoption of others. In fact, there are no two innovations whose adoption can be explained by the same set of variables. Occasionally, the same variable had a similar and significant effect on the adoption of two or more innovations studied, but on the whole, the differences were more striking than the similarities.

TABLE 2

Definitions of Dependent Variables Used in Regression Analysis
of Innovation in the Fin-Fishery of Maine and New Hampshire

Simple Variables

1. Adoption/Nonadoption of Depth Finder
2. Adoption/Nonadoption of Depth Recorder
3. Adoption/Nonadoption of Scanning Sonar
4. Adoption/Nonadoption of Radar
5. Adoption/Nonadoption of CB Radio
6. Adoption/Nonadoption of VHF Radio
7. Adoption/Nonadoption of Auto Pilot
8. Adoption/Nonadoption of Loran A
9. Adoption/Nonadoption of Loran C
10. Adoption/Nonadoption of Bottom Trawl
11. Adoption/Nonadoption of Gillnets
12. Adoption of Bottom Trawl after having lobster traps
13. Adoption of Gillnets after having lobster traps
14. Adopting a new boat which is at least seven feet larger than past boat

Complex Variables

15. Adoption of a new primary gear type (e.g., changing from bottom trawl to Gillnets)
16. Making a major change in primary fishing gear (e.g., change to midwater trawl, pair trawl or scottish seine from any other gear type)
17. Adopting any major piece of electronic gear (i.e., Loran A, Loran C, Fish Scope, Scanning Sonar)
18. Number of major types of innovations adopted. (The value of this variable could range between 0 and 3 depending on whether the person adopted a larger boat, a major piece of electronic gear, or made a major change in primary fishing gear.)

Table 3

Definitions of Independent Variables Used in Regression Analysis
of Innovation in the Fin-Fishery of Maine and New Hampshire

Type of Independent Variable	Number	Definition of Variables
Age	1	Fisherman's age
	2	Fisherman's age squared
Education	3	Number of years of formal education
	4	Special formal education in fishing*
Size of Firm*	5	Over 1 million dollars in assets*
	6	\$150,000 to \$1,000,000 in assets*
	7	\$30,000 to \$150,000 in assets*
	8	Over \$30,000 in assets*
Note: Variables 5 to 8 compare size of firm to firms under \$30,000 in assets.		
Fishing Success	9	"Highliner"-highly successful fishermen*
	10	Average*
	11	"highliner or average"*
Note Variables 9 to 11 compare fishing success with novice fishermen		
Wife's Income	12	Wife of fishermen had steady, secure, well paying job*
Information Variables	13	Number of ports visited in past year
	14	Member of fisherman's cooperative*
	15	Member of fisherman's political organization*
	16	Attended major fishing exposition in past year*
	17	Total number of kinsmen fishing
	18	Total number of kinsmen fishing in home port
Expectations of Opportunities	19	Optimistic about opportunities now*
	20	Optimistic about fishing opportunities five years in future*
Fishing Status	21	Full-time or part-time fisherman*
Fishing Experience	22	Number of years in fishing
	23	Fishing 0 to 5 years*
	24	Fishing 6 to 15 years*
	25	Fishing 16 to 25 years*
Note: Variables 23 to 25 compare years fishing to men fishing over 25 years.		

(Table 3, cont'd.)

<u>Type of Independent Variable</u>	<u>Number</u>	<u>Definition of Variables</u>
Primary Species (sub industry)	26	Other industry (non-lobster, non-herring non-groundfish)*
	27	Groundfish*
	28	Herring*
		Note: Variables 26 to 28 are all being compared with the lobster industry
Geographic Region	29	West of Penobscot Bay*
	30	East of Penobscot Bay*
		Note: Variables 29 and 30 are compared with the large urban ports of Portland and Rockland
Market Access	31	Groundfish dealer, processor or broker in home port*
Possession of Superior Gear Types	32	Fishermen had depth recorder on past or present boat*
	33	Fishermen does not have any groundfish or herring gear*
	34	Has VHF on past boat*
	35	Has VHF on present boat*
	36	Does not have boat capable of fishing offshore*
	37	Has Loran C or Loran C plotter on past boat.*
	38	Has Loran C or Loran C plotter on present boat.*
	39	Has stop seine or weir*

*Indicates a binary variable.

TABLE 4

The Regression Results for Five Innovations:
Regression Coefficient Signs and Levels of Significance*

Depend. Var.	Significantly Larger Boat	Scanning Sonar	Adopted Gillnets After Having Lobster Traps	Loran A	Major Change in Fishing Gear
R-Square	0.51056	0.29751	0.24170	0.38928	0.05570
Adj. R-Square	0.40180	0.11623	0.06793	0.21854	-0.04787
Std. Error	1.055	0.850	1.094	0.875	0.969
F Statistic	4.694	1.641	1.391	2.280	0.538
Regress. DF	26	24	11	26	17
Resid. DF	55	37	45	36	155
<u>Indep. Var.</u>					
1. Fisherman's Age	0.13	0.20		+0.04	0.41
2. Fisherman's Age Squared	0.46	0.14			0.43
3. Years Education	-0.04	0.95	0.45	+0.05	0.93
4. Special Educa. in Fishing	0.14	0.14		0.34	0.72
5. Over \$1,000,000 in Assets	-0.06			0.38	0.59
6. \$150,000 to \$1,000,000 in Assets	+0.01			+0.0003	1.00
7. \$30,000 to \$150,000 in Assets			+0.03	+0.0002	1.00
8. Over \$30,000 in Assets		0.27			
9. Highly Success- ful Fisherman	0.16		0.47		0.91
10. Average Fishing Success	-0.05				1.00
11. High or Average Fishing Success		+0.08		0.20	
12. Wife has Steady, Secure, Well- Paying Job	0.17	0.14		+0.00	0.41
13. Number of Ports Visited	0.25	0.97	0.29	0.89	0.87
14. Member of Fisher- man's Coop.	-0.09	0.66		0.97	0.57
15. Member of Fisher- man's Political Organization	+0.01	+0.02		0.22	0.90
16. Attended Fishing Exposition	+0.02	0.13	0.56	-0.04	0.29
17. Total Number of Kinsmen Fishing	0.11	-0.02		-0.003	0.16

* Two Tailed test.

(Table 4, cont'd.)

Depend. Var.	Significantly Larger Boat	Scanning Sonar	Adopted Gill Nets After Having Lobster Traps	Loran A	Major Change in Fishing Gear
<u>Indep. Var.-(Cont)</u>					
18. Number of Kinsmen Fishing in Home Port	0.12	+0.05		+0.02	0.24
19. Optimistic about Opportunities Now		-0.03	0.64		0.68
20. Optimistic about Opportunities 5 Years in Future	+0.07	+0.09		+0.002	0.79
21. Part-Time Fishermen	0.33	0.34		0.16	0.68
23. Fishing 0 to 5 Years	+0.0002	-0.09	0.17	0.29	
24. Fishing 6 to 15 Years	+0.03	0.94		+0.04	
25. Fishing 16 to 25 Years	+0.06	0.17	0.21	0.85	
26. Other Industry	0.80	+0.001		-0.002	
27. Groundfish Indus- try	-0.0003	+0.01	-0.07	-0.008	
28. Herring Industry	0.92	0.87		-0.003	
29. West of Penobscot Bay	-0.02	+0.06	-0.008	0.69	
30. East of Penobscot Bay	-0.05	0.96		-0.0002	
31. Groundfish Dealer etc. in Home Port	0.72	+0.07	+0.07	-0.04	
33. Fisherman has no Groundfish or Herring Gear		-0.002			
37. Loran C or Loran C Plotter on Past Boat				-0.00	
38. Loran C or Loran C Plotter on Present Boat				-0.002	

In order to demonstrate the strong differences in the factors associated with the adoption of different innovations, we present in Table IV a summary of the regression results for five innovations studied. The innovations we selected for analysis are: a significantly larger boat, scanning sonar, gillnets after lobster gear, Loran A, and making a major change in fishing gear. Table 4 presents the overall regression statistics for each equation. In addition, it gives the level of significance of every independent variable used and the sign of its regression coefficient provided the variable was significant at the .10 level (two tailed tests of significance were used).

Since these are different innovations which solve different kinds of problems, it is scarcely surprising that the New England fin-fishermen who adopted them have different characteristics.

In order to understand the adoption of a significantly larger boat, some background facts are necessary. It must be understood that buying a larger boat is an innovation. It involves different levels of skill, different crew sizes, addition of different equipment, and the possibility of exploiting different species in different areas. There is a general growth in the numbers of men entering gillnetting and dragging in New England. Since fin-fishing takes a good deal of skill and a good sized boat, these new fin-fishermen are not entering from non-fishing occupations. Most are switching into fin-fishing after several years experience in lobster fishing. Most of the boats being added to the fleet are of moderate size. There is increasing evidence that the optimum sized vessel for the fisheries of the Gulf of Maine may be no larger than 100 feet long and perhaps even smaller. Of course, when a person invests in a much larger boat,

he is usually investing between \$80,000 and \$350,000 and our sample contains men who were investing more. Such men are obviously making a long-term commitment to fishing.

Under these conditions, if we analyze the regression results in Table 4 for "Significantly Larger Boat," it is not surprising that the people adopting a larger boat are those with assets of \$150,000 to \$1,000,000. People having assets over one million dollars already have such a large boat that there is no advantage in buying a still larger one. These are also men who have been exposed to a good deal of information on new fishing technology and are more committed to fishing. This is indicated by the fact that the adoption of a "significantly larger boat" is positively associated with active participation in a political organization and attending a major fisheries exposition. Adopters of larger boats were also "optimistic" about the future of fishing. It was the men with between 3 and 25 years of fishing experience who were more likely to adopt a larger boat than those with more than 25 years experience. Men who were pessimistic about the future of fishing and older men on the verge of retirement are obviously not motivated to make the long-term commitment required by the purchase of a new boat.

The people who did not adopt a larger boat are those captains who are not in the large dragger ports of Portland and Rockland, as is indicated by the "region" variables. Moreover, they are people who are committed to the lobster industry or who are already committed completely to the groundfishery. This is shown, in part, by the negative sign on the variable indicating membership in cooperatives. The vast majority of cooperative members are men who fish for lobster exclusively; and the optimal size of a boat used only

for lobstering is very small. Men who are already established in ground-fishing do not purchase larger boats either, as is indicated by the negative sign on the "groundfish primary species" variable. People want larger boats, in the main, to enter full-time groundfishing. These men already have such vessels.

Another separate set of factors influences the adoption of each kind of electronic gear. Scanning sonar is used primarily by large herring boats to spot schools of fish and by groundfishing boats to detect obstacles (e.g., rock piles) that might damage their nets. It is a very expensive piece of equipment, costing between \$6,000 and \$45,000, and it is one that takes a good deal of experience to be able to operate effectively. Thus, the captains more likely to adopt scanning sonar are those who are highliners or medium skilled fishermen, not the unskilled men.³ On the whole, these are men who are committed to groundfishing or swordfishing. This is indicated by the positive signs on the variables on membership in a political organization, by the industry variables, and the variable indicating a groundfish dealer in the home port. It is only men who are committed to groundfishing who have groundfish as their primary species, who join lobbying groups to protect their interests, and who locate in harbors with groundfish dealers. This commitment is indicated by the positive signs on all these variables.

Again, since scanning sonar is a very expensive investment, it is not surprising that the adoption of this gear is associated with a positive attitude toward future fishing opportunities. Conversely, those less likely to adopt scanning sonar are men with under five years experience in the fishing industry and having no herring or groundfish gear.

Gillnets are an intermediary gear. They can be used on relatively small

boats (i.e. 35 feet), and a man who has a boat can get into gillnetting with only \$10,000 additional investment. Many of the men who adopt gillnetting gear want to switch out of the failing lobster industry for part or all of the year, but cannot or are not willing to switch completely into other fisheries requiring far more capital and skill. Thus, the regression analysis indicates that the men likely to adopt gillnets have relatively small amounts of money invested (e.g., \$30,000 to \$150,000 in assets), and are not established primarily in groundfishing (see the industry variable). They come from harbors with groundfish marketing outlets.

Loran A is an older type of navigational equipment which is scheduled to be replaced by Loran C in the very near future. Men moving into the fin-fishery or who are upgrading their equipment tend to purchase Loran C. The men who are buying the older, used, Loran A sets are people who cannot or are not willing to invest a lot of money in Loran C equipment. Many lobstermen are currently buying the Loran A sets, although the kind of inshore fishing they do does not require precise navigational equipment. The quantitative information from the regression analysis is very consistent with this point of view. The men who were likely to adopt Loran A were older men, as is indicated by the age variable. Many of them are not likely to be in the industry long enough to warrant a heavier investment in Loran C. The industry variable and the negative coefficient on the groundfish market variable reinforce the idea that the adopters of Loran A are primarily in lobster fishing. The fact that most have not attended a major exposition might suggest they are not interested in innovation. The region variable indicates that men east of Penobscot Bay are less likely to adopt Loran. This is probably because there are few fin-fishing boats in this area, so that there are few

used Loran A sets to purchase. It is puzzling that men with medium sized businesses are far more likely to adopt Loran A than fishermen with small scale firms (i.e., under \$30,000.00). Moreover, men with working wives are more apt to adopt than men whose wives are not employed in a steady job. These variables suggest that for most fishermen in our sample, the purchase of Loran A is not linked to the inability to purchase the more expensive Loran C. We suspect that many of the men purchasing Loran A are older men, who really have no pressing need for Loran at all. They are gadgeteers, and Loran A is fairly inexpensive.

While we have only analyzed in detail these four innovations, the exact same kind of analysis could have been done on any of the innovations involving a simple definition. In almost all cases, the statistical results are very easy to interpret since they coincide with fishermen's statements about the adoption of various innovations and our own field observations.

By way of contrast, most of the equations involving a complex definition of innovation produced no statistically significant results at all. In Table 4, we have included the regression results on making "any major change in fishing gear." Here innovation is being defined in terms of a man's adopting any type of fishing gear involving vastly different fishing skills.⁴ The results were terrible. Not only is the R^2 desperately low, but the F statistic indicates there is no explanatory power at all in the entire equation. None of the independent variables proved to be significant at even the .10 level.

All of these results, however, strongly reinforce the ideas of Downs and Mohr concerning innovation research. We got good, understandable

statistical results on all of the simple definitions of innovation (e.g., Loran A, larger boat, scanning sonar). There were very different sets of independent variables explaining the fishermen's responsiveness to each of these innovations. While all of the captains interviewed were involved in the inshore fin-fishery of Maine and New Hampshire, these results indicate that different men, facing different conditions, were adopting different innovations to solve different kinds of problems.

Most of the regression results we obtained on complex definitions of innovation also reinforce Downs and Mohr. When we defined innovation as a major change in fishing gear, we were aggregating together several different kinds of changes, each explained by different sets of independent variables. Even though there may have been strong associations between specific gear changes and certain explanatory factors, these results were washed out. These poor results indicate, as nothing else could, that we are dealing with several different types of innovations which solve different problems for different fishermen. The factors influencing one gear change do not necessarily influence the adoption of others.

It should be noted that in studying the regression results concerning these innovations, we were not only able to explain how certain innovations were matched to the needs of the people who adopted them, but also why they did not solve problems for the men who did not adopt them. These data underline the fact that it is "rational" for some people to adopt certain innovations under certain conditions. It is also equally "rational" for other people facing different sets of problems to reject those innovations. For certain people it makes a good deal of sense to be "laggards." Given the

circumstances under which some people are working, adopting some innovations makes no sense at all. For a lobsterman to be an "early adopter" of Scanning Sonar, to use an obvious example, would be nothing short of foolish.

Although different sets of variables are associated with different specific innovations, there are certain variables which show consistent patterns for large numbers of innovations. Some of these patterns can be explained by reference to the general social science literature, but most require consideration of conditions specific in the fishing industry. By looking at Table 5, which summarizes the results obtained from all the equations, it can be seen that some variables are significantly associated with a lot more innovations than others.

In the literature on innovation, education is often thought to be an important determinant of innovation (Mansfield 1971:198-199; Rogers and Shoemaker 1971:186). Education, on the whole, is not significant in explaining the adoption of most of the innovations we studied in the fishery of Maine and New Hampshire. The data in Table 5 indicate that education played a role in the adoption of only Loran A and VHF Radio, and had a negative correlation with the adoption of depth recorders and a significantly larger boat. What is striking is that the years of education had no significant impact on the response to the other 14 innovations studied. Fishermen themselves have noted that formal education bears little relation to fishing success or the ability to expand and modernize one's business. They have many apocryphal stories on this point with themes like: "The educated fool," or "How the college boy run his boat on the reef." These statistical results suggest that such stories have a solid basis in fact.

TABLE 5

Summary of Significant Independent Variables
on 18 Innovation Definitions in the
Maine/New Hampshire Fin-Fish Industry

Indep. Var. (See Table 3 for Labels)	Dependent Variable (See Table 2 for Labels)																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0	+	0	0			0	+	0	0	0	0		0	0	0	0	0
2	0	0	0	0	0		+			0	0			0		0	0	0
3	0	-	0	0	0	+	0	+	0	0	0	0	0	-	0	0	0	0
4	0	0	0	0	+	0	0	0	-	0	0			0	0	0	0	0
5		0		+		+	0	0		0	+				+	0		0
6		0		+		+	0	+				0		+	0	0	+	+
7		+		+		+	0	+		+	+		+		0	0	0	0
8	0		0		0				0									
9				-	0		+		+	0	+		0	0		0		0
10				-	-		0		+	0	+	0		-		0		0
11	0	0	+			0		0							0			
12	+	0	0	+	+	0	0	+	0	0	-			0	0	0	0	+
13	0	0	0	0	0	-	0	0		+			0	0		0	0	0
14	0	-	0	0	-		0	0	+	0	0			-	+	0	0	-
15	0	+	+	0	+	-	0	0	0	+	+	+		+	-	0	0	+
16	0		0	0	0	0	0	-	0	0	-		0	+	-	0	0	0
17	0	0	-	-	-	-	0	-	+	0	0	0		0	0	0	0	0
18	0	0	+	+	0	+	0	+	-	0	0	0		0	0	0	0	0
19	0	0	-	0	-	0	0	-	0	0		0		0	0	0	0	0
20	+	0	+	-	+	0	0	+	0	0	0			+	0	0	0	0
21	0	0	0	0	0		0	0	0	0	-			0	0	0	0	0
22																0	0	0
23		0	-	0	0	0	+	0	+	0	+		0	+	0			
24	0	0	0	0	0	0	0	+	0	0	0			+	+			
25	0	0	0	0	-	0	+	0	+	-	+	-	0		+	0		
26	0	0	+	0	-	0	0	-	+	-	0			0	0			
27	0	-	+	-	-	-	+	-	0	-	-		-	-	-			
28	0	-	0	0	0	-	0	-		0	-			0	-			
29	-	0	+	0	-	+	0	0	0	0	0			-	-	0		
30	0	-	0	0	-	0	-	-	0	0				-	0			
31	+	0	+	0	+	0	0	-	0	0	0		+	0	+			
32	0																	
33			-	0														
34					-													
35					0													
36							0											
37								-										
38								-										
39																0	+	

If a regression coefficient is significant at the .10 level, then its sign (+ or -) is entered in the table. Those independent variables having insignificant regression coefficients are designated by zeros. Variables not included in an equation are indicated by blank spaces in the appropriate column.

Some of the most interesting variables were those relating to kinship. In the case of Sonar, Radar, VHF, and Loran A, those who were the adopters had a large number of kinsmen fishing in the home port, and a lower than average number of kinsmen in fishing in other ports. All of these innovations are reasonably expensive, save for the used Loran A sets, and all require skill to use effectively. A good many fishermen report that only their kinsmen can be counted on to give them accurate information consistently. Fishing, after all, is a highly competitive business, and training and informing the competition is seldom advantageous. Thus, people who have ready contacts with a large local network of kin who are in fishing are more likely to adopt these innovations than others. The question needs to be asked, "Why can't fishermen obtain the same kind of information on these kinds of electronic gear from more distant kinsmen?" Distance itself is part of the answer, since it tends to inhibit the flow of information and limit the opportunities to observe gear in operation. However, another set of factors is operating here. There is substantial evidence that the operating kinship unit is the kinsmen living in the same town or within ten miles of each other. Kinsmen who move away from the local area rarely interact, and within a generation are quickly forgotten (Lazarowitz and Acheson 1980). Having a large number of kinsmen outside one's home town has no bearing on the adoption of innovations. For all practical purposes, these people do not exist.

In many studies on innovation, age is identified as an important variable. However, the results we obtained demonstrate that age plays very little role in the decision to adopt innovations. In the entire set of equations, the variables on Age and Age Squared were significant only in

three cases. The number of years experience in the industry is vastly more important. These variables are significant in nine, or half, of the equations studied. There is one pattern that is clear in these data -- the men with less experience are more apt to adopt innovations such as larger boats, Loran C, auto pilot and gillnets, in comparison with the men with over 25 years experience. There are two explanations for this phenomenon. Many of the men with over 25 years experience are older and will retire in a few years; consequently they will not gain the benefits of any investment or innovation they might make. Second, many other very experienced men have acquired what they consider to be an ideal boat and set of equipment. Although some of these men are only in their late 40's they are also not inclined to adopt gear which would move them away from what they perceive as an optimal situation.⁵

In almost all economic studies of innovation, firm size is identified as a critical variable (e.g. Mansfield 1968a:107-108). In 11 of the 18 equations, the variables on firm size proved to be significant. In all cases but one, the scale of the firm was positively associated with the adoption of innovations of all kinds, indicating that larger firms had a stronger tendency to adopt innovations in comparison with the smallest firms (less than \$30,000 in assets).

The data suggest that the intermediate sized firms (\$30,000 to \$1,000,000) were the most likely of all to adopt innovations. Firms in this size range, when compared with either smaller or larger firms, were far more likely to take on a larger boat, gillnets, depth recorder, Loran A and bottom trawl, and to adopt a major new piece of electronic gear. In addition they were more likely to adopt a larger number of types of innovations.

The reasons for this pattern are fairly clear. The smallest firms in the sample were ordinarily owned by men who fished for lobster most of the year, or had small stop seine operations (herring). Many do not have either the financial resources to purchase a lot of equipment, or the need, since lobster fishing requires only a moderate-sized boat and very little electronic gear. Many of the largest firms in the sample were vertically integrated herring packing firms. Much of the gear that is being adopted by the intermediate sized firms is associated with groundfishing (i.e., gillnets, bottom trawl, Loran A). The largest sized firms are less likely to take on larger boats, doubtless because they already have some of the largest in the fleet, and buying still bigger boats would give no advantage.

In the literature on innovation, there is strong evidence that an entrepreneur's perceptions concerning future earnings play a very important role in influencing adoption of innovations -- especially innovations requiring substantial investment (Mansfield 1963:290-311; 1968b:4-5). In our data there is a very obvious pattern in the way the variables on perceptions of present and future fishing opportunities are correlated to the adoption of innovations.

The variable on optimism about present fishing conditions was significantly related to only three variables: C. B. Radio, Scanning Sonar, and Loran C. When men in our sample were "optimistic," they were less likely to adopt these innovations. Conversely, when they were "pessimistic" they were far more likely to adopt these three innovations. The reason for such adoptions was to put themselves in a position to improve "poor" current catches.

The variable concerning "optimism about future fishing conditions" is equally easy to interpret, although it is significant in only six equations.

In five of these six cases (i.e., depth finder, scanning sonar, C. B., Loran A, larger boat) "optimism about the future of fishing" is positively related to adoption of the innovation. It is a truism that people who perceive future opportunities are apt to invest to take advantage of them. This is clearly what is happening in the case of these innovations. (In the case of the other innovations, we obtained no statistically significant results concerning "optimism about the future.")

In the literature, there is a good deal of evidence that adoption of innovations is related to access to information (Rogers and Shoemaker 1971: 11-13 and 189). People who know about the existence of innovations and their characteristics are more likely to adopt them. Our data on the role of information in adoption of innovations is very inconclusive. One of the best sources of information is the annual Fisheries Exposition held variously in places like Boston and Seattle. However, attendance at an Exposition is positively related only to the adoption of a larger boat. Exposition attendance actually "retards" the adoption of Loran A, gillnets, and a new primary gear. This can apparently be explained primarily by the fact that the Expositions are oriented mainly towards processors, owners of large, offshore fin-fishing vessels, and presumably fishermen thinking of adopting state-of-the-art fishing gear. These men are not apt to be interested in Loran A, which is being phased out, or gillnets, which are being adopted by lobster fishermen who want to get into fin-fishing on a part-time tentative basis. For Maine and New Hampshire fishermen, attendance at these Expositions, with all that indicates about access to information, plays no role in the adoption of most of the innovations studied. This is especially surprising in the case of electronic gear, since a good deal of electronic gear is displayed and competently demonstrated at these events.

One of the most important variables in our equations is membership in a political organization. This variable plays a significant role in the adoption of a large number of the innovations studied -- including depth recorder, scanning sonar, C. B. Radio, bottom trawl, gillnets, larger boats, and the number of major innovations adopted. Undoubtedly, the men who belong to such organizations obtain a good deal of technical information from other fishermen at meetings, and no doubt the information received is important vis-à-vis innovations. However, it should be noted that most of the men who said they were members of political organizations had joined the Maine Fishermen's Cooperative Association, which is based in Portland, and operates as a lobbying group to influence State and Federal fisheries legislation. Most of the members of this association live within 25 miles of Portland and are successful fishermen in the prime years of their career. These men are doing well in fishing and want to stay in fishing. They are willing to donate their time to this political organization to foster a political and legal environment which will ensure their continued success. As a result, we are certain that membership in a political organization is really a proxy variable indicating a strong commitment to fin-fishing. Thus, the data indicate that it is highline fishermen, in the southern part of Maine, who are more likely to adopt many innovations. This interpretation is supported by the variables on region, which indicate that men in Portland and Rockland are more likely to adopt innovations than people in other areas of the state.

In our discussion of these social and cultural characteristics, it has been noted that four types of variables were associated with the adoption of two or more innovations. The question this raises is "Are men who own intermediate-size firms, have a large number of kinship ties in their home port,

are optimistic about the future of fishing, and are members of a political organization somehow a class of early adopters?" We do not believe this argument can be made. All we know is that these traits were associated with the adoption of several of these specific innovations. There may have been no single individual possessing all of these traits. Even if individuals did have all these traits, all we know is that they adopted some of these technical innovations under the economic and regulatory conditions existing in the fishery at this time. We agree with Downs and Mohr that we cannot justify the conclusion that such individuals would be more likely to adopt innovations in general. However, we believe that it is legitimate to conclude that such fishermen operating in a similar geographic, economic and regulatory environment would be more likely to adopt similar kinds of technical innovations. It would be fascinating to know whether fin-fishermen in northern Europe or perhaps Alaska are also more likely to adopt technical innovations if they have large kinship networks in their home port, are members of political organizations, etc. In summary, the statistical results make little sense unless they are interpreted within the context of the ethnography.

Our analysis of the dependent variables, which represent the innovations themselves, demonstrated that these are very different innovations whose adoption can only be explained by reference to very different sets of factors. The results reinforce Downs and Mohr's argument that the responsiveness to innovations depends on how well an innovation matches the needs of potential adopters.

The analysis of the independent variables points out that some variables are associated with the adoption of many more innovations than others. This

fact might be interpreted as support for the more traditional view of innovation, since it suggests that there are individuals with specific traits who adopt large numbers of innovations. We believe such a generalization cannot be made. There is nothing in any of our data to support the assertion that some people are generally more responsive to all innovations, and a great deal of evidence rejecting this proposition.

Question 3 Can the Research Strategy Proposed by Downs and Mohr
Reduce the Instability of Research Results on Innovation?

The basic problem that Downs and Mohr were attempting to address stemmed from the fact that most studies of the adoption of innovation have produced highly inconsistent and even conflicting results. They state that if these problems are to be solved, students of innovation must take a different approach. It must be recognized that innovations are heterogeneous. These differences, in their view, can stem from differences in observable traits, recognized by everyone (primary characteristics); or by the way those innovations are viewed by potential users (secondary characteristics). Again, primary characteristics are produced by objective variations in the innovations themselves; the secondary characteristics by variations in the perceptions of potential adopters.

In addition, students of innovation must use distinct sets of factors to explain innovations that have different primary characteristics. Thus, two innovations may not be modelled in the same regression equation without distorting the results. In the case of innovations with dissimilar secondary characteristics, this is not true. By properly measuring the degree of match between the innovations and their adopters, it is possible to successfully model two or more innovations in the same equation. However, the number of variables used to explain their adoption may be very large.

In short, Downs and Mohr are suggesting a very complex approach to the study of innovation. At root they are suggesting that students of innovation should continue to use linear models in their analyses, but that they select and define their variables in a way that has not been done before. First, in cases where innovations differ in their primary characteristics, Downs and Mohr state that they should not be classified together and combined in a single dependent variable. Second, where innovations which differ in secondary characteristics are concerned, Downs and Mohr believe that two new kinds of variables should be used: (1) variables to measure the unique relationships between the individual adopter and the innovation (2) interaction terms (i.e. variables resulting from the multiplication of two or more independent variables).

We certainly agree with the first suggestion made by Downs and Mohr. Innovations we considered in the fin-fishing industry in Maine and New Hampshire are not the same, and can only be explained by distinct sets of variables. Their point concerning aggregated definitions of innovation is well taken. In some instances our attempts to use aggregated, or complex, dependent variables worked well (e.g. adoption of a new primary gear); in other cases we failed badly because we were trying to lump together substantially dissimilar kinds of innovations. For example, our equation to explain adoption of a major piece of electronic gear produced only one significant regression coefficient. Clearly the factors linked to adoption of scanning sonar, for example, are not those explaining the adoption of Loran C.

However, we see very substantial problems in the suggestion of Downs and Mohr that whole new sets of variables be introduced to explain the adoption of innovations that differ in secondary characteristics. Downs and Mohr are suggesting that an enormous number of variables must be introduced

to explain such innovations. First, this causes two problems: if we took their suggestion seriously concerning interacting variables we would have had to consider 780 additional variables in our study, since a typical original equation had 30 variables. Those are only two way variables. Higher order interactions would have required the introduction of literally tens of thousands of variables. Downs and Mohr are not seriously suggesting using higher order interactions, but even if we employ only two way variables, we have a problem in deciding which of the hundreds of variables to use. If all students of innovation interacted their variables, it would result in hundreds of different definitions. These could not possibly be compared across different studies. If this suggestion were taken seriously by students of innovation, the results would be greater confusion and conflict in innovation research -- not less.

Second, greatly increasing the number of independent variables certainly will compound the problems of colinearity currently observable in so many studies of innovation. The more highly intercorrelated a group of independent variables is, the more difficult it is to estimate stable and significant regression coefficients. A good many different kinds of factors used in innovation research are highly intercorrelated. This is particularly true in the social realm. For example, older people are apt to have less education, more years of experience, lower incomes, smaller households, more health problems, a lower consumption of food, less interest in ultimate career goals, etc. Since these factors are obviously related, the use of two or more of these variables in the same equation will produce highly unpredictable results. In short, if we followed the advice of Downs and Mohr and substantially increased the number of independent variables used,

the results would often be tantamount to statistical disaster.

There is a more basic issue involved. Ultimately, Downs and Mohr are arguing that the inconsistency in research results produced by studies on innovation are caused by a lack of a general model of innovation. They believe that the research strategy they suggest will ultimately lead to such a general model. In this regard, they say "... we are not constructing a specific theory of innovation, but are describing how one might be arrived at through research and the rough form a general theory of innovation might take" (Downs and Mohr 1976:701).

We seriously doubt that following their prescriptions will automatically result in a general theory of innovation. Ultimately, Downs and Mohr are placing primary emphasis on regression analysis. They really believe that the adoption of any innovation can adequately be modeled by a properly specified regression equation. The problem, as they see it, is that current studies of innovation have not identified the correct variables and have not interacted them properly. If this were done, they believe that a general model of innovation will become apparent to the analyst simply from looking at the regression coefficients produced by such statistical studies. In other words, if enough good data were collected by competent interviewers from enough industries and were properly treated statistically, an analyst who knows little about the intricacies of these businesses, and the people involved in them, could see general patterns in the ways innovations were adopted. Somehow, they believe that a general theory would emerge by inference from these patterns. We are certain this would not occur. The basic problem is that a regression analysis is a way of summarizing information about innovations -- not an exact analog. The numbers stemming from

a regression equation do not speak for themselves. They make sense only if interpreted by someone who is thoroughly familiar with the industry in question. Regression coefficients can highlight variables that may be important in the adoption of innovations, but they provide no information on why different variables are important, and the role they play. We know from our own study that we could not possibly have made sense of the numbers calculated by our regression procedures in the absence of a lot of information on the fin-fishing industry. Table 4 contains a tremendous amount of information about the variables influencing the adoption of the 18 innovations we studied. A person who did not know the ethnography of fin-fishing could not even attempt to interpret the numbers in Table 4 with any hope of success. Any patterns such an inexperienced person might see in this table would be nothing but wild guesses of a type that would certainly not lead on to a general theory of innovation. In this regard, it should be noted that the regression coefficients from the equations on Loran A, gillnets, a significantly larger boat and scanning sonar could not be understood without knowing what the gear was used for, the problems adopting such gear would solve, general trends in the industry, etc. Moreover, we could not interpret these data without knowing a good deal about changes in the external environment. For example, the adoption of gillnets cannot be understood in the absence of information on the difficulties faced in the lobster industry. Moreover, the adoption of scanning sonar and Loran A could not be discussed without a knowledge of the way extended kinship operates in small Maine towns.

We have noted that in interpreting the data from our regression equation, we have had to have information on: personal characteristics of the potential

adopters; the amount of information those adopters had concerning the innovation; and data on the problems the adopters faced and the ways in which adopting various innovations would help solve those problems. We would like to suggest that when a general theory of innovation does arise, those three kinds of information will prove to be of crucial importance. Such a theory will not be produced by analysts unencumbered with detailed knowledge about the industries in question. Quite the contrary. It will be developed by people who can interpret the statistical results in the light of long experience with the industries in question. A large number of factors enter the calculus when an entrepreneur contemplates adopting an innovation. Not only does the decision-making process vary with the innovation, but there are differences in the perceptions of entrepreneurs. There are also differences in the firms in an industry, and each industry has its own idiosyncracies as well. Statistical data on innovations cannot be understood in an absence of information on the context within which the decision making process occurs.

Summary

The results of our study of innovation in the fin-fishing industry lead to four major conclusions which support the point of view of Downs and Mohr. First, while the adoption of any single innovation is always highly differential, with some people adopting it before others, our data indicate that there is no group of people who consistently adopted a large number of innovations earlier than other people. The term "early adopters" or "late adopters" has meaning only when applied to a single innovation. As Downs and Mohr have suggested, there is no "early adopter class" for innovations in general.

Second, although we studied only technical changes in the fin-fishing industry of northern New England between 1973 and 1978, the innovations studied are very different and are adopted to solve distinct problems. In fact, no two innovations in our study could be explained by identical sets of factors. We have seen that the factors associated with the adoption of gillnets, for example, are very different from those explaining the adoption of Loran A, or a larger boat. What influenced the adoption of an innovation was not the characteristics of the individual alone, but also the situation he was in and the degree to which different kinds of innovations would solve the problems he faced. Our study supports Downs' and Mohr's contention that the emphasis in studies of innovation should be shifted away from the individual adopter, as distinct from the innovations, and placed more on an understanding of the circumstances surrounding a particular decision to innovate (Downs and Mohr 1976:706).

Third, the fact that innovations are adopted when they match the needs of potential adopters, emphasizes that being an "early adopter" is not always desirable, and being a "laggard" may be very "rational." The desirability of adopting an innovation depends on the problem the innovation promises to solve for the adopter in question.

Fourth, social and personal characteristics were associated with the adoption or non-adoption of a large number of innovations. We do not believe, however, that these data are indicative of a class of fishermen who are generally more responsive to innovations.

We disagree with two aspects of Downs' and Mohr's analysis. First, we are certain that the statistical approach they urge students of innovation to follow is neither practical nor reliable. Specifically, greatly

increasing the number of independent variables and interaction terms will greatly accentuate problems of colinearity already seen in so many studies of innovation. Following their advice in this regard will lead to the same kinds of unstable, conflicting results that they deplore in past studies of innovation. In addition, interpreting the results of our own regression equations would have been impossible in the absence of a lot of ethnographic information on the fin-fishing industry in northern New England. As a result, we very much doubt that a general model of innovation will come out of pure statistical summaries alone. A general model of innovation will be produced, we believe, by analysts who know a good deal about the industrial context in which innovation is taking place. If our understanding of innovative change is to go forward, statistical studies will have to be augmented by extensive case studies.

FOOTNOTES

¹James Acheson is Associate Professor of Anthropology at the University of Maine at Orono, Robert Reidman recently received his M. A. in Economics from the University of Maine. This paper draws on data collected during the course of a project entitled "University of Rhode Island -- University of Maine Study of the Social and Cultural Aspects of Fisheries Management in New England Under Extended Jurisdiction", and funded by the National Science Foundation.

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²Loran A and Loran C allow a fisherman to locate the position of his boat with extreme accuracy. The location is determined by the intersection of radio beams emanating from fixed stations. The fisherman notes the number of microseconds it took for the beam to reach a station, and finds his position on specially prepared maps. At present, Loran A is being replaced by the newer Loran C system. In fact, the Loran A stations will be closed in the next few years.

³The role of education in the adoption of innovations will be discussed later.

⁴It should be noted that several dozen types of gear changes were defined as major gear changes. This is a very complex variable.

⁵Some men in our sample began to fish full-time at age 15.

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* In this volume

NEW BOATS AND NEW GEAR: FEDERAL REGULATION AND INVESTMENT
IN THE NEW ENGLAND GROUND FISHERY

James M. Acheson

Introduction

The 1976 passage of the Fisheries Management and Conservation Act, popularly known as "the 200 mile limit," was initially greeted with enthusiasm by fishermen, conservationists and fisheries managers alike. Those interested in marine resource management favored the legislation primarily because it gave the Federal Government the power to manage badly over-exploited fish stocks, which eventually would greatly increase breeding stocks and ultimately catches. The fishermen clearly favored the legislation, primarily because it promised to end foreign encroachment in areas traditionally fished by the American fleet, which in turn would mean larger catches and higher profits. Everyone concerned with the American fishing industry expected the bill to result in more investment in new boats, fishing gear, and productive capacity, leading to a resurgence of the U.S. fishing industry.

Within weeks after the passage of the bill, support for the act turned to disquiet when fishermen discovered that the so-called 200 mile limit would not completely end foreign fishing in American waters, and that the bill gave the government of the United States enormous power to manage the fishing industry. In most areas, implementation of the bill went forward without undue conflict. However, attempts to manage the New England groundfishery have been marked by increasing resistance, disillusionment, and even scattered cases of violence. In addition, there were loud complaints from fishermen and processors, duly reported in the press, that the 200 mile limit law, rather than helping the fishing industry, was harming it. A good many fishermen claimed that the Federal Government was bent on saving the fish by driving them out of business. They predicted that the days of the small fishermen were clearly numbered.

Given the high hopes which initially greeted this bill and the increasingly obvious need to effectively manage renewable resources, it seemed very important to discover what the effect of this legislation had been on the groundfishery of New England and the way this legislation would effect the longrun prospects for the industry. Questions of growth and decline of an industry ultimately can be reduced to investment decisions. If the 200 mile law created economic opportunities for fishermen, one would expect a good deal of investments in new boats, fishing gear and processing plants, which would result in longterm growth for the industry. If, on the other hand, the law greatly increased costs for fishermen, one would expect a gradual reduction of investment, and a good many men eventually leaving the industry.

During the summer and early fall of 1978, a team of social scientists from the University of Maine and the University of Rhode Island conducted a study of the New England fishing industry, designed, in part, to assess the effects of the 200 mile bill.¹ During this study, some 65 percent of all Maine and New Hampshire finfishermen were interviewed, and a smaller proportion from Massachusetts and Rhode Island. The interview form used by both sets of interviewers contained general information on the captain or boat owner interviewed (i.e. age, address, education, marital status, employment history), a series of questions on attitudes towards fisheries management, and a large number of questions on present and past fishing equipment and operations, as well as questions about plans for the future (e.g. type of boat ordered, fishing gear, etc.). In short, this study contained not only information on fishermen's perceptions and statement about the "200 mile limit," but information on the actual decisions they had made or were going to make in response to it.

¹ This project was entitled: University of Rhode Island, University of Maine Study of Social and Cultural Factors in Fisheries Management Under Extended Jurisdiction. It was sponsored by the National Science Foundation.

The First 18 Months of Federal Regulation in New England

In 1978, about 18 months from the time regulations were put into effect, there could be little doubt that groundfishermen saw the actions of the Federal Government vis a vis fisheries management as arbitrary, capricious, unnecessary, and unfair. They believed it was designed to make it very difficult for them to earn a living or to drive them from fishing altogether. There is a great deal of justice in their complaints.

The agitation among fishermen was primarily caused by the specific regulations enforced on the groundfishermen by the Federal regulatory apparatus which resulted in fisheries being "opened" or "closed" with very short notice.¹ Regulations went into effect on March 15, 1976 on cod, haddock, and yellowtail flounder--the most important and most over-exploited groundfish stocks in New England waters. While several different kinds of management regulations were put into effect, the key managerial tool was the establishment of quotas. That is, the maximum sustainable yield of a stock was determined by scientists at the National Marine Fisheries Service Laboratory at Woods Hole (maximum amount of a stock that can be harvested continuously), and when that amount of fish was caught, fishing was prohibited. In July 1977, under four months from the inception of the law, the quota for cod had **been** reached and this fishery closed, ostensibly for the

¹ Under the FCMA, the United States and its territories are divided into eight coastal zones. Each zone has a Regional Council composed of representatives appointed by the governors of the states involved and representatives from the National Marine Fisheries Service, U.S. Coast Guard, etc. These Councils propose management plans for each species of fish to the Secretary of Commerce who, with the advice of the NMFS, rejects or accepts these plans.

remainder of the year. On November 9, 1977 quotas for all groundfish were increased, due to political pressure, so that fishing for cod was again allowed. On December 1, 1977, all groundfishing was prohibited for a month. Beginning in January 1978, quotas were established for three month periods in an effort to extend fishing throughout the year on some basis. But again, the same pattern of "opening and "closing" the fishery repeated itself. On March 1, 1978 a moratorium was imposed on cod. On April 10, limited fishing was allowed again. On July 27, cod were again closed in the Gulf of Maine for certain vessel classes and closed completely to all fishing on August 10. The fishery was opened again on October 1. On December 15, 1978 five additional fisheries were closed, including cod, haddock and yellowtail flounder.

A good deal of the uncertainty, rapid changes, and lack of stability was due to the political activities of the fishermen themselves. Every time the New England Regional Council, National Marine Fisheries Service, or Secretary of Commerce took action, there was a good deal of political agitation involving visits from Congressmen, lobbying activity, letters to public officials, heated hearings, etc. In many instances, these political activities were successful, and regulations which had been imposed were changed to ease their impact on the fishing industry (e.g. quotas raised, fishing moratoriums lifted, and so on).

Nor do the closures tell the whole story. Throughout this whole period, there were innumerable announcements concerning changes in vessel classes, announcements of hearings and emergency regulations, adjustments in allowable quotas, amendments to landing restrictions, etc. During this period, there was some change in the groundfish regulations at least once a month. Moreover, the presence of the Federal regulatory apparatus was made very obvious by a series of announcements of meetings

and hearings and a constant stream of newspaper articles from various parts of New England, which further added to the crisis atmosphere.

For many fishermen, the crisis was very real. The quota system, in effect, gave the Federal Government the right to curtail one's income-earning activities on very short notice. One day it would be legal to fish for a certain species; the next day it was not. The negative effect of the groundfish regulations was exacerbated by the fact that the gear used for groundfish (i.e. gillnets, otter trawls, and longlines) are not species selective. During a ban on cod and haddock, there is no way one can use gillnets to catch hake, pollock, and whiting without catching at least some of the forbidden cod and haddock. Some fishermen, who had a variety of gear, could switch to other species when closures came with only a few days loss of revenue, but many fishermen could not and thus were faced with the prospect of violating the law or going out of the fishing business for the duration of the ban.

Attitudes of Fishermen

During this first 18 month period, fishermen in New England were almost universally opposed to the activities of the Federal Government. Many can only be described as very angry. Quite a few voiced their displeasure at public hearings held by the Regional Council on proposed regulations; others made their feelings known to the media. Every newspaper in New England coastal communities printed articles reflecting the strong negative feelings fishermen felt about the current management efforts. The following one appeared in the Lincoln County News (Maine) on March 23, 1978 shortly after a cod and haddock closure.

As one New Harbor fisherman put it, "They (council administrators) don't care; they're still gettin' their salaries. The only thing they're interested in, is protecting their jobs. We (Maine fishermen) are just little guys. We can't afford to lose our incomes for two weeks. We don't make that much money. We've got boat payments to make, and house payments, and kids to feed. But what's the sense of goin' out if we have to shovel overboard all the cod and haddock that come up in the net? And anyhow, if you throw 'em back, they're gonna die anyway. It's crazy. It don't make sense. In a catch, them fish are worth a lot of money but dead any thrown back in the sea, they ain't worth nothin' to nobody. It's just like tossin' a 50 or a 100 dollar bill out on the water and watchin' it float away; now who's gonna do that? We can't even afford to go out, costs too much money. Even a little boat like mine is damned expensive to buy; and runnin' it ain't cheap either. I can't take it out there and run it all day, just to be able to keep a third of the catch. That's about what it amounts to, where we fish, around Monhegan; about a third of the catch is flat fish, and the other two-thirds is cod and haddock. More cod than haddock, though. They got them computers tellin' 'em how many fish we can catch. Computers don't know what's out there. Fish run in cycles; fishermen've always known that. We don't need computers to tell us. It's a crock of ----!! It's foolish, is what it is. We've always been able to take care of ourselves; we don't need them to tell us when to fish and what we can keep. But it don't do no good to talk to them fellas. I've been to their meetin's, and you might as well talk to the back of that there Jeep as to talk to Vinal Look. They set up there behind their desks and make up rules for us fishermen, and they don't know nothin' about us. I had one of them politicians ask me once if us fishermen would be satisfied if the government would subsidize us not to fish, like they do the farmers not to grow crops. I told him, 'Hell no!! All we want is to be left alone!' They don't even understand what you're talkin' about. Fishin' is a way of life--independent--free. It gets in your blood, y'know? And mostly, I guess, it's a family thing; my family's always been fishermen." Then pensively, "But it ain't the same anymore.

(Lincoln County News, March 23, 1978)

Such statements do not reflect the sentiments of only a small vocal minority. Of 139 fishermen who were interviewed in Bristol, Maine during the fall and winter of 1977-78, there were none who favored the quota system employed by the Federal Government. Of these men, 86 were so disillusioned with the regulatory efforts to date that they said they wanted no government regulations of any kind. Many of the rest felt very ambivalent about the 200 mile limit. Some were still in favor of

the law because it kept the foreign fleets at bay, but even these men did not favor the kinds of regulations being forced on them or their fellow fishermen.

It should be pointed out that of the 139 fishermen interviewed, 111 were lobster fishermen. Since lobster was not, and at this writing, still is not regulated under the FCMA (the 200 mile limit law), most knew very little about the Federal managerial apparatus and the specific kinds of regulations the local groundfishermen had to obey. Moreover, since the advent of regulations had been so recent, public opinion clearly had not had time to jell on many issues. However, it is important to note that the 27 fin-fishermen interviewed in Bristol were vociferous in condemning the actions of the Regional Council **and the "quota system."** The vast majority of fishermen in the town clearly agreed with them.

A far more definitive study of attitudes toward management was done during the summer and fall of 1978. In this study, 190 owners and captains of fin-fishing boats in Maine and New Hampshire were interviewed, along with 127 from Massachusetts and Rhode Island. During this study, we asked a series of open-ended questions about the kinds of regulations favored. The first question was: "Do you approve of the way the Federal Government is managing the fisheries of the Gulf of Maine?" Not a single fishermen said he approved. Most had unfavorable comments, and a good many went into long tirades about the "Government" and its bungling attempts at fisheries management.

The interviewers received two overwhelming impressions from the conversations on this topic: first, that fishermen were at last fully aware that their welfare and incomes were in the hands of Federal policy

makers, and second, that fishermen had a profound distrust of the Federal Government and the competence of its employees. Repeatedly we heard anecdotes to the effect that the Federal biologists, whose figures and stock estimates influenced policy, did not know what they were doing.

Table 1

Regulations Preferred by New England Groundfishermen in 1978

	Maine and New Hampshire	Rhode Island and Massachusetts	Total
No Regulation	22	41	63
Limited Entry	8	11	19
Closed Areas or Seasons	20	4	24
Mesh Size Regulations	18	10	28
Import Quotas	17	0	17
Ban Efficient Gear	9	2	11
Help Marketing and Quality	9	0	9
Lobster Trap Limit	18	2	20
Change Lobster Measure	5	16	21
Ban Foreigners	7	6	13
Less Government	2	6	8
Quotas	2	7	9
Other Miscellaneous	35	13	48
No Information	18	10	28
Total	190	128	318

Second, we asked: "What kinds of regulations would you favor for your section of the industry?" There were a total of 72 different responses, but most of the answers fell into a few categories which are summarized in Table 1.

Table 1 contains information bearing on several important issues. First, fisheries managers tend to suspect that all fishermen are anarchists whose sole aim in life is to over-exploit various fish stocks to the point of extinction and who recognize no need for management or conservation. Certainly fishermen do not welcome governmental interference, but there is clearly a growing recognition that many fish stocks need to be managed if they and the industry are to survive, and that only the government can do the job. Table 1 demonstrates that the vast majority of fishermen in New England favor some kind of regulation. They did not, however, favor the kinds of regulations being placed on them by the Federal Government. Only nine fishermen of the 318 interviewed (3 percent) said they preferred a quota system, and even some of these men said they would modify the quota system substantially if they had any say in the matter.

Second, when these fishermen were interviewed in the summer of 1978, many were clearly not sanguine about the future of their industry. These men, on the whole, said they suspected that their future prospects were not bright because the fish stocks were down due to over-exploitation and/or because the price received by fishermen was inadequate to cover constantly rising costs.

A large number of fishermen proposed solutions which would, in essence, conserve the fish stocks by cutting fishing effort. As one

can see from Table 1, nineteen men (6 percent) favored limited entry legislation (limit number of boats or fishermen); another 24 men (8 percent) suggested that areal or seasonal restrictions be imposed to protect the breeding stock; while 28 men (9 percent) wanted to increase the size of the mesh used in nets to allow a higher proportion of the small fish to escape. Another 11 men (3 percent) wanted to protect fish stocks by banning very efficient gear such as pair trawls, gillnets or purse seines. Another 13 (4 percent) would ban foreigners from fishing in U.S. waters to reserve the catch for the American fleet.

Another set of fishermen proposed solving the problems of the industry by raising the price for the fish they do catch. Nine fishermen (3 percent) wanted direct governmental assistance in marketing and maintaining quality control standards for fish; another 17 men (5 percent) wanted to impose quotas on foreign fish imports. This, they feel, would help protect American fishermen from the heavily subsidized foreign fleets who damage the local fishing industry both by taking fish in American waters and also by selling them on the American market.

Although all fishermen in this sample are involved in ground-fishing, many are also engaged in lobstering or herring fishing. Some 41 men were more concerned with the state of the lobster fishery than the groundfishery. Twenty of these men wanted to limit the number of traps an individual could fish, while 21 proposed changing the size regulations designed to protect the lobster breeding stock.

Another 48 fishermen (15 percent) proposed another set of solutions which fall into no easily definable category. Such proposals ranged all the way from "additional research" and "law enforcement" to laws prohibiting wire lobster traps and part-time fishermen.

Some 22 percent of those interviewed said they wanted "no regulations" or "less government interference." Some of these men clearly thought the fish stocks were doing very well, so that regulation was unnecessary; others were so unhappy with Federal regulatory efforts that they believed they were better off with no regulations whatsoever.

In short, most of the fin-fishermen interviewed admitted that there were problems in the fishery which could be cured or alleviated by the appropriate kind of management or governmental activity. A good many fishermen clearly stated that they believed that their futures were in the hands of government incompetents who either could not or would not do the right thing to help them. They were confused, frustrated, and very uncertain about the future.

Response to the 200 Mile Limit: Investment Behavior

Under these conditions one would predict that there would be very little new investment in fishing boats and equipment, and perhaps even some exit from the industry. There is, after all, a massive amount of evidence that as risks and uncertainty increase, investment declines (Scherer 1970:27-28). Nothing of the kind, in fact, occurred. Despite all of the complaining and predictions of disaster, there is overwhelming evidence that there is a great deal of investment occurring in the New England fishing industry. This build-up of the fleet began before the Fisheries Conservation and Management Act was passed, and is continuing at the present time despite the turmoil and hostility directed at the Federal Government. Several different changes are underway in the New England fishing industry. We obtained information on changes in boat length, electronic gear, fishing nets and gear since changes in these factors indicate major changes in investment and

changes in ability to catch fish.

Boat Length

In order to assess changes in the size of boats, we obtained information on the length of the boats a sample of fishermen owned at the present (1978), the size of the boat they owned five years previously, and the size of the boat they planned to own in the near future. As can be seen in Table 2, in 1978, 90 men had boats that were more than six feet larger than the boat they owned in 1973, while only 27 had boats that were six feet shorter. The information comparing present boat and planned boat indicates that the trend towards larger boats is likely to continue in the future. Sixty-six men in our sample planned to order or had already ordered boats that were at least six feet longer than the boat they currently owned; while only one man was planning to purchase a boat that was at least six feet shorter than the one he owns currently.

For the men in our sample, the average boat owned in 1978 was 4.2 feet longer than the average boat these men owned in 1973.¹ This difference in mean boat lengths is highly significant statistically. In the near future, these men had ordered or planned to build fishing boats that were 7.44 feet larger, on the average, than boats they currently owned. Again, the results of a t-test indicate that it is highly unlikely that these results could have occurred by accident.²

Electronic Gear

Information obtained from our sample of 318 New England fishermen indicates that investment in electronic gear is growing rapidly. Table 3

¹ A t-test was run to determine if the difference in these mean boat lengths was statistically significant. The value of the t was 28 which is significant above the .001 level.

² The value of the t was 46, which is significant above the .0005 level.

Table 2

(a) Change in Boat Length - Past to Present Boat

	less than -6 ft.	-6 ft. to +6 ft.	greater than +6 ft.	Total
New England	27	112	90	
Massachusetts and Rhode Island	11	39	28	
Maine and New Hampshire	16	77	60	
				229

(b) Change in Boat Length - Present to Planned Boat

	less than -6 ft.	-6 ft. to +6 ft.	greater than +6 ft.	Total
New England	1	39	66	
Massachusetts and Rhode Island	1	21	23	
Maine and New Hampshire	0	18	43	
				106

* Of the 318 fishermen in our total sample, we obtained this information on only 229. In the other 89 cases, the fisherman did not own a boat five years ago, or had the same boat.

** Only 106 of the 318 men interviewed had either ordered a new boat or had definite plans to order one in the next three years.

below summarizes the number of fishermen who had a particular type of electronic gear on the present boat, past boat (1973), and future boat. In every instance, the percentage of boats equipped with a particular kind of electronic gear increased. The single exception is the radio direction finder, an older navigational device, that is quickly being replaced by Loran C.

For those unfamiliar with fishing gear, it should be pointed out that SSB, CB, and VHF are all kinds of radios. Depth finders, depth

recorders, and fish scopes are used primarily to find concentration of fish; all operate essentially by reflecting sonar beams off the bottom. Loran A, Loran C, the Loran C plotter, radar, and radio direction finder are all essentially navigational equipment. They are very important to fishermen, not just because they allow him to find his way home, but also because they allow him to locate places and types of bottom which have been or should be productive of fish. Loran A, single sideband radios, and radio-direction finders are older types of gear which are being replaced by more modern equipment. This accounts for the low percentage of boats that have this type of gear. Refrigeration, Loran C plotters and fish scopes have been introduced only in the past few years. The percentage of boats having these kinds of gear should increase rapidly in the future.

Those familiar with the New England fishing scene might be surprised by the low percentage of boats having certain kinds of gear. For example, depth recorders (white and grey line recorders) are well near universal on purse seiners, draggers, and gillnetters--the most important boats in the fleet. In this sample, it should be noted that men were included if they did any fin-fishing over the course of the year. Thus, a certain percentage of men interviewed were handliners, weir fishermen, stop seiners, quahoggers, lobstermen, etc. who were groundfishing in boats with relatively little electronic equipment. However, even with such fishermen in the sample, it is clear from Table 3 that New England fishermen are rapidly increasing their investment in virtually every kind of electronic gear in common use.

Table 3

Changes in Electronic Gear on New England Fishing Boats*

	Old Boat	Present Boat	Future Boat
Depth Finder	26 (9%)	37 (12%)	18 (17%)
Depth Recorder	36 (12%)	87 (27%)	73 (67%)
Fish Scope	4 (1%)	9 (3%)	18 (17%)
Scanning Sonar	4 (1%)	25 (8%)	32 (30%)
Radar	20 (7%)	64 (20%)	46 (42%)
CB	33 (11%)	60 (19%)	37 (34%)
VHF	17 (6%)	57 (18%)	39 (36%)
Autopilot	6 (2%)	19 (6%)	21 (19%)
Loran A	18 (6%)	46 (14%)	14 (13%)
Loran C	3 (1%)	33 (10%)	41 (38%)
Loran C Plotter	0 (0%)	0 (0%)	13 (12%)
SSB Radio	7 (2%)	12 (4%)	9 (8%)
Radio Direction Finder	0 (0%)	6 (2%)	0 (0%)
Refrigeration	0 (0%)	1 (0%)	7 (6%)
<hr/>			
Total Number of Boats Observed	292	318	109

* There were 318 captains of fishing boats in the sample, Only 292 of those men had boats in 1973; only 109 men planned future boats and gave information on the type of electronic gear they planned to purchase. The numbers of boats do not equal the number of gear types observed since there were missing observations on some boats and most boats have more than one type of electronic gear.

Some kinds of electronic gear used on fishing boats are relatively inexpensive. C.B. radio sets, for example can be obtained for under

\$100.00, but most of the equipment is relatively costly. In 1978, an EPSCO Loran C Plotter cost about \$10,000. The Loran C alone cost about \$4500.00. Si-tex Radars went from \$3995.00 to \$9490.00, and accessories cost hundreds of dollars more. A Koden fish scope cost \$14000.00; while a Simrad echosounder (white line recorder) cost \$7000.00; and a Wesmar 165 scanning sonar sold for \$5600.00. While there is some variation in price depending on manufacturer, model, etc., electronic fishing gear is far from cheap. The expenditures on electronic gear have increased many times in the past decade or so. In 1965, a well-equipped 60 foot dragger might have only a radio and a recorder. The same boat now could easily have these two pieces of equipment, a Loran C, a Loran C Plotter, radar, scanning sonar, and perhaps duplicates of some of this equipment in case of a breakdown. The total could run well in excess of \$30,000.00.

Fishing Gear

Our survey data indicate that the number of fishermen using multiple kinds of fishing gear over the annual round has increased dramatically. As can be seen from Table 4, 70 percent of the men interviewed used only one type of fishing gear on their "past boat," but only 47 percent use one gear on their "present boat." No fisherman reported using more than three kinds of fishing gear over the annual round on his "past boat;" whereas 8 percent of the fishermen interviewed used four or more kinds of fishing gear on the present boat. A total of 12 percent of the men interviewed said they would use four or more kinds of fishing gear on their "future boat."

Table 4

Number of New England Fishermen Using Multiple Gear Types

# Gear Types	Past Boat	Present Boat	Future Boat
0*	6 (3%)	11 (4%)	2 (2%)
1	151 (70%)	149 (47%)	61 (48%)
2	57 (27%)	97 (31%)	32 (25%)
3	4 (2%)	32 (10%)	18 (14%)
4	0 (0%)	18 (6%)	6 (5%)
5	0 (0%)	4 (1.3%)	4 (3%)
6	0 (0%)	1 (.3%)	2 (2%)
7	0 (0%)	2 (.6%)	3 (2%)
	218	314	128

* The six men using no fishing gear on their past boat are new entrants to the fishery. The two men who say they are planning to use no gear on future boat are planning to leave the fishery. The 11 people who list no fishing gear for their present boat are temporarily out of fishing and have taken other jobs due to the fishing closures.

The way that fishermen combine types of fishing gear is very complicated, and is described in detail in another paper (Acheson 1980). There are several things to be noted about this process, however. First, fishermen switch gear to catch different kinds of fish, to take advantage of seasonal shifts in abundance of certain kinds of species or changes in price. It is relatively easy to change from some types of gear to others (e.g. dragging to purse seining), and relatively difficult to change once one is rigged for others (e.g. off-shore scalloping). In most cases, changing fishing gears is a major task which normally takes from two days to two weeks, depending on the size and configuration of the boat and the gear that one is switching. In any case, the decision to switch fishing gears is not undertaken lightly. Even if one has

a variety of drags, nets, etc., switching types of fishing gear is costly in terms of labor, materials, and lost fishing days. Building up one's repertoire of fishing gear calls for major investment. A lobsterman who wanted to go gillnetting in addition to his lobstering would have to pay a minimum of \$8000.00 for a used gillnet hauler, nets, and gear. The same fisherman who wanted to go dragging would have to invest at least \$9000.00 in a winch, cable, doors, and net. If he wanted to go stop seining, a moderate-sized net, dory, and hydraulic net hauler would run at least \$11,500.00. It needs to be stressed that a lobster fisherman would normally have a small boat between 32 and 40 feet long, so that the appropriate gear would be relatively inexpensive. Equipping a larger, off-shore boat with a variety of kinds of gear would be vastly more expensive.

Versatility

The data from our study indicate that the New England fishing fleet is clearly becoming more versatile. Versatility is difficult to measure. Unlike boat length or numbers of kinds of electronic gear, etc., whether one defines a particular fishing operation as more or less versatile depends on the criteria used. In general, a fishing operation was judged to be more versatile if there had been changes in size of boat, electronic gear, or fishing gear which would allow the boat's owner to exploit different grounds, or more species over the course of the annual round. In some cases it was relatively easy to make a decision concerning versatility. For example, a man who had the same boat and gear five years ago as he has now clearly had not increased the versatility of his operation. In many cases the situation was not this clear-cut. Has a herring fisherman who bought a scanning sonar and a boat three feet larger than the one he had

increased the versatility of his operation or not? It is very difficult to say. These indeterminate cases--and there were a large number of them--we excluded from the analysis. The results of our study on versatility are summarized in Table 5 below.

Table 5

Changes in Versatility in the New England Fishing Fleet

(a) Change in Gear Versatility - Past Five Years

Less Versatile	No Change	More Versatile	Total
8 (6%)	53 (38%)	78 (56%)	139*

(b) Expected Change in Gear Versatility - Next Five Years

Less Versatile	No Change	More Versatile	Total
7 (5%)	48 (34%)	88 (62%)	143**

* Of the 318 men in the total sample, we obtained information on only 139. Some of other 179 were not fishing 5 years ago. But in the vast majority of these cases, we did not have adequate information to be certain whether the fishing operations in question would be more or less versatile.

** In the 143 cases reported, we had sufficient information to determine that the future or planned fishing operation would be more versatile.

Only a very small percentage of the men were judged to have "less versatile" operations. Most of these were men who were thinking of dropping out of groundfishing and retiring to a small scale lobster boat. Some 38 percent of the men were judged to have the same amount of versatility in their present operation as they had in their past boat, and 34 percent were judged to be planning fishing operations which were essentially very similar to the ones they had at present. Most of the men in this "no change" category purchased (or planned to buy) a boat very similar to the one they had before and were using the same kind of gear over

the annual round. Over half of the men in the sample clearly had or were planning fishing operations which were "more versatile" than the ones they had previously. This "more versatile" category contains mainly men who had bought or "planned to buy" much larger boats and/or who had added to the repertoire of kinds of fishing gear they own or planned to own. In only a few cases did a change in electronic gear alone influence our judgements of versatility.

Entry

It is not just that fishing boats are becoming larger and are better equipped, there are more of them. One indication of such an increase is seen in the growth in the number of licenses granted by the National Marine Fisheries Service for groundfishing in the New England Region. In 1977, 1,200 licenses were issued; while in 1979 the number had increased to 2,191 (Grice 1980)--almost a 83 percent increase in two years. Increases in numbers of licenses alone are not an absolute indicator of increases in investment, since they indicate nothing about the size of the boats used, and the way they are equipped. Moreover, a large number of people hold fishing licenses and use them very little or not at all. A far better indicator of entry into fin-fishing is provided by actual boat counts. In 1974, the Department of Marine Resources of the State of Maine listed 104 "Commercial Trawlers, Purse Seiners, Gill Netters and Sardine Carriers" operating from Maine ports (anonymous 1974). In 1978, our own study turned up a total of 212 such boats in Maine. Although many of these are converted lobster boats, it is obvious there has been a substantial entry into groundfishing.

In summary, while it is impossible to obtain accurate figures on the total value of the assets owned by New England fishing firms, it is very clear that a massive amount of investment took place in the

groundfishery between 1973 and 1978.¹ It is not just that there are more boats now fishing for groundfish, but these boats are larger and better equipped. In addition, our data indicate that this investment has resulted in a more versatile fleet--a fleet giving a larger percentage of captains the capacity to exploit grounds they could not fish before, and to fish for a larger number of species over the annual round.

Factors Promoting Investment

In 1978, there was clear evidence that groundfishermen were very unhappy with the actions of the Federal Government and were predicting dire consequences for their industry from attempts by the government to manage the fishery. At the same time, there is massive evidence that large numbers of fishermen were investing very heavily in their fishing businesses and that the capability of the fleet was increasing rapidly. In short, fishermen are saying one thing and doing another. This is not an unusual occurrence. In the literature in the social sciences there are large numbers of cases where there is a wide discrepancy between verbal statements of informants and their behavior. Situations of this kind are so common, in fact, that anthropologists make it a standard practice to observe actual behavior as well as note the explanations for events offered by the people of a culture (Pelto 1970:67-86; 89-105), and psychologists have

¹ It is always difficult to obtain accurate information from businessmen in the United States concerning assets and earnings. In 1973-74 the Internal Revenue Service mounted a massive campaign against the fishing industry in which a very high percentage of fishermen were audited. Since that time, anyone asking questions about such economic matters has been highly suspect. Accordingly, we made no effort to obtain such information from the vast majority of our informants in the fishing industry.

invented an elaborate methodology to prevent informants from giving deceptive information about values and activities. Thus, no social scientist would find it surprising that the statements and behavior of fishermen are not in accord. What is surprising is the conditions under which they are choosing to invest so heavily. There is no question that the actions of the Federal Government have been arbitrary enough to make fishing a very uncertain game. As one fisherman phrased it, "at the beginning of every month we are not certain if we will be allowed to fish enough to even cover the boat payment." While this may be wild hyperbole, there is an element of truth in such statements.

While we had little luck in getting fishermen to give detailed information on their investment decisions, several factors apparently play a role in the decision of many fishermen to invest heavily under these circumstances.

First, the New England fishing fleet is very old. In Maine, for example, there were 104 trawlers, purse seiners, gillnetters and sardine carriers in 1974. The mean age of these vessels was 27.4 years old, and some of the boats that were still in use were built between 1910 and 1920. One well known Maine marine architectural firm believes the design life of most wooden and steel vessels used in Northern New England waters is about 20 years (Tupper 1979). That is, one can expect reasonable service from such vessels for 20 years without massive maintenance problems. Given these figures, it is clear that a high percentage of the boats in the Maine fishing fleet are overdue for replacement. Many are clearly dangerous to use. The same is true in Massachusetts and Rhode Island. Under these conditions, it is not surprising that many men in New England have purchased new boats in the past five years or are planning to do so in the near future (See Table 2). They had little choice if they wanted to go fishing at all. Of course the fact that the fleet is very old does not explain why fishermen are

building bigger boats with more electronic equipment and more versatile fishing gear. They might have built the same size boats or left fishing altogether. Clearly, other factors are involved as well.

Second, despite the Federal regulations, New England fishermen are doing well financially. The catch from 1976 to 1978 was very high. Despite the warnings of stock failure by the National Marine Fisheries Service, it is now clear that these increases in catches were due more to a large abundance of fish than to an increase in fishing effort.¹ The increase in the supply of fish did not bring a corresponding decrease in price. Quite the contrary. The price of fish remained very high throughout this period, due primarily to the fact that the prices of beef, pork, and other substitutable goods were at an all time high. As a result of good catches and high prices, gross revenues to fishermen were very high as well. The growth in volume and value for groundfish landings in six major New England ports is summarized in Table 6.

Table 6

Volume and Value of Fishing Landings in Six New England Ports 1975 to 1978

Year	Volume*	Value**
1978	205	59
1977	176	47
1976	153	41
1975	156	33

* in millions of lbs

** in millions of dollars

Source: Maine Commercial Fisheries 1978:6(1):28

¹ With the benefit of hindsight, we know that mistakes were made in stock assessments so that the number of new recruits into the fishery was badly underestimated.

During this four year period, catches in these ports grew from 156 million pounds to 205 million pounds, a 31.4 percent increase. The growth in gross revenues was even greater. They went from 33 million dollars in 1975 to 59 million dollars in 1978, a 78.7 percent increase. From these figures it is clear that groundfishermen in New England are doing very well, despite the way the Fisheries Management and Conservation Act had been enforced.

Third, there can be little question that the quota system itself operates to increase investment in new boats and fishing gear. Under a quota system it is the biggest and best equipped boats that get the most fish. The advantage large and well-equipped boats had under this system became very apparent in March of 1978 when all groundfishing for cod was closed. The entire quarterly quota had been taken by Massachusetts and Rhode Island boats--most of them very big--which could operate efficiently on Georges Bank and other off-shore areas in the worst months of the winter. Small boats from Maine caught literally no fish during this three month season. In January and February they cannot operate due to the weather, and there are few cod and haddock in Maine waters during those months anyway. When the weather improved in March and the fish started to migrate inshore, cod and haddock fishing was closed. The owners and crews of these boats were furious, but the lesson had hit home. As one fisherman from Port Clyde, Maine expressed it: "It doesn't make any difference whether they have a weekly quota, quarterly quota or a yearly quota. Quotas mean fishing is ended after a certain length of time. The boats that are going to do the best are the ones that can get out there and catch the most fish while the ----- will let us go fishing." This

viewpoint is widely shared. In New England fishing circles, people speak of the increase in competition due to management as a "quota race."

The quota system is also linked to the increase in more versatile fishing equipment. Fishermen are aware that when quotas for certain species are filled, fishermen who are restricted to only one type of fishing gear are effectively out of business for the duration of the ban. Those with several different types of fishing gear can switch onto other species. Having multiple kinds of fishing gear, most fishermen are aware, is the best protection one can have against Federal closures. Of the 229 fishermen on which we have information, fully 191 or 83.4 percent said they planned to have a more "versatile" fishing operation in the future. They are clearly planning to innovate their way around the worst aspects of the Federal fishing closures.

Fourth, the New England groundfishing industry certainly has had its problems under Federal management, but other fisheries are in more serious difficulties due to economic factors. The lobster industry, the most important fishing industry in New England, is in a serious economic crunch as catches have levelled off while costs have risen dramatically with inflation (Schaefer 1979). As a result, increasing numbers of lobster fishermen have moved into other fishing (or non-fishing) enterprises. In our sample of 190 groundfishermen in Maine and New Hampshire, 67 had moved completely out of lobstering in the past five years, and 44 of them moved into groundfishing. Only three had moved into lobster fishing (Acheson 1980). Groundfishing under the 200 mile limit may not be an ideal occupation, but is clearly preferable to many alternatives.

Summary

There is a very marked difference between the statements of fishermen concerning the future of their industry and their investment behavior. They are clearly very agitated by the Federal Government's efforts to regulate their industry under the Fisheries Conservation and Management Act. They have clearly voiced their unhappiness with the "quota system" and the uncertainty under which it forces them to operate. Nevertheless, they have continued to invest very large amounts of money in new boats, larger boats, more electronic equipment and more versatile fishing gear. Four factors play a role in stimulating this investment: (1) The fleet is very old and due for replacement, (2) Revenues from groundfishing have increased rapidly in the past four years due to an increase in catches and good prices, (3) The quota system itself gives a clear advantage to owners of larger, better equipped fishing boats, (4) Although groundfishermen have had their problems, the situation in other fisheries (particularly lobstering) is far worse. As a result of all these factors, fishermen are investing very heavily in the New England groundfishing industry.

This is not to suggest that fishermen are simply whining or that the Federal Regulatory apparatus has done a good job managing the groundfishing industry. The Regional Councils, the National Marine Fisheries Service, etc. have produced a set of regulations which

make it more difficult for fishermen to earn a living, and certainly have increased uncertainty and risk. However, fishermen are getting a mixed set of signals. Those emanating from the Regional Councils clearly are giving them cause to pause. But the increase in revenues, the competition induced by the quota system itself, the age

of the fleet, and so on make investment in new boats and gear seem highly desirable. It is clearly these more positive signals to which fishermen are responding. Federal regulation may not have helped the situation, but so far fishermen have been able to surmount the obstacles.

Those familiar with the New England fishing scene have speculated that the passage of the Fisheries Conservation and Management Act would ultimately mean the end of small, family-owned fishing firms, and a gradual takeover of the industry by corporate giants. Despite the protests, keening, and predictions of doom, our data indicate that the small fisherman is more than holding his own. If fishermen continue to invest heavily in the groundfishery, family-owned fishing firms and small corporations should dominate the New England groundfishery for the foreseeable future.

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SECTION III

CURRENT FISHERIES MANAGEMENT ISSUES

A MODEL TO ANALYZE THE EFFECTS OF CHANGING THE MAINE
MINIMUM LEGAL LOBSTER SIZE FROM $3 \frac{3}{16}$ INCHES TO $3 \frac{1}{2}$ INCHES

James M. Acheson

Robert Reidman

Introduction

In the past ten years biologists, fisheries administrators, and fishermen have become increasingly concerned about the lobster fishery of New England. Many of the most knowledgeable biologists are convinced that the lobster is being badly overexploited, and that there is a serious danger of imminent stock failure, which could lead to a drastic decline in catches and revenues for lobster fishermen and coastal communities. In the past several years, many different bills and recommendations for legislation have been made, including limited entry legislation and trap limits. None of these bills have passed. Many of the biologists involved in managing the lobster industry believe that one of the most effective kinds of conservation legislation would be to raise the minimum legal size of lobster from $3 \frac{3}{16}$ inches to $3 \frac{1}{2}$ inches (Thomas, Krouse, Morrissey).¹ It is safe to say that there are few kinds of proposed legislation which make fishermen more anxious, and which are more likely to receive massive opposition in the political arena.

Most biologists, in essence, argue that there are not enough eggs in the water. They point out that at least 90 percent of the lobsters are caught in the first year after they molt into the legal size, when they are between $3 \frac{3}{16}$ and $3 \frac{5}{8}$ inches. Only 6 percent of the females are sexually mature at $3 \frac{3}{16}$ inches (when they can be caught legally), while nearly all females are mature by the time they reach $3 \frac{7}{8}$ inches, a size attained by lobsters which survive at least two years after they molt into legal size. Biologists conclude that about 90 percent of

¹ According to present Maine law, only lobsters which have attained $3 \frac{3}{16}$ inches may be legally taken. Lobsters are measured by a standard gauge, from the eye socket to the back of the carapace.

female lobsters do not survive to extrude eggs. An increase in the legal measure to 3 1/2 inches, they state, would ensure that at least 60 percent of female lobsters would have an opportunity to bear eggs at least once. They argue that a very small increase in the legal measure would have a profound influence on the number of eggs released in the water, and ultimately on the long-run prospects for the industry itself.

Fishermen, on the whole, are not convinced that an increase in the measure is desirable. They agree that a very large number of lobsters caught in Maine are just over the current legal measure. In addition, however, they are convinced that there is a strong demand for small or "chicken" lobsters, which are still cheap enough for the average person to afford. An increase in the minimum measure to 3 1/2 inches would mean that a large percentage of the lobsters now caught would become illegal. Moreover, it would mean that lobsters would be larger, and, they believe, probably less marketable.

The biologists counter with the argument that they would not raise the legal minimum size to 3 1/2 inches in one step. That, they admit, would lead to severe revenue losses for most fishermen. Rather, they propose to raise the legal measure to 3 1/2 inches over the course of five years in 1/16 inch annual increments. Such small increases, some believe, would minimize the reduction in catches and cause little economic hardship. In addition, they are certain that there is a good market for larger sized lobsters.

The object of this paper is to present biological and economic data on the effect of raising the legal carapace length to a minimum 3 1/2 inches. First, we will present biological data in an attempt to project changes in the frequency distributions of the length of lobsters in the

catch. This will allow us to assess the changes in weight of the catch as the legal measure is increased at 1/16 inch intervals. Second, we will present an economic model to determine the effect of changes in the legal lobster size on revenue received by fishermen.

The Biological Model

Methodology and Data Sources

The data used in this study were gathered by a team of six social scientists who were engaged in a general study of the lobster industry in the towns around Muscongus Bay, in central Maine. This team rode eighteen lobster boats during July and August of 1977, November and December 1977, and April and May 1978 and recorded a wide variety of information on fishermen and their attitudes, catches, traps, and so on. While they were on these boats, the researchers measured every legal-sized lobster caught (in millimeters) with a standard scientific caliper and recorded the results on sheets specially prepared for the purpose. Much of the raw data used in the biological model presented in this paper was derived from the size data on the 8605 lobsters measured during this period. All of the data were then coded, keypunched, and run on the University of Maine IBM 370 computer.

The primary purpose of collecting these data was to obtain information on fishing skills, innovation, and some other social and economic variables. Only afterwards did it occur to us that our data constituted an independent source of information on the lobster population, which could be used to predict the impact of the 3 1/2 inch measure.

Data on lobster size distributions have also been collected by Thomas and Krouse, two biologists working for the State of Maine. These data were collected from a selected sample of ports throughout the state

from 1966 to 1977. Some of the information used in this paper was taken from these studies. We are particularly indebted to these biologists for information on female lobsters, escapement from traps, and natural mortality.

Biological Data

To those not familiar with the lobster industry, a 5/16 inch increase in the length of the legal measure might seem insignificant and the amount of discussion and heat it has engendered might appear well out of proportion to its real importance. This view is not correct. Our data support the view that a change to a 3 1/2 inch measure will have a substantial effect on the number of lobsters that may legally be caught. The raw data on frequency distributions of lobsters certainly underlined a point that experienced fishermen make repeatedly--namely that a very high percentage of lobsters caught are just over the legal limit. As can be seen in Table 1, 58.9 percent of all lobsters caught were under 3 1/2 inches. This means that if the legal measure were increased from 3 3/16 inches to 3 1/2 inches in one year, lobster catches would drop by almost 60 percent. Certainly, such a drastic decline in catch would put a good many fishermen out of business.

Of course, no responsible official has even suggested that the measure be increased to 3 1/2 inches in one year. Most proposals (for example, Lobster Management Plan) have assumed that the measure would be increased 1/16 of an inch every year for five years. The critical question then is what happens to fishermen's catches and revenues as the measure is increased in this incremental fashion. Unfortunately, Table 1 alone gives very little information on this question. We know that in the first year, as the measure is increased from 3 3/16 inches

Table 1

Frequency Distribution of Lobster Sizes

Lobster Size Carapace Length (inches)	Number of Lobsters	Cumulative Percent
3 3/16 - 3 1/4	892	11.7
3 1/4 - 3 5/16	867	23.0
3 5/16 - 3 3/8	870	34.4
3 3/8 - 3 7/16	988	47.4
<u>3 7/16 - 3 1/2</u>	<u>878</u>	<u>58.9</u>
3 1/2 - 3 9/16	927	71.0
3 9/16 - 3 5/8	780	81.3
3 5/8 - 3 11/16	526	88.1
3 11/16 - 3 3/4	266	91.6
3 3/4 - 3 13/16	137	93.4
3 13/16 - 3 7/8	79	94.5
3 7/8 - 3 15/16	66	95.3
3 15/16 - 4	58	96.1
4 - 4 1/16	53	96.8
4 1/16 - 4 1/8	63	97.6
4 1/8 - 4 3/16	36	98.1
4 3/16 - 4 1/4	35	98.5
4 1/4 - 4 5/16	34	99.0
greater than 4 5/16	78	100.0

Source: Acheson 1977-1978 Sample

to 3 1/4 inches, the total number of lobsters caught will fall 11.7 percent but after the first year reference to the table will provide no reliable information. We cannot conclude that in two years the catch will fall by 23 percent, in three years 34.4 percent, etc. Several additional factors must be taken into account. First, the lobsters will be in the water for an extra year, so that more will die of natural causes. Second, those that survive will be larger. Further, during the first year that the measure is increased, a large number of females which had been immature will bear eggs and thus cannot be legally taken. This means that for every increase in the legal measure, there will be fewer lobsters in the catch, but those lobsters that can be taken will be larger, on the average. Last, it is likely that legal vent size will

be changed as the legal lobster size is increased, and this will also have an effect on escapement from traps.¹ After the first incremental change in minimum legal size, all of these factors will play some role in determining the size distribution of the catch. Consequently, any model must take all these variables into account to predict the effect of changes in the legal measure on catch.

Structure of the Model

The biological model used in this paper was modified from a set of equations used by Hancock (1975) and Gulland (1961), who separately did pioneering work on the effects of changes in mesh size upon catches of crabs in England and herring in northern Europe. The formulae we developed to assess the changes in size and weight of lobster catches in Maine as the legal minimum size is increased by 1/16 inch annual increments are lengthy, and their presentation is unnecessary for our purposes. (A mathematical exposition of the model appears in Appendix I.)

However, several features of the model need to be mentioned at this point. First, changes in weight and legal sizes of lobsters as the minimum size is increased are seen as a function of six sets of variables:

1. trap selectivity
2. natural mortality
3. annual rate of carapace growth
4. frequency distribution of lobster sizes in the current catch
5. the proportion of female lobsters in each size category that are mature
6. the proportion of mature female lobsters in each size category that are "berried" (i.e. egg-bearing).

Second, this model is based on two assumptions about the lobster

¹ Mandatory spaces in the trap designed to allow small lobsters to escape.

fishery.

1. We assume that no change occurs in recruitment into the fishery during the years that the legal measure is being increased. In some years, as every fisherman knows, more small lobsters molt into legal size than in other years. Since there is no way to predict such changes in catchable lobsters years in advance, we have had to assume that recruitment is constant.
2. We assume that there will be no change in fishing effort. Fishermen may well want to increase the number of traps they fish as the measure is increased; and some men may go out of business. Both factors will affect the fishing pressure put on the lobsters. Again, since there is no way to predict what will happen, we have assumed that effort will remain constant as well. All researchers who have attempted to predict the effects of size regulations (e.g. mesh size, legal measure, etc.) on catches have had to make these assumptions. We have followed suit.

Third, we recorded the length of lobsters in millimeters, since it is impractical to weigh lobsters on a boat. However, from the point of view of the fisherman, it is the weight of lobsters that is critical, since lobsters are sold by the pound. In order to convert our data on lobster sizes to weight we used a standard formula developed by Thomas (1971).¹ We feel this formula is highly accurate since it was developed by studying the relationship between length and weight for hundreds of lobsters.

Fourth, as the measure is increased, all six factors have an influence on size and weight frequency distributions. However, it is important to note that in the first year, as the measure is increased from

¹ The formula for converting length to weight is as follows:

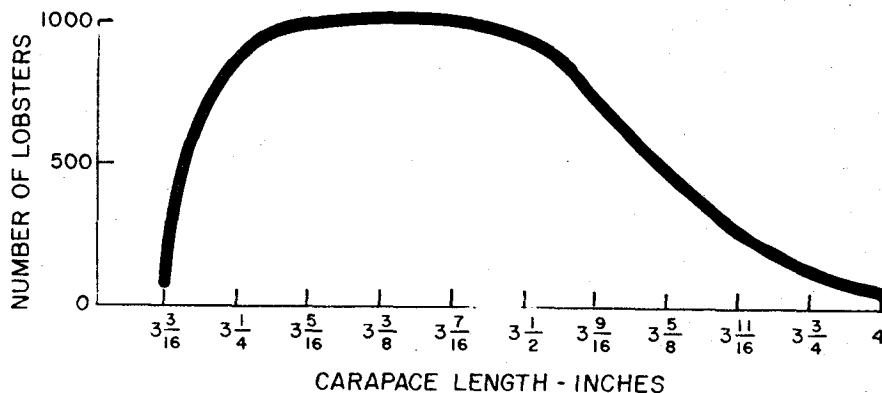
$$W_i = (25.4) (0.001682) L_i^{2.82826}$$

where W and L are the average weight and average length of a lobster in the i -th size interval, respectively. $i=1,2,\dots,k$.

3 3/16 inches to 3 1/4 inches, the number of variables the model takes into account is small. In later years, all of the variables influence size and weight distributions of lobster catches in complicated ways, and the formula used is correspondingly complex. Nonetheless, the principle of what the model is doing is relatively simple and can best be explained graphically.

Figure 1

Size Distribution of the Current Lobster Catch



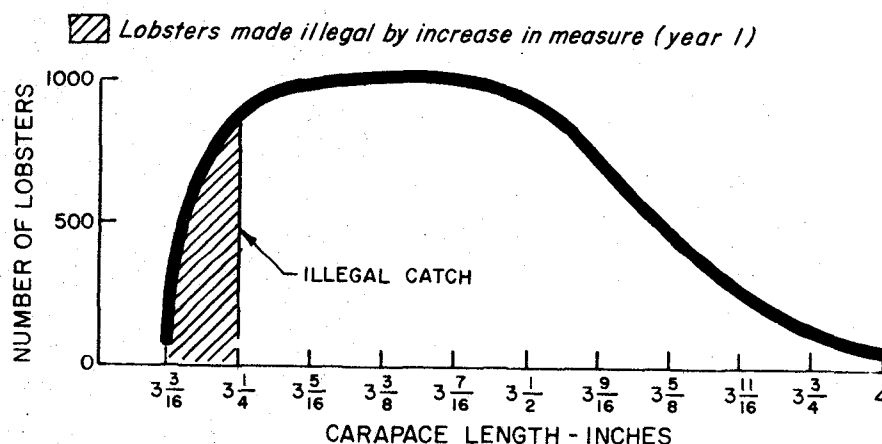
The size distribution of the current lobster catch can be graphed as in Figure 1.¹ As the minimum measure is increased from 3 3/16 to 3 1/4 inches during the first year the law is put into effect, there will be some decrease in the catch because all those lobsters under 3 1/4 inches will have become illegal. However, in the first year there will be few changes in the lobster population, since small lobsters released from

¹ This graph is not fully representative of the actual catch. The graph is approximately accurate, and is useful for heuristic purposes only.

traps (due to the change in the measure) will not have increased in size, and most of the released females will be neither mature, nor berried. Thus, in the first year, the number of lobsters fishermen can catch will decline and there will be no compensating increase in the size and weight of the lobsters. This situation is graphed in Figure 2.

Figure 2

Effect on Catch as the Legal Measure is Increased From $3 \frac{3}{16}$ to $3 \frac{1}{4}$ Inches (First Year Increment)



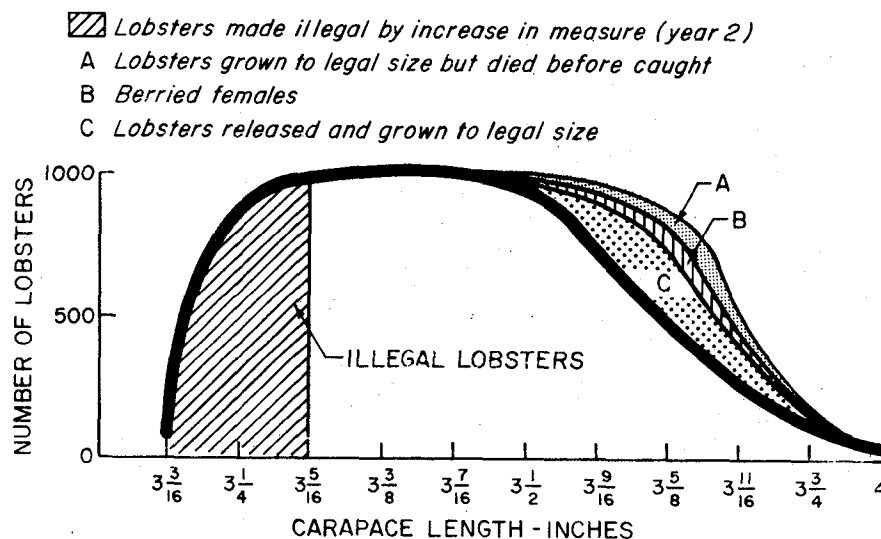
The effect of the increase in the measure is to make illegal all of the lobsters in the vertically striped portion (between $3 \frac{3}{16}$ and $3 \frac{1}{4}$ inches). These are lobsters which were legal before the increase in the measure.

In the second, third, fourth, and fifth years, the situation is more complicated, because each succeeding increase in the measure reduces the number of small lobsters that can be caught, but lobsters which have been released have shed into larger size categories, and large numbers of released females have matured and extruded eggs. Thus, a considerably

higher percentage of female lobsters will become berried and will therefore be illegal to take. In addition, the released lobsters will have lived in the ocean for an extra year and a certain proportion of these will have died of disease, predation, or other natural causes. The effect of these factors on lobster catch in the second year is graphed in Figure 3.

Figure 3

Effect on Catch as the Legal Measure is Increased From $3 \frac{1}{4}$ Inches to $3 \frac{5}{16}$ (Second Year Increment)



In Figure 3, the original frequency distribution of lobsters is indicated by the heavy black line. In the second year, all the lobsters between $3 \frac{3}{16}$ inches and $3 \frac{5}{8}$ inches will have become illegal. These lobsters are indicated by the vertically striped area to the left of the graph. However, the lobsters that have been released by the first year's incremental change in the measure are indicated by the areas A, B, and C at the right side of the graph. Not all of these lobsters have become

larger legal-sized lobsters, however. Some of these released lobsters have died of natural causes. This reduction in the number of lobsters is indicated by the dotted area A. Another proportion of the lobsters released in the first year have become berried females and are now illegal. This further reduces the size of the legal catch as is indicated by the shaded area B, at the right of the graph. Some of the released lobsters have survived, grown and are of legal size. This increase in the catch due to an increase in the measure is indicated by the horizontally striped area C.

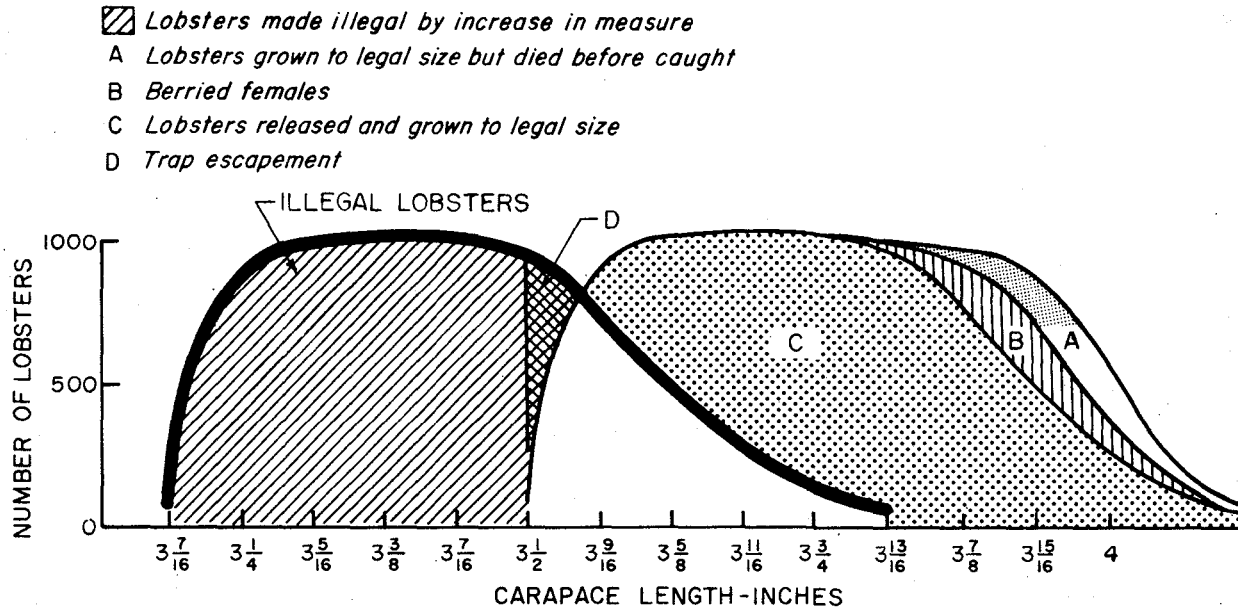
In summary, during the second year, an increase in the measure means that the lobsters represented by the vertically striped area and by the areas labeled A and B may not be taken. From Figure 3, it is obvious that the second year's increase in the legal measure will bring a decrease in total allowable catch. Similar tables could be produced for the changes in catch in the third and fourth years.

In the fifth and final year of increasing the legal measure by $1/16$ inch increments, all of the factors discussed for the second, third, and fourth years are still operating. In addition, we have assumed that during the fifth year the vent size would be increased to allow the lobsters between $3 \frac{3}{16}$ inches and $3 \frac{1}{2}$ inches to escape. Since these lobsters would be illegal, an increase in the vent size would reduce the handling and injury of sublegals, which would reduce the number of 'culls,' i.e., lobsters that have lost one or both claws. It would also help control cannibalism. All of the kinds of changes that will occur in the fifth year are summarized in Figure 4.

In Figure 4, the original frequency distribution is indicated, as before, by the heavy black line. In this year, all of the lobsters between $3 \frac{3}{16}$ inches and $3 \frac{1}{2}$ inches will have become illegal. This is

Figure 4

Effect on Lobster Catches as the Legal Measure is Increased From $3 \frac{7}{8}$ to $3 \frac{1}{2}$ Inches (Fifth Year Increment)



indicated by the large vertically striped area to the left of the graph. However, there will be a large number of lobsters which will have survived due to increases in the measure during the previous four years. This is indicated by the areas A, B, and C on the right side of the graph. Again, not all these released lobsters may be taken. Some lobsters will have died of natural causes and these are indicated by the dotted area A. And some females will have become berried; these lobsters are indicated by the shaded area B. However, in this fifth year a large number of the released lobsters will have molted into legal size and will be added to the allowable catch. These lobsters are indicated by the horizontally striped area C. As the vent size is increased in the fifth year, a few of the lobsters over $3 \frac{1}{2}$ inches, which otherwise would have been trapped, will probably escape. This added escapement is

indicated by the cross-hatched area D.

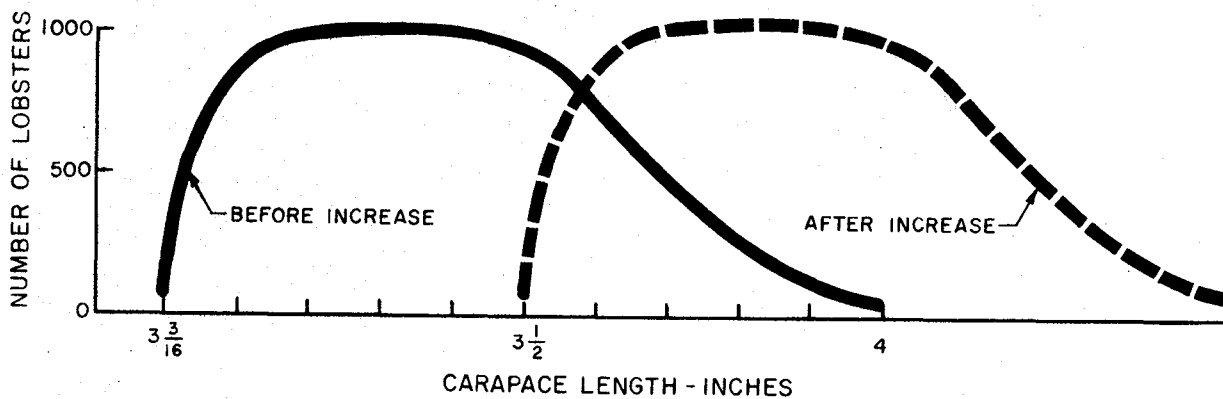
In summary, a change from the $3 \frac{3}{16}$ inch legal measure to the $3 \frac{1}{2}$ inch legal measure would lead to two general types of changes taking place:

1. all the lobsters between $3 \frac{3}{16}$ inches and $3 \frac{1}{2}$ inches would become illegal,
2. but the average lobster would be larger in size so that there would be more big lobsters in the legal size range.

The critical question is whether the decline in catch due to the loss of small lobsters is compensated for by gains in the catch of large lobsters. As we shall see, after the measure is completely increased to $3 \frac{1}{2}$ inches, there is strong reason to believe that the weight of the catch will increase. This situation again can be summarized in a graph (See Figure 5).

Figure 5

Total Catch at $3 \frac{3}{16}$ Inch Minimum Legal Size
and at $3 \frac{1}{2}$ Inch Minimum Legal Size



The frequency distribution to the left of the graph (under the heavy black line) again indicates the original frequency distribution of lobsters. When the minimum legal carapace length is $3 \frac{3}{16}$ inches all of the lobsters under this line can be legally taken. When the measure is increased to $3 \frac{1}{2}$ inches, all of the lobsters between $3 \frac{3}{16}$ inches and $3 \frac{1}{2}$ inches become illegal. In this case the legal catch is indicated by the projected frequency distribution to the right side of the graph, that is, the distribution which starts at $3 \frac{1}{2}$ inches.

Discussion of Data Used and Variables

Before we proceed further, some discussion of the data is necessary. Some of the biological data used in our model we collected ourselves; some was borrowed from other sources. Most of the basic concepts used in this paper are not new with us, but were developed by a number of other researchers. Most important, some of the variables used in our model are vastly more important than others, so even small changes in the values of these variables have a marked effect on the estimates of the sizes and weights of lobster catches. We will discuss each of the variables used in turn, covering these important factors.

Natural Mortality

Natural mortality is a critical variable from several points of view. The whole object of increasing the legal minimum size measure is to allow small lobsters to grow into larger size classes. This means that they are in the water for at least an extra year and subject to predation from other animals, disease, etc. If a very large proportion of those released lobsters die of natural causes, there is little sense in increasing the measure--in fact, it would make more sense to reduce

it. The model we have developed is very sensitive to changes in the estimates of natural mortality. From this point of view, it is one of the most important variables in the equation.

We made no pretence of trying to estimate natural mortality ourselves, but rather used the estimates of experienced biologists. There is, however, an enormous range of figures on annual average natural mortality in the literature. At one extreme, it is estimated that only 2 percent of the lobsters will die if left in the water an extra year; other estimates stemming from other techniques and data give annual average natural mortality figures of up to 30 percent (Thomas 1971: 46-53; Appendix Table 1). Thomas, who has had a good deal of experience in Maine, believes that the best estimate of annual average natural mortality is about 10 percent (1980). Accordingly, we will use that figure in our calculations. However, the uncertainty of this figure needs to be stressed. In the literature, there are nine different estimates of natural mortality for Maine. Four are higher than the 10 figure and four are lower (Anonymous 1978: Table 22). From this range of results, it is obvious that estimates of natural mortality have high variance.

Escapement

At any given vent size, a certain proportion of the small lobsters will escape from a trap. According to Thomas' work, escapement is a very important factor. Based on his data, he estimates that fully 90 percent of lobsters between $3 \frac{3}{16}$ inches and $3 \frac{1}{4}$ inches escape, and about 10 percent of those between $3 \frac{1}{4}$ inches and $3 \frac{5}{16}$ inches do so as well. Our data suggest that very few $3 \frac{3}{16}$ to $3 \frac{1}{4}$ inch lobsters escape from traps at current vent sizes. In our model, we use Thomas' data on escapement for certain purposes and our own at other times. The issue is not particularly important since our model is not very sensitive to escape-

ment. If we use Thomas' data or our own, the resulting estimates of future catches are almost identical.

If the legal minimum size were increased, it would make sense to increase the vent size to allow lobsters between $3 \frac{3}{16}$ and $3 \frac{1}{2}$ inches to escape. This would reduce cannibalism, death from handling, etc. In this paper we have assumed that the current vent size would remain in effect during the first four years that the measure is increased. In the fifth year, as the measure is increased from $3 \frac{3}{8}$ inches to $3 \frac{1}{2}$ inches, we have assumed some increase in the vent size to allow more sub-legal lobsters to escape. As has been pointed out in our discussion of Figure 4, this will cause a decline in the number of $3 \frac{1}{2}$ inch lobsters retained in traps. As a result, the catch would be slightly reduced by an increase in vent size.

Growth Rate of Lobsters

As the legal measure is increased, small lobsters will remain in the water for an extra year and then will molt into larger size classes. Thus, there will be fewer lobsters caught as the measure is increased, but they will be larger. Since our model assumes that all the benefits due to the change in the legal measure result from the larger average lobster size, the issue is, 'How much larger will lobsters be if they are allowed to survive one more year?' There is very little argument among biologists on growth rate. Virtually all lobster biologists agree that lobsters grow about 14 percent in length and about 40-50 percent in weight with every molt. In a cold year, molting of some lobsters might be retarded so that average annual growth might be 13 percent. Anyhow, the range of growth rates used in the model is between 13 and 15 percent, and our model is not very sensitive in this range. A 14 percent annual growth rate appears to be acceptable to those experienced with the biology

of the fishery, and we have used this figure (Thomas 1971:22-28).

Mature Females and Berried Females

Again, information on these two variables is important because some of the female lobsters will become sexually mature when they stay in the water for an extra year. Furthermore, some of these females will 'berry up,' becoming illegal to catch. All of the data on percentages of mature and berried lobsters in any given size class comes from work by Krouse and by Thomas. Krouse has studied the proportion of mature females in each size class; while Thomas' data indicate that, on the average, 30 percent of the sexually mature female lobsters are berried at any given time. From the work of these two biologists we have estimated the percentage of female lobster that will bear eggs and thus cannot be legally taken.

Size Distribution of Lobsters

James Thomas and his research crew from the Maine Department of Marine Resources obtained size frequency distributions for lobsters from all over Maine from 1966 to 1977. For 1977, he has a sample of 4014 lobsters (Thomas 1977).

In 1977-1979, we collected information on 8605 lobsters caught by boats operating in Muscongus Bay and John's Bay. We measured every lobster caught by the fishermen during the days we were on the boats. Despite the difference in the times the samples were collected, and the difference in sampling techniques, there are no important differences in the frequency distributions of lobster sizes reported by Thomas' research and our own. There is one difference; our sample turned up significantly more lobsters between $3 \frac{3}{16}$ and $3 \frac{5}{16}$, inches than are

reported by Thomas.¹ As we shall see, this difference does not cause any substantial change in the economic results produced by our model over the long run.

Results

We put three different sets of figures into the computer to produce three different sets of results. First, we used figures on all variables (e.g., natural mortality, growth rate, escapement, berried females) which we consider reasonably accurate. In this case, we have chosen, from among the available data, values which lie midway between the extreme observations or estimates. The results that come from using this data we call the most likely results. Since it is possible (but highly unlikely) that some of the extreme observations or estimates are accurate, we next used figures on all variables which would maximize the lobster catch after the minimum legal measure has reached 3 1/2 inches. This we call the best case. Last, we calculated the worst case, using values for all variables which would minimize the lobster catch at the end of six years. It must be stressed that the best case and worst case results are highly unlikely to occur in reality. We have calculated them for purposes of discussion, and to delineate the unusual results that might occur should all the extreme data observations turn out to be accurate. In other words, the best case results and worst case results set limits. We are sure that an increase in the legal measure will not produce a bigger gain in size of catch than our best case results. Similarly, a change in the measure would not reduce the lobster catch below our worst case estimates.

¹ In our data 23.1 percent of the lobsters measured were between 3 3/16 inches and 3 5/8 inches, whereas Thomas' data show that 16.1 percent are in this size range.

Again, it must be stressed we are assuming throughout that as the legal measure is increased, there will be no change in recruitment or fishing effort. Our model will predict actual catches as the measure is increased only if these two factors stay the same. If, for some reason, when the measure increased, a large number of high school boys should decide to go fishing, and an unusually large or small number of lobsters molt into legal size, our results will have to be interpreted differently.

Likely Results

In estimating the most likely results, we have done the following: First we have assumed that instantaneous mortality is .10, so 9.5 percent of the lobsters will die from natural causes over a year. This figure is thought to be reasonable by biologists. Second, we have assumed that the annual increase in lobster length is 14 percent. Third, we have assumed that the size distribution of mature females is as reported by Krouse in his 1972 article. Fourth, we have assumed that 30 percent of released, mature females will not be legal when caught because they will be berried. Fifth, all length frequency distribution information used came from the University of Maine project sample. Sixth, we assume that there is no significant escapement, as is indicated by the University of Maine project data.

The most likely case results are presented in Table 2. These results indicate that at the end of the first year, the number of lobsters in the catch would drop by 11.7 percent and the weight of the catch would drop by 9.2 percent. The next year, as the measure increases from 3 1/4 to 3 5/16 inches, there would be a 13.5 percent increase in numbers caught, but only a 7.7 percent decrease in weight because some of the lobsters caught would be larger. In the third year, as the measure is increased from

Table 2

Most Likely Change in Numbers and Weight of Lobsters Caught
With an Incremental Annual Increase in the Legal Measure

Year	Increase in Minimum Legal Carapace Length		Percent Change From Current Landings	
	From	To	Numbers	Weight
1	3 3/16	3 1/4	-11.7	-9.2
2	3 1/4	3 5/16	-13.5	-7.7
3	3 5/16	3 3/8	-15.7	-6.7
4	3 3/8	3 7/16	-19.6	-7.1
5	3 7/16	3 1/2	-20.9	-4.7
6	Remains at	3 1/2	-12.0	+7.9

3 5/16 to 3 5/8 inches, there would be a 15.7 percent loss in numbers and a 6.7 percent loss in total landed weight. In the next two years, there would again be losses in both numbers and weight. In the sixth year, after the measure has reached 3 1/2 inches, there would be a loss of 12 percent in numbers, but a 7.9 percent increase in weight. The results of the sixth year indicate the permanent change that would occur as the measure is increased from 3 3/16 inches to 3 1/2 inches. There would be no additional gains expected in the seventh, eighth, or ninth years.

As the measure is increased from 3 3/16 inches to 3 1/2 inches, the number of egg bearing females would double, according to our estimates. While these females cannot be legally caught, they would undoubtedly produce an increase in the number of eggs in the water. In the far future, there is a possibility that this increase in the number of eggs produced might result in an increase in recruitment and lobster catches. Whether or not this increase in catch would occur is impossible to predict; very little is known about the relationship between the number of eggs in the water and the hatching and survival of small lobsters to sizes where they can be caught legally.

It is critical to understand that nothing can be predicted from

these figures alone about the effect of an increase in the legal measure on fishermen's income. To assess the economic effect of an increase in the measure, we must combine this biological information with economic information on factors governing the supply and demand for lobsters. This will be done in a later section.

Best Case Results

In estimating the best case results, we have used the following sets of parameters. First, we have assumed that annual average natural mortality is 4.6 percent. This figure is one of the lowest, but it has been calculated by Thomas (1971:46-53 and Table 10). Second, we have assumed that lobsters increase in length by 15 percent per year. Third, in estimating numbers of mature females, we have used Krouses' data but decreased every figure in the series by 10 percent (1972). In this case, we are decreasing the number of released females considered mature, and thus our estimates of allowable catch are increased. Fourth, we have assumed that 27 percent of mature released females are already berried when they are caught. This again increases the estimated catch to fishermen. Fifth, we have used Thomas' data (1979) on escapement. Thomas assumes that a high proportion of the smallest legal lobsters are escaping from traps, and this will swell the number of lobsters which survive to be caught in future years. Sixth, we have used our own data on the frequency distribution of lobster sizes.

The results of the simulation model, operating with these assumptions and with these data, are summarized in Table 3. At best, an increase in the legal minimum measure would produce a drop in both numbers and weight of lobsters caught by fishermen during every year the measure is increased. In the sixth year, however, there would be

Table 3

Best Results Possible In Changes in Numbers and Weight of
Lobsters Caught With an Incremental Annual Increase in the
Legal Measure

Year	Increase In Minimum Legal Carapace Length		Percent Change From Current Landings	
	From	To	Numbers	Weight
1	3 3/16	3 1/4	-11.7	-9.2
2	3 1/4	3 5/16	-12.8	-6.7
3	3 5/16	3 3/8	-14.4	-4.6
4	3 3/8	3 7/16	-14.8	-0.2
5	3 7/16	3 1/2	-27.3	-8.7
6	Remains at	3 1/2	-7.8	+20.4

a 7.8 percent loss in numbers but a 20.4 percent increase in total weight of the catch due to the larger size of the lobsters being caught.

Worst Case Results

In calculating the worst possible results that could occur as the legal minimum size measure is increased from 3 3/16 inches to 3 1/2 inches, we have assumed that the annual average mortality rate is 24.2 percent, which means that roughly 1/4 of the lobsters spared by the increase in the legal measure will die before molting into the 3 1/2 inch size range. This is a very high figure, but at least has been suggested (Thomas 1971:46-53). Second, we have assumed that lobsters will increase in length by only 13 percent per year. Third, in estimating the number of mature females, we have again used Krouse's data (1972), but have increased the figures 10 percent. This increase in the estimate of the number of mature females has the effect of decreasing the allowable catch to fishermen. Fourth, we have assumed that 33 percent of mature released females are berried when they are caught. This again decreases the estimate of allowable catch. Fifth, we have used Thomas' data on escapement. His data indicate that a high percentage of smallest legal lobsters escape from traps. These lobsters will be subjected to the

24.2 percent mortality rate and this will not be available to fishermen. Sixth, we have again used only our own data on length frequency distributions.

Table 4

Worst Possible Results in Changes in Numbers and Weight of Lobsters Caught with an Incremental Annual Increase in the Legal Measure

Year	Increase In Minimum Legal Carapace Length		Percent Change From Current Landings	
	From	To	Numbers	Weight
1	3 3/16	3 1/4	-11.7	-9.2
2	3 1/4	3 5/16	-15.2	-9.9
3	3 5/16	3 3/8	-19.0	-11.1
4	3 3/8	3 7/16	-22.7	-11.5
5	3 7/16	3 1/2	-37.8	-24.2
6	Remains at	3 1/2	-22.9	-3.0

The results of our model operating under these conditions are shown in Table 4. These results indicate that there will be a decline in both the numbers of lobsters caught and the weight of the catch for every year the measure is increased. It is most important to note that under these conditions, there would be a permanent 22.9 percent decline in numbers and a permanent 3 percent reduction in the total landed weight. (See year six results in Table 4.)

Summary of Biological Model Results

There are several things which deserve to be emphasized about these results.

First, the model predicts changes in catch only if fishing effort and recruitment remain constant.

Second, as the measure is increased by 1/16 inch intervals over a five year period, the most likely result will be a decrease in both

weight and numbers in every year the measure is increased. In the sixth year, however, there will likely be a 12 percent decrease in numbers landed, but a 7.9 percent increase in weight of the total catch. The exact figures are presented in Table 2, which summarizes the most likely case results.

Third, it is possible that an increase in the measure could produce the results indicated by the best case or the worst case results, but we believe this to be extremely unlikely. We strongly believe that an increase in the measure will produce results falling between these two extremes. We have used all the most pessimistic estimates in calculating the worst case results, and the most optimistic figures in calculating the best case results. At worst, an increase in the measure would produce substantial declines in both numbers and landed weight of lobsters in every year the measure is increased. In the sixth year, there would be a permanent 22.9 percent drop in numbers and a 3 percent drop in weight. This is indicated in Table 4 in the sixth year results. At best, an increase in the measure would mean a decrease in number of lobsters caught and the weight of the catch in every year the measure is increased. However, in the sixth year, after the measure has reached 3 1/2 inches, there would be a 7.8 percent drop in numbers caught, but a 20.4 percent increase in landed weight. This is indicated in Table 3 in the sixth year results.

Fourth, these changes in numbers and weight of lobsters caught as the legal measure is increased to 3 1/2 inches over a five year period tell nothing about the way an increase in the measure will affect revenues to fishermen. To predict changes in income to fishermen we need not only these data on lobster biology, but also information on factors affecting supply and demand for lobsters.

The Economic Model

General Discussion

The object of this paper is to predict the changes in lobster fishermen's total revenue as the legal lobster measure is increased from 3 3/16 inches to 3 1/2 inches. Revenue to fishermen is calculated by multiplying the quantity of lobsters caught by their ex-vessel price. Thus, to assess changes in revenue as the measure is increased, we need to know the change in the quantity of lobsters caught as the measure is increased and the price associated with that change. In the last section, we assessed the changes in quantity which would result from an increase in the measure. In this section, we will concentrate on changes in the ex-vessel price of lobsters which occur as the measure is increased. In the final section, we will put these data on quantity and price together to assess changes in total revenue to fishermen. It is clear that an incremental increase in the legal measure from 3 3/16 inches to 3 1/2 inches will mean that there will be fewer lobsters put on the market, but they will be larger in size and weight. The way that these changes will affect the income of fishermen will depend completely on the market for lobsters. For example, if the price of lobster increases sufficiently in response to a reduction in catch, fishermen will gain income despite the smaller catch. But if the price of lobster increases at a slower rate than the rate of reduction in catch, fishermen will lose income.

The overall pattern of relationship is clear however. During each of the five years that the legal measure is being increased, lobster landings will be smaller than current catch (measured by either total numbers or by total weight). After the fifth year, the catch will contain fewer lobsters than the current catch, but the total weight will be greater. Each of these landed weights is associated with a particular

price in the market. What we want to understand, then, is this relationship between yearly decreases (or increases) in the landed weight of lobsters and the price of lobsters. The relationship between the quantity of a product offered for sale in the market and the price that consumers are able and willing to pay for the product is called a demand equation.

Ordinarily, as quantity goes down, price increases; and as quantity rises, price will fall. In addition, there are other factors influencing the quantity purchased besides price, such as the consumer's earning power and the prices of goods that the consumer might substitute for the one in question.

In economics there is a standard set of techniques and concepts to study demand equations. The way we estimated the demand equation for lobsters (relationship between price and quantity landed) is a commonly used technique called a two stage least squares regression. We first derived a list of factors which would likely influence lobster demand and supply. We were guided in our choice of factors by both economic theory and observation of the lobster fishery. These factors were used in the estimation of a supply and demand model of the market for lobsters between 1947 and 1978. The supply equation is presented in Appendix III, and the demand equation is contained in Table 5.

As we can see from Table 5, all these variables, except the price of halibut, are statistically significant and the signs of regression coefficients are as one would expect. The most significant variable is the price of lobster, and our figures indicate that as the ex-vessel price of lobster increases one cent per pound, the amount demanded falls by about 581,000 pounds in the United States as a whole.¹ National

¹ This is in 1967 dollars. The decreases in quantity consumed in 1979 dollars is about half this amount.

Table 5*

Estimated Lobster Demand Equation in the
United States: 1947-1978

Variable	Regression Coefficient	Level of Significance
Lobster price (cents/lb.)	-0.5808	.0001
National Income (billions of \$)	0.04591	.0001
Price of Scallops	0.07323	.005
Price of Clams	0.1402	.005
Price of Rock Lobster Tails	0.01215	.1
Price of Halibut	0.06454	NS
Constant	49.3412	--

R-square = 0.73; Adjusted R-square = 0.66
(All prices are expressed in cents per pound.)

* A discussion of the structure and estimation methods used in calculating this economic model are contained in Appendix II.

income is next in degree of importance. Our figures indicate that as national income increases by one billion dollars, the increase in the quantity demanded will be 46,000 pounds. The prices of scallops, clams, and imported rock lobster tails are also significant, but they are not nearly as important in determining the quantity of lobsters demanded as are the price of lobsters and national income.¹ However, our figures do indicate that as the price of all three of these substitute goods increases, the quantity of lobsters demanded also increases. In short, the results of this study indicate that the quantity of lobsters demanded is influenced not only by the price of lobsters, but by national income and by the prices of the three substitute goods.

In addition, there is another factor influencing the Maine ex-vessel price—namely the fact that the seasonal pattern of Maine landings is different from the pattern of lobster consumption in the United States as a whole. A large proportion of Maine lobsters are landed in the summer

¹ For 1978, we estimate the price elasticity of demand is -1.292, and the income elasticity of demand is 0.86.

and early fall when the price is lower than the national annual average.¹

Thus, in order to relate the estimated changes in the quantity of lobsters landed to the price of lobsters, it was essential to do two things. First, it was essential to exclude from consideration changes in national income and changes in the price of the three substitute goods which we know also influence the demand for lobsters. This was done by solving the demand equation for lobster price with national income and the prices of the substitute goods fixed at some baseline level. In this case, we used 1977 figures to establish the baseline. Second, we had to correct for seasonal differences in landings by deriving an equation relating Maine price to the price of lobsters in the national market. After making these two modifications, we are left with an equation which explains how the Maine ex-vessel lobster price will change as the quantity of Maine landings is altered by increasing the legal measure.²

Any statistical technique involves a margin of error, and it is possible to estimate how large that margin of error could be. In order to determine how sensitive the predictions stemming from our equation are to possible statistical error, we used three different estimates for the lobster price coefficient in the demand equation. First, we calculated revenues to fishermen using a lobster price coefficient that came directly from our equation. Then we calculated revenues to

¹ Price of lobster in the United States is influenced by imported Canadian lobsters as well as by demand. Imports have been taken into account in our calculations.

² In economic theory, changes in price are determined by both demand and supply curves. We have related changes in price of lobster only to demand. In fact, everyone estimating a model for the lobster ignores the supply side completely (e.g. Hasselback 1979). Since the supply curve for lobster is highly inelastic, virtually all changes in price are due to changes in demand.

fishermen using higher and lower lobster price coefficients. These higher and lower figures were obtained by estimating the range of possible variation in the original price coefficient and by adjusting the price coefficient upward or downward accordingly.¹ In short, we have used three different equations to estimate the relationship between quantity of lobsters landed and their price.

In more technical terms, each of these price coefficients is associated with different relative demand elasticities. The highest price coefficient is associated with the relatively more elastic demand curve. The lowest price coefficient stems from the equation assuming the most inelastic demand curve. The coefficient estimated by our equation (without any adjustment) is associated with a demand curve of intermediate elasticity. Of the three, this is the most likely to occur given the figures at our disposal. Figure 6 summarizes the relationship between the price of lobsters, the quantity demanded and the relative positions of the three demand curves.

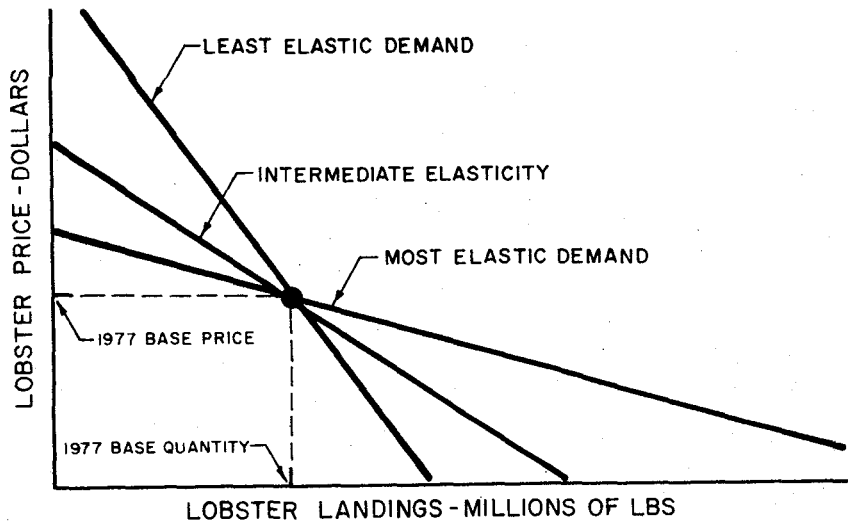
Results of Economic Model

The results of our combined biological and economic models can be summarized in a set of tables. Again, the biological model links changes in the legal measure to changes in quantity landed, and the economic model relates quantity landed to price. From this information we can calculate changes in revenues to fishermen as the legal measure changes. There are nine sets of results stemming from the fact that we calculated best, worst, and most likely biological results, and used a relatively more elastic, a relatively less elastic, and an

¹ We constructed a 70% confidence interval around the lobster price coefficient calculated in the original demand equation. We used the lower bound of that interval as the lobster price coefficient in the relatively inelastic demand equation. Similarly, we used the upper bound in the relatively elastic demand equation.

Figure 6

Ex-vessel Prices, Quantity of Landings and Elasticity of Demand



intermediate elasticity demand curve in calculating prices from quantity data. These figures on possible outcomes could be expressed in a three by three table similar to Figure 7.

Figure 7

The Nine Combinations of Biological and Economic Models

Biological Model

Economic Model	Best	Most Likely	Worst
Most Elastic Demand	'1'	'2'	'3'
Intermediate Elasticity	'4'	Center Cell	'5'
Least Elastic Demand	'6'	'7'	'8'

The center cell of Figure 7 would contain data on the most likely changes in fishermen's revenues as a consequence of the proposed increase in the legal measure. These results stem from using the most likely biological data on quantity landed and from data on price assuming intermediate elasticity of demand. These results on this most likely case are shown in detail in Table 5 below and deserve substantial elaboration since we believe they contain data on what is likely to occur if the measure is increased.

The data in Table 5 indicate that there will be a loss in total revenue to the lobster industry in all five years that the measure is being increased. In the first year the loss in revenue to the Maine lobster industry will be 2.43 million dollars as the legal measure is increased from 3 3/16 inches to 3 1/4 inches. In the second year, the loss will be somewhat less; revenue will be only 2.02 million dollars less than the baseline figure. In the third year, as the legal measure is increased from 3 5/16 inches to 3 5/8 inches, the loss in revenue will be 1.75 million dollars. Similar losses will occur in the fourth and fifth years. In the sixth year, after the measure has reached 3 1/2 inches there will be a permanent gain of 1.95 million dollars to the Maine lobster industry, which will occur every year thereafter. In terms of percentage, this represents a 5.5 percent gain in Maine lobster industry revenues resulting from an increase in the measure to 3 1/2 inches. Two things need to be stressed here.

1. These are estimates of gain and losses to the industry as a whole, and they do not predict what income to any given fisherman might be.
2. Also, Table 5 contains data on what we believe will most likely occur if the legal measure is raised incrementally over a five year period.

This table combines the most likely biological results with the most

reasonable economic model.

Table 5

Changes in Revenue to Fishermen as the Legal Lobster Measure
is Increased From 3 3/16 Inches to 3 1/2 Inches

Year	Legal Measure	Landings	Price	Revenue	Revenue Change	Percent Change
1	3 1/4	16.789	195.5	32.82	-2.43	-6.885
2	3 5/16	17.006	194.7	32.23	-2.02	-5.730
3	3 3/8	17.251	194.2	33.50	-1.75	-4.968
4	3 7/16	17.177	194.4	33.39	-1.86	-5.272
5	3 1/2	17.621	193.1	34.03	-1.22	-3.459
6	3 1/2	19.951	186.5	37.20	+1.95	5.538

1. Year indicates the number of years after the start of the incremental increase in the lobster measure.

2. Landings are calculated in millions of pounds. It is critical to note that these figures are not a prediction of actual landings which will occur as the measure is increased. These are relative figures, which assess relative changes from a baseline figure (1977 landings data) assuming all other factors remain the same, and only the legal measure changes. Landings in 1977 were 18.49 million pounds.

3. Price is in cents per pound, and again is a relative measure. Note that 1978 prices were used as a baseline. In 1977 the base price was 186.80 ¢/lb.

4. Revenue is simply landings multiplied by price and is expressed in millions of 1978 dollars.

5. Revenue Change is expressed in millions of 1978 dollars.

Similar results to the ones we have presented in Table 5 could be presented for every other cell in Figure 7. We could present data on changes in revenues to fishermen given, for example, the best case biological results and the most elastic demand estimates (cell 1), or changes in revenues assuming the worst case biological results and least elastic demand (cell 8), etc. We see no sense in presenting such a plethora of tables. This would simply confuse the issue. A study of the data from all other cells in Figure 7, however, does allow us to make one very important conclusion: there will be a loss of revenue to lobster fishermen every year the measure is increased. None of the results we obtained indicated an increase in revenue to fishermen in the first five years. This was true regardless of how we combined our

biological and economic data. In other words, it is true for every single cell in Figure 7 including the center cell, which we consider the most likely outcome (See Table 5).

There is, however, a difference in the average losses fishermen would incur depending on the cell we are talking about. The most optimistic of all possible results are contained in cell 6 (best case biological model coupled with least elastic demand). While we have not presented these results in a table, it should be noted that our figures show an average loss to the lobster industry of only 0.6 percent during the five years the measure is increased, and a 19.8 percent gain in revenue in the sixth year, after the measure has reached 3 1/2 inches.

The most pessimistic of all possible results were obtained under the conditions described in cell 3 (worst case biological model coupled with least elastic demand). Under these conditions loss of revenue in the Maine lobster industry during the five years the measure is being increased would average 14.8 percent per year. There would be a long term permanent loss of 8 percent in revenue after the measure has reached 3 1/2 inches. It must be stressed that we consider these results from cells 3 and 6 to be outlandish.

Advisability of Increasing the Minimum Legal Measure for Lobsters

The question that remains is, 'Is it worthwhile to increase the minimum legal measure for lobsters?' The answer to this depends on whether we are looking at the question from the point of view of fishermen currently in the industry or from the viewpoint of the society as a whole. We will begin by analyzing the issue from the vantage point of current fishermen and then discuss the broader implications.

When we increase the legal measure, we are asking fishermen to sacrifice current revenues to gain a permanent increase in revenues in

the future. We are, in essence, asking them to invest in the future of the lobster industry. Thus, when we are asking about the advisability of increasing the legal measure, we are really asking, 'Is the rate of return on that investment large enough to compensate lobster fishermen for the short run losses in revenues they will incur?' The standard method for assessing an investment when the costs and revenues extend over a period of years is to calculate the internal rate of return. We have calculated the internal rates of return for all the cells in Figure 7--all of the changes in revenues that could occur as the legal measure is increased using different combinations of assumptions about the biological and economic data. The results are contained in Figure 8.

Figure 8

Internal Rates of Return for all Combinations
of Biological and Economic Data*

Economic Model	Biological Model		
	Best	Most Likely	Worst
Most Elastic Demand	(1) 4%	(2) 0%	(3) 0%
Intermediate Elasticity	(4) 4%	Center 13%	(5) 0%
Least Elastic Demand	(6) 70%	(7) 43%	(8) 0%

* Internal rates of return were calculated using a time horizon of twenty years.

In Figure 8 the changes in revenue which would have occurred under the biological and economic conditions specified (for example, worst case biological data, least elastic demand, etc.) are evaluated as an investment. Again the most likely results on the internal rates of return are reported in the center cell of Figure 8. In this case we know that

as the measure is increased, fishermen will sacrifice an average of 5.3 percent of their current revenues in the five years the measure is increased, and will gain 5.5 percent each year after the measure is 3 1/2 (See Table 5). The results from figure 8 indicate that, for this most likely outcome, the return on the lobster fishermen's investment as the measure is increased is 13 percent. (For an explanation of the way these results were calculated, see Appendix II.)

We ran the exact same model, with the same specifications, using Thomas' size frequency data in place of our own. Under these conditions the most likely estimate of internal rate of return was 13 percent. Our data on lobster size distributions indicated that there were a larger number of small lobsters than Thomas observed. Thus, if our data are used, estimates of economic losses are greater in the first years the measure is increased, but losses are smaller in later years, and the long-term gain is slightly greater. These differences balance out, so that the same internal rate of return is produced using both Thomas' data and our own.

The most pessimistic result is contained in cell 3 of Figure 8, which combines the worst case biological data with the most elastic demand. The internal rate of return in this case is 0 percent. The results are worse than even this figure would indicate. Should these extreme assumptions prove accurate, fishermen would not only lose their entire investment, but would suffer additional losses as well. The most optimistic results are continued in cell 6 of Figure 8, which combines the best case biological data with the least elastic demand. Here the internal rate of return is 70 percent. This shows that in these conditions, fishermen would receive back not only the original investment they made as the measure was being increased in the first five years,

but 70 percent more. We regard these most optimistic and most pessimistic results as virtually impossible because they stem from combining the extreme economic and the extreme biological assumptions.

The fact that the internal rate of return is estimated to be 13 percent (most realistically) permits us to make few certain statements about the desirability of increasing the legal measure. The figure is neither high enough nor low enough to give us any definite answers.

From the point of view of the fishermen, this figure indicates that they will get a 13 percent return on the financial sacrifice made during the first five years while the legal measure is being increased. This is not an unacceptably low rate of return on investment. After all, return on investment on growing industries in the United States has been only 10 to 12 percent in 1979, which is considered a good rate of return. If the men in the industry were certain to receive this return, they would be foolish not to support an increase in the legal measure. Unfortunately, there is no guarantee they would get 13 percent. Our data on some aspects of the model are uncertain enough that an increase in the legal measure might bring a smaller or larger return. We have no way of knowing for sure. Moreover, an increase in the legal measure will certainly result in financial sacrifice on the part of those currently in the business. It is, in effect, an involuntary form of investment. However, established fishermen can be less certain about receiving the benefits in the future. They may not be in the industry several years hence. Even if the lobster business does improve due to an increase in the measure, newcomers are certain to enter and get part of the benefits, which would reduce returns to the men who made the original sacrifice. Given the uncertainty involved

about the true value of the internal rate of return, and the certainty that part of the future benefits will be captured by newcomers, an increase in the legal measure would probably not be desirable from the point of view of current fishermen.

From the point of view of the state as a whole, one can make a stronger case for increasing the legal measure. Our data indicate that an increase in the measure will likely bring some increase in revenues in the future. We are not certain which fishermen will gain the benefits but we know that fishermen in aggregate will gain financially over the long run.

In addition, we are relatively certain that an increase in the measure will double the number of berried females. Given the uncertainty of the stock/recruitment relationship, we do not know if an increase in berried females will result in higher catches in the future. However, an increase in the measure would add a margin of security. Certainly, there are biologists who strongly feel more berried females are needed to avert drastic decline in the lobster population (Anonymous 1978:125). While there is no overwhelming evidence supporting or refuting this position, if these biologists are correct, an increase in the measure would have beneficial effects in that it would help to avert such a disaster and would aid in insuring that future fishermen and consumers would have an ample supply of lobsters at a reasonable price. Such biological insurance would have benefits apart from any increase in fishermen's revenues that would result from a change in the legal measure.

Research Which Would Improve the Model

We are reasonably certain of the results we have produced--particularly in the most likely cases described for the biological and economic aspects of the model. In the course of doing this research, we

discovered that the precision of our model is limited chiefly by two things. First, the model is very sensitive to estimates of natural mortality. Unfortunately, estimates of natural mortality vary from 4 to 30 percent. While most biologists agree that natural mortality is about 10 percent, narrowing the range of these estimates as well as providing statistical confidence intervals would help narrow the range of our 'best' and 'worst' case biological estimates. Unfortunately, since we are social scientists, there is nothing we could easily do to improve on the biologists' estimates of natural mortality. Second, the certainty of our economic results would be increased by using monthly figures for all variables in the economic model, rather than annual figures. However, monthly data for the economic variables in question have not been published. It should be noted that the unavailability of monthly data has probably caused us to somewhat overestimate the economic benefits of increasing the measure.

Another important area for future concern is the size/price relationship. Students of fisheries economics have noted that there are differential prices paid for different-sized fish. They are beginning to take the size factor into account in estimating demand for fish (Gates 1974, 1979). If such price differentials do exist, changes in the legal measure, which will certainly affect size distributions, will also have an effect on revenues. In the lobster industry we have noted that such size effects do exist. In the Boothbay area, particularly, a premium price is charged for lobsters between 1 1/4 and 1 1/2 lbs. "Chicken" lobsters and larger lobsters bring a lower price per pound. In our model we have ignored this issue, although we recognize that a change in the measure will alter these size/price effects. There is no hard evidence concerning the way that a change in the measure will influence the prices

of various sizes of lobsters. We know that an increase in the measure will result in an increase in lobster sizes from 1.2 lbs to 1.47 lbs. This increase in "dinner lobsters," it might be assumed, would bring a higher price and thus increase revenues to the industry. On the other hand, such an increase in the measure will result in fewer small lobsters. It is possible that these scarce chicken lobsters might bring the highest price per pound if there is a group of consumers or restaurant owners who prefer them more. Since there is no way to predict whether the size effects will result in increased or decreased revenues as the measure is increased, we have made the conservative assumption that there are no relevant size effects. At present, any other assumption is unwarranted. Nevertheless, it should be noted that there are ways to include such effects in our model should data on the subject become available in the future.

Finally, it is critical to note that there are factors which could have caused us to overestimate and underestimate the internal rate of return resulting from a change in the legal measure. We have already mentioned that the size effects could have caused either an overestimation or an underestimation. Moreover an increase in the measure will certainly result in several kinds of costs which we have had to ignore. The gauges would have to be changed repeatedly, and an increase in the vent would mean that millions of traps would have to be altered. In addition, there will certainly be costs in administration, education and enforcement. We have ignored these costs, due to the problems of estimation involved. However, our model would have been improved had some way of including these costs been devised. Certainly ignoring these costs has caused us to overestimate somewhat the benefits of an increase

in the legal measure.

Summary

1. The results of our biological data alone show that an increase in the Maine legal lobster measure from 3 3/16 inches to 3 1/2 inches in 1/16 annual increments would most likely produce a decline in both weight of lobsters caught and the number of lobsters caught during all five years in which the legal measure is being increased. After the legal measure has reached 3 1/2 inches, there would be a 12 percent decline in numbers caught, but a 7.9 percent increase in the total landed weight (See Table 2).

2. The results of our biological and economic data demonstrate that such an increase in the legal measure would likely produce a decline in revenue to fishermen during all five years the measure is increased. In the sixth year, such an increase in the measure would produce an increase of \$1,950,000 total revenues in 1978 dollars (See Table 5).

3. Given both the biological and economic data, such an incremental increase in the legal measure would likely give a 13 percent rate of return on investment in the lobster industry as a whole. Current fishermen would sacrifice catches and income during the years the measure is being increased and would probably earn a lower rate of return. Given the uncertainties involved, an increase in the measure is probably not desirable from the point of view of those established in the business. From the point of view of the State of Maine, such an increase in the measure probably is desirable. It would likely increase total revenues to fishermen in the future and would provide some insurance against drastic stock declines. In addition, it might increase future lobster catches through long run recruitment increases.

Appendix I - The Biological Model

Let the sample of lobsters collected on the boats be described by the carapace length frequency distribution N_i ; $i=1, \dots, k$, where N_i is the number of lobsters in the i -th size category. With this notation $i=1$ corresponds to lobsters from $3 \frac{3}{16}$ inches to $3 \frac{1}{4}$ inches, $i=2$ corresponds to lobsters from $3 \frac{1}{4}$ inches to $3 \frac{5}{16}$ inches, etc. This is the base year frequency distribution, sampled with the legal measure set at $3 \frac{3}{16}$ inches.

We assume, given the large size of the sample, that the carapace length frequency distribution of the total Maine lobster catch is directly proportional to N_i and can be represented as bN_i ; $i=1, \dots, k$, where b is a constant. In the base year, the total catch of lobsters in numbers is

$$C_0 = b \sum_{i=1}^k N_i$$

Let C_t ; $t=1, \dots, 6$ represent the Maine lobster catch in numbers for years 1 through 6. Starting in year 1 and ending in year 5, the minimum legal lobster size will be increased by $1/16$ inch annual increments.

In the first year the $i-1$ size interval is now illegal, so the total catch is given by

$$C_1 = b \sum_{i=2}^k \frac{S_i^{(1)}}{S_i^{(0)}} N_i$$

where $S_i^{(0)}$ represents the base year trap selectivity for the i -th lobster size group, i.e., the base year probability that a trap will retain a lobster that falls into the i -th size category. Similarly, $S_i^{(1)}$ represents the trap selectivity for the i -th size category in the first year in which the legal measure is increased. In year one, the lobsters represented by bN_1 are now illegal and are released back into the ocean. These lobsters will have increased in size by the second year and will then become legal. In the second year, the catch is given by

$$C_2 = b \sum_{i=3}^k \frac{S_i^{(2)}}{S_i^{(0)}} N_i + b \sum_{j=1}^k \frac{S_j^{(2)}}{S_j^{(0)}} (1-M)q_{1j} (1-p_j)N_1 ,$$

where $S_j^{(2)}$ is trap selectivity for the j -th size group in year two, M is the average annual rate of natural mortality, p_j is the proportion of all lobsters in the j -th size category that can be expected to be bearing eggs, and q_{1j} is the proportion of lobsters that were in the first size category in the previous year, but have grown into the j -th size category in the current year.

The expression under the second summation represents the number of lobsters that, having been released into the fishery in year one, have survived and have been caught in year two. Not all the lobsters released in year one are caught in year two. The number caught is reduced from the year one total by three factors:

1. changes in trap selectivity,
2. natural mortality,
3. and the presence, in year two, of egg-bearing females that were immature in year one.

The formula assumes that 100 percent of the lobsters released in year one and not affected by these three factors will be caught in year two. In other words, the model assumes none of the lobsters spared by years one's increase in the legal measure will be spared in year two because they did not enter a lobster trap.

In the third year, the catch will be

$$C_3 = b \sum_{i=4}^k \frac{S_i^{(3)}}{S_i^{(0)}} N_i + b \sum_{i=1}^2 \sum_{j=1}^k \frac{S_j^{(3)}}{S_j^{(0)}} (1-M) q_{ij} (1-P_j) N_i$$

where all variables are defined as before. Note that q_{ij} represents the proportion of lobsters that were, in year two, in the i -th size category, but have grown, in year three, into the j -th size category. The values of the q_{ij} 's depend upon the annual rate of carapace growth.

In general, for any arbitrary year t , the catch can be represented as

$$C_t = b \sum_{i=x}^k \frac{S_i^{(t)}}{S_i^{(0)}} N_i + b \sum_{i=1}^y \sum_{j=1}^k \frac{S_j^{(t)}}{S_j^{(0)}} (1-M) q_{ij} (1-P_j) N_i$$

$$x = \min(t, 5); \quad y = \min \{(\max(0, t-1)), 5\}.$$

To convert the catches in numbers to catch in weight, we have applied the Thomas (1971) formula:

$$W_i = (25.4) (0.001682) D_i^{2.82826},$$

where D_i is the mean length of a lobster in the i -th size category (measured in inches), and W_i is the average weight of a lobster for size category i .

Let Q_t represent the weight of the total Maine catch in year t , then Q_t is given by

$$Q_t = b \sum_{i=x}^k \frac{S_i^{(t)}}{S_i^{(0)}} N_i W_i + b \sum_{i=1}^y \sum_{j=1}^k \frac{S_j^{(t)}}{S_i^{(0)}} (1-M)q_{ij} (1-P_j) N_i W_i,$$

$$x = \min(t, 5); \quad y = \min\{(\max(0, t-1)), 5\}.$$

Finally relative changes from base year numbers and weights given by

$$C_t^* = (C_t - C_0)/C_0 \text{ and } Q_t^* = (Q_t - Q_0)/Q_0, \text{ respectively.}$$

The equations developed above may be interpreted as predictions of future catches only if the levels of fishing effort and lobster recruitment remain at their base year levels throughout the period of prediction. If either of these factors change then the formula for total catch is difficult to interpret. However, the formula for the percentage change in catch remains valid. Rather than representing the percentage change from the base year catch, the formula represents the percent change in catch compared to what the catch would have been, had the measure remained at 3 3/16 inch. This distinction will prove important when the biological model is integrated with the economic model to predict changes in lobster industry revenue.

Appendix II - The Economic Model

The biological model provides estimates of relative changes in future Maine lobster landings, Q_t^* , due to the phased implementation of the 3 1/2 inch minimum legal lobster size. These estimates are based solely upon the observed carapace length frequency distribution and certain biological parameters. In addition the biological model assumes that the levels of lobster recruitment and fishing effort will not change.

To evaluate the economic impact of these estimated changes in lobster landings we must first convert the predicted quantity of landings into predicted ex-vessel price and then into estimated changes in future Maine lobster industry revenues. For this purpose we have estimated a lobster demand equation. This demand equation shows the relationship between the quantity of lobsters purchased, the level of national income, and the prices of certain seafoods that are substitutes for lobsters. The demand equation can be represented as

$$Q_t^{ME} + Q_t^{US} + Q_t^{CI} = a + b_1 P_t + b_2 X_{qt} + \dots + b_i X_{it}, \quad b_1 < 0, \text{ where}$$

Q_t^{ME} is the quantity of northern lobsters landed in Maine in year t ;
 Q_t^{US} is the quantity of northern lobsters landed in the United States in year t , excluding Maine landings; Q_t^{CI} is the quantity of northern lobsters imported from Canada into the United States in year t ;
 P_t is the ex-vessel price of northern lobsters in year t , measured

in real (inflation corrected) dollars;¹

X_{2t}, \dots, X_{it} are the variables measuring real national income and the real prices of substitute goods; e.g., scallops, clams, spiny lobsters, imported rock lobster tails, etc.; and a, b_1, b_2, \dots, b_i are regression coefficients calculated in a two stage least squares regression procedure.

To predict the real price associated with a given quantity of landings we solve the demand equation for lobster price, p_t , to get

$$P_t = \{a + b_2 X_{2t} + \dots + b_i X_{it} - Q_t^{ME} - Q_t^{US} - Q_t^{CI}\} / (-b_1), \quad b_1 < 0;$$

and Maine lobster revenue in any arbitrary year t is given by

$$R_t^{ME} = Q_t^{ME} P_t = Q_t^{ME} \{a + b_2 X_{2t} + \dots + b_i X_{it} - Q_t^{ME} - Q_t^{US} - Q_t^{CI}\} / (-b_1), \quad b_1 < 0.$$

The annual gain, or loss, in Maine lobster revenue that results from the phased change in the minimum legal carapace length is defined as

$$\Delta R_t^{ME} = R_t^{ME} - R_0^{ME}, \text{ where}$$

R_0^{ME} is base year revenue, measured in some year prior to any increase

¹ In the demand equation dollar values were corrected to 1967 dollars, but results of the economic model are reported in 1978 dollars to facilitate comparison with current dollars.

in minimum legal carapace length. We are interested in estimating the change in Maine lobster revenue that results solely from the proposed change in minimum legal carapace length, rather than revenue changes due to, say, an increase in the level of national income. Therefore, when estimating revenue, we have fixed the levels of all variables (except ex-vessel lobster price and Maine lobster landings) at their 1977 base year, $t=0$, values. To simplify the notation, let a constant k_0 be defined as

$$k_0 = a + b_2 X_{20} + \dots + b_i X_{i0} - Q_0^{US} - Q_0^{CI}$$

where X_{20}, \dots, X_{i0} , Q_0^{US} , and Q_0^{CI} are all set at their base year levels. Then for any year t , the alteration in the legal measure will cause a change in Maine lobster revenues which is calculated by the formula

$$\Delta R_t^{ME} = Q_t^{ME} \{ Q_t^{ME} - k_0 \} / b_1 - P_0 Q_0^{ME}, \quad b_1 < 0.$$

Since the biological model's predictions of future catch are measured in relative changes (Q_t^*) from base year landings, the formula for

ΔR_t^{ME} must be modified to accommodate the Q_t^* 's.¹ The identity,

$$Q_t^{ME} = \{1 + Q_t^*\} Q_0^{ME},$$

allows us to convert directly the relative changes in weight into absolute changes in revenue. With this substitution the formula becomes

$$\Delta R_t^{ME} = (1 + Q_t^*) Q_0^{ME} \{ (1 + Q_t^*) Q_0^{ME} - k_0 \} / b_1 - P_0 Q_0^{ME}, \quad b_1 < 0.$$

¹ Percentage changes are given by $100Q_t^*$.

Finally, to determine whether the proposed change in legal measure is of economic benefit to the industry, we solve the equation

$$\sum_{t=1}^{20} \frac{\Delta R_r^{\text{ME}}}{(1+r)^t} = 0$$

for r , the internal rate of return. If r exceeds the current interest rate, the proposed changes would prove economically efficient, and lobster fishermen would gain from the change in legal measure. But, should r be less than the current rate of interest, then the change in the minimum measure would be a net economic loss to the lobster industry. Although the predicted changes in revenues are evaluated for only the first twenty years, extending the time horizon beyond twenty years will not significantly increase the internal rate of return. Hence, our conclusions about the desirability of changing the legal measure would not be affected by this factor.

Appendix III - The Supply Equation

A supply equation for lobsters was constructed using the two stage least squares regression technique. As one can see from Appendix Table I, , which follows, four variables turned out to be statistically significant, sea water temperature, price of codfish, number of days a year when rain exceeds 0.1 inches, and the ex-vessel price of lobsters.

There has been a good deal of work done on the relation between the behavior of lobsters and sea water temperature. (Dow 1969). Our data certainly confirm the fact that catches are directly proportional to water temperature. We are not certain of the reason. Dow and others have hypothesized that fewer lobsters are caught in cold water because lobsters slow down and hibernate in deep winter months. However, we have noticed that fishermen slow up during the same months, and that fishing pressure is greatly reduced by bad weather. This leaves us with the important question of whether the catch reduction effect of cold weather is due to changes in the behavior of lobsters or of the fishermen. In this regard, it is to be noted that increases in the number of rainy days are also associated with reduction of catches. Rain, like sea water temperature, could effect fishermen or lobsters. In the case of water temperature, it is impossible to say whether declines of catches in cold water years are due more to changes in the behavior of lobsters or of fishermen. Rain probably affects fishermen more than lobsters. However, it should be noted that lobsters are very sensitive to changes in salinity. One wonders if rain might have an effect on the animals through changes in salinity. In any case, it is clear that adverse weather conditions affect catches.

Appendix Table I

Lobster Supply Equation

<u>VARIABLE</u>	<u>REGRESSION COEFFICIENT</u>	<u>LEVEL OF SIGNIFICANCE</u>
Annual average sea water temperature (Boothbay Harbor)	1.123	.001
Ex-vessel price of Cod	-1.233	.02
Number of days per year when rain exceeds 0.1 inch	-0.445	.05
Ex-vessel price of lobsters	0.081	.05
Ex-vessel price of Yellowtail Flounder	0.174	NS
Ex-vessel price of Scallops	-0.035	NS
Number of days per year snow exceeds 1 inch	-0.039	NS
Ex-vessel price of Haddock	0.056	NS
Ex-vessel price of Shrimp	-0.010	NS
Constant	-0.259	--

R Square = 0.55, Adjusted R Square = 0.37

An increase in the price of cod is associated with a reduced catch of lobsters. This probably indicates that when the price of groundfish is reasonably high, some fishermen will switch from lobster to groundfish. In recent years, there have been an increasing number of lobster fishermen who have fished for groundfish in the spring.

The price of lobsters is positively correlated with the quantity of lobsters landed. This indicates that as price of lobsters goes up, fishermen will make more effort to catch them.

It should be noted that the elasticity of supply for 1977 was estimated at 0.180. This is highly inelastic, which means that when lobster price increases, there is a less than proportional increase in the quantity supplied. For example, if the price of lobsters in 1977 had been \$1.00 higher per pound, the increase in total U.S. landings and imports from Canada would have been only 180,000 pounds.

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CULTURAL AND TECHNICAL FACTORS INFLUENCING FISHING EFFECTIVENESS
IN THE MAINE LOBSTER INDUSTRY: AN ASSESSMENT
BY FISHERMEN AND BIOLOGISTS

James M. Acheson

Introduction

One of the topics of concern to fishermen everywhere is the factors influencing catches. They spend literally thousands of hours together talking about the effects of weather, seasons, fishing gear, and related topics, and many more hours alone wondering about fishing locations, the competition, and potential changes they might make to improve catches. Of course, fishermen do not always agree. At first, the outsider can pick up no discernable pattern in the conversations and technical talk. But as one becomes more familiar with the industry it becomes apparent that fishermen have pinpointed sets of factors which they are relatively sure influence catches, and have developed a set of hypotheses about the relative importance of these various factors. Moreover, the highline fishermen have a clear picture of fish behavior, ocean bottom, etc., and are able to relate these to catches. In short, highline fishermen not only note what comes out of fishing gear when it is pulled up, but have a world view which explains why.

The object of this paper is twofold: (1) to describe and analyze a set of natural, technical, and cultural factors which fishermen generally suggest influence catches in the Maine lobster industry, and (2) to discuss the analytic framework used by highline fishermen in assessing these factors.

When the novice begins to discuss factors influencing catches and behavior of lobsters, he is forced to enter a strange and technical sub-culture. Both the biologists and the fishermen have amassed an enormous amount of information and have developed a set of concepts for dealing with it.

Our study was carried out in two stages. In the first, a team of social scientists obtained detailed data on 7698 trap hauls which were

then analyzed with a view toward obtaining an independent set of baseline data on factors fishermen said affected catches. During this phase of the project, we obtained data on virtually all of the factors fishermen themselves said influenced catches in the short run. These data indicate that there is a tremendous amount of variation in catch levels, and that a large number of variables influence lobster catches. We felt it was important to obtain quantitative data on what actually influenced catches, in order to be able to assess the responses of fishermen.

In the second phase of the project, some of the data were compiled into tables and shown to 24 fishermen and four biologists¹ to obtain their reactions. Many of our findings on catches did nothing more than reinforce what fishermen already knew and could state very clearly; other tables contained data reinforcing what some fishermen believe but contradicting what other men believe. In many instances the explanations offered by fishermen agreed with those put forth by biologists; in other instances they did not. The results of this project not only give a picture of the so-called "objective" factors influencing catches, but also a kind of "world view"--an insight into the cognitive map lobster fishermen have concerning some of the important factors on which their livelihood depends. This viewpoint is compared with that of experienced biologists.

Methodology

Two very different methodologies were used in collecting the data on which this paper is based.

¹The four biologists were: Thomas Morrissey of the National Marine Fisheries Service; James Thomas, Department of Marine Resources, State of Maine; Dr. David Dean, Head of the Darling Center for Oceanographic Research and an amateur lobster fisherman; and Dr. Hugh DeWitt, Chairman of the Oceanography Department, University of Maine.

Factors Influencing Catches

To obtain independent baseline information on factors affecting catches, five researchers rode lobster boats owned by 18 fishermen in four towns in the Muscongus Bay region of Maine, and recorded data on 7698 traps hauled while researchers were on board.¹ One set of data was recorded for every string of traps pulled:² the name of the fisherman, the date, the string position, the type of bottom, the depth of the string, the position of the string, the type of bait being used, the number of layover days, and the relation of that string to those of other fishermen. For each trap in the string, we recorded the trap construction material, the length of the trap, the number of heads, and any unusual features of the trap. We also measured all of the legal-sized lobsters, and notched-tailed lobsters, and recorded the number of oversized lobsters caught, if any.³

¹During the summer of 1977, the trap sample was obtained by John Thorvaldsen, William Acheson and James Acheson. The winter (1977) sample was obtained by James Acheson and John Bort. The Spring (1978) sample was obtained by John Bort, Jayne Lello and James Acheson. During periods when we were doing our trap sample, we would normally wait until the evening news to get the weather, and then call fishermen who had agreed to help us to make arrangements. We would then get up between 3:00 a.m. and 6:00 a.m., depending on season, and meet the fisherman at some designated place-- normally the dock of the dealer or cooperative where he sells lobsters. Each of us would then spend the day on different boats recording data on every trap that was pulled during the day.

²Lobster traps are normally laid in clusters or "strings."

³Under current Maine law, only lobsters may be legally taken which measure between 3-3/16 inches on the carapace, and five inches. Moreover, it is illegal to take female lobsters with eggs or which have ever had eggs on them. In the past, female lobsters with eggs had to be marked by cutting a v-shaped notch out of one of her tail flippers. Such "notched-tail" lobsters and lobsters over 5 inches may not be legally taken by any fishermen since they are proven breeding stock.

The carapace lengths of lobsters were measured with a standard scientific caliper, and the results were recorded in millimeters. The weight was obtained by using a conversion formula developed by Thomas.¹ These data were then coded, keypunched and analyzed, and tables constructed.

Several biological and cultural factors influenced the information we obtained, and the way the data were handled. The most important were fishermen's hypotheses about catches and the variables affecting them.

(1) Fishermen strongly asserted that the working time of the bait ("layover days") was one of the critical factors influencing catches. In order to control for this factor, the output of all traps used in this study is measured in terms of pounds of lobster produced per trap per layover day (lbs/trap/LOD).

(2) Since fishermen strongly asserted that the trap construction material influenced catches, only fishermen who owned both metal and wooden traps were asked to participate in this project. These men did not have the same number of metal and wooden traps by any means, but they all had some of both types. This allowed us to compare catches of metal and wooden traps obtained by the same man in the same day.

(3) There is a good deal of evidence that some men are much better fishermen than others (Acheson 1977). In order to isolate the factors connected to skill, information was obtained only from fishermen who had been in the business full time for at least five years. There were no new fishermen or part-time fishermen in the sample. Thus, all the information we have on the fisherman's view of lobster behavior and fishing comes from men who are reasonably well-qualified to speak.

¹ According to Thomas (1973: 56) the weight-length relationship is indicated by the following formula: $Weight = 0.001682 L^{2.82826}$

(4) To test hypotheses concerning seasonal variations, we obtained data just after the lobsters shed in July and August; during November and December in the productive fall season; and again in April and May.

(5) Fishermen are constantly making minor changes in design of their traps, since they believe that the heads, size of the trap, trap construction material, etc. influence catches. We selected fishermen for this study who used metal and wooden traps, which were three and/or four feet in length and had hake mouth or hog ring heads, or a combination of these two types of heads.¹

(6) The annual round influenced the data we collected. A lobsterman's activities vary greatly from season to season. The midwinter months are unquestionably the slowest months of the year. During January, February, and March, men are fishing some three to 10 miles offshore. Bad weather and high winds increase gear losses, and make the work very difficult. Many men stay ashore during this period to build traps, and those who continue to fish pull their traps no more than six or seven times a month. As winter turns to spring, fishermen move their traps closer and closer to shore. During the three or four week moulting season, traps are placed very close to shore--literally in feet of breaking surf. The months of August, September, and October are prime fishing months when men put as many traps as possible in the water, and pull them every chance they get--sometimes every day. As fall progresses, fishermen again move their traps into deeper and deeper water, so that by December they are fishing traps miles from shore, and pulling them every few days at best.

¹ Heads are funnel-shaped openings in the trap, usually made of woven nylon twine, which allow lobsters to crawl in relatively easily, but make it difficult for them to crawl out. Hake mouth or skate mouth heads are made completely of twine and have very narrow openings for the lobster. Hog ring heads are also made of twine but the opening is held open with a metal ring about 5 inches in diameter.

The type of bait used varies also with season. Throughout the year one can ordinarily obtain redfish frames from local fish processing plants. During the alewife runs, in May and early June, fresh alewives are used for bait in large quantities. In the past few summers, very large quantities of menhaden, or "poggies," have moved into the area and have been caught up for bait. Herring cuttings are used between late June and November depending on herring catches. Periodically fishermen use mackerel or groundfish frames, but these are generally not preferred.

Due to the annual round, it was impossible to obtain sample catches for all depths and locations for every season. For example, it is impossible to obtain information on a large enough sample for statistical reliability on traps placed near shore for one or two layover days, under ten fathoms, in the winter. In the winter, no alewives, poggies or mackerel are used as bait. Correspondingly, we do not have adequate information on traps pulled in very deep water in the early summer for very long layover times.

(7) Lobster fishermen are strongly territorial. One does not go fishing at all unless one gains entrance to a harbor gang, and once admitted, one can only fish in the area "owned" by that harbor. Persistent interlopers are usually sanctioned by having some of their lobstering gear destroyed (Acheson 1972; 1975). In this area of Maine, fishing territories are nucleated. That is, men from each harbor gang have a strong sense of territoriality close to the mouth of their harbor, with this sense of "ownership" being weaker the farther from the home harbor one goes. On the periphery, there is almost no sense of territoriality, and a good deal of "mixed fishing" takes place. In the summer, when men are fishing shallow water areas for lobsters which have molted or are about to

much of the "bottom" they are exploiting is owned exclusively by their own harbor gang. In the late fall and winter, when traps are placed in 20 to 40 fathom water in the middle of the bay or "offshore," men are fishing with a large number of men from different harbors. Specifically, in the winter and fall, when men are fishing in the middle of Muscongus Bay, their traps are placed alongside those of men from New Harbor, Round Pond, Bremen and Friendship. During these months, the Pemaquid fishermen are fishing with men from New Harbor, South Bristol, and Little River.

Conceptual Frame of Fishermen and Biologists

The second part of this project involved collecting data on beliefs and concepts of fishermen and biologists concerning catches. These were obtained through participant observation and open-ended interviewing techniques. The principal investigator recorded observations and ideas fishermen offered about traps, catches, etc. during the course of the year we were on boats obtaining our catch sample. In addition, our data on catches were compiled into some 14 tables which were then shown to 24 fishermen and four biologists familiar with the lobster fishery, and their comments were recorded. These interviews lasted from 1 to 4.5 hours. It should be stressed that we obtained information on fishermen's concepts concerning catches through interviewing techniques that allowed them to spontaneously bring up any observation or hypothesis they desired. We deliberately did not use formal questionnaires, with directed questions, and so on. While data from formal questionnaires can be obtained quickly and is more amenable to quantitative analysis, the use of formal instruments restricts the choices made by respondents, and unquestionably predetermines

answers to some extent. We were interested not only in just obtaining answers, but in something more subtle--the world-view underlying those answers.

Factors Affecting Catches

Our data on catches were analyzed using two different sets of tools: (1) a multiple stepwise regression analysis, and (2) a set of elementary statistics (graphs, means, etc.). The regression analysis is perhaps most useful in allowing us to compare the importance of variables influencing catches relative to each other. The elementary statistics allowed us to bring out points concerning variation over the annual round. These graphs and charts could also be understood by fishermen, who ordinarily have no background in statistics. It was these graphs and statistics we showed fishermen and biologists when asking for reactions and explanations. In analyzing each factor, we will first give the quantitative data, then the fishermen's reactions to it, and finally the reaction of the biologists. The reactions will usually be phrased in qualitative terms. It is very important to record exactly what fishermen say in their own words.

Layover Day and Season

Catch Data

A good deal of work has been done on the relationship between the time traps are in the water and catches. It is one of the few variables that has been adequately studied. Our data reinforce previous work. In Table 1, it is to be noted that in every season, the catch increases every day the trap is left in the water, then levels off, and after some point begins to decrease.

Table 1

Lbs/Trap Haul by Layover Days by Season, 1977-78

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Summer	.7712 N=186	1.052 N=635	.928 N=1028	2.059 N=211	1.1934 N=10	1.033 N=48									
Late Fall			1.618 N=48	1.467 N=998	1.921 N=526	1.646 N=436	1.559 N=495	1.517 N=153			1.844 N=48	1.299 N=102			1.494 N=40
Spring	.6561 N=62	.623 N=463	.8752 N=770	.9024 N=809	1.1557 N=287	.8763 N=99	.842 N=209						.6120 N=26		

Statistical Note, Table 1
Results of t Tests on Differences in Mean Lbs/Layover Day by Season

Comparison	Value of t	Degrees of Freedom	Level of Significance
2 days Summer vs Spring	5.67	1074	P > .001
4 days Summer vs Spring	7.98	252	P > .001
" Summer vs Fall	4.10	265	P > .001
" Spring vs Fall	8.49	1804	P > .001
6 days Summer vs Winter	3.15	66.7	P > .005
" Summer vs Spring	.78	74.5	P > .20
" Spring vs Winter	6.26	251	P > .001

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For example, in the summer of 1977, traps caught a mean of .7712 lbs when they were hauled after one layover day; 1.052 lbs when they were hauled after two days; 2.059 lbs when they were hauled after four days. After five days, catches fell to .1934 lbs, and 1.033 lbs after six days. The same kind of pattern can be seen in Table 1 and Figure 1 for the spring and fall as well. In both these seasons, pounds per trap haul reaches its maximum after six layover days and falls if the traps are left in the water longer.

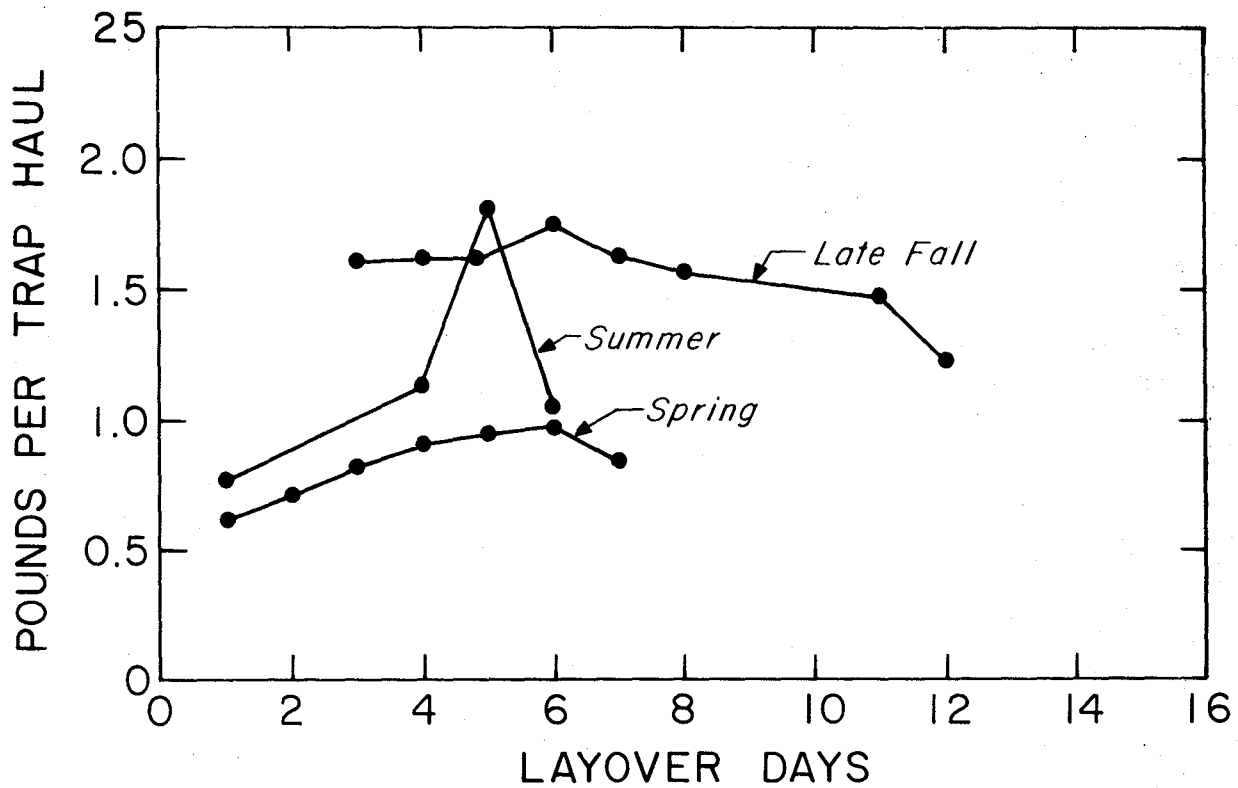
The data in Table 1 and Figure 1 demonstrate that traps are generally far more effective in the fall than in any other season, and least effective in the spring of the year. Traps hauled during the summer always do better than traps in the spring, for any given number of layover days, and worse than traps pulled in the fall. The one exception is that traps hauled after four days in the summer produce more than any other traps.

A series of t-tests demonstrate that the differences in mean catches is highly significant statistically. For example, traps pulled in the summer after two days produced 1.052 lbs, while traps pulled after two days in the spring gave .623 lbs. As can be seen in the statistical note this difference in means is significant at the .001 level. After four days in the water traps pulled in the summer produced 2.059 lbs, in the fall 1.457 lbs, and only .9024 lbs in the spring. The statistical note for Table 1 shows that all of these differences in means are significant at the .001 level as well. Much the same pattern is in evidence for traps pulled after 6 days too.

Traps come to their peak productivity faster in the summer than they do in either the spring or the fall. This is indicated in both Table 1 and Figure 1. In the summer, traps come to peak productivity at 4 layover

Figure 1

Pounds/Trap/Layover Day: Spring, Summer and Fall



The curves have been smoothed by using a 3 day rolling average.

days, whereas peak production is not reached in the fall or spring until after 5 days.

There is a great difference in the working time of traps in different seasons. In the summer, traps produce lobsters, if they are going to, after only a very few days. In fact 87.2 percent of the traps during the summer months were pulled in three layover days or under. By way of contrast, traps were pulled in the fall after much more time in the water. No traps were pulled after only one or two days in the water, and only 48 traps out of 2846 (or 1 percent) were pulled after three days. In this respect, the spring season, stands between these two extremes. In this season, almost half the traps (47.9 percent) were pulled when they had been in the water for one, two, or three layover days.

Correspondingly, catch begins to drop off much faster in the summer than in the other two seasons. In the summer, very few traps are pulled after four layover days, and those that are allowed to stay in the water five or six days produce significantly less than those that were pulled after four days. In the summer the traps pulled after four days produced 2.059 lbs of lobster per trap, while the traps allowed to stay in the water 6 days produced only 1.033 or half that amount¹. In the fall, traps were still producing lobsters after they had been in the water 15 days. In this season, 1274 out of 2846 traps (or 44.7 percent) produced lobsters after six layover days, and those traps were quite productive.

Fall traps do not begin producing lobsters until they have been in the water for three days, but they continue to produce at high levels for many days with very little drop in productivity. As can be seen in Table 1,

¹A t-test was run to determine whether this difference in means was significant. The calculated value of the t was 4.65 ($p > .001$).

all traps hauled between three and 11 layover days produce between 1.5 and 1.7 lbs of lobster per haul. More specifically after six days fall traps produce 1.64 lbs, and after 15 days, they produce 1.49. There is no significant difference in these means ($t = .524$, D.F. = 45, $p > .50$). In this respect, the spring season is far more like the summer than late fall in that the vast preponderance of traps were pulled between two and five layover days, and the productivity of traps fell after they had been in the water for a few days. For example, in the spring traps in the water for five days produced 1.155 lbs of lobster; those in the water for seven days got only .842 lbs per haul. This difference in means is highly significant ($t = 2.6$, D.F. 478, $p > .01$).

Fishermen's Reactions

Very few of these results surprised any of the fishermen interviewed. They are fully aware that the working time of the bait has an enormous influence on catch. As one man put it, "naturally a trap that is in the water three days will catch more than one that is in for only an hour or so. More lobsters have had a chance to discover the trap." The fact that catches per haul levelled out after some point was usually explained in terms of the defensive behavior of lobsters. Several men said something like, "once a trap has a couple of good sized lobsters, they will keep the others out."

Several fishermen were disturbed that pounds caught per trap haul actually decreased after some point, although some had suspected this might be the case. This was clear evidence that lobsters can crawl out of traps after the bait had been used up, and were fully capable of cannibalism--a fact no fisherman likes to think about.

The information on season was not questioned by any fisherman. They are familiar with the fact that catches are highest between September and December, and that spring fishing has been bad for a number of years. The fishermen questioned differ in their explanations for these phenomena. Most questioned explained this drop in catch in terms of availability. They know that most of the lobsters they catch are just barely over the legal size, and that a very high percentage of the lobsters that molt into the legal size are caught within a few months. "Just after shedding (molting), there's a whole new crop of lobsters we can catch. By the time spring rolls around, most of them have been caught up. A lot of the lobsters we catch in the spring are large. I think most of these come from 'offshore' in winter storms."

Some fishermen noted that this seasonal drop in catches was linked to water temperature too. That is, not only were there few lobsters, but the ones that were still available were very inactive in the cold spring water.

Fishermen were relatively uncertain why traps hauled in the summer and spring get their peak catches much faster than those in the fall and winter. Most of the explanations revolved around the bait and water temperature. This argument was put most coherently by a man who said: "In the summer you can't keep bait on for more than three days. Everything is eating it. If you haven't caught any lobsters in three or four days or so you are not going to. In the winter it is a lot colder and the bait lasts longer." Other men explained the reason it takes the bait so long to "work" in the winter in the following terms: "Everything is slowed down in the winter, including the way lobsters crawl. Have you ever seen the way lobsters act around a trap? First they have to circle it, and then they crawl all over the trap, and finally some will go in it. You can't catch any lobsters by pulling traps

every day in the winter. In one day, they haven't even got up ambition enough to find the trap."

At any rate, fishermen are fully aware that traps reach the peak production very quickly in the summer and spring, and that traps need to stay in the water a longer time in the fall. Their behavior reflects this knowledge. In the summer, traps were hauled after an average 2.7 days in the water. In the spring, they were pulled, on the average, after 3.8 days. In the late fall traps were allowed to "sit over" for an average of 5.7 days.

Biologists' Reaction

The biologists questioned about these data agreed almost completely with this whole analysis offered by the fishermen. The terms they used were a lot more technical to be sure, but little in the fishermen's general explanation seemed completely wrong or impossible.

There is some existing literature on the way catches are influenced by the working time of bait, usually described in terms of the number of layover days the trap is in the water (Dow 1961: 1-2; Thomas 1973: 29-42). All four biologists consulted agreed that catches were lowest in the spring and much higher in the fall and summer per unit of effort. The fact, they said, that productivity peaked and then fell in all seasons was due to cannibalism and escapement from traps. Three of these men had hard data on lobster escapement from traps.

Like the fishermen, these biologists were puzzled by the fact that traps in the summer produced peak productivity after four days. They were all aware that traps are usually pulled after one, two, or three days during the summer, and believed that productivity is highest after only a few days in this season. They suggested several possible explanations for this anomaly, which were not brought up by fishermen. One

suggested that females caught in these traps may have been exuding pheromones to attract males, and that this factor might have influenced catches in ways to produce the peak at the end of four days. Another suggested that these four day traps might have been in a different place or depth. He also pointed out that as layover days increase, there is an increase in the size of the lobsters retained by the trap. A third pointed out that lobsters eat a lot of crabs, and that if crabs crawled into traps first, there might be more lobsters in traps which had set in the water longer.

Skill

Catch Data

While there is some information in the literature concerning the effect of layover days on catches, there is nothing on many factors which fishermen assert are absolutely critical. Among those are fishing skill, trap construction material, and fishing areas, which fishermen believe have great influence on catches. There is no question that fishing skill and the territory in which one is allowed to fish have a great and obvious impact on catches. Our data on trap construction material are more complicated and need far more analysis.

The evidence that fishing skill is of critical importance is overwhelming. In virtually every case where we had a large enough sample to control for fishing area and type of trap, there were statistically significant differences in the pounds per trap per layover day caught by men of different skill levels for all towns in all seasons. The data presented to fishermen on this point was Table 2 which follows:

Table 2

Pounds Per Trap Per Layover Day by Harbor by Skill
New Harbor 1977-78

Fishing Skill	Trap Type		
	Vinyl	Wood	Aluminized
High	.266 (n=599)	.255 n=1668	.303 n=120
Highest	.353 (n=87)	.334 (n=949)	.513 n=177

Statistical Note, Table 2

A set of t tests was run to determine whether the differences in means observed in Table 2 were significant statistically. The results are summarized below:

Comparison	Value of the t	Degrees of Freedom	Significance Level
High Skill, vinyl vs wood	t= .666	1166	P < .50
High Skill, vinyl vs aluminized	t= .959	155	P > .20
High Skill, wood vs aluminized	t=1.290	135	P > .10
Highest Skill, vinyl vs wood	t= .450	103	P > .50
" " " vinyl vs alumin.	t=2.903	224	P > .005
" " " wood vs alumin.	t=4.473	214	P > .001
Vinyl Traps, High vs Highest Skill	t=2.065	107	P > .05
Wood Traps, High vs Highest Skill	t=5.169	1459	P > .001
Alumin. Traps, High vs Highest Skill	t=4.003	289	P > .001

The highest skilled men fishing from this one harbor caught more pounds of lobster per layover day than men fishing the same type of traps who were in the "high" skill category.¹

¹ In this study, no information was obtained on catches of unskilled novices or even average fishermen. Men were placed in the "highest" or "high" skilled category on the basis of their reputation in their own harbor gang.

High skilled men using vinyl traps got .266 lbs/trap/layover day, while men using the same kind of traps in the most highly skilled category got .353 lbs/trap/layover day. High skilled men using wooden traps got .255 lbs/trap/layover day, while the highest skill men got .334 lbs/trap/layover day. The most dramatic differences of all show up between men of different skill levels using aluminized traps. The high skilled men got .303 lbs/trap/layover day; while the men in the highest skill category got .513 lbs/trap/layover day.. Moreover, a set of t tests demonstrates that the differences in mean lbs/trap/layover day of men in these two skill categories is significant at the .05 or .001 level. (See Statistical Note in Table 2.)

However, the data in Table 2 tell very little about the productivity of different kinds of traps used by men of a given level of skill. For example, if we compare the traps used by high skilled men, the vinyl traps got .266 lbs/trap/layover day; the wooden traps got a little less, .255 lbs/trap/layover day; whereas the aluminized traps caught .303 lbs/trap layover day. However, none of the differences in means is statistically significant. The differences in mean output of traps used by the most "highly skilled" men produce better results. As one can see in the statistical note for Table 2, aluminized traps pulled by these men outfish both vinyl and wooden traps, and the difference in means is statistically significant. There is no significant difference between vinyl and wood traps pulled by these fishermen.

Fishermen's Reactions

The reaction of fishermen to Table 2 was very interesting. They completely ignored the skill issue, except for wanting to know who was in what category, and focused down on the information on trap type. No

one contested the results on skill. It is one of the truisms of the industry that some men are better fishermen than others.

Although it is clear that skills are critical in influencing catch levels, it is difficult to pinpoint exactly what those skills are. The topic of fishing skills is very complicated, and had been the topic of another article (Acheson 1977). Several factors complicate the study of skills. First, experienced and inexperienced fishermen identify different sets of skills as "the most important." Moreover, fishermen rarely talk about skills with any degree of candor. As one fisherman expressed it: "You're talking about the way I earn my living -- things that give me an edge on other people" (i.e. other fishermen). Nevertheless, it is clear that skills in trap placement are critically important. That is, what differentiates the good fishermen from an average one is the ability to move traps to take advantage of seasonal migration patterns and the ability to "hit" specific topographical features on the bottom (e.g. a certain depth, a certain deep spot where lobsters are concentrated, and so on). Of course, in addition, a fisherman must know how to build traps, maintain the boat and gear, obtain the proper kind of bait, etc., but all fishermen must know these things. Usually it takes years for a fisherman to learn how to place traps properly. Some men never learn. Every harbor has at least one middle-aged man who cannot seem to catch lobsters.

Fishermen have a great deal to say about skills when they want to talk about such matters. Generalizations are rare. Talk of trap placement quickly becomes a discussion about various "bottoms" and recent experiences "on" them. Stories are legion, but far too specific and technical to include here. Two older fishermen pointed out that they didn't think skill was as important a factor as in the past, since the advent of electronic depth recorders made it much easier to learn the bottom. Three younger men pointed out it was still a difficult task and one many men couldn't master, electronic gear or not.

Biologists' Reactions

None of the four biologists had much to say about the skills issue. It was not that they disagreed with the results, and all three had heard that skill did make an important difference in catches. However, there was nothing in their experience which allowed them to say much (Simpson 1975: 52). They had much more to say about the issue of trap construction material. The exception was the one biologist who is an amateur lobsterman. He strongly reinforced the fisherman's hypothesis concerning skill and trap placement.

Some biologists are aware that skill factors can influence catches. Thomas, for example, mentions that the "effectiveness of fishing is a factor that has been overlooked in the literature," and he goes on to mention that effectiveness over the course of time might have been influenced by the diffusion of more powerful engines and electronic gear (Thomas 1973).

Fishing Areas

Catch Data

Even in very small parts of the Maine coast, there are great variations in concentrations of lobsters. The reasons for this are obscure, but there is little question that men in some harbors have many more lobsters available to them than men fishing in the same season only a few miles away. The evidence for this assertion shows up most conclusively in the data gathered in the summer. In the fall and spring, men are doing a lot of mixed fishing together in the deeper waters in the middle of the bays or "off shore." In the summer, fishermen from each harbor are exploiting different fishing areas--namely the inshore areas held exclusively by the men from that one harbor. Thus, the catch figures for the summer pertain to traps that were pulled in different areas of

Muscongus Bay and John's Bay.

Table 3

Pounds/Trap/Layover Day by Town, Summer, 1977

<u>Bremen</u>	<u>New Harbor</u>	<u>Pemaquid</u>	<u>Friendship</u>
.674	.388	.496	.193
N=743	N=919	N=264	N=195

Table 3 which summarizes all of the catch data for the summer of 1977 gives very strong evidence that there are substantial differences in the rate that lobsters can be caught in these four fishing areas. Moreover, a series of t tests demonstrates that all of the differences in mean lbs/trap/layover day were significant at the .005 or .001 level. These results indicate that in the summer of 1977 Bremen fishermen caught the most lobster per unit of effort, followed by Pemaquid, and New Harbor. The Friendship fishermen did the least during this season.

It should be noted that this table does not control for either fishing skill or the type of trap used. Skill is highly significant, and as we shall see, trap type is as well. However, an attempt to compare traps, by season, town, skill level and trap type did not work out well since the numbers of traps in each cell was too small for statistical reliability. We cannot compare, for example, catches from aluminized traps from Friendship in the summer, for there were none in the sample. There were a good many other cells where there was no information.

Table 4

Catch by Town, Summer, 1977
(Controlling for Season, Skill & Trap Type)

<u>Skill Level</u>	<u>Trap Type</u>	<u>Lbs/Trap/LOD</u>	<u>Lbs/Trap/LOD</u>	<u>t</u>	<u>DF</u>	<u>p</u>
Highest	Wood	Pemaquid .439	Bremen .452	.309	1975	$p < .50$
Highest	Wood	Bremen .452	New Harbor .319	3.87	155	$p > .001$
High	Vinyl	Bremen .265	New Harbor .174	3.56	44	$p > .002$
Highest	Alumin.	Bremen .999	New Harbor .435	6.36	106	$p > .001$

In Table 4, as in Table 3, there is evidence that traps from Bremen did better than traps from other towns. The most spectacular results occurred by comparing lbs/trap/layover day of aluminized traps pulled by the most highly skilled fishermen from Bremen and New Harbor during the summer of 1977. The Bremen traps got .999 lbs/trap/layover day, while those pulled by New Harbor fishermen got only .435/lbs/trap/layover day. The results are significant at the .001 level. There is also a statistically significant difference in the catches of wooden traps pulled by Bremen and New Harbor fishermen (highest skills category). In the other two cases, Bremen traps did better than traps pulled by men from other fishing areas, but the results are not significant statistically. Both Tables 3 and 4 suggest that something was going on in at least Bremen waters to increase levels of productivity there.

Fishermen's Reactions

The fishermen were shown only Table 3. They were not surprised at the results. It was widely known in the industry that the Bremen fishermen have been doing very well the past few summers. There was a lot of adverse com-

ment to the effect that the Bremen men had done nothing to deserve this good fortune, but their success had been widely noted. Fishermen from other harbors were very interested to see the figures we presented to see just how much the Bremen fishermen had actually taken.

Surprisingly, most fishermen were at a loss to explain exactly why there were a lot more lobsters in Bremen waters during the summer. A couple halfheartedly mentioned darkly that they had heard a rumor that the Bremen fishermen had been saving all the short lobsters they caught in the spring, and were throwing them overboard as they approached the dock in Bremen. These lobsters, when they molted, turned legal, and stayed in Bremen waters to be caught up.

Eight fishermen mentioned that fact that there were two lobster pounds in Bremen. They suggested that there were probably more lobster eggs in Bremen waters due to the fact that there is a state program to buy back lobsters that "egg-up" in pounds; these are released to continue breeding. Six of these men were not totally convinced that the existence of pounds in the area could explain the phenomenon since they felt that even if the "egged lobsters" were released close to the two Bremen pounds, there was no strong reason to believe that they, their eggs, or offspring stayed in Bremen waters in numbers to make any difference in catch. Despite the fact that these men are generally aware that there is a circular current in the Gulf of Maine, phrased in terms of a "general westerly tide," so that larvae and eggs are carried long distances, and all believed that lobsters migrate seasonally, there is a nagging suspicion that the good fishing in Bremen was somehow connected to the existence of the pounds there. Two of the men who mentioned this possibility were absolutely certain of it. Most, however, had no explanation for the phenomenon.

The important point is that good fishermen feel there are "bodies of lobsters" in certain places at certain times. They are not spread over the bottom evenly. The trick in fishing is to move traps to hit those changing concentrations.

Biologists' Reactions

None of the biologists questioned saw anything startling in these results. One said that this phenomenon is "not unique." "All of a sudden, one area will do very well for a few years, and then return to normal." "Probably," he said, "a maze of environmental factors are involved. Any number of factors could account for unusually good fishing conditions in a small area: heat in summer, cold in winter, unusual success in reproduction, amount of fresh water in the bay" (Morrissey 1979). Two other biologists said they had not observed this phenomenon. One suggested it might be due to a difference in the kinds of traps used in one area (e.g. vented vs non vented). Another wondered about the skill of the fishermen involved. The fourth biologist hypothesized that the physiography of the region could account for much of the good fishing in Bremen. That is, he pointed out, Muscongus Bay is funnel shaped. It has a very broad mouth (10 miles) which becomes narrower, and finally turns into the Medomak River near Bremen. In summer, many lobsters enter the mouth of the Bay, and in June end up concentrated near Bremen as they migrate into shore. None of the biologists were much impressed with the fact that Bremen has two lobster pounds. Two, however, said this was an interesting hypothesis, but they clearly thought that eggs, larvae, and adult animals moved so much that lobsters released from the Bremen pounds would have little effect on catches ultimately. All the biologists were very familiar with the literature on lobster migration (Cooper and Uzmann 1971).

Trap Construction Material

Catch Data

The material that lobster traps are made from unquestionably has some effect on catch levels. On the whole, it appears that aluminized traps do better than those covered with vinyl coated wire, which in turn do still better than wooden traps. The data concerning trap construction material are complicated and difficult to interpret. Certainly no simple study of mean catches will suffice. This can be seen by looking at Table 2 which presents data on lbs/trap/layover day for the three types of traps, controlling harbor and skill level. As can be seen in this table, men in both the high skill and highest skill categories did best with aluminized fishing gear, and worst with wooden gear. The catch levels of vinyl traps were in between the other two. However, four of the six t-tests concerning these data produced insignificant results.

The situation vis-a-vis trap construction material is complicated by the fact that there is a great deal of variation over the annual cycle. This information is summarized in Table 5. In the summer, the data show that aluminized traps are superior to vinyl which, in turn, outfish wooden traps. These results are all significant statistically as well. The results from the winter and spring, however, produce no clear-cut results. In the winter, metal traps (vinyl and aluminized) clearly outfished wooden traps, and the differences in means is significant at the .005 level. However, the output of vinyl and aluminized traps during this season was so close that there was no significant difference in mean lbs/trap/layover day between the two. In the spring again, catches of aluminized traps were highest, and those of wooden traps lowest. However, there is no statistically significant

difference in mean catches at this time of year.

Table 5

Pounds/Trap/Layover Day for Vinyl, Aluminized
and Wooden Traps Over the Annual Cycle

<u>Season</u>	<u>Trap Type</u>	<u>Pounds per Trap per Layover Day</u>	<u>Number of Trap Hauls</u>
Summer 1977	vinyl	0.306	250
	wood	0.315	1402
	aluminized	0.850	466
Winter 1977-78	vinyl	0.381	270
	wood	0.265	1737
	aluminized	0.377	851
Spring 1978	vinyl	0.238	686
	wood	0.260	1119
	aluminized	0.267	917

Statistical Note, Table 5

	<u>Comparison</u>	<u>Value of t</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Summer 1977	vinyl vs wood	.0251	328	$P < .50$
	vinyl vs aluminized	-9.929	712	$P > .001$
	wood vs aluminized	11.813	550	$P > .001$
Winter 1977-78	vinyl vs wood	5.139	325	$P > .005$
	vinyl vs aluminized	0.156	510	$P < .50$
	wood vs metal	7.257	1277	$P > .005$
Spring 1978	vinyl vs wood	-1.220	1602	$P > .20$
	vinyl vs aluminized	-1.559	1549	$P > .10$
	aluminized vs wood	-0.396	1978	$P < .50$

The regression analysis gives far more evidence to substantiate the fact that trap construction material does have some influence on catches. (The regression figures were shown to only a very few fishermen.) The results of this analysis will be described in the next section, but some of this information can usefully be presented here.

Table 6 contains the results of the regression analysis for all the data on trap construction material gathered throughout the year.

Table 6

Trap Construction Material					Level of Significance
<u>Variable</u>	<u>B</u>	<u>BETA</u>	<u>Std Error of B</u>	<u>F</u>	
Vinyl Traps	Baseline Variable				
Wooden Traps	-0.2767385	-0.09448	0.07508	13.584	.001
Alumin. Traps	0.1546972	0.04821	0.07886	3.848	.05

In this analysis, wooden traps and aluminized traps are being compared to vinyl traps which serve as the baseline variable. The regression coefficients (B figures) indicate that wooden traps catch .27 lbs/trap less than vinyl traps, while the aluminized traps got .154 lbs/trap more. Even though these differences in poundage caught are quite small, they are highly significant statistically so that we can be reasonably certain that these results did not happen by accident.

Fishermen's Reaction

Our data on trap constructions material produced a good deal of discussion. This is scarcely surprising given the inconclusive nature of the results we presented to fishermen in Tables 2 and 5. Some men were very sure that metal traps produced larger catches overall; others were not at all sure.

Very few fishermen contended that wooden traps generally outfished metal gear. However, many men said they could see no difference in trap performance, and a couple of others said they were reasonably sure that wooden traps did as well as metal gear at certain times of year. They are quite correct in this respect. There is substantial evidence to demonstrate that some men, fishing at certain times of year did better

with wooden traps than with aluminized or vinyl gear. Such instances are few and far between, but they do exist (See Acheson 1980b and 1980c).

It should be noted that metal lobster traps are an innovation and have been used in this area only since 1974. The factors influencing the adoption of this innovation are complicated, and are the subject of another article (see Acheson 1980a). Two things should be noted about the spread of this innovation. First, metal gear is found in only a few harbors along the coast. The spotty nature of the adoption process is undoubtedly related to patterns of information flow. It is in harbors where such traps already exist that men can have a chance to observe the results. Second, even in those harbors, adoption of aluminized and vinyl traps is highly differential, with some men accepting them far faster than others. The early adopters are ordinarily men in their prime fishing years, who are highline fishermen with a strong commitment to fishing. They also have money to invest and network ties to sources of information on new fishing gear. The late adopters are generally older fishermen or very young men just starting out in fishing. There are very few highline fishermen among these late adopters. Furthermore, most of these late adopters are not in position to invest heavily in new fishing gear.

The opinions early, middle, and late adopters express about fishing gear vary greatly. The late adopters or men who have not accepted metal traps tend to believe that they do not really fish any better than wooden ones. Moreover, these men note, metal traps are much more expensive than the old style wooden gear. The early adopters, who are mainly highline fishermen, feel strongly that metal traps do fish better, although they are not sure of the reason. These men have advanced three hypotheses.

First, many fishermen believe that metal traps stay on the bottom better. Wooden traps, even when weighted, have a tendency to float and thus move somewhat due to the action of waves, wind and tide. Lobsters, so the story goes, prefer to crawl into far more stationary traps. As one fisherman put it "If you came up to a house and it was bouncing all over the lot, would you go in? It's the same with a trap." Second, some fishermen believe that lobsters are repelled by the smell emanating from vinyl-covered wire, and thus prefer the aluminized traps. Third, some men have mentioned that lobsters may be able to see better than we think, and thus prefer the bright, shiny metal wire of the aluminized traps over the duller wooden and vinyl traps. One fisherman, operating on this hypothesis, has put silver paint on parts of some of his wooden traps in the hopes of improving catches. Of all these hypotheses, fishermen mention the weight-of-metal-traps theory most frequently.

While our study indicates that trap construction material does have an important influence on lobster catches, there is nothing in our data to indicate why. All we know for certain is that in Muscongus Bay in 1977-78 lobsters were crawling into aluminized traps with greater frequency than into vinyl or wooden traps.

Biologists' Reactions

None of the biologists interviewed contested the accuracy of the information we gathered on the relationship between trap construction material and catches. On the whole, their explanations for the success of metal traps differed substantially from those offered by the fishermen. One biologist said that he believed metal traps caught more lobsters because they were more open (i.e. lobsters were less hesitant to enter a trap when they could see that nothing else was in it). Another went

along with the theory that the aluminized were shinier and hence more attractive to lobsters. The third wondered if the construction material was the critical factor, or if other variables were involved. He asked if it could be that more of the metal traps were vented. All of these questions are good ones. Unfortunately, we do not have the data to be able to give satisfactory answers to them. What is certain is that the fishermen clearly favor the weighted trap theory, while other explanations suggested themselves more readily to the biologists. This is not to say that the biologists completely discount the idea that metal traps do better because they are more stable on the bottom. All four biologists admitted, when asked, that this factor might have some bearing on the issue. One, who fished himself, said this hypothesis sounded quite sensible. He said all his wooden traps moved in storms or with the tide. The metal trap does not. His overall reaction to Table 6 was the same as many fishermen. "This data," he said, "tells me I should buy more metal traps."

None of the biologists suggested that smell of traps (i.e. vinyl) might influence catches, although there is substantial evidence that lobsters are repelled by certain smells (Dow and Baird 1961).

Bait

Catch Data

There are a large number of types of bait used over the annual round, depending on the availability of various types of fish and the preferences of fishermen. Redfish frames are obtained from plants, along with herring remnants. Most herring and redfish used as bait are obtained from Maine plants, but a fair amount is trucked from the

Atlantic Provinces of Canada. Redfish can usually be obtained fairly readily, while herring are usually available only during the processing season--June to December. Other types of bait can be obtained only at specific seasons. Alewives, for example, are taken from local fish traps as they run upstream to spawn, and are available only during a few weeks in the spring and early summer. Poggies (menhaden) periodically show up in Maine waters only in the warmest summer months, and consequently are available as bait only during the late summer and early fall. Periodically, local draggersmen will sell groundfish for lobster bait when they cannot obtain a reasonable price in Boston. Thus, what is known as dragged bait consists of cod, haddock, hake and whiting. During the fall a lot of small flat fish are sold as bait, while in the summer mackerel, kayak, or sea robin are sometimes used. Dogfish are only rarely used as bait although they are plentiful from July to September, because the vast majority of fishermen are convinced they catch nothing.

Table 7
Lbs/Trap/Layover Day by Bait by Season

	<u>Bagged Herring</u>	<u>Redfish</u>	<u>Poggies</u>	<u>Misc.</u>	<u>Alewives</u>	<u>Dragged Fish (Whittings)</u>	<u>Combined (Bagged & Stringed)</u>
Summer	.3045 N=560	.4599 N=188	.5131 N=528		.1726 N=195	.3551 N=160	.6090 N=487
Late Fall	.2643 N=1225	.2836 N=581		.3038 N=432		.2079 N=24	.4355 N=594
Spring	None			.3043 N=26	.2597 N=2505	.2105 N=194	
Total	.2769 N=1785	.3267 N=769	.5131 N=528	.3039 N=458	.2534 N=2700	.2715 N=378	.5137 N=1081

Statistical Note, Table 7

Results of t-tests for Bait

<u>Bait</u>	<u>Comparison</u>		<u>t</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Bagged Herring	Summer .3045	Winter .2643	4.11	764	P > .001
Redfish	Summer .4599	Winter .2836	3.49	220	P > .001
Misc. Fish	Winter .3038	Spring .3043	.010	29	Not Significant
Alewives	Summer .1726	Spring .2599	4.27	267	P > .001
Dragged Fish	Summer .3551	Winter .2079	2.28	55	P > .01
Dragged Fish	Winter .2079	Spring .2105	1.59	30	P > .07
Dragged Fish	Spring .2105	Summer .3551	2.28	55	P > .025

The same bait produces very different amounts of lobster from one season to another. In general, a given type of bait produces the most lobster per layover day in the summer, followed by the late fall, and the least in the spring.¹

¹It should be noted that pounds per trap haul are highest in the fall, as can be seen in Table 1. However, traps stay in the water much longer in the fall than any other season, so that the lbs/trap/layover day is smaller for the fall season than for the summer, when traps are pulled far more frequently.

This can be seen very clearly in Table 7. For example bagged herring produce .3045 lbs/trap/layover day in the summer; and .2643 lbs/trap/layover day in the fall. (No traps we observed used herring as bait in the spring.) Moreover, as can be seen in the statistical note for Table 7 the seasonal decline in mean catches for a given type of bait is highly significant statistically. The only exception to this rule is alewives, which produce significantly more in the spring than in the summer.

The reason that traps produce most in the summer and least in the spring is almost certainly connected to the availability of lobsters, as we have mentioned previously. That is, in the summer there are a large number of lobsters that have just molted into the legal size range. By the following spring, most of them have been caughts.

Perhaps more important than the seasonal variation observed is the fact that within any given season the productivity of different kinds of baits varies enormously. The relative productivity of various kinds of bait has been summarized in Table 8.

Table 8
Productivity of Bait by Season*

Best Bait	Summer	Late Fall	Spring
1	Combined .6090	Combined .4355	Misc. .3039
2	Poggies .5131	Misc. .3038	Dragged .2715
3	Redfish .4599	Redfish .2836	Alewives .2534
4	Dragged .3551	Herring .2643	
5	Herring .3045	Dragged .2079	
6	Alewives .1726		

*(Cont. from Table 8, Page 32) The numbers under each kind of bait are lbs/trap/layover day.

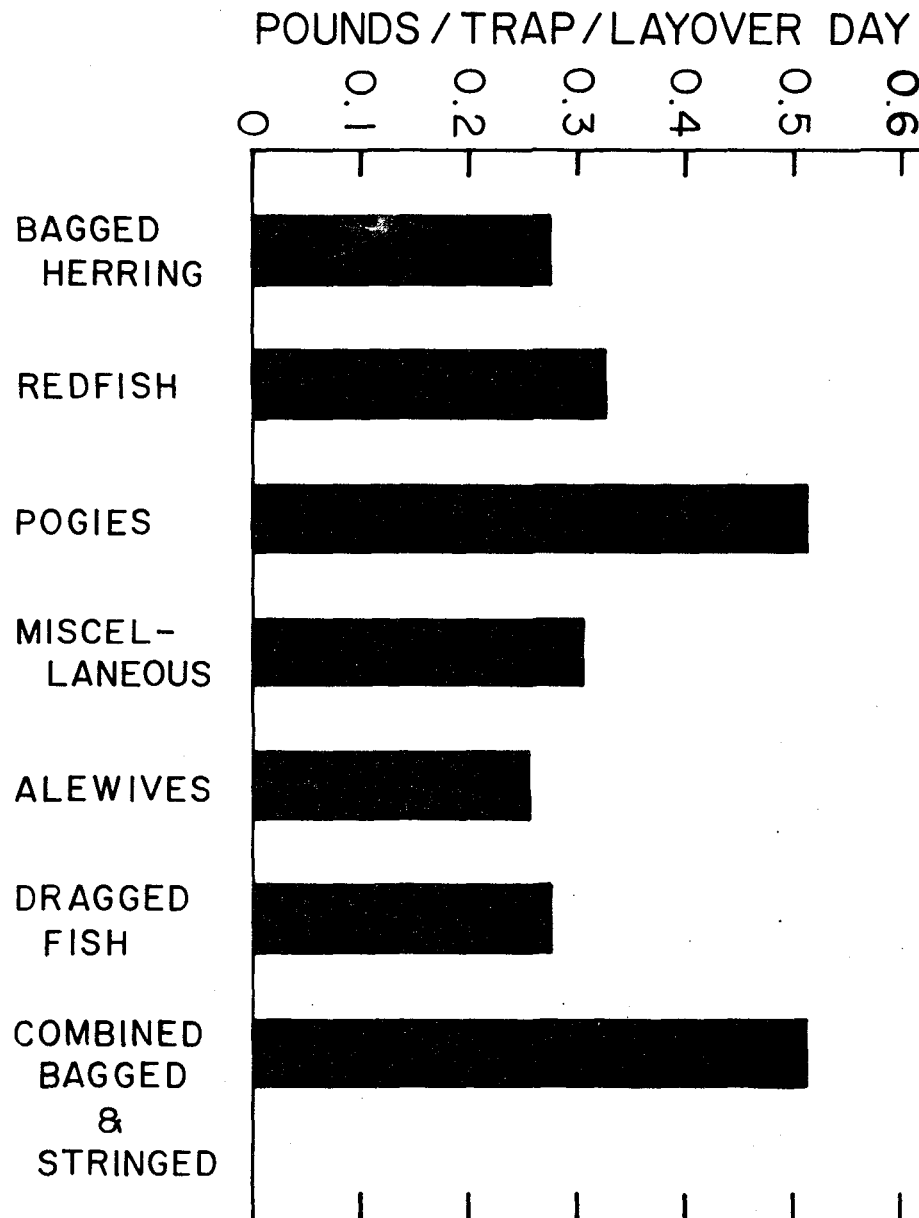
Statistical Note, Table 8

Results of t-tests for Bait

<u>Season</u>	<u>Comparison</u>		<u>t-test</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Summer	Combined .6090	Poggies .5131	1.91	1008	$p > .05$
	Poggies .5131	Redfish .4599	8.92	418	$p > .001$
	Redfish .4599	Herring .3045	3.16	247	$p > .001$
	Herring .3045	Dragged .3551	1.17	229	$p > .20$
	Herring .3045	Alewives .2534	5.07	550	$p > .001$
=====					
Late Fall	Combined .4355	Misc. .3038	5.38	983	$p > .001$
	Misc. .3038	Redfish .2836	.901	869	$p > .20$ Not Significant
	Redfish .2836	Herring .2643	1.24	954	$p > .10$ Not Significant
	Herring .2643	Dragged .2079	2.057	597	$p > .025$
	Combined .4355	Herring .2643	9.24	836	$p > .001$
=====					
Spring	Misc. .3039	Alewives .2534	.724	25.8	Insignificant
	Alewives .2534	Dragged .2715	2.30	257	$p > .01$
	Misc. .3039	Dragged .2715	1.44	30	$p > .07$

Figure 2

Pounds/Trap/Layover Day, By Bait Type



In the summer, the best bait is combined herring and redfish (.6090 lbs/trap/layover day), followed by poggies (.5131 lbs/trap/layover day), then redfish used alone (.4599 lbs/trap/layover day) and herring (.3045 lbs/trap/layover day). The worst bait is alewives which produce only .1726 lbs/trap/layover day. In the fall and spring, we obtain a different listing reflecting differences in the type of bait available.

T-tests were run on all kinds of bait listed in Table 8 to determine whether there was a significant difference between one kind of bait and others whose mean productivity was very close to it. The results of these tests were highly significant as can be seen in the statistical note for Table 8. For example, in the summer, traps baited with poggies produced .5131 lbs/trap/layover day, while those with combined redfish and bagged herring got .6090 lbs/trap per layover day. This difference in means is significant at the .05 level. Given these data, there can be little question that the combination of herring and redfish is superior to poggies during the summer season. Similar tests of significance were run on other kinds of bait listed in Table 8 as well. In general, these tests demonstrated that the listings of bait from best to worst (in any given season) are valid.

If we can judge by the results of Table 8 and its statistical note, it appears that combined (redfish and herring) are a very superior bait, along with poggies in the summer. Herring (used alone) and alewives do not do especially well in comparison with other types of bait. The results on dragged bait are inconsistent. Dragged bait

seems to do reasonably well in the spring and summer, but not at all well in the fall. The results of miscellaneous bait are inconclusive, since the number of traps using such bait was too small for statistical reliability.

Fishermen's Reactions

Fishermen were shown Tables 7 and 8 and Figure 2 in which all of the results concerning bait are summarized for the entire year. In general, all fishermen thought these results coincided with their experience. Certainly, they presented no strong arguments contesting the results. However, during the interviews it became apparent that fishermen generally believe that bait is very important in influencing catches and have a great interest in the subject. They also have a lot of opinions about the proper kind of bait to use.

Several specific sets of comments and observations deserve mention.

First, redfish combined with bagged herring is generally considered a good bait, but opinions concerning poggies varied considerably. Eleven of the 18 fishermen interviewed said that they knew that poggies had worked well during the past few years when they have been available. However, several fishermen said that poggies are only good in traps placed on soft bottom. On hard bottom in the summer, sea fleas will eat poggies in a matter of hours and leave the trap baitless.

Second, four of the older men were surprised that redfish and herring used alone showed up so poorly. One man said he thought that redfish did as well as anything.

Third, no one was surprised that alewives, dragged bait, and miscellaneous bait did poorly. Several men mentioned that bait was very scarce in the spring of the year, and that during

that time, fresh alewives were the bait they preferred. However, they said that alewives or any other bait would do relatively poorly at that time of year, since spring was a very slow season for lobster fishing. Moreover, any alewives used in the summer, they said, had to be frozen, since the alewife runs stop during the first week of June and frozen alewives do not last long in the trap.

Again, no fishermen thought that dragged fish was a good bait, although two fishermen said that periodically they had done very well on hake heads or pollock heads. On the whole, they were surprised that dragged bait or miscellaneous bait show up so well. Most fishermen clearly would put these kinds of bait on the bottom of the list of preferred ones.

Fourth, several fishermen interviewed mentioned that lobsters were not hungry in the spring and were very hungry after they shed in the summer. In their view, this made lobsters much more difficult to catch in the spring of the year than in the summer after shedding season. In the spring, several mentioned, only fresh bait can be used since "lobsters won't touch salted bait." After shedding, virtually any kind of bait can be used with reasonable hope for success, since lobsters want to eat to "fill out their shell."

Fifth, several fishermen mentioned that it is a good idea to change the bait being used periodically regardless of what it might be. While they were not certain of the reason, these men mentioned that catches seemed to pick up after the bait type had been changed. This was particularly true if one could suddenly switch to a new bait while competing traps in the same area were using a bait "lobsters had grown tired of." Several men mentioned that they deliberately alternated bait every other time they pulled the trap with this in mind. The explanation for this phenomenon is that lobsters "grow

bored with the same kind of food if it is offered day after day."

Biologists' Reactions

The fishermen talked a great deal about bait; the biologists had much less to say about the subject. Several of their comments were very interesting, however.

All four biologists pointed out that there is no reason to suspect that all baits would be equally productive. Lobsters, one agreed, "have food preferences like any other animal."

One biologist mentioned that there are studies demonstrating that lobsters like fresh bait. The exception, he said, were cod heads, which were preferred by lobsters only after the flesh was falling off the bone. This information appears to stand in contradiction to the fishermen's belief that fresh bait is preferred only during the spring. Another biologist agreed that the fresh vs frozen issue probably had a strong effect on catches. We did not collect data on this, unfortunately.

One said he was very puzzled by the fact that our data showed that dragged bait and miscellaneous bait did as well in the late fall as in the spring. He said he would have expected any given bait to produce more lobsters per unit of effort in the fall since there were more lobsters available to be caught then. The fact that these kinds of baits did so poorly in the fall indicates, as much as anything, the strong preference lobsters have for other kinds of bait.

Another biologist said he did not believe that bait made any significant difference in catches. When lobsters were hungry they would eat something. He pointed out in this connection that in eastern Maine bagged herring is used as a bait almost exclusively,

while in the central part of the state all kinds of bait were used, including herring. There is no difference in catch per unit of effort between these areas, he said.

The biologist who is a part-time fishermen said he strongly believed the fishermen's axiom: "never fish the kind of bait the men around you are fishing."

Depth

Catch Data

Fishermen move their traps over the annual cycle to follow, in their view, concentrations of migrating lobsters. Fishermen generally perceive their annual cycle as one in which lobsters are in shallow water in the summer; gradually move into deeper water as the fall progresses; and then go back into shallow water in the spring. As can be seen in Table 9, they move traps accordingly.

Table 9
Lbs/Trap/Layover Days/Depth/Season

Fathoms →	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Summer	.3155 N=1064	.5591 N=989	.4945 N=49	.1387 N=16						
Late Fall	.1262 N=48		.2889 N=63	.2942 N=211	.2850 N=208	.3056 N=713	.2928 N=688	.3560 N=458	.3177 N=336	.3716 N=131
Spring	.3010 N=472	.2613 N=761	.2210 N=486	.2288 N=277	.2376 N=211	.2916 N=228	.2453 N=203	.1150 N=40	.5804 N=6	.3207 N=41

Statistical Note, Table 9

Season	Comparison		Value of t	Degrees of Freedom	Level of Significance
	Depth 1	Depth 2			
Summer	6-10 fathoms .5591 lbs/trap/LOD	16-20 fathoms .1387 lbs/trap/LOD	6.33	18.5	p > .001
Fall	11-15 .2889	21-25 .2850	.0948	105	p > .50
	21-25 .2850	31-35 .2928	.3265	370	p < .50
	41-45 .2928	41-45 .3177	1.14	653	p > .50
	31-35 .2928	36-40 .3560	2.92	909	p > .005
Spring	16-20 .2288	26-30 .2916	1.94	458	p > .05
	26-30 .2916	36-40 .1150	3.96	80.7	p > .0005
	36-40 .1150	46-50 .3207	2.86	65.0	p > .005

In the summer, no traps were placed over 20 fathoms, and the vast majority were placed in far shallower water. In fact, 96.8 percent were placed under 10 fathoms. There is apparently little reason to place traps in deeper water during the summer since traps placed in shallow water clearly do better than those in deeper areas. For example, traps in 6 to 10 fathoms got .5591 lbs/trap/layover day, while those placed at 16 to 20 fathoms got only .1387 lbs/trap/layover day.¹

¹As can be seen in the statistical note for Table 9, these differences in means are significant at the .001 level.

In the fall, traps are placed in a very wide range of depths, but the vast majority are placed in relatively deep water. In this season, only 18.2 percent of the traps hauled were set in water under 25 fathoms. However, in the fall the productivity of traps remains fairly constant in a wide variety of depths. For example, traps placed in 11 to 15 fathoms produced .2889 lbs/trap/layover day; traps in 21 to 25 got .2850 lbs/trap/layover day, and those in 31 to 35 fathoms got .2928 lbs/trap/layover day. None of these differences in means is significant. (See statistical note for Table 9.) The single important exception to this generalization is that traps placed in very deep water are clearly more productive. For example, traps placed in 31 to 35 fathoms got .2928 lbs/trap/layover day, while those at 36 to 40 fathoms got .3560 lbs/trap/layover day. This difference in means is statistically significant. (See statistical note for Table 9.)

In the spring, traps were placed in a very wide range of depths, but the vast majority were put in relatively shallow water. Specifically, 45.2 percent were set under 10 fathoms. In this season of the year, the productivity of certain depths of water varied significantly. For example, in 16 to 20 fathoms of water, traps produced .2288 lbs/trap/layover day; in 26 to 30 fathoms, they got .2916 lbs/trap/layover day; in 36 to 40 fathoms only .1150 lbs/trap/layover day; and at 46 to 50 fathoms, .3207 lbs/trap/layover day. It should be noted that all of these differences in means are statistically significant (see statistical note for Table 9), even though they do not point to any striking pattern in the relationship between depth and trap productivity in the spring sample.

Fishermen's Reactions

The information on depth produced fewer comments from fishermen than any of the other data since it did nothing more than reinforce what everyone knew--namely that one has to move traps seasonally. No one was surprised that the vast majority of traps were placed in shallow water in the summer; deep water in the winter; and shallow water again in the spring. This is the way virtually all fishermen move traps over the annual cycle to follow lobster migrations.

Three sets of comments deserve mention.

a. Several men remarked that early in the spring lobsters are in very deep water. Some time in May, they move very rapidly into very shallow water to shed. Thus, during this season, one can get two or three very good hauls in deep water, and then traps have to be moved into very shallow water very rapidly. There is nothing in our figures to indicate that in the spring both deep and shallow water are exploited at different times.

b. Fishermen had surprisingly little to say concerning the fact that the 36 to 40 fathom depth areas produced a significantly larger amount of lobster than adjacent depths in the fall, and far less lobster in the spring. A couple of men mentioned that there were a few productive holes at this depth, which were known only to a few men. A more likely explanation was suggested by four other men who pointed out that one of the most productive places to fish in the fall is along the "edge" (where mud bottom meets rocky bottom), and that much of this "edge" and gravel is between 36 and 40 fathoms. No fisherman had any hard and fast ideas concerning the reason the 36 to 40 fathom depth areas produced so little in the spring except to jokingly suggest that the lobsters in those areas had all been caught up in the fall.

c. Several men noted that the most productive fishing of the entire year occurred in the summer in shallow water and in the late fall in relatively deep water. In the summer, fishing is good, they said, due to the availability of lobsters and to the fact that newly-shed lobsters are hungry and thus trap easily. In the fall, the relatively good fishing is due to lack of competition as much as anything. These men suggested that late fall fishing is productive not because natural factors make lobsters more available or easier to trap, but because there are no part-time fishermen operating so that there are so few traps in the water that those remaining do reasonably well.

Biologists' Reactions

All of the biologists interviewed agreed wholeheartedly with the fisherman's idea that lobsters live primarily in rocks and migrate into shallow water to shed in the early summer, and out again in fall. Thomas pointed out that there is a good deal of strong evidence from tagging studies reinforcing this conception of migration and shelter related behavior (Dow 1974: 622-23; Krouse 1977; Cobb 1971). The way that fishermen move their traps seemed perfectly logical to these biologists, given what they knew about the migration patterns of lobsters. One biologist also strongly reinforced the fishermen's idea that lobsters are not hungry just before they shed in the spring, but are very hungry after they shed, and hence are easily trapped in the latter part of the summer.

Trap Size

Catch Data

In every season, four foot traps do substantially better than three foot traps. As can be seen in Table 10, the difference is greatest in the summer, when four foot traps produced .6242 lbs/trap/layover day, while the three

foot traps got an average of only .3079 lbs/trap/layover day. But at every season of the year, the longer traps outfished the smaller ones. Moreover, as can be seen in the statistical note in Table 10, all of the differences in means between three and four foot traps for every season were highly significant statistically.

Table 10
Lbs/Trap/Layover Day by Trap Size by Season

	Summer	Winter	Spring
3 foot trap	.3079 N = 1287	.2750 N = 1765	.2451 N = 1497
4 foot trap	.6242 N = 831	.3649 N = 1091	.2709 N = 1227

Statistical Note, Table 10
Results of t-tests on trap size

<u>Season</u>	<u>lbs/trap/LOD</u> <u>3 ft. trap</u>	<u>lbs/trap/LOD</u> <u>4 ft. trap</u>	<u>Value of</u> <u>t</u>	<u>Degrees of</u> <u>freedom</u>	<u>Level of</u> <u>Significance</u>
Summer	.3079	.6242	9.98	1190	p > .0005
Late Fall	.2750	.3649	6.642	1909	p > .0005
Spring	.2451	.2709	1.73	2619	p > .05

Fishermen's Reactions

The fishermen had a great deal to say about this phenomenon. All the men interviewed had heard the rumor that four foot traps did better than three footers. Many men have always maintained that the four foot traps outfished three foot traps, while other men have maintained that trap length per se made no difference. Among the fishermen we spoke to, no one claimed that three foot traps outfished four foot traps, but many of the men who fished a lot of three foot traps were clearly disturbed by these figures we presented to them. Several of them tried to suggest that the results of the study might be wrong. The strong relationship between catch and length of trap gave them food for thought.

Several comments were made which bear repeating. First, several men said they thought that four foot traps only did better on a "longer set over," since they had an extra head to hold the lobsters in and stop them from escaping after the bait had been eaten. If this theory were correct, then we would expect that the difference in four foot traps and three foot traps would be greatest in the fall and spring when traps are pulled less frequently, and we would expect the four foot traps to do little or no better than three foot ones in the summer when traps are pulled after two or three days as a rule. This is not the case of course. These fishermen had little to say when it was pointed out that the four foot traps outpaced three foot traps most in the summer when number of layover days was shortest.

Secondly, 15 men out of the 18 interviewed explained the superiority of the four foot trap in terms of the defensive behavior of lobsters. That is, the more spacious four foot traps do better, they said, since a lobster caught in the traps gets in the rear "parlor" of the trap (goes through two internal heads) and consequently does not bother or threaten lobsters trying

to crawl in the side heads by the bait. In the three foot traps, any lobster caught is very close to the bait and in position to threaten another thinking of entering the trap. In the summer, when there are a lot of active lobsters around, four foot traps do better since, as one fisherman explained it, "they allow more than one lobster to be caught, and prevent one lobster from hogging the whole trap. In the spring, when there are few lobsters around, the extra space doesn't matter. If one can catch one lobster per trap, he is lucky." The data we have gathered lends some support to this hypothesis.

Biologists' Reactions

Three of the four biologists strongly supported the fishermen's idea that four foot traps were superior to three foot traps because they had two internal heads rather than one. The biologist/amateur fisherman said that if he had a hauler in his skiff, he would "buy all four foot traps in a minute." (He has 3 footers since they are lighter). The fourth biologist admitted he knew nothing about traps.

Two of the four biologists said they believed four foot traps were superior to three footers at any season. They did not believe the fisherman's theory that four foot traps were superior only when a longer number of layover days were involved.

Head

Catch Data

Fishermen are very interested in the heads they put in their traps. They believe the productivity of traps depends in large part on the type of heads in the trap and the way they are tied in. They spend hours talking with each other about heads and discussing the relative merits of various

types. There is apparently something to talk about. Heads clearly make a difference in catch. (See Table 11.)

Table 11

Lbs/Trap/Layover Day by Season by Type of Heads

<u>Season</u>	<u>Unknown</u>	<u>Hog Rings</u>	<u>Hake</u>	<u>Mixed</u>
Summer	.4155 N = 722	.1961 N = 12	.3816 N = 837	.5356 N = 547
Fall		.5374 N = 2	.2822 N = 1842	.3583 N = 1012
Spring	.1855 N = 24	.1358 N = 46	.2972 N = 1083	.2333 N = 1572

Statistical Note, Table 11

<u>Season</u>	<u>Comparison</u>	<u>Value of t</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Summer	Hog Rings vs. Hake	1.886	11.9	p > .05
	Hake vs. Mixed	4.329	1046	p > .0005
	Hog Rings vs. Mixed	3.360	13.29	p > .0005
Late Fall	Hog Rings vs. Hake	.774	1.0	p < .50
	Hake vs. Mixed	5.418	1678	p > .0005
	Hog Rings vs. Mixed	.556	1.0	p < .50
Spring	Hog Rings vs. Hake	4.67	68.2	p > .0005
	Hake vs. Mixed	4.09	2173	p > .0005
	Hog Rings vs. Mixed	2.91	52.9	p > .005

These data point out that the mixed heads¹ are more productive than traps with either hake mouth or hog ring heads in the summer and the fall. In the summer, traps with mixed heads got .5356 lbs/trap/layover day, while hake mouth heads got only .3816, and traps with all hog rings got only .1961 lbs/trap/layover day. The same general pattern also occurred in the

¹Mixed heads refers to traps which have both hake mouth heads and heads with funnel rings or hog rings. Generally the funnel rings are in the side heads, while the interior heads are the hake mouth type.

late fall when the traps with mixed heads took .3583 lbs/trap/layover day; and the hake mouth traps got .2822 lbs/trap/layover day. As can be seen in the statistical note for Table 11 all these differences in means are very highly statistically significant. (In the fall, the traps with hog ring heads took .5374 lbs/trap/layover day, but these results are statistically insignificant since only two traps were involved.)

In the spring, however, the hake mouth traps do better than the traps with mixed heads. The former took .2972 lbs/trap/layover day, while the latter got only .2333 lbs/trap/layover day. As can be seen from the statistical note, in Table 11, these differences in means are also significant statistically.

If this data gives any indication, it would appear that traps with only hog ring heads are not as good as the other two types of head configurations.

Fishermen's Reactions

Generally, fishermen agreed with the data concerning heads. Virtually all of the younger fishermen agreed that traps which had all funnel hoops (hog rings) in the heads would not fish well. In their view, funnel hoops were valuable, if at all, only in side heads since they allowed lobsters to enter the trap easily, but that hake mouth heads should be used inside the trap to "hold" the trapped lobsters and stop them from escaping. However, three older, well-experienced fishermen recalled the time when a good many men used nothing but funnel hoops in all heads in all their traps and made a very good living. One very respected fishermen said that traps with funnel hoops in all heads did well as long as the rear internal head was no more than five inches from the rear wall of the trap.

No fishermen had any idea why mixed headed traps outfished all other types of head configurations in the summer and fall, while traps with only hake mouth heads did substantially better in the spring. Several fishermen said they always thought the opposite would hold true, that is, that hake mouth heads would do better in the summer and fall when lobsters were very active, and more likely to escape. One fisherman speculated that lobsters that survived to spring without being caught were a "cagier breed"--one that only the narrower hake mouth heads would hold in traps. Another fisherman suggested that since spring lobsters are very hard shelled, they might be able to push through hake mouthed traps in greater numbers than they could in summer and fall when their shells are soft. Both these men admitted they were only guessing. Several other fishermen stressed that spring fishing was very different from summer and fall fishing in a good many respects. As one man said, "a lot of things change when you go spring fishing, and I guess the heads is one of them."

Two very thoughtful fishermen suggested that our categories for studying heads needed to be refined. As one man put it, "there are all kinds of heads--not just three kinds." There are so many different ways of making heads that what we call "hake mouth" heads are really ten different kinds of heads. He was convinced that hake mouth heads, properly installed, would outfish any other kind of head. He may well be correct, but this conclusion is certainly not indicated by the data we obtained.

Biologists' Reactions

The biologists saw very little unusual in these results. Two said they thought that the hog ring heads would be easier for a lobster to escape from. One said that when he was skin diving, he observed lobsters moving in and out

of the entrance ways of a trap in order to watch his movements better. Thomas said that even with random movement, the hog ring traps would be easier to escape from. These men clearly agreed with the fishermen's contention that traps with mixed heads outfished all others because they allowed lobsters to enter the side heads easily, and also had hake mouth heads to prevent them escaping from the rear parlor. The other two biologists said they could make no statement, since they had no experience with these heads.

Like the fishermen, the biologists had no idea why traps with all hake mouth heads were superior to all others in the spring. They all did, however, agree that catches could be influenced by heads or vents. There is a good deal of evidence to support their claims (Krouse 1977a; Simpson 1975:51).

Bottom Material

Catch Data

Fishermen pay particular attention to the type of bottom on which a trap is being placed. In the minds of many men in the industry, fishing skill is largely a matter of knowing when to place a trap on a particular type of bottom in a given season. Depth is a secondary consideration in the minds of many. That is, one tries to place a trap on a given type of bottom, and one does not worry whether that bottom is at 35 fathoms or 25 fathoms. Other men accord much more importance to depth, but in all conversations among fishermen, the type of bottom being fished is carefully noted.

Generally fishermen speak of "hard" or "soft" bottom, meaning rocky or mud bottom, but they are also aware that some bottom is sandy and other bottom has gravel. All of these types of bottom have certain characteristics vis a' vis the lobster. In the past, it was much more difficult to learn the type of bottom since this information could only be had by using a lead

line and recalling the type of material sticking to the bottom of traps when they were pulled. The job now is made much simpler by the advent of electronic sounding machines. Most machines will give a fainter or hazier signal when the boat is over soft bottom and a stronger signal when over hard bottom. With a few hours experience, most novice fishermen can now tell exactly what kind of bottom they are on. This has lead a good many older fishermen to remark that skill does not count in fishing now. This, of course, is an overstatement. But there can be no doubt that such machines have greatly simplified the task of obtaining data that is very important to the fishermen.

The data we obtained on catches and type of bottom are contained in Table 12.

Table 12

Lbs/Trap/Layover Day by Bottom by Season

<u>Season</u>	<u>Hard</u>	<u>Mud</u>	<u>Gravel</u>	<u>Sand</u>	
Whole Year	.3282 N = 4365	.2872 N = 2099	.4870 N = 362	.3489 N = 303	.3164 N = 570
Summer	.4165 N = 1053	.2270 N = 164	.6426 N = 198	.4329 N = 111	.5390 N = 142
Winter	.3490 N = 934	.3070 N = 1398	.8281 N = 94	.2959 N = 100	.2469 N = 330
Spring	.2493 N = 1928	.2541 N = 537	.4552 N = 70	.3053 N = 92	.2280 N = 98

Statistical Note 1, Table 12

<u>Type of Bottom</u>	<u>Comparison</u>	<u>Value of t</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Hard	Summer vs. Winter	2.99	1814	p > .005
	Winter vs. Spring	6.44	1844	p > .0005
	Summer vs. Spring	7.99	1519	p > .0005
Gravel	Summer vs. Winter	6.51	225	p > .0005
	Winter vs. Spring	4.49	83.4	p > .0005
Sand	Summer vs. Winter	1.56	130	p > .10
	Winter vs. Spring	.175	141	p > .25
Edge	Summer vs. Winter	5.33	161	p > .005
	Winter vs. Spring	.57	144	p > .05
Mud	Summer vs. Winter	2.55	190	p > .025
	Winter vs. Spring	2.94	871	p > .0025

Statistical Note 2, Table 12

<u>Season</u>	<u>Types of Bottom</u>	<u>Value of t</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Summer	Hard vs. Mud	5.35	305	p > .0005
	Mud vs. Gravel	5.58	268	p > .0005
	Gravel vs. Sand	1.94	243	p > .025
	Sand vs. Edge	1.07	191	p > .10
	Gravel vs. Hard	3.20	227	p > .001
	Gravel vs. Edge	1.20	335	p > .10
	Sand vs. Mud	2.31	138	p > .01
	Mud vs. Edge	5.12	226	p > .0005
Winter	Hard vs. Mud	2.73	1739	p > .0025
	Mud vs. Gravel	6.05	136	p > .0005
	Gravel vs. Sand	3.58	178	p > .0005
	Sand vs. Edge	1.67	164	p > .05
	Hard vs. Gravel	7.37	195	p > .0005
	Hard vs. Sand	1.86	153	p > .05
	Hard vs. Edge	5.37	875	p > .0005
	Gravel vs. Edge	2.74	211	p > .005
Spring	Hard vs. Mud	.265	899	p > .50
	Hard vs. Gravel	3.35	79.6	p > .001
	Gravel vs. Sand	2.01	145	p > .025
	Sand vs. Edge	1.48	153	p > .10
	Gravel vs. Edge	3.50	104	p > .0025
	Gravel vs. Hard	3.52	72	p > .001
	Edge vs. Mud	.7813	158	p > .25
	Edge vs. Hard	.693	115	p > .25

As one can see from Table 12, there is a tremendous difference in the productivity of various types of bottom, and the types of bottom where lobsters can best be caught changes radically over the course of the year. In the summer, gravel bottom, edge, and sand bottom are more productive of lobsters. Hard bottom and mud are the least. The same pattern holds generally in the spring, when again gravel bottom and sand bottom prove most productive. In the winter, the reverse pattern is true. At this time of year, it is the hard bottom and mud that are most productive. As can be seen from statistical note 2 in Table 12, the differences in means is highly significant.

Fishermen's Reaction

The data in Table 12 strongly reinforce several general theories about the movements of lobsters and their behavior over the annual cycle. The first thing the data elicited from several fishermen was a general picture concerning the nature of the bottom. Fishermen conceive of ocean bottom in terms of a whole series of ridges or shoals with valleys or channels in between. In some places, shoal water covers vast areas; in other places shoals are very small. The same is true of channels. On the top of shoals is the hard bottom, generally composed of rocks which are covered with kelp. As one goes deeper "down off the hard bottom," one runs into gravel, then sand, and finally at the bottom of channels, mud.

Over the course of the annual cycle, according to fishermen, lobsters are found on different types of bottom. During the early summer, lobsters come in very shallow water to shed. At this time of year, they can be found burrowed in holes in the mud or in rocky areas along shore. While they are shedding, they cannot be caught. There is little sense putting traps on the mud during the early summer for this reason.

After lobsters shed, they begin to head into deeper water, and are very hungry. They travel, according to the fishermen, over sand and gravel bottom since this type of bottom affords fewest obstacles. As one fisherman phrased it: "They don't climb up the shoals and climb over the rocks, and they don't plow through the mud. At this time of year, they go along the sand and gravel bottom since this is easiest for them." Several fishermen mentioned that as lobsters "move off" into deeper water they like to hug the "edge" of the shoals. They can move relatively fast on the gravel, and presumably are close enough to rocky hiding places should danger threaten. In late fall and during the winter, lobsters go almost into hibernation. At this time of year, they can be found burrowed in the mud or in hiding places on rocky bottom. In the winter, so many experienced fishermen believe, fishing is not good, but if one is going to catch lobsters, it will be on the hard bottom or on the mud. Since they are not travelling during these seasons, lobsters are not on sandy bottom or gravelly bottom, which they ostensibly use primarily as "highways going to somewheres else."

In short, according to fishermen, lobsters can best be caught in the spring and summer on sandy bottom, gravel, or on the edge when they are moving from one place to another. In the late fall and winter, they are in deep water on rocky bottom or on the mud preparing to go into hibernation.

Given this general view of lobster behavior, fishermen saw little to argue with in our figures. After all, these data support the idea that lobsters can best be caught on mud and hard bottom in late fall and winter. The data also support another hypothesis fishermen expound--namely that there are lobsters to be caught on hard bottom all year. This type of bottom provides the most natural cover for lobsters, they believe. Indeed, these data demonstrate that hard bottom is reasonably productive at all seasons. Several fishermen mentioned the fact that fishermen in the past used to put

traps on nothing but hard bottom all year long. It is only in the past few decades that fishermen have exploited mud, sand, and gravel extensively. Many men still place all or most of their traps on shoals, as the data on number of traps pulled indicates.

Biologists' Reactions

The biologists had only a few points to make about the productivity of various types of bottom, but they are worth recording.

One was mildly surprised by the results. He said he would have expected the rocky bottom to be most productive, since rocks provide the best cover for lobsters and he would assume that a very high proportion of lobsters would be in the rocks most of the time.

Another said that lobsters are found on all kinds of bottom, but that the studies concerning bottom were most inconclusive. There are scientific papers which report definitive results concerning bottom material, and others where no reliable results were obtained. As far as he was concerned, little could be said with any degree of certainty about the relationship between type of bottom and catch.

A third said that he believed bottom was insignificant. "What counts," he said, "is proximity to hiding places. One can do very well fishing on mud or sand if that area is near rocks or crevices where lobsters can hide."

None of the biologists spoke of lobsters as using sand and gravel bottom as seasonal highways. But three did not completely discount the theory either.

Results of the Regression Analysis

Data Analysis

All of the data from this study were analyzed by multiple stepwise

regression analysis. In regression analysis, the formula is commonly given, but in this case, giving the formula would be very difficult since 110 variables were used. It is by far more meaningful to list the types of variables, as shown in Table 13 below.

Table 13

List of Variables in Lobster Catch Regression Analysis

<u>Type of Variable</u>	<u>Variable Labels</u>
Head type	<ol style="list-style-type: none"> 1. Metal (all hog rings) 2. Hake mouth 3. Hog rings and hake mouth 4. Unknown
Trap construction material	<ol style="list-style-type: none"> 1. Vinyl 2. Wood 3. Galvanized or aluminized
Trap length in feet	Actual length (in feet) used
Number of heads in trap	Actual number of heads used
Bait used in trap	<ol style="list-style-type: none"> 1. Bagged herring 2. Redfish 3. Poggies 4. Miscellaneous 5. Alewives 6. Whiting, and/or other dragged fish 7. Bagged and strung fish
Depth of trap in fathoms	<ol style="list-style-type: none"> 1. 0-5 fathoms 2. 6-10 fathoms 3. 11-15 fathoms 4. 16-20 fathoms 5. 21-25 fathoms 6. 26-30 fathoms 7. 31-35 fathoms 8. 36-40 fathoms 9. 41-45 fathoms 10. 46-50 fathoms
Type of material on ocean bottom	<ol style="list-style-type: none"> 1. Hard 2. Mud 3. Gravel 4. Sand 5. Edge of hard bottom

Table 13, continued

Topography of ocean bottom	<ol style="list-style-type: none"> 1. Hole 2. Large area of hard bottom 3. Shoal 4. Next to shore 5. Channel
Protected vs. unprotected position	<ol style="list-style-type: none"> 1. Unprotected 2. Protected
Fishing area	<ol style="list-style-type: none"> 1. Pemaquid 2. Bremen 3. New Harbor 4. Friendship
Fisherman	18 Variables involved. Each fisherman assigned a variable number going from 1 to 18.
Season	<ol style="list-style-type: none"> 1. Summer of 1977 2. Late fall 1977 3. Spring 1978
Length of lobsters caught	12 Variables allocated for length of lobsters caught in each trap.
Weight of lobsters caught	12 Variables were allocated for weight of lobsters caught in each trap.
Layover days/ season	<ol style="list-style-type: none"> 1. Layover days for summer 2. Layover days for fall 3. Layover days for spring
Pounds per layover day	1. lbs per layover day
Estimated availability of lobsters on bottom	1. Est. availability of lobsters
Computational variables	

In stepwise regression analysis, the last step is generally considered to be the most significant since it allows one to see the effects of all factors working together simultaneously. Accordingly, we will concentrate on analyzing the last step of the regression analysis alone and ignore the reams of computer output which led up to these results.

In the last step of this analysis, some 53 independent variables printed out. Much of the information it contains strongly reinforces the preceeding analysis; other aspects of this analysis add other dimensions to our understanding of the factors influencing the pounds of lobsters caught per trap.

Major Conclusions

An analysis of the regression coefficients (B figures) allows one to compare the importance of variables of the same type with each other, and gives strong evidence for the following assertions:

(1) Catches in the summer and fall are about the same, but drop dramatically between fall and spring. The figures indicate that in the spring of the year, a trap will catch .89 lbs/trap haul less than it caught in the summer, a phenominally large drop. [Summer = Baseline Variable; Winter ($B = .1542285$); Spring ($B = 0.8951936$, $p > .05$).]

(2) Four foot traps catch .53 lbs/trap haul more lobsters than three foot traps. Traps with four heads did substantially better than traps with three heads. Number of heads can be treated as a proxy variable for length of trap since four foot traps generally have four heads, and three foot traps generally have three heads. [3 ft. trap = Baseline Variable; 4 ft. trap ($B = .5357639$, $p > .001$).]

(3) In studying the effectiveness of bait, bagged herring was used as the baseline variable. Our figures indicate that bagged herring is more effective than some other kinds of bait, and less effective than others over the annual round. A list of the kinds of bait, from most effective to least effective is as follows: poggies ($B = .7996427$); bagged herring and stringed redfish ($B = 0.2033606$); alewives ($B = 0.2694326$); bagged herring (Baseline variable); miscellaneous ($B = -0.3508594$); whiting ($B = -0.2940270$); redfish ($B = -0.2099449$);

(All results significant at least at the .05 level). These results correlate nicely with our earlier data concerning bait.

(4) Some fishermen are far more highly skilled than other men. One very good fisherman was used as a baseline variable, so that others are seen in relation to him. The range in B figures went from 0.4148997 ($p > .001$) to -0.9441483 ($p > .001$). These figures indicate that the best fisherman in our sample caught .32 lbs. per trap haul more than the least skilled fisherman. Of course, the regression analysis gives no indication of exactly what fishing practices influence catch, or even whether all of these "skills" are conscious or unconscious.

(5) As we saw earlier there is an association between the depth at which traps are placed and season. Traps are more productive in shallow water just after shedding and are moved into deep water in the fall, etc. We noted that in any given season or week, fishermen undoubtedly do obtain more lobsters from certain depths than others. However, the regression analysis contains information from the entire year. Over the course of the annual cycle, there is no single depth that is strongly associated with high productivity. Each five fathom interval was treated as a single independent variable. In every case, the results were insignificant. The single exception is again the 26 to 30 fathom range which produced a B of .3036022 ($p > .002$). This means that traps at this depth produced .303 lbs/trap haul more than traps placed in 0 to 5 fathoms (our baseline variable), and that these results could scarcely have happened by accident.

(6) The results of the regression analysis do not appear to buttress our earlier results concerning type of bottom, in that they indicate that traps placed on hard bottom do better than traps placed on mud, gravel or sand.

The results are highly significant statistically. The various types of bottom, from most productive to least productive, are listed as follows: hard bottom (baseline variable); mud ($B = -0.1243054$, $p > .05$); gravel ($B = -0.3021396$, $p > .002$); Sand ($B = -0.3720884$, $p > .001$).

Our earlier data on mean catches by season by type of bottom demonstrated that gravel and sand bottom produced the most lobsters in the spring and summer. These results are really not inconsistent, however, since the regression analysis contains all the data over the entire year. Moreover, there are very few traps placed on sand and gravel; most were placed on hard bottom. Taking all these factors into account, it is not surprising that over the whole year the regression analysis indicates that hard bottom does best.

(7) The regression analysis indicates that there is no statistically significant difference between the amount of lobster produced by traps with funnel (hog ring) heads, hake mouth, or a combination of the two types. This was true even though the mixed heads unquestionably produce more lobsters in the summer and fall, while the hake mouth heads are more productive in the spring. There is no difference if all data from all seasons are taken into account.

(8) There is a statistically significant difference between the lbs/trap produced by traps made of different materials. (This information is summarized in Table 6.) Again, these results substantiate the fact that the most productive traps are the aluminized, followed by vinyl, and finally by wooden traps. These results are significant statistically.

The Relative Importance of Factors Influencing Catch

A comparison of the standardized regression coefficient (BETA figures) from this regression analysis allows us to do something that can not be done either by a study of the cross tabulations appearing in the earlier part of this

paper, or the B figures (regression coefficients): namely, it allows us to compare the importance of all variables in the total regression equation. If we list the variables in terms of the values of their respective BETA figures, we obtain a reasonable idea of the importance of various factors in explaining total lbs/lobster/trap haul. Table 14 contains such a listing.

Table 14

Factors Influencing Catch as Indicated by Standardized
Regression Coefficients
Beta Figure²

<u>Variable Name</u> ¹	<u>(Standardized Regression Coefficient)</u>
Spring	.295
Availability of lobsters	.227
Trap size	.180
Number of heads	.150
Poggies	.138
Layover days winter	.109
Fisherman #11	.106
Fishermen #9, 14 and 5	.090
Wooden traps	.094
Alewives	.088
Fishermen 17, 10, 18	.087
Layover days spring	.086
Fishermen #12 and 4	.075
Bagged and stringed bait	.074

¹All variables with levels of significance over .05 have been excluded from this Table except for those concerning head types. We can say nothing definite about them since the results reported could have occurred by accident.

²The last two digits on the BETA figures have been left out and the sign as well, since we are interested only in the relative importance of variables.

Table 14, continued

26-30 Fathoms depth	.068
Sand	.049
Aluminized traps	.048
Fishermen #15, 8, 6	.045
Whiting	.043
Redfish	.043
Gravel	.043
Mud bottom	.043
Hake mouth heads	.042 (insignificant f)
Hog ring and hake mouth heads	.041 (insignificant f)

If we can judge from this listing in Table 14, it appears the factors affecting catch per trap haul can be listed, from most significant to least important, in the following way:

Most Important	Seasonal factors Trap size Number of heads
Medium Importance	Fishing skill Poggie and alewives used as bait Layover days Use of wooden traps (negative) Bagged and stringed bait
Low Importance	Depth Type of bottom Type of heads Whiting and redfish used as bait

Fishermen's Reactions

Fishermen are fully aware that a large variety of factors influence catches and that some of these variables are more important than others. In order to study the way people in the industry assess the relative importance

of the factors influencing catch, the fishermen in our sample were asked the following questions: Which of the following factors is most important in influencing lobster catches? Which is least significant? They were then presented with the following list:

Depth
Season of the year
Head type
Fishing area
Type of bait
Skill of fisherman
Length of trap
Number of heads
Type of bottom
Layover days

The results of this little survey are summarized in Table 15.

Table 15

Fishermen's Responses to Questions on Importance of Factors
Influencing Catches

<u>Variable</u>	<u># Responses</u> <u>"Most Important"</u>	<u># Responses</u> <u>"Least Important"</u>
Depth	0	2
Season of year	8	0
Head type	0	2
Fishing area	4	1
Type of bait	1	4
Skill of fisherman	7	0
Length of trap	0	5
Number of heads	0	3
Type of bottom	1	0
Layover days	1	2
No response	2	5

On the whole, fishermen had a very difficult time answering this question. They were most reluctant to state that any single factor was least important. Since they clearly recognized the complexity of the factors influencing catches, they were much more inclined to give an answer after much hemming and hawing, and then go on to discuss the reasons for their answer for half an hour. Several very important insights stemmed from the answers fishermen gave, and from the resulting discussions.

The responses tended to agree with some of the observations stemming from the regression analysis in certain areas, but conflicted in others. On the whole, fishermen indicated that three different types of variables were of critical important in affecting catches: seasons, skill and fishing area. Two men said they would like it to be October all year. The results of the regression analysis would substantiate the fact that all of these factors are important. However, the responses of fishermen are not in accord with the results of the regression analysis in a number of other areas. The regression analysis indicated that type of bottom and depth were of little importance in influencing catch. The fishermen, on the whole, would disagree with this. Several pointed out that skill is a very important factor, and that skill was closely connected with depth, type of bottom, layover days, and so on. That is, a skillful man knows where to put his traps and how long to leave them. In their view, these were not separable variables. More important, the regression analysis suggested that size of trap and the closely related variable "number of heads" was very important. On the whole, fishermen are not aware of the importance of this variable. No fishermen put "size of trap" as "most important," and five said it was the least important factor. Another two stated that the closely related variable "number of heads" was least important.

In addition, the regression analysis indicated that type of bait was of moderate importance. Fishermen appear to underestimate the importance of type of bait, since four placed it as the least important factor, and several others clearly did not think it was of critical importance.

Several fishermen said that the area one went fishing in was of critical importance. While the regression analysis contained one variable for area or town, our earlier analysis of fishing areas (see Table 3) tends to suggest they are correct.

On the whole, it appears that fishermen are aware of the importance of season, skill, and fishing area in influencing catches. However, if the regression analysis is to be believed, they are underestimating the importance of length of trap and number of heads. They also pay a great deal of attention to such factors as depth, layover days and type of bottom which they see as closely related to skill. The regression analysis indicates that these variables are very unimportant. Here the fisherman's analysis may be more accurate than the regression analysis would suggest.

Undoubtedly there is no single depth or type of bottom that is associated with large catches throughout the year. But no fisherman has ever suggested that traps be left in one place all through the seasonal cycle. They know they must be moved, and place a lot of emphasis on analyzing when and where they should be moved. In this respect, the regression analysis and the statements of fishermen tend to agree. Both suggest that traps left in one place throughout the year will do poorly.

Biologists' Reactions

All four biologists were presented with the same list of factors as the fishermen and asked to identify the most important. One guessed that type of head was probably most significant, another said it was probably type of

bottom, and the third said it was probably layover days. The fourth biologist, the one who fished for lobsters immediately said: "seasons and length of trap" were most significant. I have no comment to make on these responses, save to point out that those with firsthand experience in fishing gave responses which were perhaps more in line with the results of this particular study.

Long-Term Factors Influencing Catches

Fishermen and biologists are in relatively close agreement concerning factors influencing catches in the short run. This is far less true when we are dealing with factors influencing catches over the course of many years.

While no data were presented to fishermen or biologists concerning long-run factors, these matters were mentioned by both fishermen and biologists in virtually every interview. These matters were clearly on their minds.

Two of the four biologists questioned clearly think the lobster industry is headed for difficulties in the long run. The problem is that over 90 percent of the females are caught before they have a chance to extrude eggs once (Krouse 1973: 172; Anonymous, State of Maine: 3). As a result, there are not enough eggs in the water so that recruitment into the fishery is being negatively affected. Several biologists have pointed out that the total catch of lobsters in Maine has remained the same or has dropped, despite generally favorable ecological conditions and an enormous increase in traps and fishing effort. The solution biologists generally favor is an increase in the legal measure to 3.5 inches (Krouse 1972: 10-12; Thomas 1973: 54; Krouse 1973: 172; Anonymous, State of Maine: 3).

Three of the four biologists we interviewed spontaneously volunteered that they strongly favored raising the legal measure to 3.5 inches and doing

away with the five inch measure. An increase in the legal measure, they felt, would greatly increase the number of eggs in the water and increase recruitment. The oversize measure, they felt, did little to increase the number of eggs in the water since so few lobster actually survived to this size. Moreover, two biologists pointed out, a great many small lobsters are undoubtedly eaten by the so called "Jumbo" lobsters.

Like the biologists, very few lobstermen support the five inch oversize law. In a study done on the Pemaquid Peninsula in 1977, only 9 men favored the oversize law, while some 59 said they wanted to do away with the measure on oversize males. Fishermen's reasons for wishing to do away with the "oversize" measure are not the same as those of biologists. When talking about this law, fishermen often make a distinction between oversize males and females. The analogy used is straight from the cattle range. In the view of many fishermen, an oversized male lobster is to be compared to a bull, in that he can presumably breed many females. In the view of many of these men, the law protecting an oversized female has some substance since she can lay eggs, while the law on oversized males just protects a lot of superfluous animals that are not needed for breeding stock and which might as well be caught and eaten. The biologists make no distinction between the sexes when arguing against the law on oversized lobsters. Unlike the biologists, very few fishermen favor a raise in the legal measure to 3.5 inches. In our 1977 study, only four fishermen favored the raise to 3.5 inches while some 82 said they would oppose such a proposal.

There are two reasons for this opposition. First, they fear that an increase in the measure would make it illegal to take many lobsters they can now catch legally. They are undoubtedly correct. A recent study has demonstrated that an increase in the measure of even 1/16th of an inch would reduce

catches by 20 percent (Acheson and Reidman 1980). If the measure were suddenly increased from 3 and 3/16ths inches to 3.5 inches (this has never been seriously suggested), the drop in catch would be 69 percent.

Second, many fishermen clearly do not believe there is a clear connection between fishing pressure, eggs in the water and recruitment. In short, they doubt the whole set of connections and the logic that biologists use to justify the increase in the measure to 3.5 inches. In the view of many fishermen, the long-run fluctuations in lobster landings are due to "a natural cycle." This is not to say that they do not believe that there is no overfishing, but rather that other factors are far more important in influencing the supply of lobster than fishing pressure. In this study, 16 men out of 24 said there were too many fishermen and traps, but they strongly suspected that factors such as water temperature, predation by other animals, the supply of food, disease, etc. had far more influence on the supply of legal lobsters than the biologists were willing to admit. As one man phrased it, "the 3.5 inch law may give us more berried (egged) females, but that don't mean we'll get larger catches down the road. Anything can happen to those eggs. They might never hatch, and even if they do, the little lobsters can get sucked out to sea, eaten by fish or froze up in the ice." His own pet theory was food supply, and he went on to expound on the virtues of trying to increase the lobster supply by letting people dump raw sewage into the water again. The food supply issue cannot be easily disposed of. One of the biologists questioned underlined the fact that most animal populations constantly vary with the size of their food supply.

Conclusion

A very wide variety of biological, seasonal and technical factors influences lobster catches. Fishermen are generally aware of them, and have developed

a whole set of insights about the behavior of lobsters and the various sets of conditions which influences the animal's propensity to enter traps. They modify their own behavior accordingly. On the whole, fishermen are well aware of the combinations of variables which affect catches. Moreover, the kinds of explanations they use to explain variations in catches and lobster behavior, while not scientific, do not seem preposterous to fisheries biologists familiar with the lobster fishery. Quite the contrary. In many cases, fishermen and biologists are in very close agreement concerning the factors influencing catch. Our data do not give substance to the theory that fishermen and biologists really talk a different language and have completely different views of the fishery.

Fishermen have correctly identified seasonal, areal and skill factors as being the most important in influencing catches. If the results of our regression analysis are to be believed, their only serious error may be in according depth, bottom, and type of heads more importance than these variables deserve, and in under-estimating the importance of trap length and number of heads. But without question, they have a very clear view of the important factors influencing catches.

However, the fishermen and biologists strongly disagree on the factors affecting long-term variations in lobster supplies. The biologists clearly believe that predation by man is one of the most important factors decreasing the supply of lobsters. Fishermen point to other factors as being more apt to be responsible. "Its all a natural cycle," they say.

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FACTORS INFLUENCING PRODUCTION OF METAL AND WOODEN LOBSTER TRAPS:

A TECHNICAL REPORT

James M. Acheson

Introduction

Although metal lobster traps have been in existence for at least two decades, and fishermen in Maine have been using them in large numbers since 1974, the desirability of changing to such traps remains in doubt. Many fishermen feel that metal traps are vastly more efficient; other fishermen, equally experienced, argue that the trap's construction material has little effect on lobster catches in comparison with other factors; still other fishermen argue persuasively that certain types of metal traps are inferior to the traditional wooden traps. The object of this paper is to analyze the factors influencing lobster catches, with a view towards determining the relative importance of such factors. The effect of trap construction material on catches is of particular interest.

In order to evaluate factors affecting lobster catches, we carried out two different studies. In the first, fishermen in Muscongus and John's Bay helped us obtain data on 7716 trap hauls during 1977-1978. Most of the data presented in this paper come from this study. In the second study, conducted in the fall of 1978, three fishermen from Pemaquid Harbor allowed us to gather data on a smaller number of traps to address issues concerning metal traps which we had not examined in the first study. We are pleased with the quality of the data from both studies. Not only is the number of traps hauled large enough for statistical reliability, but the data were collected under conditions which allow us to control for a number of significant factors influencing lobster catches. The issue of controls is critical. One cannot compare the catches of various types of wooden and metal traps unless one also takes into account factors such as season, the type of bait used, the position of the trap, head type, and other variables.

These data generally support five conclusions. First, there are a large number of factors influencing lobster catches. Second, some variables play a much larger role in influencing catches than trap construction materials. Third, trap construction material has an effect on lobster catches, but not all kinds of metal traps are equal by any means. The same is true for other trap construction materials. Fourth, no single type of lobster trap consistently outfishes all other types of traps under all conditions. Fifth, although the trap construction material (metal, vinyl, wood) has relatively little effect on catches compared with other factors, it has enough effect on income levels that it should be taken into account when one is investing in new gear.

Two different kinds of apologies are owed at the outset. First, it is assumed that readers will be familiar with the most elementary aspects of the lobster industry. Periodically, descriptions are included on aspects of the industry unique to Maine (e.g. local laws, etc.), but no pretense has been made to describe the boats, traps, daily round, the territorial system, etc. Those who are relatively unfamiliar with the Maine lobster industry may wish to consult the following articles written by the author which are listed in the bibliography (Acheson 1972; 1975; 1977). Second, fishermen are suspicious of statistics, and justifiably so. All too often statistical evidence has been a sanctuary for scoundrels of various sorts seeking to make their case in terms that could scarcely be challenged by working fishermen. Fishermen, after all, may know a great deal about fishing and fish, but they are rarely able to express their findings in numbers.

Unfortunately, when trying to assess different kinds of gear and catches of different types of traps, only a statistical analysis will do. Impressions will not replace hard data on exactly what was caught from various kinds of traps, and the worth of those lobsters.

We apologize, in advance, for throwing around a lot of numbers. We will attempt to present all the data in terms that throw light on the problems, not obscure them, and explain the concepts used. Throughout the paper, we will make a clear distinction between the facts (data) on what came up in traps, and our analysis. We recognise that experienced fishermen may accept our information, but may have a different interpretation. One final cautionary note needs to be sounded. When we are analyzing all of the factors that influence lobster catches together, only a regression analysis will suffice. While regression analysis is a very powerful set of tools of immense practical value to social scientists, it is an advanced statistical technique, relying on mathematical concepts that are beyond the control of a large number of college professors. If there were any recourse to this kind of analysis, we would use it. The rest of the paper and the results will, hopefully, be readily understandable to anyone who knows lobster fishing.

Methodology

In our first study to obtain information on the relative efficiency of different kinds of metal traps, five University of Maine employees rode lobster boats owned by 18 fishermen from five towns in the Muscongus Bay region of Maine, and recorded data on 7716 traps that were pulled in while team members were on board. The data were obtained in three different seasons: July and August of 1977; November and December 1977; and April and May of 1978.¹

¹During the summer of 1977, the trap sample was obtained by James Acheson, John Thorvaldsen, and William Acheson. The winter 1977 sample was obtained by James Acheson and John Bort. The spring 1978 sample was obtained by James Acheson, John Bort, and Jayne Lello, while the 1979 fall sample was obtained by Terry Cucci and James Acheson.

This was coded, keypunched, and analyzed by computer. The information was then incorporated into a preliminary article on trap catches which was shown to several fishermen for their commentary. On the whole, the fishermen who saw this paper agreed with the results, but pointed out one serious deficiency -- namely, that we had assumed that all galvanized and aluminized traps were alike. Several fishermen claimed that traps made of wire that was impervious to corrosion fished better than those made of wire that corroded. Accordingly, we obtained data on another 2135 traps pulled by three Pemaquid Harbor fishermen in the fall of 1979 to test this hypothesis. During this second study, we recorded all of the original information plus data on the condition of the wire in metal traps pulled. It should be noted that the only data we have on the corrosion issue comes from the 1979 fall samples. In 1977 and 1978 the vast majority of the traps pulled were not corroding. In short, all of the data which appear in this paper were obtained by six people from the research team who were either permanent or temporary University employees; none was obtained by fishermen, State employees, or anyone else.

During periods when we were doing our trap sample, we would normally wait until the evening news to get the weather and then call fishermen who had agreed to help us for permission to accompany them in the morning. Those of us who comprised the research team would then get up between 3:00 a.m. and 6:00 a.m., depending on season, and meet the fisherman at some designated place -- normally the dock of the dealer or cooperative where he sells lobsters.

Each of us would spend the day on different boats recording data on every trap that was pulled during the day. One set of data was recorded for every string¹ of traps that was pulled: the name of the fisherman, the date, the string position, the type of bottom, the depth of the string, the harbor from which the man fished, the type of bait being used, the number of layover days, and the distance of that string to strings owned by other fishermen. For each trap in the string, we noted whether it was a metal or wooden trap, recorded any unusual features of the trap, measured all of the legal sized lobsters, and noted the number of notched-tailed lobsters if any.² Since fishermen are paid only for pounds of legal sized lobsters caught, we made no attempt to record data on the short lobsters. A trap which was good only for catching shorts would be of very little interest to fishermen. Moreover, it should be noted that we made no attempt to weigh the lobsters caught since scales would be inaccurate on a moving boat. Rather, we measured the carapace lengths of legal lobsters using a standard scientific caliper, and recorded the results in millimeters. The weight of lobsters was obtained later by converting length measurements into pounds using a simple mathematical formula. Ordinarily, there was ample time to record all this data. In the area where this project took place fishermen pull between 150 and 350 traps per day or a trap every two or three minutes on the average. (A sample data sheet used to record all of this information is included in the appendix.) Usually we would arrive

¹ Lobster traps are normally laid in clusters or strings.

² Under current Maine law, only lobsters may be legally taken which measure between 3-3/16 and 5 inches on the carapace. Moreover, it is illegal to take females with eggs or which have ever had eggs on them. Formerly, when a female lobster with eggs was caught, she was marked by cutting a v-shaped notch out of one of her tail flippers. Such "notched-tail" lobsters cannot be legally taken by any fisherman again since they are proven breeding stock.

back at the dock between 1:30 and 3:00 p.m. and arrive home by 4:00 or so. On some highline boats, one might leave the dock at 5:00 a.m. and not land until 5:30 p.m.

We made no attempt to obtain data on lobster catches from all over the state, but purposely concentrated all of our effort on data from carefully selected fishermen fishing out of four adjacent harbors in order to control for a number of ecological and technological factors. Since the issue of controls is so critical, some explanation of this aspect of the methodology is called for.

A very large number of factors influences lobster catches. The number of lobsters a man obtains varies enormously depending on season of the year, the number of traps employed, and the area he is fishing. In any area, at any given season, lobstermen state, catches will vary depending on the skill of the fisherman, the position of the trap, the depth at which it is placed, the type of bait used, the type of heads, the length of the trap, and what the trap is made of. We cannot accurately assess how well metal traps do compared to wooden ones if we compare the catch of four foot wooden traps, baited with alewives, in the Stonington area in the spring with three foot vinyl-covered traps, baited with bagged herring, from the Kittery area in mid-winter. If we want to compare metal and wood, we need to keep as many of these factors the same as we possibly can. In a word, we need to control for all these extraneous factors. This could only be done by carefully selecting the people and conditions under which the data were collected.

Several important comments need to be made in this regard:

(1) It is necessary to control for the time the trap has been in the water. One cannot compare a metal trap and a wooden one if one trap has been in the water for three days and the other only half an hour. Conse-

quently, in measuring the output of traps, we used as a measure pounds of lobster produced per trap per layover day. This is the standard measurement we will use throughout this paper. In this paper, the number .333 lb/trap /LOD means "1/3 pounds per trap per layover day."

(2) Only fishermen who were using both metal and wooden traps were asked to participate in this project. These men did not have the same number of metal and wooden traps by any means. But they all had some of both types. This allowed us to compare catches from metal vs. wooden traps taken by the same man in the same day.

(3) There is substantial evidence that some men are much better fishermen than others (Acheson 1977). This is generally acknowledged by everyone in the industry. In order to control for skill, we chose men who had been in the lobster business full-time for at least five years. There were no part-timers or "new" fishermen in the sample. This attempt at control was of some help, but proved to be inadequate. As we shall see, a great deal of the variation in catches can only be accounted for if we use a vastly more sophisticated indicator of skill. It is naive to assume that all people with five years experience are equally skilled fishermen.

(4) Some fishermen stated with great vehemence that there would be a strong variation in the performance of wooden and metal traps with the season. Such a hypothesis was generally phrased in terms of predicting that either wood or metal traps would fish better at different times of year. In order to obtain information on such factors, we gathered data at three different times of the year: just after shedding in July and August; in the middle of the productive fall fishing season (November and December); and in the spring, when catches are generally lower.

(5) There is a good deal of evidence suggesting that men fishing from some areas do better than men fishing from others due to differences in concentrations of lobsters, variation in fishing effort along the coast, and other ecological factors not understood (Acheson 1975). For this reason we limited our investigation only to fishermen from Pemaquid, New Harbor, Bremen, and Friendship. Even this attempt at control proved to be inadequate. While Muscongus Bay is relatively small, it is not a uniform body of water by any means. Some areas of the Bay are far more productive of lobsters than others. These differences show up most dramatically in the case of Bremen, whose fishermen had been doing unusually well the past few summers when they were fishing far up Muscongus Bay, while fishermen from Friendship and New Harbor, further down the Bay were catching far fewer lobsters during this season. For this reason, it is impossible to compare catches (particularly during the summer) without controlling for the specific territory in this bay where men from particular towns fish.¹

(6) Lobster fishermen believe that the type and construction of traps strongly influences catch. The majority build their own traps and rig them out, and they are constantly making minor changes in design. Thus, it is not only that trap styles differ from one man to another, but that the same man might have several different styles, which differ -- at least in his mind -- in important respects. At the lobster trap factory run by James Davidson in Round Pond, Maine, fishermen can choose between some 40 different models.

Controlling for the type of trap is not as difficult as it might at first sound, since all fishermen in the area under study use only a limited number of types of traps. All traps used are either three foot or four

¹ See Acheson (1972; 1975).

foot models, with either 3 or 4 heads made of nylon or some other synthetic twine. In this area the vast majority of the traps are fitted out with either hake mouth heads (string heads where the opening for the lobster is made very narrow by pressure from guy strings) or "hog ring heads" (heads with openings held open with metal rings about 5 inches in diameter). In this area there are two different kinds of metal traps in use: traps covered with aluminized wire, and traps covered with vinyl coated wire. All of the wooden traps are the traditional bow trap (oval) covered with oak lathes. In order to control for type of trap, we selected fishermen who used metal and wooden traps, which were three or four feet in length and had hake mouth or hog ring heads or a combination of these two types of heads. If men pulled any other odd type of trap during the days we were on their boats, the information was not recorded.

While it took two faculty members and three research assistants along with 20 lobstermen over a year to collect the data on these thousands of traps, the results can be expressed in very few tables.

In the following pages, we will present three different types of tables. Each one approaches the issue of metal vs. wooden traps from a different perspective, and gives different information.

Seasonal Variations and Trap Type

Table 1 summarizes all the data we obtained during our first study on pounds per trap per layover day for all seasons we collected information.

Table 1

Pounds/Trap/Layover Day for Vinyl, Aluminized and Wooden Traps

Over the Annual Cycle*

Season	Trap Type	Pounds per Trap** per Layover Day	Number of Trap Pulls
Summer 1977	vinyl	0.306	250
	wood	0.315	1402
	aluminized	0.850	466
Winter 1977-78	vinyl	0.381	270
	wood	0.265	1737
	aluminized	0.377	851
Spring 1978	vinyl	0.238	686
	wood	0.260	1119
	aluminized	0.267	917

Statistical Note #1

Season	Comparison	Value of t	Degrees of Freedom	Level of Significance
Summer 1977	vinyl vs wood	.0251	328	P=.50 (not significant)
	vinyl vs aluminized	-9.929	712	P=.001 (significant)
	wood vs aluminized	11.813	550	P=.001 (significant)
Winter 1977-78	vinyl vs aluminized	0.139	325	P=.50 (not significant)
	vinyl vs wood	0.156	510	P=.50 (not significant)
	wood vs aluminized	7.257	1277	P=.005 (significant)
Spring 1978	vinyl vs wood	-1.220	1602	P=.20 (not significant)
	vinyl vs aluminized	-1.559	1549	P=.10 (not significant)
	aluminized vs wood	-0.396	1978	P=.50 (not significant)

*All data in Table 1 were obtained in our first study (1977-78).
The metal traps were in good condition and were not corroding.

**There are two commonly used ways to measure the output of a trap: (1) pounds of lobster per trap hauled, and (2) pounds of lobster per trap hauled per lay-over day. In this case, pounds per trap per layover day has been used since this measurement takes into account the working time of the bait.

Several critical facts stand out clearly in Table 1. First, Table 1 underlines the fact that a good deal of seasonal variation exists in the lobster fishery. In general, traps do best after shedding season in the summer, and worst in the spring. Wooden traps, for example, caught .315 lbs/trap/layover day in the summer; .265 lbs/trap/layover day in the winter; and .260 lbs/trap/layover day in the spring. The same downward trend can be seen in the figures for the aluminized traps as well. There is nothing surprising in this. Everyone in lobster fishing has known for years that spring fishing has been very bad in comparison with shedder season and fall fishing.

More important, this table points out that there is no single type of trap that consistently outfishes all others, nor any type of trap that always does worse than any others.

However, these figures give very little reliable information about which traps fish best at any given season or over the course of the year. For example, it might appear that we could conclude that vinyl traps did worse than either aluminized traps or wooden traps in the summer, but did significantly better than wooden or aluminized traps in the winter. In the spring, they were again outfished by the wooden and aluminized traps. Unfortunately almost none of these conclusions can safely be made given the statistical probabilities involved. In the spring of 1978 aluminized traps caught .267 lbs. of lobster/layover day; wood .260 lbs/trap/layover day; while the vinyl got .238 lbs/trap/layover day. However, these differences are not statistically significant. The difference in average catches (lbs/trap/layover day) is small enough that they could have occurred by accident. Moreover, in the winter of 1977-78, there is no statistically significant difference in the catches of vinyl and aluminized traps. The vinyl traps

caught 0.381 lbs/trap/layover day, whereas the aluminized traps caught 0.377 lbs/trap/layover day, but the results of our test of significance again demonstrate that there is a high probability this could have occurred purely by accident.

Of course, tests of significance are not always reliable indicators of what is going on. These figures indicate that in the summer of 1977 aluminized traps outfished both vinyl and wooden traps by a wide margin. Moreover, the differences in mean catches are highly significant statistically.¹ In fact, there is only 1 chance in 1000 that these results could have occurred by accident (those who know some statistics can verify this by looking at the P figures in Statistical Note #1). From these figures, obtained in the summer of 1977, it might appear that the aluminized traps are clearly superior, and that there is not much difference between the vinyl and wooden traps. These conclusions are not warranted. A great deal of the aluminized fishing gear in the summer 1977 sample was used by Bremen fishermen, and for reasons no one can figure out, catches have been very high in the headwaters of Muscongus Bay and the Medomak River where Bremen fishermen place their traps in shedder season (summer). The critical question then is: are the spectacular results of the aluminized traps, recorded in Table I, due to the traps, or to the fact that fishing in certain areas is spectacularly good? The information in Table I does not allow us to answer this question.

Without going into a lot of fancy statistics, it should be noted that wooden traps are outfished by either vinyl traps or aluminized traps. In no season of the year do they clearly do better than both vinyl or aluminized

¹There is no statistically significant difference in the catches of vinyl and wooden traps.

traps. Those who know statistics will immediately seize on the fact that Statistical Note #1 demonstrates that the difference in means between wooden and vinyl and aluminized traps is not always significant, and that nothing conclusive can be drawn from Table 1. Nevertheless, as we shall see, there is strong reason to believe that wooden traps do not do as well as metal traps as long as the metal is not corroding. This is indicated, though not proven, by the information in Table 1.

Fishing Skill and Catches

All of the men who allowed us to gather catch data on their boats had at least five years experience, were full time fishermen with inboard powered boats, and fished throughout the year. We hoped that this would control for skill. It did not. The men who helped us are clearly of different skill levels. There is a great difference in the lbs/trap/layover day produced by men of different skill levels using the same type of traps from the same harbor. In New Harbor, for example, where we have a particularly large trap sample, there is a marked difference in the mean lbs/trap/layover day between very high skilled fishermen and high skilled men for every type of trap. As one can see from Table II, high skilled men using vinyl traps caught .266 lbs/trap/layover day, whereas the most highly skilled men caught .353 lbs/trap/layover day. High skilled men using wooden traps got .255 lbs/trap/layover day, while the highest skilled men got .334 lbs/trap/layover day. With the aluminized traps the same difference can be observed: high skilled men in New Harbor got .303 lbs/trap/layover day whereas the most highly skilled got .513 lbs/trap/layover day. Statistical Note #2 demonstrates that all of these differences in means are highly significant (at the .05 level or .001 level).

However, the data in Table 2 tell very little about productivity of different kinds of traps used by men of a given level of skill. For example, if we compare the traps used by high skilled men, the vinyl traps got .266 lbs/trap/layover day; the wooden traps got a little less, .255 lbs/trap/layover day; whereas the aluminized traps caught .303 lbs/trap/layover day.

Trap 2

Pounds per Trap per Layover Day by Harbor by Skill, New Harbor 1977-78

Fishing Skill	Vinyl	Trap Type Wood	Aluminized
Intermediate	---	---	---
High	.266 (n=599)	.255 n=1668	.303 n=120
Highest Skill	.353 (n=87)	.334 (n=949)	.513 n=177

n = no. of trap hauls

Statistical Note #2

A set of t tests was run to determine whether the differences in means observed in Table 2 were significant statistically. T tests were run to determine the level of significance of different types of traps at the same skill level, and for different skill levels controlling for traps.

Comparison	Value	Degrees of Freedom	Significance Level
High Skill: vinyl vs. wood	.666	1166	p = .50
High Skill: vinyl vs. aluminized	.959	155	p = .20
High Skill: wood vs. aluminized	1.290	135	p = .10
Highest Skill: vinyl vs. wood	.450	103	p = .50
Highest Skill: vinyl vs. aluminized	2.903	224	p = .005
Highest Skill: wood vs. aluminized	4.473	214	p = .001
Vinyl Traps: high vs. highest skill	2.065	107	p = .05
Wood Traps: high vs. highest skill	5.169	1459	p = .001
Aluminized Traps: high vs. highest skill	4.003	289	p = .001

However, the differences in these means are not statistically significant (see Statistical Note #2 in the section on catches for high skilled men). The output of traps used by the most highly skilled men produced better results. The aluminized traps these men used caught .513 lbs/trap/layover day whereas the vinyl traps got only .353 lbs/trap/layover day, and the wood .334 lbs/trap/layover day. (Statistical Note #2 demonstrates that only two of the three comparisons are significant. The difference in means between vinyl and wooden traps is insignificant).

The data in Table 2 strongly suggest two things: First, the skill of the fishermen is a critical factor influencing trap catches of all kinds. This table demonstrates clearly that our initial assumption that all men who were full time fishermen and had five years experience were essentially equal is absolutely wrong. Secondly, the information in this table suggests that the aluminized traps do better than the vinyl or the wood. There is a good deal of other evidence that tends to buttress both of these conclusions.

Vinyl, Wooden and Aluminized Traps: A Controlled Comparison

Far more conclusive information can be obtained about the effectiveness of metal vs. wooden traps by comparing the lbs/trap/layover day figures for each trap type, controlling for season of the year, fishing area, and skill of the fishermen. That is, we can tell a lot more about the catches of these various types of traps if we compare catches of wooden, aluminized and vinyl traps pulled by men of the same level of skill, in the same season, who are fishing in the same fishing area, which is usually designated by the town or hamlet name.

To be sure, some of the information we collected cannot be used in a controlled comparison, but a very large amount can. The results are expressed in Table 3, which follows:

Table 3

Controlled Comparisons on Lbs/Trap/Layover Day for Aluminized, Vinyl and Wood Traps*

Season	Town	Skill Level	Lbs/trap/LOD One Type Trap	Lbs./trap/LOD Second Trap	Value of t	Degrees of Freedom	Significance Level	
1. Summer	Bremen	High	Vinyl .265 (n=9)	Aluminized .323 n=140	2.753	12	P=.02	aluminized better than vinyl
2. Summer	Bremen	Highest	Vinyl .315 (n=9)	Wood .452 n=121	.768	10	P=.20	wood not clearly better than vinyl
3. Summer	Bremen	Highest	Vinyl .315 n=9	Aluminized .999 n=302	3.788	10	P=.005	aluminized better than vinyl
4. Summer	Bremen	Highest	Wood .452 n=121	Aluminized .999 n=302	6.720	376	P=.001	aluminized better than wood
5. Summer	New Harbor	High	Vinyl .174 n=85	Wood .332 n=552	.348	138	P=.50	wood not clearly better than vinyl
6. Summer	New Harbor	Highest	Wood .319 n=256	Aluminized .453 n=24	1.206	26	P=.20	aluminized not clearly better than wood
7. Summer	Friendship	Intermediate	Wood .176 n=172	Vinyl .148 n=23	.621	35	P=.50	wood not clearly better than vinyl
8. Winter	Pemaquid	Highest	Vinyl .428 n=68	Wood .276 n=411	2.681	78	P=.01	vinyl better than wood
9. Winter	Bremen	Highest	Wood .210 n=43	Aluminized .378 n=742	3.250	51	P=.005	aluminized better than wood

*These data were obtained in the 1977-78 study. The data from the supplementary study done in the fall of 1979 are not included.

Table 3 , continued

Season	Town	Skill Level	lbs/trap/LOD One Type Trap	lbs/trap/LOD Second Trap	Value of t	Degrees of Freedom	Significance Level	
10. Winter	New Harbor	High	Vinyl .353 n=172	Wood .237 n=715	4.669	231	P=.001	vinyl better than wood
11. Winter	New Harbor	High	Vinyl .353 n=172	Aluminized .348 n=43	.076	54	P=.50	Vinyl not clearly better than aluminized
12. Winter	New Harbor	High	Wood .237 n=715	Aluminized .348 n=43	1.788	44	P=.10	aluminized not clearly better than wood
13. Winter	New Harbor	Highest	Vinyl .430 n=30	Wood .297 n=566	1.883	31	P=.20	vinyl not clearly better than wood
14. Winter	New Harbor	Highest	Vinyl .430 n=30	Aluminized .382 n=66	.608	46	P=.50	vinyl not clearly better than aluminized
15. Winter	New Harbor	Highest	Wood .297 n=566	Aluminized .382 n=66	2.158	80	P=.05	aluminized better than wood
16. Spring	Pemaquid	Highest	Vinyl .261 n=137	Wood .395 n=292	2.771	334	P=.01	wood better than vinyl
17. Spring	Pemaquid	Highest	Vinyl .261 n=137	Aluminized .203 n=121	1.077	250	P=.50	vinyl not clearly better than aluminized
18. Spring	Pemaquid	Highest	Wood .395 n=292	Aluminized .203 n=121	3.769	277	P=.001	wood better than aluminized

Table 3, continued

Season	Town	Skill Level	lbs/trap/LOD One Type Trap	lbs/trap/LOD Second Trap	Value of t	Degrees of Freedom	Significance Level	
19. Spring	New Harbor	High	Vinyl .244 n=342	Wood .180 n=401	2.809	266	P=.005	vinyl better than wood
20. Spring	New Harbor	High	Vinyl .244 n=342	Aluminized .278 n=77	.707	102	P=.50	aluminized not clearly better than vinyl
21. Spring	New Harbor	High	Wood .180 n=401	Aluminized .278 n=77	2.098	91	P=.05	aluminized better than wood
22. Spring	New Harbor	Highest	Vinyl .312 n=57	Wood .529 n=127	3.291	139	P=.002	wood better than vinyl
23. Spring	New Harbor	Highest	Vinyl .312 n=57	Aluminized .629 n=87	3.967	141	P=.001	aluminized better than vinyl
24. Spring	New Harbor	Highest	Wood .529 n=127	Aluminized .629 n=87	1.308	157	P=.20	aluminized not clearly better than wood
25. Spring	Friendship	Intermediate	Vinyl .177 n=144	Wood .121 n=205	.1888	243	P=.50	vinyl not clearly better than wood

Table 3 necessitates some explanation. In this table we have assembled all the data collected in a way which controls for season, town, and skill level of the fishermen involved. Moreover, we have included the statistical values necessary. This table appears to be more complicated than it really is. Each case should be read across the page. In controlled comparison #1, we are comparing the lbs/trap/LOD of vinyl traps with lbs/trap/LOD of aluminized which were pulled by high skilled men from Bremen in the summer season. The t value and the degrees of freedom are statistical devices used to indicate whether the difference in means is statistically significant or not. In this case, they indicate that the aluminized traps caught more than vinyl traps pulled by men from the same town in the same season, and that this difference is significant. The P value indicates that there is only a 2 percent chance that this difference in lbs/trap/LOD could have occurred by accident. With this level of significance, we can safely conclude that these uncorroded aluminized traps owned by high-skilled Bremen fishermen in the summer of 1977 outfished vinyl traps pulled by the men under the same conditions.

Controlled comparison #2 compares the lbs/trap/LOD of vinyl traps with the lbs/trap/LOD of wooden traps pulled by the most highly skilled fishermen in Bremen during the summer of 1978. In this case the t test indicates that there is a .20 or one in five chance of these results occurring by accident. A one in five chance is generally considered too high to prove anything. Thus, we conclude that the wooden traps pulled by these men are not clearly superior to vinyl traps pulled by the same men under the same circumstances.

One should not be fooled by the statistics. They are really a lot easier than they appear. If an average fisherman could take two weeks off from fishing (which he cannot), he could learn enough statistics to make good sense out

of all of this. The important thing to recall is that we are trying to find out whether one type of trap pulled by men under certain conditions does better than another type of trap pulled by the same men under the same conditions. A t test is merely a standard statistical test used to find out whether differences in the mean or average lbs/trap/layover day are significant or not. The results are always phrased in terms of some percentage. Normally, anything over a one in 20 chance ($P=.05$) is considered statistically insignificant, since the results could have occurred by accident in 1 out of 20 cases.

The results of all of these controlled comparisons is summarized in Table 4. (Note that Table 4 does not contain anything that cannot be extrapolated from Table 3. It merely pulls together information on the results of controlled comparisons of particular type). The first comparison in Table 3 is one in which high skilled fishermen in Bremen in the summer caught .323 lbs/trap/layover day from aluminized traps and .265 lbs/trap/layover day from vinyl traps. The difference in these two means is highly significant (at the .02 level). In Table 4, this information appears as one of the four cases where the mean lbs/trap/layover day of aluminized traps exceeds vinyl traps. It is also one of the three statistically significant cases where the lbs/trap/layover day of aluminized traps exceeds the lbs/trap/LOD of vinyl traps.

The information on the statistically significant cases tells a good deal about the relative superiority of one type of trap over another.

There are three controlled comparisons with statistically significant results where lbs/trap/LOD of aluminized traps exceeds the lbs/trap/LOD of vinyl. There are no statistically significant cases where the mean catches of vinyl traps exceed the aluminized. This is very strong evidence suggesting that aluminized traps in good condition are superior to vinyl in general.

There are four statistically significant cases where the catches of aluminized traps exceeds those of wooden traps, and only one statistically significant case where lbs/trap/LOD of wooden traps exceeds the lbs/trap/LOD of aluminized traps. This is strong evidence that aluminized traps are also superior to wooden one.

Table 4

Summary of Controlled Comparisons*
on Lbs/Trap/LOD for Various Types of Traps

Case Description	No. of Cases	No. of Statistically Significant Cases
lbs/trap/LOD aluminized traps exceeds lbs/trap/LOD vinyl traps	4	3
lbs/trap/LOD aluminized traps exceeds lbs/trap/LOD of wooden traps	7	4
lbs/trap/LOD of vinyl traps exceeds lbs/trap/LOD of wooden traps	5	3
lbs/trap/LOD of vinyl traps exceeds lbs/trap/LOD of aluminized traps	3	0
lbs/trap/LOD of wooden traps exceeds lbs/trap/LOD of vinyl traps	5	2
lbs/trap/LOD wooden traps exceeds lbs/trap/LOD of aluminized traps	1	1

* These data were obtained in the first 1977-78 study. The aluminized wire traps were generally in good condition.

The situation with wooden and vinyl traps is not clear. There are three statistically significant cases where the lbs/trap/LOD of vinyl traps exceeds the lbs/trap/LOD of wooden traps, and two cases where it is the other way around. From this, the only thing we can conclude is that the catch of vinyl traps and wooden traps are approximately equal, with a slight edge going to the vinyl traps.

Perhaps the most important thing that can be gained from Tables 3 and 4 is an appreciation for the complexity of the situation we are dealing with. Even in situations where we are comparing catches of different types of traps pulled by men from the same town, with approximately the same level of skill, at the same season, there is no single type of trap that clearly outfishes all others and none that outdone by all others all of the time. The result of these controlled comparisons indicates that aluminized traps are superior generally to vinyl and wood, and that vinyl traps are, perhaps, a little superior to wood. There are, however, a few instances where wooden traps will outfish vinyl and even one case where very high skilled men got more from wooden traps than aluminized traps (see Table 3 , controlled comparison #18).

Factors Influencing Trap Catches: A Regression Analysis

All of the data from this study were analyzed using stepwise multiple regression. Regression analysis is a very powerful statistical tool. Unfortunately, it cannot be adequately explained in a paper of this kind. Those who have had a background in statistics will immediately understand what is to follow. For those who have not, it is important to realize several things about the analysis presented here: (1) Regression analysis allows us to take into account a very large number of variables.

In the previous sections, we were really taking into account only lbs/trap/day, season, type of trap, skill level, and fishing area or town. This analysis gave very interesting results. However, it did not allow us to take into account such factors as bait, depth of the trap, length of the trap, type of bottom, head type, and fishing practices of individual men. A regression analysis will allow us to take all of these factors into account all at once. (2) In regression analysis, we are attempting to separate out the effects of a whole cluster of independent variables on a dependent variable. In this case, the dependent variable -- the thing we are trying to account for -- is pounds of legal-sized lobsters in a trap. The independent variables are such items as type of trap, type of bait, season, depth, and bottom. Thus, this regression analysis will analyze what effect items like type of trap, boat, season, bottom, etc. have on lbs/trap caught. As we shall see, this regression analysis strongly reinforces many observations made earlier in this paper. It also gives a good many additional observations as well.

(Those who have not had time to take statistics may wish to skip to the section on conclusions.)

In regression analysis, it is standard to give the formula. In this case, giving the formula would be very difficult since some sixty variables were used in the regression equation. It would be more meaningful to list the types of variables used. This has been done in Figure 1 which follows:

Figure 1

List of Variables in Lobster Catch Regression Analysis

	<u>Variable Labels</u>
Head type	<ol style="list-style-type: none">1. Metal (all hog rings)2. Hake mouth3. Hog rings and hake mouth4. Unknown
Trap construction material	<ol style="list-style-type: none">1. Vinyl2. Wood3. Galvanized or aluminized
Trap length in feet	<ol style="list-style-type: none">1. Actual length (in feet) used
Number of head in trap	<ol style="list-style-type: none">1. Actual number of heads used
Bait used in trap	<ol style="list-style-type: none">1. Bagged herring2. Redfish3. Poggies4. Miscellaneous5. Alewives6. Whiting, and/or other dragged fish7. Bagged and strung fish
Depth of trap in fathoms	<ol style="list-style-type: none">1. 0-5 fathoms2. 6-10 fathoms3. 11-15 fathoms4. 16-20 fathoms5. 21-25 fathoms6. 26-30 fathoms7. 31-35 fathoms8. 36-40 fathoms9. 41-45 fathoms10. 46-50 fathoms
Type of material on ocean bottom	<ol style="list-style-type: none">1. Hard2. Mud3. Gravel4. Sand5. Edge of hard bottom
Topography of ocean bottom	<ol style="list-style-type: none">1. Hole2. Large area of hard bottom3. Shoal4. Next to shore5. Channel

Figure 1, continued

Type of Variable

Protected vs. unprotected position	<ol style="list-style-type: none">1. Unprotected2. Protected
Fishing area	<ol style="list-style-type: none">1. Pemaquid2. Bremen3. New Harbor4. Friendship
Fisherman	18 variables involved. Each fisherman assigned a variable number going from no. 1 to no. 18
Season	<ol style="list-style-type: none">1. Summer of 19772. Late fall of 19773. Spring of 1978
Length of lobsters caught	12 variables allocated for length of lobsters caught in each trap
Weight of lobsters caught	12 variables were allocated for weight of lobsters caught in each trap
Layover days/season	<ol style="list-style-type: none">1. Layover days for summer2. Layover days for fall3. Layover days for spring
Pounds per layover day	<ol style="list-style-type: none">1. lbs per layover day
Estimated availability of lobsters on bottom	<ol style="list-style-type: none">1. Est. availability of lobsters
Computational variables	

In stepwise regressions, one variable is fed into the computer and analyzed, then another is fed in and analyzed, etc. The last step is generally considered to be the most interesting since it allows one to see the effect of all factors working together simultaneously. Accordingly, we will concentrate on analyzing the last step of the regression analysis alone and ignore the reams of computer output which led up to these results. In the last step of this analysis, some 53 dependent variables printed out. Some are very interesting because they are so significant; others because they

have so little influence on catches. There is a great deal of information in this regression analysis. Most of it is meaningless without substantial explanation and interpretation. The remainder of this section is devoted to analyzing the results of this analysis.

Season

As one might expect from the controlled comparisons which preceded this, variables connected with seasons are the most highly significant.

Table 5
Regression Analysis: Season Variables

<u>Variable</u>	<u>Regression Coefficient</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Spring	-0.8951936	-0.29389	.39859	5.004	p = .05
Late Fall	.1542285	.05116	.32003	.232	not significant
Availability	-0.9268357	-0.22724	.44631	4.312	p = .05

The standardized regression coefficient of -.29389 for the spring season is the highest in Table 5 along with the standardized regression coefficient of -0.2273 for the availability factor,¹ which is closely connected with season. (Both are significant at the .05 level.) These figures reinforce again the notion that nothing influences catch as powerfully as the season of the year. All other factors being equal, catch clearly drops dramatically between shedding time in August and spring. The regression coefficient figures

¹ The availability factor needs some explanation. Approximately 93 percent of all lobsters that molt into the legal size range in July and August are caught before the next shedding season. Thus, there are a lot more lobsters available to be caught in August than the following May. In order to take into account the availability of lobsters a variable was constructed that assumed that 100 percent of the lobsters were available in August and that there was a 10 percent drop in legal-sized lobster population every month thereafter so that in May only 10 percent of the lobsters remained.

indicate that in the spring of the year, a trap will catch .89 lbs/trap less than it caught in the summer, a phenomenonally large drop.

These figures indicate that there is no significant difference between summer catches and fall catches, all other factors being equal. Note that the standardized regression coefficient for late fall is .05116 which suggests that fall traps do just slightly better than summer traps of the same type, but this difference is not statistically significant. All this does is reinforce the idea that August and November-December are some of the best months of the year for lobstering and that there is no significant difference between these seasons.

Trap Size

The next most important factor influencing lobster catches is the size of the trap. As we can see from Table 6, the standardized regression coefficient for trap size is .18089, and the standardized regression coefficient for the closely related variable of number of heads is -.15019.¹ Both of these results are significant above the .001 level. These figures indicate that four foot traps catch far more lobsters than three foot traps. The regression coefficient figures on trap size indicate that a four foot trap catches .536 lbs/trap pulled more than the three foot trap.

Table 6
Regression Analysis: Trap Size Variables

<u>Variable</u>	<u>Regression Coefficient</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Trap Size	.5357639	.18089	.09907	29.245	p = .001
N Heads	.4156289	.15019	.07815	28.288	p = .001

¹It should be noted that 3 foot traps have three heads generally, and four traps have four heads. Thus the number of heads is not generally independent of trap size..

Many men in the industry have long argued that the four foot trap outfishes the three footers. These results will come as no surprise to them.

Bait

Table 7
Regression Analysis: Bait Variables

<u>Variable</u>	<u>Regression Coefficient</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Poggies	0.7996427	0.13881	0.13597	34.589	p = .001
Bagged Herring and Stringed Bait	0.2033606	0.04852	0.07425	7.502	p = .005
Alewives	0.2694326	0.08827	0.12571	4.593	p = .05
Miscellaneous	-0.3508594	-0.05700	0.10185	11.868	p = .001
Whiting	-0.2940270	-0.04364	0.11463	6.579	p = .02
Redfish	-0.2099449	-0.04324	0.08034	6.828	p = .01
Bagged Herring	Baseline variable				

All of the information concerning type of bait used is contained in Table 7. There are two critical pieces of information. First, if we can judge by the standardized regression coefficient there is a great variation in the importance of various kinds of bait on lobster catches. The standardized regression coefficient for poggies and alewives is relatively high, which indicates that they are significant in influencing catch figures, although they are not as critical as season, trap size, or skill. The standardized regression coefficients for the other kinds of bait are relatively low, indicating that these variables have relatively little influence on catches when compared with the whole set of data under consideration.

Second, bagged herring was used as the baseline variable, so that the effectiveness of different kinds of bait is judged in terms of its

effectiveness relative to bagged herring. The regression coefficients indicate that bagged herring is more effective than some fish and less effective than others. The negative figures for whiting and redfish indicate that bagged herring is slightly more effective as a bait than either of these. The fact that the regression coefficients for alewives is 0.269 and that of bagged herring combined with stringed bait is 0.203 indicates that these two kinds of baits are a little better than bagged herring used alone. The regression coefficients for poggies is .800, which indicates it is a very much better bait than bagged herring.

These results are very difficult to interpret, particularly since various kinds of baits are not used all year. Two figures in the data particularly demand some comment. The regression coefficients for poggies indicates that they catch .800 lbs/trap/layover day more than bagged herring. However, poggies are used only in the late summer when fishing is generally very good, whereas herring are used throughout the fishing season -- even in the spring when fishing is generally bad. Thus, the high regression coefficient for poggies might reflect the generally good summer fishing conditions as much as anything about the bait itself. I am at a loss how to explain the fact that alewives show up as better bait than bagged herring. Alewives are used exclusively in the late spring and early summer, when fishing generally is very bad so that one might have thought that a bait used exclusively in the spring would not have done well. A great many fishermen insist that lobsters in the spring will only take fresh bait, and alewives are generally fresh. Fishing may be generally bad in the spring, but alewives may be so effective as bait that they show up better than bagged herring despite the poor fishing conditions under which they are used.

Fishing Practices and Skill

Many of the regression coefficients on individual men are very large and statistically significant, as can be seen in Table 8, which summarizes the regression output on fishermen. It is important to note that the variable concerning men is really a residual variable. That is, a great deal of fishing skill is knowing the size of the trap to use, the bait, the place to put the trap, the type of heads to use, etc. These variables have already been handled in this regression equation. Thus, the variable on each man is indicative of fishing practices over and above the ones already taken into account in the analysis. Thus, a high standardized regression coefficient on a "fisherman variable" indicates that this man is doing something important to influence the output of traps which cannot be explained by looking at heads, trap size, trap type, and all of the other factors explicitly handled here.

Table 8
Regression Analysis: Fishing Practice and Skill Variables

<u>Variable Name</u>	<u>Regression Coefficients</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Fisherman #12	0.4148997	0.07443	0.10700	15.035	p = .001
Fisherman #9	-0.9967670	-0.09767	0.21146	22.220	p = .001
Fisherman #7	0.1665962	0.03936	0.08605	3.749	p = .1
Fisherman #15	0.4461531	0.04331	0.14336	9.685	p = .002
Fisherman #3	0.0527552	0.01149	0.08858	0.355	not significant
Fisherman #17	-0.8374076	-0.08762	0.13672	37.515	p = .001
Fisherman #14	-0.8441483	-0.09400	0.13226	40.736	p = .001
Fisherman #11	-0.6043286	-0.10637	0.12290	24.180	p = .001
Fisherman #8	-0.5286158	-0.04571	0.16475	10.296	p = .002
Fisherman #4	-0.3982837	-0.07449	0.10231	15.154	p = .001
Fisherman #10	-0.8933552	-0.08481	0.21050	18.011	p = .001
Fisherman #18	-0.4954385	-0.08735	0.12722	15.167	p = .001
Fisherman #5	-0.4396956	-0.09376	0.12853	11.703	p = .001
Fisherman #6	-0.3033652	-0.04553	0.15226	3.970	p = .05
Fisherman #16	-0.2507777	-0.02219	0.16683	2.260	insignificant
Fisherman #13	-0.1806167	-0.01775	0.15627	1.336	insignificant
Fisherman #2	0.05547563	0.0062	0.15149	0.134	insignificant

A large number of the standardized regression coefficients are moderately high. In 8 out of the 18 cases reported, the coefficients were .08 to .10; the remainder are below that figure. This indicates that the fishing practices of a large number of men are moderately important in influencing catch. These coefficients indicate that these residual skills and practices are not as important as season, trap length, etc., but they are far more influential than other factors such as topography of the bottom, etc.

Although all of the men who helped in this project are full-time, experienced fishermen, there are differences in their fishing practices and levels of skill. This shows up very plainly in the regression coefficients which compare the pounds/trap each fisherman caught with the catch of fisherman #1 who served as a baseline for measuring fishing practices and skills. Since fisherman #1 was very highly skilled, only a very few men (e.g. fishermen no. 12, 15) caught more lbs/trap than man #1 where the measurements were statistically significant. Most of the other fishermen have a negative regression coefficient which indicates they caught less lbs/trap than fisherman #1. Some of these men caught significantly less. For example, fisherman # 14 has a regression coefficient of -0.837 which indicates that he caught .84 lbs/trap less than man #1. Numbers 14 and 10 did about the same.

While it is clear from these figures that fishing practices and skills of individual men are very important in influencing catch, it is not at all clear exactly what those skills and practices might be. As anyone in the business knows, a great deal of thought goes into fishing, and people are constantly trying all kinds of different things. Moreover, successful fishermen are not prone to talk about these skills, so that it is difficult to pinpoint exactly what different men are doing. Some of the factors making some men more successful than others are clearly conscious; others are almost unconscious,

or at least difficult for fishermen to describe even when they want to, and are the results of long years of experience. However, a previous study, which focused specifically on lobster fishing skills, demonstrated that the most important kinds of skills concern placement of traps (Acheson 1977: 111-138). That is, the most important factor distinguishing very good fishermen is the fact that they have, as one man put it, "an advanced degree in ocean bottom". By this he meant that very good fishermen know the bottom very well, know how to place traps at different seasons on bottom where concentrations of lobsters will be. This kind of skill makes a great difference in catch levels, and it is probably this kind of knowledge and skill that we are measuring when we see differences in regression coefficients for different individual fishermen. But there may very well be other factors involved. Unfortunately, this kind of statistical analysis gives us no solid idea what exactly is being measured in these so-called "fishermen variables" beyond the fact that we are getting at some kind of residual sets of practices and skills.

Depth and Topography of the Bottom

Since fishermen are very concerned with the depth of water their traps are in, one might assume that depth would be a critical factor influencing catches. This is not so. In any given season or week, fishermen undoubtedly do obtain more lobsters at certain depths than others. Over the course of the annual cycle, there is no single depth that is strongly associated with high productivity. This can be seen clearly in Table 9 which summarizes the regression information on depth and bottom topography.

Table 9

Regression Analysis: Depth and Bottom Variables

<u>Variable</u>	<u>Regression Coefficient</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Hard bottom	Baseline variable				
Mud	-0.1243054	-0.03803	0.06272	3.928	p = .05
Gravel	-0.3021396	-0.04393	0.09417	10.293	p = .002
Sand	-0.3720884	-0.04969	0.09888	14.160	p = .001
Edge of Hard	0.02589977	0.00465	0.08184	0.100	insignificant
0-5 fathoms	Baseline variable				
6-10 fathoms	0.1216492	0.03501	0.05754	4.470	p = .05
11-16 fathoms	0.0383904	0.00706	0.08252	0.216	insignificant
16-20 fathoms	0.1203541	0.02039	0.10140	1.409	insignificant
21-25 fathoms	-0.007365116	-0.00115	0.10568	0.005	insignificant
26-30 fathoms	0.3036022	0.06830	0.09760	9.676	p = .002
31-36 fathoms	0.06304481	0.01385	0.10866	0.337	insignificant
37-40 fathoms	0.2071612	0.03500	0.11849	3.057	insignificant
41-45 fathoms	0.1546614	0.12189	0.13491	1.314	insignificant
46-50 fathoms	0.2267935	0.02302	0.15180	2.232	insignificant

These results will come as no surprise to people familiar with the fishing industry. They strongly reinforce the idea that one must keep moving traps from one depth to another with the season of the year, etc. One cannot leave traps in the same depth for long periods of time without moving them and expect to do well.

Where bottom topography is concerned, all types of bottom are being compared to the figures for hard bottom, which is serving as the baseline variable. Since the regression coefficients for mud, gravel and sand are negative in comparison to hard bottom and the level of significance is relatively high, it can be concluded that hard bottom is more productive of lobsters than these types of bottoms, and that there is a very small probability of these results happening by accident. For example, since the regression coefficients for mud bottom are -0.1243054 , we can conclude that traps on mud bottom produce $.124$ lbs/day less than traps on hard bottom. Since these results are significant at the $.05$ level, there is only one chance in 20 of these results happening by accident. Since the regression coefficient for edge of the hard bottom is insignificant, we can conclude that "edge" and hard bottom are equally productive of lobsters. Furthermore, it is obvious that the "edge" is significantly more productive than mud, sand or gravel bottom.

These data indicate that depth of water has less influence on catches than type of bottom. In studying depth, the 0-5 fathom variable was used as the baseline. Not only are the regression coefficients on depth variables lower than those for bottom variables, but their level of significance is very low as well, indicating that in most cases, these figures on depth may well have occurred by accident. The one exception is the 26-30 fathoms depth variable. Here the regression coefficient is 0.06830 , suggesting that this depth has some influence in determining catches in comparison with all other variables. The regression coefficient of 0.304 indicates that traps at this depth catch $.304$ lbs/day higher than traps in 0-5 fathoms. These results are highly significant (at the $.002$ level). I can offer no explanation for these results save to suggest that there is apparently a lot of

bottom at this depth moderately productive of lobsters throughout much of the year.

Head Type

Fishermen pay special attention to the type of head used in their traps. They have as many theories and ideas about the type of heads used as any other aspect of lobstering. For this reason, we thought that the figures on type of head used would prove to be of special significance. This does not prove to be the case. In fact, head type proved to be one of the least significant variables in the entire equation, as can be seen from Table 10.

Table 10
Regression Analysis: Head Type Variables

<u>Variable</u>	<u>Regression Coefficient</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Hog ring heads	Baseline variable				
Hake mouth heads	-0.1243684	-0.04269	0.19276	0.416	Not significant
Hog rings and hake mouth	-0.1224263	-0.04130	0.18750	0.426	Not significant

The level of significance indicates that there is no statistically significant difference between the amount of lobster produced by traps with these different kinds of heads. Moreover, the regression coefficients are very low as well (i.e. -0.04), which strongly suggests that heads play a relatively unimportant role in determining catch levels in comparison with other variables. We felt very uneasy about these results, since so many outstanding fishermen are convinced that heads do make an important difference

and that poor heads will produce poor results. It should be noted that while fishermen feel strongly about the importance of head type, they do not agree very often on what type of head fishes best. These data suggest they may have real cause for disagreement. Certainly the data support no single school of thought on heads--or even the idea that heads are important.

Trap Construction Material

Our regression data concerning the trap construction material is very interesting. The data from our first study are statistically significant and reinforce the conclusions we reached through the controlled comparisons. As we can see from the data in Table 11, wooden traps and uncorroded aluminized traps are being compared to vinyl traps, which serves as the baseline variable.

Table 11
Regression Analysis: Trap Construction Material

<u>Variable</u>	<u>Regression Coefficient</u>	<u>Standardized Regression Coefficient</u>	<u>Std Error</u>	<u>F</u>	<u>Significance Level of F</u>
Vinyl traps	Baseline variable				
Wooden traps	-0.2767385	-.09448	0.07508	13.584	p = .001
Aluminized traps	0.1546972	0.04821	0.07886	3.848	p = .05

The regression coefficient figures indicate that wooden traps catch .277 lbs/trap less than vinyl traps while the aluminized traps get .155 lbs/trap more. Even though these differences in poundage caught are quite small, the difference in catches are statistically significant, so that we can be reasonably certain that these results did not happen by accident.

It should be noted that these results were obtained on the data collected in 1977-78 when we were studying traps that had no corrosion problems. In the fall of 1979, we obtained information on traps that were in good condition as well as traps that were corroding. We added the 2135 traps pulled in 1979 to the 7716 in the 1977 and 1978 sample. Table 12 contains figures on pounds/trap/layover day of the 9782 traps in our sample on which we had information.

Table 12

Pounds/Trap/Layover Day by Trap Construction Material: Other Factors Uncontrolled

<u>Trap Construction Material</u>	<u>Lbs/Trap/Layover Day</u>	<u>Sample Size</u>
Aluminized (good condition)	.421	2567
Aluminized (rusted)	.300	208
Vinyl	.292	1589
Wood	.270	5011
Aluminized (corroding)	.263	456

These figures indicate that aluminized traps in good condition caught more pounds of lobsters per day in the water than traps made of any other kind of material. Aluminized traps with all of the protective metal coating rusted off produced .300 lbs of lobster for every day they were in the water. The least productive were the aluminized traps which were in the process of corroding; these produced only .263 lbs of lobster per day in the water. In between are the wooden and vinyl traps. These results on lbs/trap/layover

day must remain tentative since they do not reflect all of the other factors which we know influence catches. A much better indication of trap productivity comes from our regression analysis which takes a large number of factors into account. That is, it compares the productivity of different kinds of traps (i.e. aluminized, wood, vinyl, etc.) as though factors such as bait, season, skill, etc. were all held constant. The results of this regression analysis are summarized in Table 13 below:

Table 13

Productivity of Types of Traps: The Regression Analysis

<u>Trap Construction</u> <u>Material</u>	<u>Regression</u> <u>Coefficient*</u>	<u>T</u>	<u>Level of</u> <u>Significance</u> <u>of T</u>	<u>Adjusted Pounds/Trap/</u> <u>Layover Day</u>
Aluminized (good condition)	0	---	---	.314
Aluminized (rustied)	-.0359	1.09	.14	.278
Vinyl	-.050	3.11	.002	.264
Wood	-.111	8.15	.0001	.203
Aluminized (corroding)	-.0685	2.75	.01	.242

* $R^2 = .141$
Adjusted $R^2 = .138$

Several things need to be explained about this table. First, the regression coefficients compare the catches of all other kinds of traps to those of the aluminized traps in good condition. These figures again indicate that the aluminized traps (good condition) catch the most. The same kind of traps with all the coating rustied off catch .0359 lbs/trap/layover day less. The vinyl traps catch .050 lbs/trap/layover day less than these good condition aluminized traps, etc.

The figures on the adjusted pounds per trap per layover day indicate that under typical conditions encountered in our sample, good condition aluminized traps catch .314 pounds of lobster every day the trap is in the water. Under the same controlled conditions, the aluminized traps with all coating rusted off would catch .278 lbs/trap/layover day, followed by the vinyl traps with .264 lbs/trap/layover day. According to the regression analysis, the aluminized traps which are corroding catch only .242 lbs/trap/layover day. The least productive traps, all other factors controlled, are the wooden ones. It should be noted that Table 13 indicates that the corroding aluminized traps do worst. However, the more powerful regression analysis indicates that the wooden traps are least productive -- all other factors being equal.

A series of standard statistical t-tests were run to see if differences in trap productivity are statistically significant. The figures on the t-tests and level of significance in Table 13 indicate that the aluminized traps (good condition) do significantly better than the vinyl, wooden, and corroding aluminized traps. We could find no significant difference between the aluminized traps (good condition) and the aluminized traps where all the coating had corroded off. These results suggest something rather strange -- namely, that aluminized traps do well if the coating stays on and after it has completely corroded off. Traps in the process of corroding are clearly not as productive.

These results clearly indicate that trap construction material influences productivity. The reasons for this are not clear, though a number of fishermen and scientists have suggested several plausible explanations. Many fishermen believe that metal traps stay on the bottom better, while wooden traps, even when weighted, have a tendency to float, and thus move somewhat due to the action of waves, wind, and tide. Lobsters, so the story goes, prefer to crawl into far more stationary traps. In support of this theory, several

fishermen, who have observed lobsters in pounds, report that lobsters will crawl all over a baited stationary trap. If the trap moves, even slightly, these fishermen say the lobsters will scatter. Secondly, some fishermen believe that lobsters are repelled by the smell emanating from the vinyl-covered wire and corroding traps. Third, still other men believe that lobsters can see fairly well and thus prefer the bright, shiny, metal wire of the uncorroded aluminum traps over the duller wooden and vinyl traps. Fourth, one scientist at Woods Hole has hypothesized that lobsters may be attracted or excited by the ions emanating from the aluminized traps, and consequently crawl into them in greater numbers than into the other types of traps.

All or none of these hypotheses may be correct. None of the data presented in this paper support or negate any of these various guesses. In short, this study tells us a good deal about what comes out of traps, but nothing about the reasons why a lobster prefers traps made of one construction material over another. All we know for sure is **that** lobsters in Muscongus Bay did crawl into some types of traps in greater numbers than others.

We also know something far more important -- namely what the trap is made of is relatively unimportant in determining catches in comparison with other variables. This is indicated by the regression coefficient figures, which are summarized in the next section.

Summary of Results: Regression Analysis

One of the geniuses of regression analysis is that it not only allows comparisons of variables of a given type but also allows one to assess the importance of all variables in the equation. The regression coefficient figures, for example, allow us to compare the effectiveness of one type of bait to other types of bait; the standardized regression coefficients, by way of contrast, allow us to tell how important various types of bait are in

explaining catch, in comparison with depth of water, season, head type, etc.

It is useful to pull together all of the information on the standardized regression coefficient figures from Tables 5 to 11 to compare and discuss the importance of various factors influencing catches.

Table 14
Regression Analysis: Importance of Factors
Influencing Lobster Trap Production

<u>Variable Name*</u>	<u>Standardized Regression Coefficients***</u>
Spring	.295**
Availability of lobsters	.227
Trap size	.180
Number of heads	.150
Poggies	.138
Fisherman #11	.106
Fishermen #9,14 and 5	.090
Wooden traps	.094 (negative figure)
Alewives	.088
Fishermen #17, 10 and 18	.087
Fishermen #12 and 4	.075
Bagged and stringed bait	.074
26-30 fathoms depth	.068
Sand	.049
Aluminized traps	.048 (positive figure)
Fishermen #15, 8 and 6	.045
Whiting	.043
Redfish	.043
Gravel bottom	.043
Mud bottom	.043
Hake mouth heads	.042 (insignificant statistically)
Hog ring and hake mouth heads	.041 (insignificant statistically)

*All variables with levels of significance of over .05 have been excluded from this table except for those concerning head type. We can say nothing definite about them since the results reported could have occurred by accident.

**The last two digits on the standardized regression coefficient figures and the sign have been left out since they are irrelevant and including them would make the table more difficult to read.

***All these figures stem from the 1977-1978 sample. The data from the fall of 1979 (the information from Table 13) are not included.

Again, the season variables are unquestionably the most significant. This shows up in both the spring variable and the availability of lobster variable, which is an estimate of lobsters still on the bottom in any given month. Nothing is more important in influencing catch than the month that the trap is placed in the water. Next in importance are trap size and number of heads, which, as has been said, are closely related variables. Next in influence is a type of bait (i.e. poggies). The fact that poggies show up so high probably reflects the fact that they are used exclusively in the warm summer months when fishing is very good. Most other kinds of bait show up as relatively low in the scale, indicating that the kind of bait used is relatively unimportant in influencing lobster catches. The fisherman variables show up as moderately important. This variable is a residual variable, and probably reflects skill in trap placement as much as anything else. Such skills and practices, while difficult to pinpoint, can clearly not be ignored in any analysis of factors influencing lobster catches.

On the bottom of the list are items such as depth, material on the bottom, type of heads, and some kinds of bait. Several things need to be stressed about these unimportant variables. First, it should be noted that the number of heads is very significant; but whether those heads are hake mouth or hog ringed has little influence on catches. We make no pretense at understanding these results, but this is clearly what the figures show. Second, these figures probably indicate that traps do have to be moved; however, there is no depth which is unusually productive of lobsters over the course of the entire year.

Most important, there clearly is a difference in types of traps. The vinyl traps, which have served as a basis for comparative purposes, are

significantly better than wooden traps, and just a little less productive than uncorroded aluminized traps. This is indicated both by our controlled comparisons and the regression analysis (see pages 738, 739, and 756 for explanation). The standardized regression coefficient figures do not reflect a comparison of trap types to each other, but to all other variables. In this regard it is important to note that the trap construction material is relatively unimportant in influencing catch in comparison to variables such as season, size of trap, etc. Wooden traps in this 1977-78 sample have a standardized regression coefficient of .094 and aluminized .048, while variables like trap size are .180, and availability of lobsters is .227.

These figures indicate something very important: what material a trap is made from does make a difference, but trap construction material is nowhere as important in influencing lobster catches as factors such as season, trap size, and the practices of the fisherman using those traps. All other things being equal, the figures in Table 11 indicate that a man with vinyl or aluminized traps will outfish a man with wooden traps. However, they also demonstrate that a man with vinyl or aluminized traps who is unskilled and uses his traps in March will be badly beaten by a more skilled man who uses wooden traps in August. (For those familiar with the fishing industry, this is merely stating the obvious.)

The regression analysis takes us a long way in understanding the factors influencing lobster catches and the relative importance of those factors. It should not be thought that this analysis tells us everything there is to know about the factors influencing catches, however; quite the contrary. There is a great deal left to be explained. This is indicated most importantly by the fact that the R^2 for the last step in the equation is only 0.14327, which indicates that all of the variables we have considered explain only 14 percent of the total variance in lobster catches on which

we have information. This is not to say that the results we have are completely false or inadequate, only that there is still a good deal about lobsters, traps, and fishermen that we are unable to explain. Of course, no regression analysis explains 100 percent of the variance, but we do consider this R^2 figure on the low side.

There are two reasons which might explain why we are able to explain so little of the variance. First, we may have ignored some factor or set of factors that is critically important for understanding catch results. Secondly, a great deal of lobster behavior may be highly unpredictable, or there might be a highly random component in placing traps where lobsters are. We believe the second explanation is far more likely than the first. There are literally hundreds of factors that might influence lobster catches, which we have not considered, but we feel we have most of the major ones. It is possible that age of the trap, or height of the head, or number of worm holes, or mesh size of the head, etc. is a critically important variable. Maybe so. However, we feel that much of the unexplained variance is due to the fact that lobsters are highly unpredictable creatures, whose brains work in ways no human being can fathom. Most of the reasons they crawl into one trap over another are unknown, and likely to remain so. Jim Thomas, a very experienced marine biologist, has noted cases where tagged lobsters were released in the eastern part of Maine only to be caught in waters near the New Hampshire border (Thomas 1979). Such lobsters passed literally thousands of traps before they finally crawled into one several hundred miles away from the place they started. What was it about the one trap, if anything, which distinguished it from all the rest? If our suspicions about lobster behavior are correct, any analysis of lobster catches is apt to have a very high unexplained variance, and lobstering is always

going to be a business in which what comes out of a trap will always be a surprise.

Economic Issues

From the point of view of the fisherman, one of the critical questions is whether or not it is advisable to invest in aluminized, vinyl, or wooden traps. We know from the regression analysis that trap construction material has far less influence on catches than other factors. Are those differences in trap productivity so small that they can safely be ignored in considering various kinds of traps? Are they large enough to substantially influence income? We have some evidence that differences in trap productivity are substantial enough so that they should be considered when a fisherman is contemplating buying new traps.

One cannot answer questions about the desirability of investing in various kinds of traps by looking at the figures on physical productivity of various types of traps. Several factors complicate the issue. First, metal traps are far more expensive than wooden traps. In 1977, some four foot aluminized traps cost \$27.50, so that a pair of these traps, equipped with warp line, toggles, and buoy ran about \$65.00. A single 3 foot oak trap could be bought for \$12.00, and a pair of them fully rigged cost about \$25.00. Moreover, the wooden traps, it is estimated, last 5 to 7 years, while an aluminized or vinyl trap lasts about three or four years. In addition, investment in lobster traps lasts over a period of years, so that the discount rate or time value of money must be taken into account. Finally, the physical output of a trap varies dramatically over the course of a year, along with the price the fisherman receives for lobsters. All of these factors make it impossible to automatically assume that a trap that fishes better during one

month is the trap to buy. In order to be able to tell which trap is the better investment, one needs catch and cost figures over the entire lifetime of a large number of various types of traps. Unfortunately, such information does not exist. One fisherman did volunteer information of this kind on 20 traps: 10 wood and 10 uncorroded aluminized. While this is not an adequate sample by any means, this information will allow us to make some tentative statements about the advisability of investing in wood traps and aluminized traps. Unfortunately, we do not have access to similar data on vinyl traps or corroding wire traps, etc.

The most widely used technique accountants, bankers, and businessmen use to evaluate investment options is to compare the Net Present Values on the investments in question. Information on internal rates of return allows us to ascertain whether an amount of money invested in one project will bring a higher or lower return than the same amount of money invested in another. The data at our disposal will certainly allow us to do this for the wooden and uncorroded aluminized traps. The internal rate of return is that interest rate which returns the following formula to zero.

$$\text{Net Present Value} = \sum_{T=1}^N \frac{\text{NCF}_t}{(1+i)^t} - C$$

Here, NCF is Net Cash Flow; i is the interest rate; c is the initial cost of the project; and N is the expected life of the project.

In order to obtain information on the NPV of an investment in wooden vs. aluminized traps, detailed information on costs, interest rates, catches and revenues for 10 metal and 10 wooden traps was made available by this fisherman for the period from June 15, 1977 to April 1, 1978. Given the

information made available, the following is assumed in calculating the NPV of wooden vs. aluminized traps.

(1) that the interest rate is 8.75% (This is the interest rate the fisherman was actually charged in the summer of 1977 on a secured loan to buy traps.)

(2) that an aluminized trap cost \$32.50 and a wooden trap cost \$17.50 (fully rigged). These are the actual costs he paid during the spring of 1977.

(3) that a metal trap will last 4 years and a wooden trap will last 6 years.

(4) that the Net Cash Flows will remain constant over the course of the investment.

(5) that a fisherman already has a boat, dock, pick-up truck, workshop, etc. The only decision he is currently making concerns the traps themselves.

In order to obtain Net Present Value figures for investments in these wooden and aluminized traps, we need to have data on Net Cash Flows -- the gross revenue minus cash costs associated with each type of trap. To this end, data on prices paid for lobster was obtained from the New Harbor Co-op from June 1977 to April 1978, along with data on pounds of lobsters caught by the local fisherman in his 10 wooden and 10 aluminized traps. The results are summarized in Table 15.

Table 15
Revenue Produced by a Sample of Wooden and Aluminum Traps

Month	price received (15th of the month)	lbs. (total lobsters caught in wooden traps) (10)	lbs. (total lobsters caught in alumin- ized traps)(10)	Total Revenue (wooden traps)	Total Revenue (alum. traps)
June 1977	\$1.90 lb.	26	40	\$ 49.40	\$ 76.00
July 1977	\$1.30 lb. (soft shell) \$2.30 lb. (hard shell)	6	37	\$ 9.33	\$ 61.10
August 1977	\$1.40 lb. (soft shell) \$2.00 lb. (hard shell)	55	86	\$ 86.40	\$133.00
Sept. 1977	\$1.40 lb.	83	129	\$116.20	\$180.60
Oct. 1977	\$1.50 lb.	96	155	\$144.00	\$232.50
Nov. 1977	\$1.80 lb.	104	171	\$187.00	\$307.80
Dec. 1977	\$2.40 lb.	62	85	\$148.80	\$204.00
Jan. 1978	\$2.75 lb.	28	33	\$ 77.00	\$ 90.75
Feb. 1978	\$3.00 lb.	19	30	\$ 57.00	\$ 90.00
March 1978	\$3.00 lb.	24	33	\$ 72.00	\$ 99.00
April 1978	\$3.60 lb.	?	?	?	?
Totals		502 lbs.	799 lbs.	\$947.13	\$1,476.75

Table 15
Revenue Produced by a Sample of Wooden and Aluminum Traps

Month	price received (15th of the month)	lbs. (total lobsters caught in wooden traps) (10)	lbs. (total lobsters caught in alumin- ized traps)(10)	Total Revenue (wooden traps)	Total Revenue (alum. traps)
June 1977	\$1.90 lb.	26	40	\$ 49.40	\$ 76.00
July 1977	\$1.30 lb.(soft shell) \$2.30 lb.(hard shell)	6	37	\$ 9.33	\$ 61.10
August 1977	\$1.40 lb.(soft shell) \$2.00 lb.(hard shell)	55	86	\$ 86.40	\$133.00
Sept. 1977	\$1.40 lb.	83	129	\$116.20	\$180.60
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Nov. 1977	\$1.80 lb.	104	171	\$187.00	\$307.80
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Feb. 1978	\$3.00 lb.	19	30	\$ 57.00	\$ 90.00
March 1978	\$3.00 lb.	24	33	\$ 72.00	\$ 99.00
April 1978	\$3.60 lb.	?	?	?	?
Totals		502 lbs.	799 lbs.	\$947.13	\$1,476.75

There are, of course, enormous costs involved in the lobster business. This particular fisherman (see Table XV) pays about \$5,200.00 for bait during the year and another \$3,200.00 for gas, and it cost him another \$500.00 cash (to say nothing of his time) to maintain the traps he already has. Since he has approximately 500 traps, and his annual variable costs are \$8,900.00, his cost per trap is \$17.80¹.

These ten wooden traps yield \$947.13, therefore the gross revenue for one trap per year is \$94.71. Since 10 aluminized traps in good condition yielded \$1476.00, one trap produces a gross revenue of \$147.60. If variable costs per trap are \$17.60, then the Net Cash Flow for a wooden trap is \$76.90 per year and the Net Cash Flow for an aluminized trap is \$129.00 per year.

If the Net Cash Flow for a year per aluminized trap is \$129.00, the interest rate is 8.75 percent, the trap lasts for four years, and the initial cost of the investment is \$37.50 then the Net Present Value is as follows.

$$\begin{aligned}
 \text{NPV (Aluminum Traps)} &= \sum_{T=1}^N \frac{\text{NCF}_t}{(1+i)^t} - C \\
 \text{good condition} & \\
 &= \sum_{T=1}^4 \frac{\$129.00}{(1 + .0875)^T} - \$32.50 \\
 &= \$387.75
 \end{aligned}$$

¹Only variable costs, or costs connected with actually putting traps out, have been included. Payments on boat, pickup truck, insurance, (fixed costs), would have to be paid whether a man put any traps in the water or not. Since such fixed costs have nothing to do with traps, they have been excluded for our purposes.

If the Net Cash Flow on a wooden trap is \$76.90, the trap lasts 5+ years, the interest rate is 8.75 percent, then the Net Present Value is as follows.

$$\begin{aligned}
 \text{NPV (Wooden Traps)} &= \sum_{T=1}^N \frac{\text{NCF}}{(1+i)^T} - C \\
 &= \sum \frac{\$76.9}{(1+.0875)^6} - \$17.50 \\
 &= \$340.05
 \end{aligned}$$

The figures on the Net Present Value of aluminized vs. wooden traps support the idea that aluminized traps are a better investment. The NPV for these aluminized traps is \$387.75, while the NPV of wooden traps is only \$340.05. This comparison takes into account the difference in: physical productivity, the life of the traps, and the initial costs.

These figures, however, do not prove the superiority of aluminum wire traps in good condition over all other traps. First, the net present value figures for these wooden traps are very close to being as high as that for the aluminum traps. Second, the sample of 20 traps is too small for statistical reliability. Third, we have no economic information on vinyl lobster gear or aluminum traps which are corroding. What these figures do suggest is that if one could get the proper kind of aluminum wire traps (non corroding)

one would probably do well. More important, these figures suggest that the trap construction material has a strong enough effect on income that it cannot be safely ignored when one is considering investment in lobster traps.

Conclusion

Lobster fishing is a very complicated business, and as every fisherman knows, there is a wide variation in catches, not only among different fishermen, but by traps pulled by the same fisherman. In an effort to sort out the factors affecting catches -- particularly the effect of the trap construction material on catches -- we obtained detailed information on 7716 traps hauled by 18 fishermen working in the Muscongus Bay and John's Bay area of the central Maine coast in 1977-78 and another 2135 traps in 1979. These different data were analyzed in three different ways. First, it was demonstrated that trap catches varied considerably according to layover day, season, fishing area and fishing skill (third and fourth sections). Since all these factors obviously affected catches, a set of controlled comparisons was used to assess the effect of trap construction material on catches (fifth section). When we compared the lbs/trap/layover day of aluminized, uncorroded, vinyl and wooden traps pulled by men of equal skill, in the same area, in the same season, the aluminized traps appear to do best, followed by the wooden traps. However, this analysis also pointed out that there was no trap construction material that consistently beat all others, and no material that was always inferior. That is, in many cases, men from one area, in the same season, of the same skill using aluminized traps, beat men using wooden traps. But there are cases where men from the same harbor, in the same season, of the same skill using wooden traps beat men using aluminized traps and vinyl ones. More than anything else, these controlled

comparisons underlined the complexity of the phenomena we were dealing with and the fact that a good many factors strongly affected lobster catches -- including the material of which the trap was made.

Second, all of the variables collected were analyzed using stepwise multiple regression analysis -- an advanced, complicated, but very powerful statistical tool. While the intricacies of regression analysis cannot be fully understood by the layman, the results are worth paying attention to. This analysis strongly documents the fact that there is a statistically significant difference in catches of different types of traps. In the discussion of the data in Table 11 and Table 13, it was demonstrated that the regression coefficients on trap type indicate that the aluminized traps in good condition caught the most lobsters, followed by the vinyl traps, and that wooden traps caught the least. It also demonstrated that while trap construction material did affect catch levels, other factors were far more important. The most important variables were connected to season of the year, followed by the size of the trap. Next in importance were the fisherman variables, which are really proxy variables for fishing skill and fishing practices. The next important variables were bait and trap construction material. The least important factors influencing catch were type of bottom, depth, and type of heads used. This is not to say that where a man places traps is not critical, but only that there is no one type of bottom or depth that is productive of lobsters all year long. In short, one must move traps, as everyone knows. We are suspicious of the data on head type, since most men in the fishing industry believe that heads are critically important. Heads may be important, but this regression analysis strongly suggests that it does not make an iota of difference if the heads are hog ring, hake mouth, or mixed.

type heads. The R^2 on this regression indicates that all of the variables in our regression equation **explain only** 14 percent of the total variance. We believe this is primarily due to the erratic behavior of lobsters and/or a random component in placing traps where lobsters are.

Third, we analyzed cost and income data provided by one fisherman on a small sample of wooden and aluminized traps in good condition to assess the desirability of investing in each type. The Net Present Value figures for noncorroded aluminized traps exceeded the NPV for wooden traps, indicating that aluminized traps in good condition are a better investment even though they cost a lot more and last half as long. Even though no accurate economic data on vinyl and corroding traps (seventh section) exists, these results suggest that the trap construction material is one of the factors that should be considered when a fisherman is contemplating buying new traps.

From the results of this study it might appear advisable for fishermen to purchase large metal traps, assuming the proper kind of metal can be purchased. After all, four foot metal traps made from non-corroding aluminum wire appear to catch more lobsters than anything else. Recently, we have cause to wonder about the advisability of such a switch.

As one wise old fisherman recently explained the broader implications "The first fishermen who get them [i.e. big aluminum traps] are going to do well. But after everyone gets them, everyone is going to be equal again. All that will be accomplished is that everyone will have a lot more invested in gear and the pressure on the lobster will be increased so that the chances of a disaster occurring [e.g. stock failure] are much better. If everyone stuck to the older traps, we would all be better off. Of course, the hogs won't do it, so we'll all have to go to the damn things." We believe this warning bears a lot of thought.

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ATTITUDES TOWARDS LIMITED ENTRY LEGISLATION AMONG
FIN-FISHERMEN IN NORTHERN NEW ENGLAND

James M. Acheson

Introduction

The past fifty years have seen a rapid decline in many of the world's most productive fisheries. For example, in the United States, the Georges Bank haddock catch, once the mainstay of the New England fishery, declined from 120 million pounds in 1965 to a mere 11.7 million pounds in 1972 (Alexander 1972:192). Similar declines have been seen in the past few years in bluefin tuna, northern shrimp, the southern shrimp (*penaeus* species), Pacific sardine, northern lobster, dungeness crab, cod, Pacific halibut, surf clams, and many other species. Although natural environmental factors (e.g. water temperature) and industrial side effects (e.g. dams, pollution) have played a role in the decline of some species, the major problem in most cases is overfishing (Gulland 1974).

The solution to the problem of overfishing, it is generally agreed, is effective fisheries management. In most of the fisheries mentioned above, there is a need to cut fishing effort to protect the breeding stock and/or juvenile fish.

While there are a good many different techniques that can be used to cut fishing effort (seasonal restrictions, area restrictions, etc.) one of the most promising techniques is limited entry, which usually entails restricting the numbers of boats or fishermen allowed to fish a specific species. The advantage of limited entry systems is that they promise to substantially reduce fishing effort¹ while promoting economic systems. In general, many fisheries managers favor the introduction of limited entry systems. If many fisheries administrators have their way, limited entry schemes will become the cornerstone of management policy under the new 200 mile limit bill which greatly extends Federal jurisdiction over fisheries.

Fishermen are clearly not convinced that limited entry holds forth the promise of the best of all possible worlds. When such systems are proposed, fishermen clearly feel very ambivalent about such plans or actively oppose them.

The object of this paper is to analyze the reactions of Maine fin-fishermen to proposed limited entry legislation. In order to understand their responses, we must first review some of the theory behind limited entry schemes, and the way these promise to solve economic and biological problems facing fisheries. Fishermen know a great deal about limited entry and the potential impact of its specific provisions.

The Theoretical Promise of Limited Entry

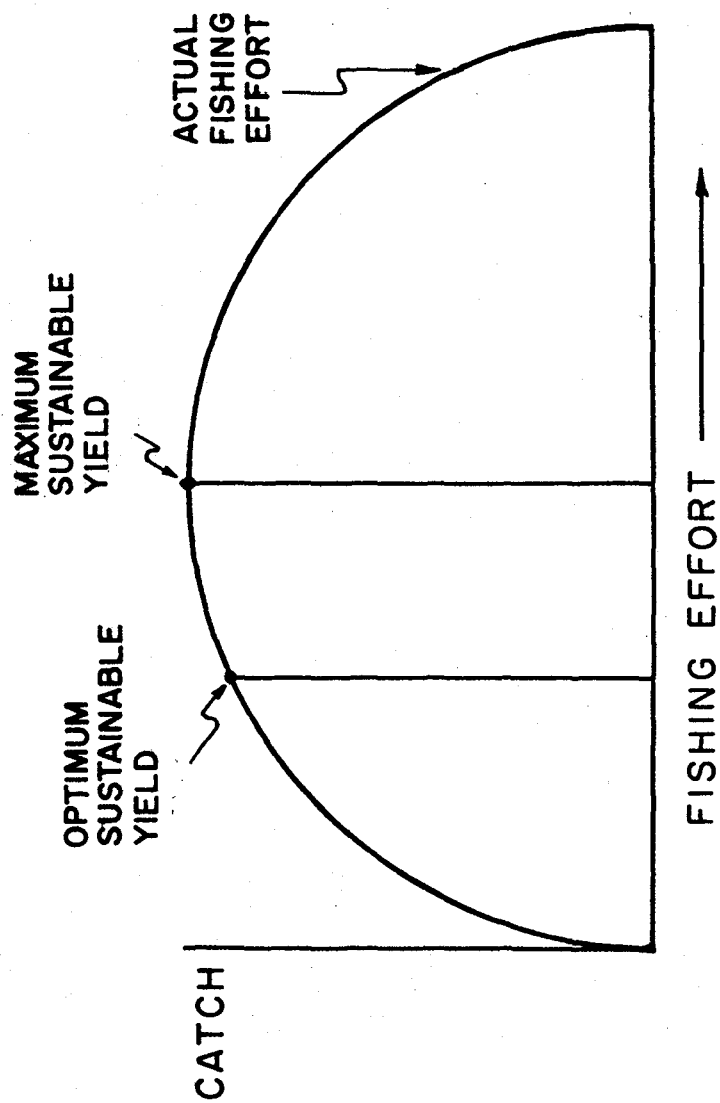
Fisheries economists have pointed out that overexploitation is not an unusual phenomenon, but is to be expected, given the fact that oceans are common property resources. Since oceans are owned by no one and can be exploited by anyone, no one has any interest in maintaining the resources. Why should one man cut his fishing effort to conserve? The fish he does not catch today will be caught by someone else tomorrow. Under these conditions, a fisherman is only being rational when he expands the amount of capital equipment he owns, and tries to catch all the fish he can as quickly as possible (Acheson 1975b.:205; Wilson 1975).

The result is what Hardin (1968:1244) calls the "tragedy of the commons." Common property resources of all kinds--publically owned land, air, rivers, oceans--are subject to abuses and overexploitation that do not occur with privately owned resources. It is not only that common property resources are overexploited by a callous public; they are subjected to a kind of escalating abuse because those exploiting such resources are locked into a system in which it is only logical that they increase their exploitation

without limit. As far as fisheries are concerned, the "tragedy" takes the form of overexploitation, depletion of fish stocks, underutilization of capital, and where opportunity costs are high, the acceptance of low incomes (Hardin 1968:1245-1246).

All of these unfortunate effects stem from the fact that fisheries are the classic case of market failure. Under ordinary conditions, as costs of production increase, firms cut back production so that supplies fall. If this were the case with fisheries we would expect that as supplies of fish became scarcer, costs of production would rise, and fishermen would either switch to exploiting other species or go into other businesses. In either case, we would expect that as fish stocks were lowered, fishermen would decrease their fishing effort so that, in time, the stocks would have time to rejuvenate. In reality the opposite occurs. As fish become scarce, fishermen often redouble their efforts on this species--many times by purchasing larger boats and better equipment to allow them to better be able to compete. There are two causes: first, as stocks of fish decrease, catches decrease so that market price for fish rises--sometimes astronomically. Thus, although the fishermen may catch fewer pounds of the species, the revenue he receives for them may be as great if not greater than it was when the species was abundant. Second, the fishermen are not bearing the full costs of production, in that they are not paying rent on the oceans they exploit as a farmer, for example, must pay for the land he uses. Both of these factors make it profitable for fishermen to maintain a level of fishing effort which ultimately leads to gross overexploitation, and in some cases, the collapse of the entire fishery. This whole situation is summarized in Figure 1.

FIGURE 1. FACTORS CAUSING OVEREXPLOITATION
OF FISH STOCKS.



The best profit point for the individual firm--and the level of fishing effort for which individual boats strive--is substantially in excess of a level of effort which would achieve maximum sustainable yield. This also leads to gross inefficiency, as more men compete to buy bigger, better equipped boats to catch fewer and fewer fish. In virtually every area of the fishing industry, the same volume of fish could be caught by a far smaller fleet. In the Maine lobster industry, for example, it is estimated that the same catch of lobsters could be harvested by 1000 well equipped boats rather than the approximately 2000 boats that are currently employed on a full-time basis (Acheson et al 1980).

From the point of view of fisheries managers, a decrease in fishing effort, regardless of how it was accomplished, would not only prevent species from being overexploited, but would actually increase the volume available to be caught. As can be seen from Figure 1, a decrease from the actual level of fishing effort to a level where maximum sustainable yield is achieved would greatly increase the catch.

At both the national and state levels, attempts to regulate fisheries usually take the form of manipulating fishing seasons, fishing areas, and the type of fishing gear used. While such regulations may limit fishing mortality, economists have pointed out that they are probably relatively ineffective and certainly make fishing more inefficient (Pontecorvo and Vartdal 1967; Crutchfield and Pontecorvo 1969; De Wolf 1974). This, in turn, lowers returns to the fishermen and raises prices for the consumer.

Several economists have argued that a far better management system would involve limiting entry into the fishery either by a licensing system (Pontecorvo 1967; Christy 1973) or by taxation (Pontecorvo and Vartdal 1967).

If management were to take the form of a limited entry system (in which the number of boats and/or men were restricted), then not only would fishing

mortality be cut, but the catch would ultimately increase. Moreover, efficiency of the boats remaining in the fishery would be increased, since each boat would presumably be able to catch more fish per unit of effort. This would result in larger returns to owners of boats and presumably higher wages to fishermen since their "share" of the catch would be larger. The larger supplies of fish and the increases in efficiency should result in more fish being made available to the consumer at lower prices. Finally, the redundant capital and labor removed from the industry (i.e. boats and fishermen no longer allowed to fish) would presumably be transferred to some other industry where they could be used more productively, and where returns would be higher. In short, a complete lack of regulation leads to "tragedy." Management of fisheries, especially management by limited entry legislation, should produce great economic benefits.

Administrators and biologists in state and Federal Agencies concerned with fisheries management are increasingly convinced that limited entry legislation offers a general solution to biological and economic problems currently facing a large number of fisheries. Moreover PL 94-265, the Fisheries Management and Conservation Act of 1976, which gives the Federal Government control over all fisheries out to 200 miles from the U.S. shore, is written in such a way that it will almost certainly stimulate a series of limited entry proposals. Under these circumstances it seems important to understand the factors influencing the political acceptability of such proposals--especially the reasons fishermen oppose or advocate such management schemes. They are the interested players, and in the past have demonstrated a marked capacity to effectively block attempts to manage fisheries regardless of how badly regulation might be needed.

In the 25 years that have passed since limited entry was first discussed

widely, only a few full-fledged limited entry bills have been put into effect. The salmon fisheries of British Columbia and Alaska are regulated by such laws. More recently, such regulations have been put into effect for certain fisheries in the Maritime Provinces of Canada. Even these few laws have been passed only after substantial opposition. In 1974-75, there was a very serious attempt on the part of fishermen from Kodiak, Alaska to overturn the Alaska law. In 1975, a bill to limit fishermen in the Maine lobster industry was soundly defeated in the state legislature due to opposition by certain industry groups.

The reasons fishermen oppose limited entry legislation are not completely clear. However, several social scientists have noted that the major proponents of limited entry legislation are economists, who have focused on the economic and biological benefits and have overlooked the fact that such legislation will also cause disruption to existing social and economic systems (Andersen and Stiles 1973:61-64; Stiles 1976:248 f.f.). These social scientists have hypothesized that opposition to limited entry stems from real or perceived deleterious social and economic effects of such legislation (Smith 1974). Our current study substantiates this hypothesis.

The Project: Methodology

During 1977 and 1978 a team of researchers from the University of Maine and the University of Rhode Island gathered a very large amount of information on fishermen all along the New England coast. Special emphasis was placed on: actual fishing operations (type of fishing, techniques employed, size of boat and crew, etc.); technical and economic innovation; and attitudes toward various kinds of management schemes which might be employed in different fisheries. A great deal of information was obtained

on attitudes towards limited entry. The questionnaire used took a minimum of one and a half hours to administer and usually interviews were far longer than that. In Maine alone, we obtained 190 such interviews with groundfishermen and herring fishermen, and another 108 with lobster fishermen. In this paper, we will confine our efforts to understanding the attitudes of groundfishermen and herring fishermen toward limited entry. Attitudes of lobster fishermen are the subject of another paper (Acheson 1975a). Lobstermen have been included in this sample only if they fish for fin-fish during some point in the annual cycle. The 190 interviews represents at least 65 percent of all full-time fin-fishing boats in Maine and New Hampshire in 1977-78. All interviews were obtained with the skipper of the boat, who, in most cases, was the owner as well.

All of the information on limited entry was obtained by open-ended interviews. We simply asked the fishermen involved if he "would approve or disapprove of limited entry legislation" for his section of the industry. Then we asked for an explanation. This technique produced a tremendous amount of data. Fishermen, on the whole, knew a good deal about limited entry and had a good many ideas on the subject. In great part, their interest and knowledge can be traced to the fact that a limited entry bill for the lobster industry--the largest fishery in the area--had recently been proposed and defeated. There were also several articles on limited entry in the Maine Commercial Fishermen and other trade papers.

After the data were collected by the interview team, the results were run on the University of Maine IBM 370 computer.

Expectations About Fishermen's Responses

Although, we purposely used open-ended interviewing techniques in order to elicit the fishermen's own ideas we initially had a set of hypotheses

concerning the reactions we expected. First, we expected that men would favor limited entry, if at all, for solely economic reasons--namely, that they would make more money since limited entry legislation promises to decrease competition for those remaining in the fishery. It may also improve their bargaining position with dealers. Second, we strongly suspected that the opposition to limited entry could be traced to the fact that such schemes might cause a good deal of social disruption. The proponents of limited entry legislation, after all, are concerned largely with conservation of the fish and with economic efficiency. They have tended to ignore the potential social impacts. We strongly suspected that limited entry would cause six different kinds of disruptive effects that were certainly going to be mentioned as reasons for opposing such legislation.

(1) We suspected that some fishermen would think they would be removed from the industry and would be worried about being able to find other jobs.

(2) Limited entry promises to pass on economic costs only to a certain class of fishermen and thus promote social inequality. Those who remain in the industry would presumably have higher incomes; those who are removed might well have lower incomes or perhaps none at all for a time.

(3) The results of limited entry legislation would not show up for years. When the government limits fishing effort to conserve a species, stocks and catches ultimately will rise, but only after considerable delay. The costs are thus borne by the men currently in the industry (usually in the form of reduced catches); the benefits will be gained by men fishing in the future--sometimes by a whole new generation of fishermen.

(4) Under limited entry, competition may be increased. Such schemes are designed to promote efficiency by encouraging the use of larger boats,

equipped with more sophisticated devices. Thus, fishermen who do manage to get a license to fish under a limited entry scheme may be forced to invest a great deal of money, hire a larger crew, and obtain more skills or lose a high proportion of the potential catch to those who are willing and able to make such investments. Men who are unable or unwilling to invest up to \$250,000 in a new boat may not only find their relative income decreasing, but also their status affected as other men surpass them to become "highline" fishermen.

(5) Many fishermen maximize catch and income by exploiting multiple fisheries over the course of the year. Limited entry, of course, may limit the numbers of species a boat can fish, and thus interfere with this kind of strategy.

(6) Fishing firms are often family businesses which are passed down from father to sons. Limited entry schemes may disrupt such groupings--particularly by interfering with the inheritance of fishing vessels and businesses.

Some of our initial hypotheses concerning reactions to limited entry proved to be correct. Others were wildly inaccurate. On the whole, we did not predict the great range of concerns fishermen had about limited entry.

In this paper, two different types of data will be presented: (1) the verbal statements of fishermen concerning the reasons they do or do not favor limited entry legislation. As we shall see, many of these responses are highly ideational and show a strong concern with broad philosophical issues about governmental regulation, and (2) a set of quantitative data linking attitudes towards limited entry to other social, technical, and economic factors. These latter data strongly suggest that fishermen are far more concerned with short run economic costs and benefits

than some would care to admit.

Responses of Fishermen Concerning Limited Entry Proposals

Very few fishermen were neutral or ambivalent towards limited entry. The 190 fishermen questioned gave some 55 different answers on the topic. However, these responses clearly fell into six different classes, showing six different kinds of concerns. Two classes of responses showed a decided positive stance toward limited entry; four were negative. These classes of responses are summarized in Table 1 below.

Table 1

Summary of Responses of Fishermen Towards Limited Entry Legislation

<u>Type of Response</u>	<u>Response of Fishermen</u>	<u>Number Responding</u>
Negative Response #1	Limited entry is not needed; other types of regulation should be passed and are far more important.	7
Negative Response #2	Natural economic or biological cycles will solve the problem.	15
Negative Response #3	I am against limited entry since it may prevent me or close kinsmen from fishing.	12
Negative Response #4	The Adam Smith response: I am against limited entry, because this is supposed to be a free country; there are too many regulations now. Free enterprise will handle the problems of the fisheries better than the government.	61
Positive Response #1	I am for limited entry since there are too many boats, traps, and fishermen now. Something has to be done to ensure that some fish will survive to breed.	28

Positive Response #2	I am for limited entry since it will reduce excess competition and benefit me personally	28
Ambivalent		4
Missing Data		38
<hr/>		
Total		148

Several people interviewed mentioned more than one of these answers. Most fishermen, however, gave one answer or were clearly primarily interested in only one issue. We recorded only the primary response given by each respondent. Giving a complete breakdown of secondary or tertiary answers would complicate matters unduly, and add little to our understanding of the concerns fishermen have concerning limited entry legislation. Several comments need to be made on each of these responses.

Negative Response #1. Men who gave this response were not against regulation per se. They did have in mind very specific kinds of regulations which they thought would benefit their section of the industry more than limited entry would. Several different types of regulations were mentioned. One draggerman wanted larger mesh regulations; two herring stop-seiners favored laws prohibiting purse seiners from operating close to shore; another favored laws on the size of boats that could be used in his fishery (dragging for groundfish); two other dragger fishermen favored a ban on gillnetting on the grounds that "lost gillnets kill a lot of fish."

Negative Response #2. Men who gave this response are really making two different kinds of arguments. First, they are suggesting that levels of stocks and populations are strongly cyclical, and that predation by man is not one of the primary factors responsible for the great fluctuations

in fish stocks observed. In the words of one fishermen: "Why have a limited entry system to save the fish? The amount of fish is going to go up and down as it always has. The number of boats in the fishery has nothing to do with fish stocks. Other things like water temperature and food supplies are far more important." Some biologists would agree, at least in part (Dean 1979). Most population dynamicists would not agree. These fishermen are questioning a basic equation of this field of biology--namely, that recruitment into the fishery (i.e. numbers of marketable fish) is dependent on the number of eggs in the water, which in turn is a function of number of breeding-sized fish. Numbers of breeding fish is ultimately dependent on fishing pressure.

The second kind of argument these men are explicitly making is that the problem of overfishing will be reduced by economic pressure. That is, as fish stocks fall, some people will be forced out of business, which, of course, will automatically reduce fishing pressure. In time, as natural conditions change, these men argue, the fish stocks will increase again.

Negative Response #3. Very few men who gave this response said openly that they personally feared being removed immediately from the industry. They were all aware that those proposing limited entry provisions have always made provisions to "grandfather in" all those men currently fishing. A few openly said that they thought limited entry would result in more competition, which might force them from the business at some time in the future.

Most of the men who gave this response were concerned with closing out "my sons" or other "young people." This concern reflects the fact that effective lineage ties in local communities are very strong, and a great deal of the meaning of life is tied up with living in a particular place with a wide set of kinsmen. Many men enter fishing, not because they are

committed to the industry per se, but because it is the only occupation they can enter which allows them to live near home. There is, of course, no sense living at home, if the people you want to be near are forced to live in Pittsburgh or Muncie.

It should be clearly understood that very few of these men assumed that their sons or kinsmen would be prohibited outright from entering fishing. Rather, they were concerned that the rules governing entry into the fishery under a limited entry scheme would somehow favor wealthy people or large corporations. Five or six of these men said (in almost the same words): "No one is going to say that a poor boy can't go fishing, but you know it will be the big companies which will get the licenses or permits." While only 12 men mentioned this as a primary reason for opposing limited entry, a much larger number of men mentioned "relatives" or "inheritance of the business" in passing. It was something they clearly didn't quite know how to talk about. Men in the United States do have trouble talking about how much their family means to them. However, we received the distinct impression that a limited entry bill that was framed in such a way that it would interfere with traditional transmission of family fishing businesses would be severely opposed by a far larger number of men than our sample alone would indicate.

Negative Response #4. The most common response was what we came to call the "Adam Smith response." That is, men said they opposed limited entry because that would mean government intervention, and an end of free enterprise. Free enterprise, in their view, was obviously a good thing; and government intervention was both bad and ineffective as a solution to the problems facing fisheries.

Frankly, we never imagined that large numbers of people would give this response when asked about limited entry. At first, we were very

suspicious, and tended to probe deeply to get at the other real reasons people opposed limited entry. A surprising number, when questioned, went into long spiels about the "government." It was very clear that most of these people really had a strong distaste for additional regulation, and did not believe that the government could solve the problems of fisheries (or very much else for that matter). In this respect, these fishermen are joining the millions of Americans who have made California's Tax-cutting proposition 13 a potent political reality all across the nation.

Our probing, however, revealed two other deeper concerns. First, some 20 men who were concerned about "the government" were automatically assuming that the rules and regulations a government would pass would benefit large corporations or other wealthy interests. In this respect, their responses were not much different from those who gave Negative Response #3.

The other concern was one that many people could hardly articulate clearly. Many kept talking about welfare, and about being protected by "big brother" government. They clearly did not like either. In the phraseology of two men, "Limited entry doesn't protect the fish; it protects fishermen." We received the overwhelming impression that people in the fishing industry place great value on doing something useful, on earning their own way, and take pride in contributing to the food supply of the nation. Limited entry, in the view of many, threatened these basic values and their own sense of worth. As usual, it is very difficult to talk about the basic presuppositions of a culture. Most of these people resorted to certain stock phrases about the government.

Positive Response #1. Twenty eight men favored limited entry because this legislation, was necessary, in their view, to preserve fish stocks. None of these men was happy at the thought of more government regulation,

but they thought that some control on fishing effort was needed and that limited entry would be both effective and cause the fewest problems. As one man phrased it, "There are just too many boats, men, and traps. More are coming all the time, and the gear is getting more efficient. If we are going to have any fish left to catch, some of these fishermen are going to have to earn their living in some other line of work. That's the truth." The mood of these men was somber. They clearly had misgivings about the viability of their industry and about limited entry.

Positive Response #2. Some 25 men in the sample approved of limited entry legislation because they were sure it would help them personally in both the short and long run. Most of them assumed that since they were established in the business, they would be granted a license to continue fishing. They saw the benefits primarily in terms of decreased competition as potential new entrants were excluded from the fishery. Eight of these men, however, mentioned the fact that they expected that limited entry would bring a gradual increase in fish stocks and catches. However, concern for the welfare of the fish stocks was of secondary importance.

It should be noted that many of the kinds of comments we expected to receive concerning limited entry were not of great concern to fishermen or at least were not mentioned openly by many men. First, only a few openly mentioned that they might be removed from the industry, and no one mentioned that they might not be able to find another job. Second, there was no mention that limited entry would produce inequality within local communities, although a few men mentioned that this type of legislation would produce a "favored or pampered group of fishermen." Third, there was no mention that limited entry would improve the bargaining position of fishermen vis á vis dealers. Fourth, there was little overt mention

at all of the time horizon problem--namely, that the benefits of such legislation would only show up some time in the future. Fifth, save for a few men who gave negative response #3, there was no mention that limited entry might stimulate competition which would force certain men from the industry. There was also little open opposition to limited entry on the grounds that it would interfere with the strategy of fishing several species over the course of the year.

There were three sets of concerns, which we did not predict, which showed up very strongly in overt statements of fishermen: (1) a concern with the welfare of the species, (2) a strong concern with government regulation and the Federal government in general, (3) a concern that limited entry would be administered in ways to favor a general takeover of the industry by corporations.

Structural Position and Attitudes Toward Limited Entry

When asked about limited entry, a very high percentage of the respondents mentioned ideational issues (i.e. negative response #4), and stressed their faith in free enterprise as a solution to the problems of overexploitation, and their lack of faith in government regulation. A few men, particularly those giving positive response #2 and negative response #3, mentioned their own economic self interest. But these men constitute only 19.4 percent of the total sample of 190 fishermen. There is, however, a good deal of quantitative evidence that many, if not most, of the fishermen questioned are very concerned about the effect of limited entry legislation on their own economic position. This appears to be the case whether or not they admitted it openly.

There are significant correlations between attitudes toward limited entry and three different variables: age, major species sought, and the

versatility of a man's fishing operations. All of these types of relationships need to be explained in detail, and all tell something significant about social, economic, and technical factors underlying attitudes concerning management.

Age and Limited Entry

There is a very strong relationship between the age of the fisherman and his attitudes toward limited entry legislation.

Table 2

Attitudes Toward Limited Entry by Age of Fisherman

	Under 39	40 or Over	Total
For Limited Entry*	28	15	43
Opposed to Limited Entry*	33	42	75
	61	57	118

Chi Square = 4.077

Degrees of Freedom = 1

Level of Significance = $>.05$

* Those who were listed as "for limited entry" gave either positive response number 1 or number 2. Those listed as "opposed" gave one of the four negative responses listed in Table 1.

In Table 2, we see that there is clearly a proportion of men under the age of 39 who are "for" limited entry legislation; while a high proportion of men over the age of 40 oppose it. Forty-five percent of the men under the age of 39 favor limited entry; while only 26.7 percent of those over 40 favor such legislation. (The result according to the Chi Square test are significant at the .05 level.)

One possible explanation for this phenomenon is that older men are

simply more rigid and more prone to resist anything which would change their habitual way of operating. This does not appear to be the case. Several men pointed out that older men can and do change their operations very quickly when there is some reason to do so.

It is relatively clear that attitudes toward limited entry legislation are related to the differential incentives. The benefits of limited entry will clearly occur sometime in the future. Young men stand to gain by such legislation; a high proportion of the older men do not. Since limited entry legislation will produce higher fish yields in an estimated 5 to 30 years, passage of such legislation will mean that older men will pick up the costs in terms of decreased catches, etc. now, while the benefits will accrue to other men long after they are dead or retired. A good many fishermen are well aware of this situation, and will talk about it when pressed. One young herring fisherman put it this way: "I know that limited entry will mean a sacrifice in the immediate future; but it will also help to ensure that there are some fish around in the future." Another 74 year old New Harbor fishermen expressed his views in more pungent terms: "I ain't going for nothin' of the likes (i.e. limited entry). Maybe it will bring in the fish by the year 2000 but I'll be long gone by then. I'm thinking of what I can catch from one year to the other." A close friend, who overheard the conversation, averred that this man wasn't even planning to buy any new lobster traps on the grounds that he could see little sense in investing in traps that "would last longer than he would."

These men, and others their age, were clearly assigning a high discount rate to future catches. It is obviously not in the best interest of such people to conserve fish now so that someone else can get higher yields in the future. They very clearly recognize their own best interest.

Our data indicate that the older the class of fishermen, the more opposed they are to limited entry.

Limited Entry and Primary Target Species

As can be seen in Table 3, fishermen in different kinds of fishing enterprises have very different attitudes towards limited entry. The results are significant at the .01 level, so that it is very unlikely that these results could have occurred by chance alone.

Table 3

Attitudes Towards Limited Entry by Primary Species Fished For

	Scallops	Lobster	Herring	Groundfish	Total
"For" Limited Entry*	0	12	0	30	42
"Against" Limited Entry*	5	7	10	51	73
					115

Chi Square = 6.9

Degrees of Freedom = 3

Level of Significance = .01

* Those who were listed as "for" limited entry gave either positive response number 1 or 2 (as indicated in Table 1). Those listed as "against" gave negative responses 1 to 4.

In general, the lobster fishermen strongly favored "limited entry" legislation. Another study involving a much larger sample of lobster fishermen showed exactly the same thing (Acheson 1975a). There are two basic reasons why lobstermen appear more favorable toward such legislation than men fishing for other species. First, lobster fishing has become less profitable in recent years. Total catches have remained about the

same for the past 10 years, while the amount of effort has increased enormously. For example, in 1963 the lobster catch was 10,300 metric tons. In 1973 the catch fell to 7,700 metric tons, while the number of traps used doubled (Morrissey 1968: Table 20). Spring fishing in the past six or seven years has been particularly bad. As a result, profits to lobster fishermen have been eroded in the past few years to the extent that a large number of lobster fishermen have begun to fish for other species during part of the annual cycle. All of the men in this sample fish for groundfish during the spring of the year.

In addition, lobster fishermen have always limited their numbers by informal means. In order to go lobster fishing at all, one must not only have a license, but also gain entry into a "harbor gang." Once a person is admitted to such a "gang" or clique, he is only permitted to go fishing in the territory "owned" by that "gang" (See Acheson 1972, 1975a, 1975b, 1979). Part-time fishermen, or others who are not members of the harbor gang, are usually heavily sanctioned by surreptitious destruction of their fishing gear. In short, lobstermen favor limited entry more than any other group primarily because they are fully aware that there are too many fishermen, and because such legislation is very congruent with existing norms prevailing in the industry.

A relatively high percentage (37 percent) of the groundfishermen also favored "limited entry." A very high percentage of these men noted openly that groundfishing was becoming crowded as larger numbers of lobster fishermen and others moved into this fishery--particularly during the spring. Many of these men openly favored limited entry since it promised to reserve this fishery for those already established in it. However, 62.9 percent of the groundfishermen interviewed did not favor limited entry. Most of these objected to this kind of legislation on ideational grounds

(negative response #4), and gave long lectures on the values of free enterprise, etc.

All of the herring and scallop fishermen on whom we have data "opposed" limited entry legislation. While the numbers involved are too small for statistical reliability, it should be noted that several of these men admitted openly that they had been "doing very well" in the past two or three years. They did not want any legislation passed (i.e. limited entry) that would change or modify a very profitable fishery. Most of these scallopers and herring fishermen said they opposed limited entry for ideational reasons (negative response #4). However, their own economic self interest was only barely under the surface.

Versatility of Fishing Operations and Attitudes Towards Limited Entry

A few fishermen in recent public hearings concerning fisheries management legislation have openly opposed limited entry on the grounds that they were involved in several different fisheries over the annual cycle and were afraid that limited entry legislation would prevent them from exploiting the numbers of species needed to fish to make a living. For example, one fishermen phrased the issue in this way: "To keep the wolf away from the door we have to switch from scallops to fin-fish to lobsters" (Maine Commercial Fisheries Vol. 6, No. 8:1). A good many other fishermen stated during the course of being interviewed that they were planning to buy more versatile boats and fishing gear, since they were afraid of being "closed out" of the fishery they were in by Federal legislation.

With these kinds of comments in mind, we originally hypothesized that men who depended on one species would favor limited entry, since this would reserve this species for them exclusively. Correspondingly,

those who exploited multiple species over the year, or who planned to have versatile operations, would oppose such legislation, because limited entry would likely restrict the range of species open to them.

The data demonstrate that there is a strong connection between versatility of fishing operations and attitudes towards limited entry. They also show that our original hypotheses were absolutely wrong.

The data on versatility of fishing operations and attitudes toward limited entry are presented below in Table 4.

Table 4

Versatility of Fishing Operation and Attitudes Toward Limited Entry

	Dependence on Single Species**	Versatile Fishing Operation**	
"Opposed" to Limited Entry*	24	50	
"Favors" Limited Entry*	5	38	
			117

Chi Square = 5.24

Degrees of Freedom = 1

Level of Significance = .02

* Men were classified as "opposed" to limited entry if they gave one of the four negative comments listed in Table 1. They were classified as "favoring" limited entry if they gave either positive response 1 or 2.

** Men were classified as having versatile fishing operations if they did one or more of the following: (1) make a major change in species sought over the year, (2) make a major change in fishing gear once in the annual cycle, (3) expect to buy a boat at least eight feet larger than their present boat in the near future, (4) expect to enter a more versatile type of fishing in the near future, (5) anticipate a major change in species mix exploited in the near future, (6) anticipate a major change in vessel or gear in the near future.

From these figures it is apparent that a very high proportion (82 percent)

of those who are dependent on a single species are opposed to limited entry legislation, while a moderate percentage (43 percent) of those with versatile fishing operations favored such legislation. The Chi Square figures are significant at the .02 level, so that these results are very unlikely to have happened by chance.

These results certainly do not buttress our original hypotheses which led us to predict that it would be the men with versatile fishing operations who would be opposed to limited entry, and the single species fishermen who would favor it.

A check through our original interview forms and some eight subsequent calls to fishermen interviewed in the original sample strongly suggest that men dependent on a single species oppose limited entry because they are afraid such legislation would close them out of the fishery on which they are completely dependent. They are aware that such legislation might benefit "the fish in the long run" as one man phrased it, but they are concerned with making a living in the short run.

Over 50 percent of the men with "versatile" fishing operations also oppose limited entry--mainly on ideational grounds. More of them favor it, however, than do the "single species" fishermen. Our information suggests that these men believe it will benefit either them personally or the fish stocks. In addition, they are not as fearful of limited entry as men with less versatile operations. After all, they have or plan to have the capital, skill, boat, etc. to fish several species so that being prevented from fishing one species will not put them out of business. It will merely mean a change to another species--probably a species the fisherman is currently exploiting. We suspect that a lot of the men listed as "versatile fishermen" agree with one Portsmouth, N.H. fisherman when he said: "the secret of success in this business is to

be able to do everything: gillnet, drag, purse seine, scallop. The government may have to close off some fisheries some of the time; but they can't close them all off."

Summary

The results of this study indicate that fishermen feel very ambivalent about limited entry. On the whole, support for such legislation would be greatest among lobstermen and groundfishermen; less among scallopers and herring fishermen. On the whole, younger men who fish or plan to fish for multiple species would support such legislation more than older men who are dependent on single species fisheries. Support for such legislation will undoubtedly be linked to the ways in which specific legislation is framed. Support will be greatest if limited entry bills minimize the day to day influence of governing agencies in fisheries, do not interfere with transmission of businesses from senior kinsmen to junior kinsmen, and give no special favors to large corporations which will result in a corporate takeover of the fisheries.

This is not to suggest that fishermen are solely concerned with short run benefits and costs. There were two aspects of fishermen's attitudes towards limited entry that deserve significant mention in this regard.

First, there were a large number of men interested in long run effects of such legislation. This shows up in overt concern for the well-being of fish stocks (positive response #1 and negative response #1); the fact that many young men favored limited entry even though they are fully aware that the benefits will show up far in the future if at all; and in the questions fishermen have about the government being able to positively affect fish stocks through legislation. A concern with the long-

term situation is also revealed in the concern that limited entry regulations might be subtly rigged so that, sometime in the far future, the fisheries would belong to big corporations. These men were clearly not merely thinking of just making money at the expense of the fish stocks in the next month or next year.

Second, an overwhelming number of the fishermen interviewed were not just interested in limited entry as it affected their industry, but in any increase in governmental regulation. In many cases, questions about limited entry resulted in comments and speeches revealing a deep-seated concern with trends in the Federal Government. Fishermen were bothered by corruption. Several men specifically mentioned: Watergate, Koreagate, Wilbur Mills in the Tidal Basin, and congressmen in the till. They were bothered by the waste of money, and the selfserving bureaucracy. They were bothered by a Federal government responsive to the needs of big industry, big agriculture, big labor, and other special interest groups. They were bothered by the lack of leadership and the inability of those in power to propose creative solutions to pressing problems. Most important, their comments reflect a growing lack of faith in government to solve any serious problem. Their responses were not totally negative. What does not show up in the figures we presented is the overwhelming impression we received that these people wanted to control their own lives. They are people who want to make their own decisions and are willing to accept the consequences--including going broke--if that is what occurs as a result of their own mistakes or laziness.

When we asked about limited entry legislation, we expected pointed and specific commentary on fisheries management. All too often we got long treatises on Government in general. Our experiences left us with the strong impression that the political support limited entry legislation

will receive (at least in Maine and New Hampshire) is currently tied up with attitudes and situations that go far beyond fish.

Notes

1. Fishing effort refers to the amount of productive effort expended to harvest a particular species of fish. It is measured by a complicated formula which take into account such factors as the size of nets used, size of boat engines, number of hours spent fishing, size of boat, size of crew, etc.
2. This situation is extremely rare in the annals of economics. Ordinarily a decrease in productive effort brings about a decrease in output or supply not an increase.

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SECTION IV

SUMMARY

THE TRAGEDY OF THE COMMONS: AN UNCOMMON VIEW

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Economists familiar with problems of fisheries management generally agree that real fishing effort greatly exceeds the level necessary to produce the maximum sustainable yield of most heavily exploited species. In short, they point out that fisheries are one of the few cases where lessened productive effort would result in greater output.

If there were less fishing effort on a species, the stocks would rejuvenate to a higher level, and a given unit of effort would thus produce more fish. Theoretically, fisheries management would benefit everyone: the fish populations would be at more optimum levels biologically, there would be higher supplies of fish at lower prices for consumers, and fishermen would catch larger quantities of fish with less productive effort.

Given all the benefits which should accrue to management, why then do fishermen traditionally overexploit? The explanation offered by economists is this: fisheries are a common property resource which are subjected to a kind of escalating abuse since they are exploited by everyone, but protected by none. Why should one fisherman conserve the resource? The fish he does not catch today will be caught by someone else tomorrow. Under these conditions, a fisherman is only being rational when he expands the amount of capital equipment he owns and tries to catch all the fish he can as quickly as possible, so the argument goes.

The result is what Hardin (1968: 1244) has called the "tragedy of the commons." Common property resources of all kinds--the air, waters, oceans, publically-owned lands--are subject to abuses and overexploitation that do not exist with privately owned resources (Hardin 1968: 1245-1246). As Hardin (1968: 1244) explains it, those exploiting a common property resource are locked into a system in which it is only "logical" that they increase their

exploitation without limit. Where the fisheries are concerned, the "tragedy" takes the form of overexploitation, depletion of fish stocks, underutilization of capital, an oversupply of labor, and, where opportunity costs are low, acceptance of low incomes (Crutchfield 1964: 212).

The whole body of theory concerning common property resources is one of the primary intellectual buttresses behind efforts to manage fisheries. After all, the theory of common property resources points out the deleterious biological and economic effects when fisheries are unmanaged and fishermen are left to do as they want. Management would clearly benefit everyone--the fish, the fishermen, and the consumer.

The image of fishermen conjured up by the body of theory concerning common property resources is an interesting one. First, it assumes that fishermen enter fishing solely for economic reasons. The glut of fishermen in the industry, according to the economists working in the area, is due to the fact that there are no barriers to entry into fishing and few viable occupational alternatives for men established in the fishing business. Fishing, it would appear, is a kind of occupational "catch basin"--easy to get into, but difficult to get out of.

Second, it assumes that fishermen are competitive, predatory individuals who operate alone and are motivated by nothing as much as a desire to catch as many fish as quickly as possible. In short, fishermen do not recognize their collective interest in conserving the fish stocks. Even if they recognize the value of conservation, they are unwilling or unable to organize themselves to preserve the resources on which their livelihood depends.

Last, the academics working with the common property resource model have a very simplistic view of fishermen and the communities in which they live, in that they assume that fishermen are all alike.

The findings of our studies indicate that all three of these assumptions need to be questioned and that the presuppositions behind the theory of common property resources need to be modified and extended. We will discuss each of these issues in order.

Commitment to Fishing and Occupational Choice

We have discovered several different kinds of social and cultural factors influencing the occupational decisions of fishermen; opportunity costs are only one factor, and in many places in New England, a minor factor.

Our data demonstrate that fishermen in most areas of New England do have other occupational options. In most parts of New England, there is no significant difference between the educational level of fishermen and the general adult population in the same region. (The only notable exception to this general rule are New Bedford and New Gloucester, Massachusetts, which have high proportions of recent immigrants.) In the eight coastal counties of Maine, for example, the median education level of fishermen is higher than that of the total population in two of the counties; it is slightly lower in four counties; and exactly the same in the remaining two counties. In only two of these counties is the difference in the median education of fishermen significantly different statistically from the median educational level of the total population (Acheson 1979). In addition, fishermen have had a good deal of experience with different kinds of jobs inside and outside the fishing industry. A sample of 190 captains of Maine and New Hampshire fin-fishing boats, for example, turned up the fact that these men had had 2.55 different types of fishing occupations and 1.15 types of non-fishing occupations. Many had had a great many different specific jobs on a large number of boats and ashore.

These data point out that many fishermen have had other economic options open to them in the past, but for some reason have remained in the fishing industry.

The question this raises is: why do fishermen stay in the fishing industry? Why do they value fishing above other occupations?

While there is no simple answer to this question, our research data provide a series of potential explanations. First, it is critical to note that there is a good deal of variation among fishermen. There is no question that fishermen throughout the New England region generally will sacrifice a great deal to stay in the industry. However, the factors tying them to fishing in one region or set of ports are very different from those causing the same behavior in fishermen from other ports.

In general, our research suggests that two sets of factors are influencing people's commitment to the fishing industry: psychological factors and structural factors.

Psychological Factors

In our study of job satisfaction among fishermen from different communities in New England, we found very great variation with respect to levels of satisfaction on three dimensions of this important variable. These three dimensions were: "Basic Needs" (safety, psychological well-being, and so on), "Middle Level Needs" (love, belongingness, independence), and "Highest Level Needs" (self-realization, challenge). Maine fishermen, who generally go day-tripping in small boats, are most concerned with Basic Needs (Pollnac and Poggie 1980; 266-272). The profile on the fishermen from Maine indicates that the most problematical part of their job is concerned with income, physical safety, working conditions, and the hazards of the occupation.

Since they are home every night, and part of an extended family network, they felt no lack of love or belongingness.

The profile of New Bedford fishermen, who generally fish far offshore, is considerably different, in that these men are least satisfied with their Middle Level and Highest Level Needs. These are men whose long absences from home and subordinate position in large crews reduce their their contact ~~with~~ their family and their sense of accomplishment in their work. In Pt. Judith, Rhode Island, still another pattern is apparent. There, fishermen manifest the most satisfaction with their Highest Level Needs and Basic Needs, but are less satisfied than the Maine fishermen with the Middle Level Needs.

Although there are many differences between the total profiles of Maine and Rhode Island fishermen, they are henerally satisfied with fishing as an occupation. For the men of New Bedford, the pattern of dissatisfaction leads one to conclude that other occupations might be generally preferable to fishing. (Poggie and Pollnac 1980).

Structural Factors

In New England coastal communities, there are a variety of structural factors tying people to fishing and to their home communities.

In small Maine coastal towns, the most important structural units are kinship and the community itself. The long established residents focus inwards on family and the community. Life in such communities is strongly localized. Community membership and kinship are themselves closely related. Membership in an established family automatically makes one a member of the core of the community. Members of such families have the imprimatur of the community on them because they have "inherited" the yardstick by which acceptable behavior is measured. For better or worse, a person from an established family is a known, predictable quantity. He is not like the outsider whose actions cannot be put in any meaningful context.

For members of established families, both nuclear and extended kinship are important. Individuals are part of a dense, complicated "network" of "relatives." People who move away from the local area are quickly forgotten. Acheson 1980). Given the uses to which kinship is put, they are irrelevant (Lazarowitz and A

Kinship ties are manipulated in ways which give members of established families a distinct edge over "newcomers" and other residents of the towns. Coming from a family with a long local history (patrimony) makes one fully eligible to run for important local political offices, and members of such families usually have enough family votes to make their bids for office successful. Second, and more important, the dense network of local contemporary relatives can be manipulated to give one differential access to jobs, valuable land and businesses, business information, and loans. They can also be used to obtain jobs on fin-fishing boats, and to gain access to protected local lobster fishing territories (Acheson 1972, 1975; Acheson and Lazarowitz 1980).

In short, members of such established families have a strong set of incentives to remain in their natal communities. Many do just that.

In Rhode Island, at the other end of the spectrum, we found quite a different pattern. Here, the nuclear family overshadows all other social units in importance, and extended kinship ties are comparatively unimportant (Danowski 1980: 116 ff.). In this area, community life among fishermen resembles more the pattern of middle class suburban life common throughout the United States. Communities are relatively unimportant, in so far as the town one lives in is not the focal point of one's life. Unlike the Maine case, there is a clear separation between the people fishermen interact with on the job, and those they associate with in their place of residence. There are really no fishing towns. Rhode Island's fishermen live throughout the southern part

of their own state and in adjacent towns in Massachusetts and Connecticut, and commute to work in Point Judith, Newport, and other ports.

Certainly membership in an old established family does not automatically confer membership in any kind of community core nor does it give special advantages in the economic and political realm as it does in small Maine coastal communities. Except in rare instances, one's most important business contacts are not relatives. Anyone who purchases a boat automatically gains access to fishing rights. In the recent past, people have come to Rhode Island and become successful fishermen from as far away as the Pacific Coast. In this area, occupational selection is not as strongly influenced by family and community membership. Certainly sites on board boats, with all that indicates about access to fishing skills, are not reserved for people from certain families or certain coastal towns.

In the Massachusetts ports of Gloucester and New Bedford, which have heavy concentrations of Italians and Portuguese respectively, yet other patterns are apparent. Here, ethnicity and kinship are of critical importance. In these complex urban areas, kinship and ethnicity are in no way synonymous with community. But this is not to deny that a great deal of the meaning in life and the people who are important to an individual center around kinship ties. It is crucial to note that recruitment on boats, and often ownership of boats, is influenced by both these factors. There are boats whose crews are composed completely of recent Italian immigrants, others with older Italian immigrants, and still others with solely Portuguese speakers. In both ports it is common for boats to be owned and manned by close kinsmen.

In one sense, the highly ethnic ports of Gloucester and New Bedford are reminiscent of the Yankee harbors of Maine. In both Maine and "ethnic" Massachusetts ports, fishermen have strong structural ties to their home community

and have extended kin networks. In both instances, while fishermen can succeed outside their home community, there are clear benefits from residential stability. There are, of course, important differences. In Maine, there is again the equation between established families and community; in the major Massachusetts ports, kin and community are divorced. Thus, in the large ports of Massachusetts individual economic success is the key to prestige, as is evidenced by a large house and a new car. In small Maine towns, prestige and power come from business or professional success combined with long residence and service to the community.

In summary, there are many different sets of reasons that fishermen in New England remain in the fishing industry and these reasons differ substantially from one part of the region to another. Income and alternate economic opportunities are only part of the picture.

In Maine it is true that there are few alternate jobs--particularly in the eastern part of the state--but people are also strongly linked to their natal communities and local extended kinship units. They derive real advantages from remaining "at home." In addition, Maine fishermen are reasonably well satisfied with the occupation, particularly as it makes it possible to satisfy Middle Level Needs. Our data suggest that Maine fishermen are generally more attached to the community and their kin network than they are to the occupation itself. Given the choice between community and their occupation, 97 percent of our Maine respondents would elect to change occupations and remain in their home town rather than move away and remain in fishing (Acheson 1979: 253). A few men openly volunteered the fact that they are in fishing primarily because it is an occupation which allows them to live in the place they want to be.

In the large, highly ethnic Massachusetts ports, there are again few alternate jobs available. Here also, family ties and ethnicity, with all this indicates about a secure, predictable and socially meaningful environment, are some of the major factors tying people to the industry. Many of these men are not necessarily strongly committed to fishing, but would not leave the industry because it would mean leaving all the benefits they receive in their home communities.

In Rhode Island, on the other hand, we see quite a different pattern, in which fishermen have fewer loyalties and structural links to the communities where they live, but love fishing as an occupation because of the rewards they receive--especially in the satisfaction of their Basic and Higher Level Needs.

The Social Organization of Fishing: Clusters and Institutions

The vast majority of anthropological studies on fishing have focused on the "fishing community"--the people who live in one hamlet or town where fishing or fish processing is an important occupation. Such studies focus on the important ties fishermen have with kinsmen, neighbors, business associates and friends who live in the same geographic area. They tend to overlook the fact that some of a fisherman's most important social ties are with other men who are fishing for the same species. In another volume (Wilson and Acheson 1980: Section III), we have distinguished between fishing "clusters" and "institutions" to describe these various kinds of off-shore associations among fishermen. A great deal of the behavior of fishermen and much of their relative success is determined by their ties with other fishermen at sea.

Clusters are essentially loose networks formed among men who fish for the same species in the same area with the same gear. Such units are not only

an important source of knowledge for the fishermen involved in them, but they also serve as reference groups for most fishermen--the yardstick by which they measure success.

Institutions we define as bilateral agreements among fishermen, governed by formal or informal rules, which structure the relationship between them. Institutions involve repeated exchanges over a period of time.

Several things should be noted about clusters and institutions.

(1) Both clusters and institutions are essentially responses to problems of knowledge and uncertainty. Fishermen operate in an environment which is very complicated and heterogenous, and which introduces a high degree of uncertainty into the fishing business. This uncertainty is increased by the fact that many of the factors on which fishing success depends vary considerably from one time to another. Stocks of fish fluctuate from year to year, and the locations where they can be caught vary with the season or week; the prices paid for them can alter daily. This uncertainty places a premium on obtaining accurate information. Individuals obtain much of the information they require from others in their same cluster, either by communication, by direct observation, indirectly through intermediate links in the network, or through "hands on" experience on another man's boat. The way one obtains information from men in one's fishing cluster depends on the nature of the species being sought and the duration of the knowledge. Knowledge about species locations is valuable for a long period in the case of sedentary species. In these industries (for example, clamming and lobstering), secrecy is the rule. In these industries, men obtain information from each other primarily by observation. In the case of highly mobile species, the duration of the value of knowledge is very short. Here a great deal of knowledge is transmitted verbally. In either case, the information obtained is critical for

success. Ironically, in the fishing industry, much of the information one needs for success is learned from one's direct competitors.

The range of feasible options open to men in various parts of the fishing industry varies tremendously. In some industries, such as lobstering, the technology, range of boats, and markets are almost identical throughout the area where it is carried out, so that the feasible options of fishermen are very similar. These clusters we refer to as "tightly packed." In other clusters, the range of feasible options is much larger. In such industries (for example, the groundfishery), the range of boats, fishing gear, electronic equipment, crew size, and so on, is large enough to permit cluster members a wide variety of options. These clusters we term "loosely packed" (Wilson and Acheson 1980: Section III).

(2) Institutions, by way of contrast, are really substitutes for information. One cannot predict the future, but one can enter into agreements with other people which assign the risk, and hence lower uncertainty. Clusters are ubiquitous; institutions are much rarer--at least in New England. We have, however, noted at least eleven instances in which fishermen have entered into these enforceable, bilateral agreements. These range all the way from agreements among lobster fishermen in Casco Bay (Maine) to lay strings of traps in a northeast to southwest direction to avoid severe gear tangles to an understanding among scallop fishermen in New Bedford to limit the length of fishing trips and to stagger the time boats leave port to ensure a steady supply and high price for scallops. Two of these institutions have been studied in some detail--namely the institution of lobstering territories (agreements to limit access to restricted ocean areas), and marketing institutions, which are essentially agreements between fishermen and fish dealers involving the exchange

of services, information, extensive financial backing and credit, for a steady assured supply of fish.

For our purposes, it is important to stress that eight of the eleven institutions noted involve agreements among fishermen to limit fishing operations or restrict the use of gear (Wilson and Acheson 1980: Section III). In these instances, fishermen have actually petitioned the legislatures to have these informal agreements among themselves enacted into law. This transfers the problem of enforcement from the fishermen themselves to state officials. These three cases are: (a) a petition by the Southern Maine Lobstermen's Association to pass a trap limit and limited entry bill, (b) the actions of herring processors to pass a fisheries management plan under PL 94-265, and (c) a bill proposed by the herring fishermen of Maine to limit the placement of weirs and stop seines.

In most instances, there is no solid evidence that these institutions actually functioned to cut fishing mortality and increase recruitment and fish landings--even though they have restricted the use of fishing gear. In the case of Maine lobstering territories, such evidence does exist, however. In this case, individuals are not permitted to go lobster fishing unless they are admitted to a "harbor gang"--the group of men fishing from one harbor--and once admitted to such a gang, they can only go fishing in the area jointly "owned" by the men from this harbor. Interlopers are met with strong sanctions, sometimes merely verbal, but more often involving the surreptitious destruction of lobstering gear. This territorial system is entirely the result of political competition between groups of lobstermen. It contains no "legal" or jural elements.

In the Maine lobstering industry, two kinds of territoriality exist, which we have termed "nucleated" and "perimeter defended." In nucleated areas,

a "harbor gang's" sense of ownership is relatively strong near the mouth of their harbor, but grows progressively weaker the further from the harbor mouth one goes. Five or ten miles offshore, ownership rights are very weak, and these waters are fished by men from several harbors (Acheson 1975: 189). The island areas of Penobscot Bay are perimeter-defended territories. Here, boundaries are sharply drawn and defended to the yard. In these areas, ownership rights are defended up to the perimeter of the territory. It is critical to note that entry into gangs having perimeter-defended areas is much more difficult than into gangs fishing in nucleated areas. As a result, there are fewer fishermen per square nautical mile of fishing grounds in perimeter-defended areas (Acheson 1975: 196). This reduction in fishing effort has three biological and economic benefits. First, lobsters caught in perimeter-defended areas are larger. This means that the percentage of female lobsters which are sexually mature and capable of extruding eggs is much larger in perimeter-defended areas than in nucleated areas (Acheson 1975: 200). Second, the reduction in fishing effort has resulted in higher stock densities in perimeter-defended areas. Third, fishermen in perimeter-defended areas catch larger lobsters and more pounds of lobsters with less effort. Thus, the average gross incomes of men fishing in perimeter-defended areas is significantly higher than those of men in adjacent nucleated territories (Acheson 1975: 2-3). Thus, the system of territoriality found in the Maine lobster fishing industry--a kind of spontaneous limited entry system--clearly has beneficial effects for both the lobster and the men fishing for them. We suspect, that other institutions we have found in the New England fishing industry might have the same kind of beneficial effects. At this writing, we have no hard evidence of this, however.

Such institutions are only rarely formed among fishermen, and the conditions under which fishermen form them cannot be pinpointed with a high degree of certainty because of the small number of cases examined and the lack of historical data on many of these cases. However, five factors appear to be involved in many of these situations (Wilson and Acheson 1980: Section III: Chap. 4).

(1) Many fishing institutions are formed by men whose overt goal is to avoid gear conflict or to obtain more favorable marketing situations. Some of these institutions function to affect fishing effort, but this impact on effort is an accidental after-effect—not the primary purpose of the arrangement.

(2) Institutions are formed when the men involved in them enter into transactions in which the things exchanged are of equivalent value.

(3) Institutions are formed by small groups of men who can interact repeatedly over time.

(4) Institutions are formed when the fishermen involved receive benefits in the short run.

(5) Last, and most important, fishermen who enter into institutional agreements in which their own fishing operations are restricted are involved in tightly packed clusters.

Implications for Fisheries Management

The theory of common property resources has had a tremendous impact on resource management, and modifications and elaborations in that body of theory have managerial implications as well as theoretical ones. The idea that fishermen fish solely for financial rewards, and would leave the industry if better economic options were available, is a set of assumptions behind many plans to

manage the fisheries. For example, in the view of many fisheries managers, one of the most promising types of regulatory techniques are limited entry options. Such plans are attractive because they promise to limit fishing effort while maintaining economic efficiency. Essentially, limited entry options involve retaining only a limited number of boats and fishermen in the industry. The fishermen who are removed would presumably enter other industries where their labor could be used more efficiently and where they would presumably receive greater monetary rewards. It is assumed that they are highly mobile and would be happy to leave. The idea that fishing--and probably all other occupations--involves far more than money is not part of this theoretical construct. Certainly there is no suggestion in the body of literature on common property resources that fishing itself gives rewards and allows people to live in places where they can participate in institutions which give much of the meaning to life. This oversight, we are certain, is the ultimate cause of much of the opposition to limited entry proposals. (There are other sources of resistance to such plans as well. See Acheson 1980.) Schemes to manage fisheries--especially those forcing people to migrate--are going to have to be assessed not only with the economic costs and benefits in mind, but with socio-cultural costs and benefits as well.

The assumption that the fishing industry is highly homogenous and that the motivations of fishermen are essentially similar is bound to cause problems for management. Fishing is, of course, a highly diversified industry. There is such diversity even in New England that management options which might be unopposed in one region might be violently opposed in another. For example, in Maine, where fishermen are so concerned with Basic Needs and where extended kinship units and community mean and convey so much, the kinds of managerial plans which would likely be most opposed are those that would make

it impossible to live in one's natal community, would lower income, or would restrict the freedom to fish under the most favorable weather conditions. In Rhode Island, where the relatively isolated nuclear family predominates, and where Middle Level Needs are less well satisfied, plans which force greater time at sea and further frustrate "love and belongingness" satisfaction, would cause the most disruption. This is not to suggest that fishermen from Rhode Island would meekly go along with management options which would lower income, but our data suggest that such options would receive less opposition than in Maine. In the ethnic ports of Gloucester and New Bedford, Massachusetts, where many fishing firms are family-owned firms, any restriction of effort would affect large family segments which are specialized in fishing. However, in New Bedford, where many fishermen appear basically dissatisfied with fishing, management plans might be well received, even if they forced people from the industry, if they were coupled with plans to re-employ these individuals in the local area, and to aid boat owners, who wish to leave the fishery, in divesting themselves of their capital investment.

The assumption that fishermen cannot and will not organize to conserve the resources on which their livelihood depends is perhaps the most misleading of all. Our studies indicate that it is not all fishermen who overexploit, but fishermen operating under certain specifiable conditions. These are essentially men who are involved in loosely packed clusters, with large, geographically spread out membership, where potential institutions would bring unequal benefits far into the future. The vast majority of fishermen know only the men in their own cluster. Their social ties and range of their vessels is far smaller than the range of the resources. If they cut their own fishing effort, they will not receive the full benefit.

However, the fact that some fishermen are capable of forming these kinds of institutions has special implications for fisheries managers. Some of these institutions are spontaneous fisheries management systems in that they involve structured relationships between fishermen to limit fishing activities in ways that reduce fishing effort. If one can pinpoint the factors associated with the evolution of such institutions, it might be possible to introduce policies which would encourage their formation. This might preclude the need for regulations and the costs associated with them. In addition, studies of such institutions would hopefully give some insights into the kinds of regulation fishermen would accept with little political opposition. Presumably, fishermen would be less likely to oppose the same kinds of regulations they impose on themselves than regulations not matched to the existing social system and normative structure.

In summary, we would like to suggest that many of the problems currently facing managers of the marine resources of the United States and elsewhere stem from theoretical inadequacies. The most important problems concern the reasons people remain in the so-called "over-capitalized," inefficient fishing industry and are ostensibly caught in a situation where over exploitation is "rational." If the object of management is to control fishing effort, then it is essential to understand all the significant reasons people remain in the industry, and manage their own resources under certain circumstances. Hardin (1968), Crutchfield (1964), Scott (1955), Gordon (1954), and others who have become involved with common property resource problems as they apply to fisheries have made tremendous strides in delineating the economic factors behind the overexploitation of marine resources. They are not concerned with social systems, and we believe that the weaknesses in the body of theory they

have developed stem primarily from some of their presuppositions concerning the motivations and social organization of fishermen. We believe our studies of the social and cultural aspects of the fishing industry in New England have made some contribution in this area.

There are practical reasons to take such social factors into account. If it is mandatory to manage the marine fisheries of the United States, then rules are going to have to be promulgated which receive some industry support. The most interested group--the most affected--are the fishermen themselves, not the consumers. For better or worse, the political viability of management schemes depends in large part on the reaction of the fishing industry.

If our research does not tell managers what options will most benefit the stocks, it gives some insights into those which will be the most disastrous politically.

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* In this volume

SOCIAL AND CULTURAL FACTORS
INFLUENCING FISHING EFFORT

James M. Acheson

Ann W. Acheson

Introduction

Among those concerned with the management of marine fisheries in the United States, it is axiomatic that too many species are being exploited by too many fishermen in too many boats fishing with too much efficient gear. As a result of this overexploitation, recruitment, stock sizes, catches, and the amount of fish that can be made available to consumers are all far lower than they would be if fishing mortality and exploitation rates were controlled. The problem for the fisheries manager is to control exploitation rates, and virtually every fisheries management scheme has a reduction in fishing effort as its ultimate goal.

One problem stems from the fact that effort must be measured by different techniques in different fisheries. However, it is very difficult to isolate all the factors which influence fishing effort, and to measure it in any consistent fashion. In the lobster industry, it has been measured by the total number of traps in the water; in the dragger fishery, through estimates of the amount of time spent fishing (Cushing 1968: 78), and through more complicated formulas which, in essence, attempt to estimate the amount of ocean bottom that has been covered by nets. Among fisheries biologists, there is a good deal of dissatisfaction with such attempts to measure fishing effort. There are not only difficulties with the technical measures, but more substantial problems as well. The more serious problem is that "fishing effectiveness" has been overlooked in the literature (Thomas 1973: 41). In other words, it is generally recognized that the catches of individual fishermen vary widely, but few attempts have been made to understand the reasons for such differential success, or to take it into account in measuring effort. In addition, fisheries biologists have made few attempts to estimate changes in fishing efforts over the long run.

They are fully aware that effort is a function of the number of boats and gear employed on a given species and that these can change over time. But again, such factors have remained unstudied since they concern the human beings involved and are clearly outside the realm of fishery biology.

During the course of this study, we obtained a good deal of information on many different topics which shed light on issues connected to fishing effort. Some of our work was devoted to understanding fishermen's perception of factors influencing their catches and factors influencing fishing skills. We also did a great deal of work on topics such as innovation, gear switching, investment, entry into the fishing industry and commitment to fishing as an occupation -- all of which bear on the issue of long-term changes in effort. In this paper we will discuss the factors we have uncovered affecting fishing in the short-term and then those having more long-term effects.

Studies of Short-Term Influences on Effort

Our most extensive and quantified data on short-term factors affecting fishing effort come from our studies of the Maine lobster industry. Several other studies with potential for adding to our understanding of this topic were also carried out, and are briefly summarized here.

The Maine Lobster Industry

Our studies of the Maine lobster industry indicate that there are a large number of variables affecting catches, though some are more significant than others. A regression analysis of our data on some 9500 trap hauls indicated that the season and the length of the trap were the most important factors influencing catch, followed by the skill of the indivi-

dual fisherman, the number of layover days, the type of bait used, and the trap construction material. The type of heads used in the trap and the depth at which the trap was placed had relatively little effect on catches, while the type of bottom being fished was of intermediate importance (Acheson 1980a). Attempting to measure fishing effort on the lobster resource in terms of the number of traps, as has usually been done, is clearly inadequate.

The results of this study were of great interest to fishermen, since they indicate what kinds of traps are most effective and what fishing practices should be undertaken to maximize catches. Fisheries managers might well be interested in this study for another reason -- namely, it points out which factors should be controlled and which might be safely ignored in any management plan aiming to reduce fishing effort. For example, given the results of our study, a management plan which limited the size of traps and limited fishing seasons (for example, made it illegal to fish four foot traps and go fishing from August to October) would do far more to control effort than restrictions placed on locations where one could fish, the type of bait one could use, or the number of days a trap could be left in the water.

Of all the factors we examined, the one which has received the least attention and which is most difficult to quantify is fishing skill. It is common knowledge in the fishing industry that skill plays a very important role in ensuring success. It therefore also plays an important part in determining levels of fishing effort. Two separate studies of the lobster industry serve to underline this point. Our statistical analysis of fishing effectiveness indicated that skill (in a very general sense) played an important role in influencing catches (Acheson 1980a). Another study, carried

out several years earlier, pointed out that skilled lobstermen earned significantly higher incomes than less skilled ones (Acheson 1977).

Although these studies demonstrate that skill plays an important part in determining both fishing effectiveness and income levels, they do not pinpoint exactly what components are involved in the concept of "fishing skill." Intensive interviewing and participant observation among lobster fishermen revealed that the most important kinds of skills were concerned with trap placement. (This assumed that the fishermen already had the most basic skills in navigation, equipment maintenance, and so on.) Highly successful fishermen had a detailed knowledge of the ocean bottom and a good understanding of the habits and movements of lobsters. They were able to place traps with pinpoint accuracy in areas where concentrations of lobsters were likely to be located (Acheson 1977: 122-129).

This earlier study, however, did little to illuminate exactly what skilled fishermen knew about lobsters and the bottom which allowed them to make greater catches than their less-skilled counterparts. Accordingly, we prepared eleven charts and graphs, containing summaries of data on various factors affecting lobster catches, which were shown to a sample of skilled fishermen in the hope that we could elicit more precise information about their perceptions of lobster biology, bottom type, and other potentially relevant variables. Without going into details which are summarized elsewhere (Acheson 1980a, 1980b), we discovered that skilled lobster fishermen know an incredible amount about the habits of their prey, the area it inhabits, and its behavior around traps so that they can locate concentrations of lobsters and catch them once they do. Skilled fishermen know a good deal about the life cycle of the lobster (e.g. movements of larvae in currents, breeding cycles, growth rates), feeding habits, seasonal mi-

gration cycles, types of bottoms inhabited by lobsters at different times of years, and so on (Acheson 1980a, 1980b). Less successful fishermen clearly do not know as much about these topics.

The issue of knowledge as a component of fishing effort is one which has important managerial implications. Biologists concerned with fisheries management have generally believed that their scientific training gives them special insights concerning the ocean and the fish. Fishermen, for their part, point to their long years at sea and their ability to wrest a living from it as evidence of their own expertise. Each group is all too quick to ignore the advice and observations of the other, confident as they are in the correctness of their own views. In order to study these differences in world view, we decided to present the same charts and graphs to a group of biologists as we had to the group of lobstermen. The results were surprising. The biologists had the exact same interpretations of the data concerning factors affecting fishing effort as the lobstermen had had, save for the fact that the biologists had a different set of interpretations on long-term recruitment and catch cycles. The results of this study were shown to a group of lobstermen, and their reactions are as informative as the data itself concerning fishing effort. The fishermen were incredulous that the biologists' views were so close to their own. The idea that lobstermen's and biologists' views overlapped came as a shock, we suspect, because it undermined claims to special expertise and knowledge which each group has maintained (Acheson 1980b). If biologists and lobstermen differ on management issues, it is because their interests differ, not because of different or superior views of the world.

These kinds of studies of fishing skills go a long way toward eliciting the kinds of knowledge and skills successful Maine lobster fishermen

have. Two of these studies contain quantitative data indicating that such skills have a major effect on fishing effort and are critical for success in this industry.

The same kind of information could be obtained from studies of the factors affecting effectiveness of other kinds of fishing gear and effort in other fisheries. We regret that we did not have time to undertake similar studies in fisheries such as groundfish and herring. It should be noted that such studies offer a double-edged sword. The same information which can be used by managers to limit fishing effort can also be used by fishermen to improve the effectiveness of their short-run fishing strategies.

Information Networks and Fishing Effort

Still another study shows that fishing effort is partly a social phenomenon. The most important set of social ties fishermen have are not with the people who live in the same fishing community, but with the men who fish for the same species, in the same area with the same gear. Such quasi-groups, which we have termed "clusters," are important from several perspectives (Wilson and Acheson 1980). They are a reference group, and as such are the yardstick by which success is measured. They have sets of informal rules minimizing conflict during the production process. Most important, men obtain a good deal of information on fish locations and innovations from men in the same cluster. In industries where the target species is sedentary, extreme secrecy is the rule so that knowledge about fish concentrations is obtained primarily by observation. In the case of highly mobile species (i.e. tuna, herring, etc.) fishermen will openly broadcast the location of schools in the hope that others will reciprocate

when they locate fish. If the boats of such fleets operate completely separately the total amount of fish caught is less than when they increase their search pattern by exchanging information. As a result, the amount of fishing effort in these kinds of fisheries is strongly influenced by the social organization of fishermen and their information networks.

Crew Composition and Fishing Effort

The results of another study, suggest that fishing success is a function not only of knowledge, but also of crew composition and willingness to take moderate risks (Roberts and Acheson n.d.). While the findings of this study have not yet been written up, the interviews are complete, and the results are very clear. These data indicate that fishing success is highly correlated with crews composed of men with certain complementary sets of psychological traits. The crews which have the most success have a captain who is not prone to take risks matched with a first mate who is. Conversely, the least successful crews have captains who are very high risk takers and mates who want to take none. The idea that fishing effectiveness and hence effort is connected with crew composition, and particularly with the complementary psychological characteristics of crewmen, has never before been suggested in the literature to the best of my knowledge. Yet our data strongly indicate that this is indeed the case.

Long-Term Factors Influencing Effort

Occupational Commitment and Community Ties

An obvious factor increasing fishing effort is the number of people in the fishing industry. If people were readily willing to leave fishing or were not attracted to it in the first place, effort would of course be

much less. We have found that fishermen in all parts of New England will sacrifice a good deal to remain in the industry. However, our studies have revealed that there are a variety of different factors affecting individual's entry decisions and their commitment to fishing. Furthermore, these factors show a good deal of variation from one port to another and one region to another. Economic variables certainly play a role, but the notion that fishermen enter and remain in fishing solely for economic reasons is one which needs considerable modification.

Ties of kinship and community have important effects on individual's decisions to enter and remain in fishing. In small Maine coastal communities, the most important structural units are kin groupings and the community itself. Furthermore, kinship and community membership are themselves closely related: membership in a so-called "established family" automatically makes one a member of the core of the community (Acheson and Lazarowitz 1980; Lazarowitz and Acheson 1980). Individuals are part of a dense, complicated "network" of local "relatives." This network can be manipulated to give differential access to valuable land and family businesses, jobs, business information, and loans, including jobs on fin-fishing boats, loans for fishing businesses, and information on markets and fishing practices; kin networks can also help individuals gain access to protected local lobster fishing territories (Acheson 1972, 1975; Acheson and Lazarowitz 1980). Thus there are strong incentives for members of "established families" in Maine communities to remain in fishing and in their natal towns. Many do just that. Our data suggest, however, that Maine fishermen are generally more attached to the community and their kinsmen than they are to the occupation itself. Given the choice between remaining in their home town but leaving fishing or moving away in order to stay in fishing, 97 percent

of a sample of Maine fishermen indicated that they would elect to change occupations in order to stay in their own community (Acheson 1979: 253).

In large, highly "ethnic" ports in Massachusetts such as Gloucester and New Bedford, ethnicity and kinship are critical factors influencing entry and commitment to fishing, but the pattern is rather different than that found in small Maine towns. In these complex, urban areas, kinship and ethnic group membership are not synonymous with community. Nonetheless, fishermen have extended kin networks and strong structural ties to their home community, especially to members of their own ethnic group, and even to sub-units within those ethnic groups (Miller and Van Maanen 1979). Recruitment on boats and often boat ownership are influenced by both ethnicity and kinship. Equally important, family and ethnic ties provide a secure, socially meaningful environment. As in Maine, many fishermen in the large "ethnic" ports of Massachusetts are not necessarily strongly committed to fishing, but choose to remain in the industry because of all the benefits -- economic and otherwise -- they receive in their home communities.

In Rhode Island (and, by extension, in some of Massachusetts' other ports), we find quite a different pattern. Here, extended kinship ties are relatively unimportant, and there are almost no "fishing towns." Community life among fishermen resembles more the pattern of suburban middle-class life found throughout the U.S., in that residential and occupational networks are quite separate (Danowski 1980: 116 ff.). Entry into fishing and commitment to it are apparently tied more to economic and individual psychological factors than they are to social-structural ones.

Our studies of job satisfaction among New England fishermen reveal some further areal differences in factors affecting commitment to fishing (Poggie and Pollnac 1980; Pollnac and Poggie 1980). The three dimensions

of job satisfaction delineated were "Basic Needs" (safety, psychological well-being, and so on), "Middle Level Needs" (love, belongingness, independence), and "Highest Level Needs" (self-realization, challenge). The profile on Maine fishermen indicates that they are most concerned with Basic Needs; the most problematical parts of fishing for them include working conditions, income, and the physical hazards of the occupation. Middle Level Needs are of less concern, since most Maine fishermen do not spend long periods at sea away from their families, and are part of extended kin networks. In the Point Judith, Rhode Island sample, by way of contrast, fishermen manifest the most satisfaction with their Highest Level and Basic Level Needs, but are relatively less satisfied than Maine fishermen with Middle Level Needs (Pollnac and Poggie 1980: 266-272). In spite of these differences, Maine and Rhode Island fishermen are generally more satisfied with fishing as an occupation than are the men in a sample from New Bedford. New Bedford fishermen generally fish on large, offshore vessels; their long absences from home and subordinate positions in large crews limit their sense of work accomplishment and reduce their contact with their families. These fishermen are thus least satisfied with their Middle Level and Highest Level Needs. The general pattern of dissatisfaction among New Bedford fishermen suggests that other occupations might be preferable to fishing (Poggie and Pollnac 1980). Nonetheless, ties of kinship and ethnicity continue to influence New Bedford fishermen to remain in the area and to remain in fishing.

Traits of Captains who Adopt Innovations

The willingness and ability to adopt new innovations is clearly an important factor influencing fishing effort. After all, men who are able

to adopt larger and better equipped boats or who can add new kinds of fishing gear to the vessels they currently own are going to be able to put more effort on the fish resources than men who cannot make these changes. In the literature on innovation, it is well substantiated that the adoption of innovations is highly differential, with some people adopting them before others. When we started our studies of innovation in the fishing industry, we had two hypotheses. First, we hypothesized that the adoption of innovations was related to the career cycle of fishermen. More specifically, we predicted that it would be men at the high point of their careers who are the most apt to take on many innovations. Older men, who are winding down their careers, are far less likely to adopt innovations since this would require substantial investment and acquisition of knowledge from which they would not gain the full benefit. The youngest men or novice fishermen do not have the experience, capital or skill to take on new types of fishing gear, purchase substantially larger boats or make radical changes in their fishing operations. Second, we hypothesized that some individuals consistently adopted innovations faster than others. That is, there are a class of "early adopters" who have a history of accepting a large number of innovations, "middle adopters," and "late adopters" who consistently adopt innovations later than others. There is a very substantial literature on these various adopter categories (e.g. Rogers and Shoemaker 1971) which points up the fact that "early adopters" are likely to be younger, better educated, more cosmopolitan, and have a wider range of social ties than middle and late adopters.

In short, we assumed that in the management of the fisheries of New England the men on whom attention must be focused are the early adopters and men at the high point of their careers. They are the ones most likely

to respond to new economic opportunities by adopting new innovations which could greatly intensify fishing effort.

The data we gathered are mixed and do not support either hypothesis fully. In the lobster industry, men at the height of their careers did adopt metal lobster traps in larger numbers than older or younger fishermen, and these men had many of the traits associated with the "early adopter" category (Acheson 1980e). At least the men who adopted these traps were younger and better educated than the middle and late adopters. However, in another study of 18 innovations in the herring and groundfishing industry, the results are clearly mixed. Men between 35 and 50 were more likely to adopt six of the innovations examined than fishermen under 35 or over 50, but age had no bearing on the adoption of the other twelve (Acheson and Reidman 1980). It also apparently has no influence on the adoption of pair trawlers (Bort 1980). Moreover, this study demonstrated that there was no "early" or "late adopter" class (Acheson and Reidman 1980).

The results of these studies caused considerable reanalysis of our data, and led to a reassessment of our ideas about the factors influencing the adoption of innovations. In this regard, two ideas need to be mentioned. First, we are still convinced that age plays an important role in adoption decisions. However, in some fisheries where very rapid technical change is taking place, the competitive situation makes the adoption of innovations imperative regardless of age. If an innovation is developed which gives a great advantage, one has to have that innovation or be driven out of business. In such cases, age is overridden by economic considerations. Second, innovations are adopted if they match the needs of the boat owner. A fisherman may be very wise in rejecting an innovation if it does

not help him solve some problem he faces (Acheson and Reidman 1980). Third, a regression analysis of the factors influencing the adoption of 18 innovations pointed out that the adoption of most innovations are associated with a distinct set of the 39 independent variables considered. However, some of these independent variables were associated with the adoption of a large number of these innovations; these variables included firm size, number of kinsmen a captain has in his home port, geographic location, and type of marketing outlet (Acheson and Reidman 1980: Tables 3, 4, 5). These results indicate that the adoption of fishing innovations is vastly more complicated than we had previously thought.

In general, our studies show that the willingness to innovate, which often increases effort on the fish stocks, can be explained primarily in terms of the match between the innovation and the needs of the potential adopter. The career cycle of fishermen plays an important role in the adoption of certain innovations, but by no means in all of them. However, the age of the fisherman and the career stage he is at are very important factors defining his needs and hence the kinds of innovations that would be matched to those needs.

There has been a great deal of innovation in the New England fishing industry in the late 1970's, which has made a substantial impact on the amount of fishing effort exerted by the American fleet. Based on an extensive study of 190 skippers of herring and groundfish boats in northern New England, it can be said with some certainty that between 1973 and 1978, substantially larger boats began to be used; those boats are better equipped (i.e. have more electronic gear); and the fishing gear is much more versatile, since men are adding different kinds of fishing gear while retaining their old gear. Moreover, there are substantially more boats entering

these fisheries. In fact, the number of groundfish licenses doubled in the first three years the so-called 200 mile limit law was put into effect (Acheson 1980c). If it were not for a reduction in the number of foreign boats allowed to fish in New England waters, there would have been a dramatic increase in the amount of effort on species, such as cod, haddock, and so on.

There are a number of reasons that so many fishermen have invested so heavily in larger, better equipped boats with more versatile fishing gear. The need to remain competitive is one such factor. Also, the fleet is very old and many of the boats in it should have been replaced long ago. But one of the most important factors has been the regulatory activities themselves. Groundfish and herring have both been regulated by a quota system which operated in such a way that when the quota was filled, fishing ceased -- sometimes with very little prior notice. The vessels that did the best under such a regulatory system were the biggest, most modern and best equipped. The lesson was not lost on members of the industry, and it was one of the primary factors motivating fishermen to invest in larger, more modern vessels (Acheson 1980c). In addition, the periodic opening and closing of fishing for certain species gives a distinct advantage to boats which are able to shift from one gear and species to another with some alacrity. A large number of fishermen have emulated these versatile operators by purchasing additional gears. The net effect of the large scale adoption of more and different kinds of gear has been not only an increase in overall effort but an increase in the number of boats which can quickly switch from putting effort on one species to another, and a corresponding increase in effort on unregulated species.

Certain fisheries managers are currently worried that this increase in

the fleet will continue and that effort on the major market species of fish will expand rapidly, threatening the viability of these fisheries. Our data indicate there are very real limits on the number of boats and fishermen that can enter these fisheries. Managers, we believe, tend to greatly underestimate the difficulties of entering a new fishery and the blocks to entry encountered. Fishing takes a great deal of skill and experience. In our study of 190 northern New England herring and groundfishermen, we found not a single instance in which men had entered these fisheries from a non-fishing occupation. Virtually all of the men who had entered these fisheries started as lobstermen, and then gradually expanded their business, purchased a bigger boat and changed fisheries (Acheson 1980d). Moreover, the switch from lobster fishing to fin-fishing was not abrupt. The vast majority of the men who entered fin-fishing started fishing for herring or groundfish during part of the annual cycle and then expanded the amount of time they devoted to fin-fishing while reducing the percentage of time in lobstering. In northern New England, men do not become the owners of fin-fishing vessels by working on the fin-fishing vessel of another man and then working up to captain. One becomes the captain of a big fin-fishing vessel by first becoming the captain of a small vessel and then changing boats. In summary, the number of people who can enter fin-fishing in the short run is limited to the number of men currently fishing for other species who have had experience in fin-fishing or scalloping -- at least over part of the annual round. In Maine, for example, there are only 282 men who have had any experience fishing for groundfish who do not have groundfish as a major species (Acheson et. al. 1980: 259). If ground-fishing suddenly became a very attractive option, the number of new entrants into the fishery could be no larger than this population. (This presumes

that there would not be a large influx of fishermen from other areas.) In the long run, a good many men could gain the experience, knowledge and capital needed to enter such fisheries as scalloping, groundfishing, or purse seining for herring. But in the short run, there is not likely to be a sudden quantum increase in fishing effort due to large numbers of new entrants.

Summary

Several social science studies on the New England fishing industry have demonstrated that a large number of social, cultural and psychological factors influence fishing effort. These data indicate that fishing effort depends not only on the amount of time spent fishing, and the horsepower of boats of different sizes, but also on the effectiveness of the vessels and men in the fleet. Fishing skills, especially skills relating to a knowledge of the bottom and of fish behavior, strongly affect catches in the short-run, along with information networks and crew composition.

In the long run, a different set of factors influence effort. Fishermen in most ports of New England are strongly committed to fishing, although they are attracted to it for different reasons. The fact that men remain in the industry -- even though the same volume of fish could be caught by far fewer boats with fewer men -- clearly increases the pressure on the resources. In addition, the fleet is being expanded and modernized. Not only are fishermen purchasing larger vessels, but those vessels are better equipped, and have more versatile fishing gear. Furthermore, the number of boats in fin-fishing and scalloping has increased. However, the number of vessels in the fleet cannot continue to expand at a rapid rate, since there are currently a very limited number of men who have the necessary experience

to enter fin-fishing, scalloping, herring fishing, and other large boat fisheries.

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