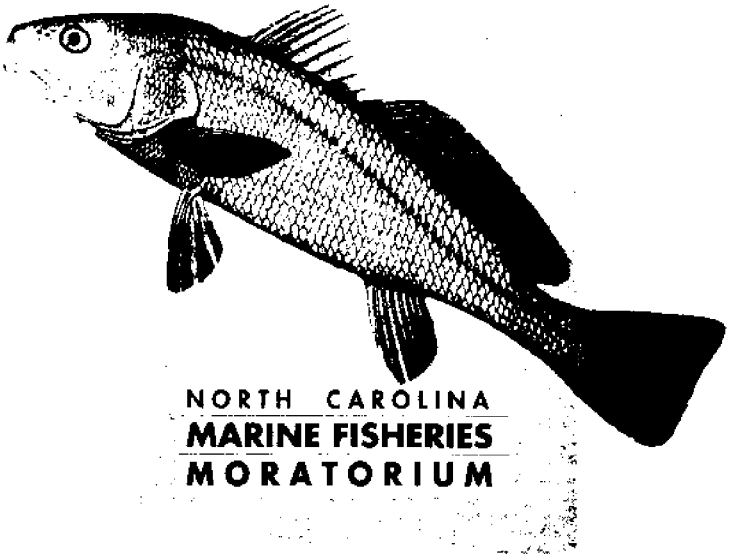

FISHERIES RESEARCH REPORTS TO THE FISHERIES MORATORIUM STEERING COMMITTEE

Effort Management in North Carolina Fisheries: A Total Systems Approach

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by

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A report to the North Carolina Moratorium Steering Committee

Executive Summary

The objectives of this project were:

1) To assess the current state of North Carolina fisheries with respect to the relationship between effort, catch and landings, and the social and economic conditions in the fisheries;

2) To collect data on effort control or reduction systems which are currently in use in other fisheries, and their characteristics and effects with respect to the needs of North Carolina fisheries;

3) To solicit, through an extensive series of public, fishery constituent workshops in locations throughout the state, the involvement of all of those involved or concerned with North Carolina fisheries in education and assessment concerning limited entry alternatives; and

4) To develop an evaluative framework through which the Moratorium Steering Committee, Marine Fisheries Commission, General Assembly, fishery constituent groups and the public may evaluate the appropriateness of various limited entry alternatives for North Carolina fisheries.

Approach and Methodology

The first step in this process was an extensive set of interviews conducted all over North Carolina by researchers from East Carolina and Duke Universities. In-depth interviews with 388 people were conducted, 266 in person and 122 by telephone, stratified by area of the state and category of licenses held. Of these, 294 were with holders of both a commercial vessel license and an endorsement to sell (ETS); 74 were with fishers who held a commercial vessel license but no ETS; 20 were with holders of a non-vessel ETS. A wide range of data was collected in these interviews, including demographics, fishing operations and patterns, amounts and patterns of gear use, and attitudes and perceptions of problems and issues in North Carolina fisheries, including the subject of limited entry and access.

The second step was to hold three different series of workshops. The purposes of the first workshop series, held in August of 1995, were: 1) To discuss problems and issues in North Carolina fisheries; and 2) to discuss the concept of limited entry, or access, how it has been used in other fisheries, and what the effects of those limited entry systems have been. The purpose of the second workshop series, held in October of 1995, was to evaluate the potential impact of a number of alternatives, both limited entry-type and non-limited entry-type, on selected North Carolina fisheries. The purposes of the third workshop series, held in January of 1996, were to present the results of the evaluations from the second workshop, and to discuss further development of the concept of limited entry for North Carolina fisheries. In addition to the five regularly scheduled workshops in each series, which were held in Manteo, Washington, Beaufort, Raleigh and Wilmington, we met, at their request, with the Hatteras and Carteret Auxiliaries of the North Carolina Fisheries Association after each workshop series and, also at their request, with groups of pound netters on Ocracoke and Cedar Islands and with a group of crab fishermen associated with the Blue Crab Data Gathering Project funded under the North Carolina Fishery Resource Grants Program.

North Carolina Fisheries and Fishers

There are several summary points to be made concerning the general characteristics of North Carolina fisheries and fishers relevant to the charge of the Moratorium Steering Committee:

1) The vast majority of the commercially licensed fishing vessels, and by implication the fishers who use them, are not in fact engaged in commercial fishing in that they either do not sell any of their catch or they do not have a significant degree of economic dependence on the sale of their catch. The principal reasons for holding a commercial vessel license even though the holder may have no intent to sell or to substantially depend on commercial fishing are 1) the requirements of current North Carolina marine fisheries regulations; 2) the availability of tax and other financial benefits from the possession of a commercial license; 3) the ability to fish under different regulatory options (i.e., quotas and bag limits) attendant upon the possession of a commercial license; and 4) the desire of some license holders to fish in the future or obtain other benefits of future

licensing privileges, even though they do not currently, and may not have ever, fished commercially.

2) A single, comprehensive "definition" of a "commercial fisher" is difficult to specify. For example, 33% of the "full time" fishers in our sample reported shore-based work other than fishing. Distinctions among various levels of dependence on commercial fishing must be tied to the goals and objectives of any particular management system for each fishery or complex of fisheries.

3) The fisheries and fishers of North Carolina are significantly interrelated through common patterns of "annual rounds" of fishing. These patterns are relatively stable over time and vary from one section of the state to another.

4) The fishers of North Carolina are not a homogeneous group. For almost all of the demographic characteristics summarized in this report for which central tendency figures such as mean or median were reported, the standard deviation, a measure of the variation in the sample away from the mean, or average, was high. Some of this variation can be explained with reference to different categories of fisher. For example, differences in age, education, socio-economic status, household size, and average vessel size and value were noted between full time and part time or recreational fishers.

5) The full time commercial fishers have relatively low levels of education and training, which is reflected in their perceptions of their occupational alternatives outside of fishing.

6) There are significant regional differences in the characteristics of fishers. For example, the general characteristics of fishers and fishing in Carteret and New Hanover counties, which are more urbanized, differed from those of fishers and fishing in the Albemarle and Pamlico Sound areas, which are more rural. These differences reflect not only different fisheries and ecological characteristics of the areas, but also the different potential impacts of new management systems on the fishers and their communities.

The Potential for Limited Entry in North Carolina Fisheries

The discussion of the potential for some form of entry or access limitation in North Carolina fisheries is driven by two general factors. The first is a general fear of increasing numbers of fishers coming into North Carolina in general due to events occurring outside of North Carolina, in particular the Florida "net ban," the collapse of the New England groundfish fishery, access limitation programs in other states, and the perceived relative abundance of fish or lack of regulation in North Carolina fisheries.

The second factor is concern over specific fisheries in terms of the actual or potential effort which has or could be applied to these fisheries. These are fisheries where specific concern has developed over the mismatch between the amount of effort in the fishery and the available amount of the fishery resource. The amount of excess effort in these fisheries has led variously to decreased net profits for fishers, increased competition and conflict among fishers for the fishery resource and for 'space,' increased difficulty in administration, monitoring and enforcement, and the potential for harmful biological or ecological effects.

The Form of Limited Entry Programs

There are two general options for the establishment of limited entry programs. The first is through the creation of general authority, as was done in the federal Magnuson Fisheries Conservation and Management Act (MFCMA). The North Carolina General Assembly could establish such general authority, perhaps with specific legislative oversight provisions, with the responsibility for the development of such programs delegated to the Marine Fisheries Commission, the Department of Environment, Health and Natural Resources (DEHNR) or some other entity.

Second, each specific limited entry or access program could be established in detail legislatively. This is in fact how the vast majority of the existing state limited entry systems have been established -- by legislation detailing the characteristics of the system and delegating certain functions within the system, usually to the principal state fishery policy agency.

Limited entry systems which appear to fulfill their stated goals have been developed under both processes. The important feature of any limited entry policy system is that the goals, objectives, standards and procedures for the creation and operation of the system be clearly specified by whichever approach is chosen.

Support for Limited Entry in North Carolina

Approximately 70% of our random sample of fishers, stratified by area of the state, who held both a commercial vessel license and an ETS agreed with the statement, "Limited entry can make fishermen better off in the long run," and 78% agreed with the statement, "Limited entry may be appropriate to some of North Carolina's fisheries." Included in this report is a general outline of a proposal for one such limited entry system for the blue crab pot fishery, a proposal which was developed subsequent to our workshop discussions by a group of crab fishermen with the intent of asking that the proposal be included in the report of the Moratorium Steering Committee for public comment. For this specific fishery, responses from a separate survey of 239 North Carolina blue crab fishermen reported that 82% supported or conditionally supported (that is, would support if fishermen had input to the design of the system) pot limits and 71% supported or conditionally supported license limitation for the blue crab fishery.

Limits on Overall Participation, or by Fishery?

A central question before the Moratorium Steering Committee is whether -- if any limited entry system is desirable at all -- to attempt to control fishing effort by limiting *overall* participation in North Carolina fisheries, or to create systems for specific fisheries or fishery complexes. In the overall approach, a cap might be set on the total number of commercial fishing licenses in North Carolina, which in the future would presumably be the equivalent of the current ETS system. Fishery-specific systems would be those such as the blue crab pot fishery proposal referenced in this report. It would also be possible to develop compatible systems for 'fishery clusters' of inter-

related fisheries. There are several features of the comparison of these approaches which deserve comment:

1) Although excess effort can be demonstrated in some of our fisheries, there is currently not a demonstrable excess of effort in all of our fisheries.

2) There is a general concern over the impact of fishery specific limited entry systems on the flexibility of fishers with respect to their 'annual rounds' of fishing. The tradeoff is between efficiency, stability, profitability and the potential for conservation benefits in the fishery, and open access for all fishers.

3) Care would have to be exercised concerning how any system of restricted privileges, overall or fishery-specific, would provide for actual effort control. In general, limiting the number of participants alone does not control fishing effort, because each unit can use increasing amounts of gear, time, etc. One option would be to create fishery-specific limited entry systems for all of North Carolina's fisheries at the same time, before the moratorium is lifted. This may be possible but would be very difficult, because there may not currently be justification for such limitation in all fisheries, which would make support for such systems from the fishers questionable.

4) Attention must be devoted to the question of how any limitation system would actually function in the on-going distribution of fishing privileges. For example, in a fishery-specific system where the limited units, say crab pots, are similar in their economic fishing potential in that a market system for those privileges may easily develop. In an overall license limitation system for all fisheries, however, a market system would be difficult to envision because each license could be attached to such a wide range of fishing operations of different size and economic potential.

Major Options for the Development of Limited Entry Systems

In summary, the major options available for the development of limited entry systems for North Carolina fisheries, if such systems are desired, are: 1) Legislative development of fishery-specific systems; or 2) Legislatively-created authority for the development of limited entry systems, with authority delegated to a body such as the Marine Fisheries Commission, perhaps with the stipulation that such systems could only be approved in the context of an approved fishery management plan for the subject fishery. Either approach would have to clearly specify the goals, objectives, standards and procedures for the creation of such systems. Either approach could produce either overall or fishery-specific systems. All alternative form of entry or access limitation should be considered in each case, and the impact of those alternatives clearly analyzed based on adequate biological, economic and social data. Finally, involvement of the fishing constituencies in the development of limited entry systems, as we have done with the workshops in this project, is critical to adequate design and acceptance of any potential system.

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Acknowledgements

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Section 1: Introduction

All around the world fishing industries and communities are changing (McGoodwin, 1990). Some of these changes are due to natural fluctuations in the fishery resource or habitat. Some are due to changing fishery regulations. Some are due to changing conditions in the U.S. and international markets for fish. Some are due to the changing character of coastal regions in the U.S., regions which were once mostly commercial fishing oriented but which are increasingly oriented towards leisure, tourism and retirement. Some are due to normal internal changes in the fishing industry itself.

These changes have brought considerable attention to the subject of marine fisheries, in a variety of ways. The situation of the New England groundfish fishery; the Florida net ban; the listing of Pacific salmon species as threatened or endangered; the increased authority of the Atlantic States marine Fisheries commission; all of these events and many more contribute to the pressures now being felt in North Carolina's fisheries.

In response to these pressures, in 1994 the North Carolina General Assembly passed a bill creating a two-year moratorium on the issuance of new commercial vessels licenses. This moratorium was meant to slow down the effects of these pressures while a group created by that same moratorium bill, the North Carolina Fisheries Moratorium Steering Committee, develops a set of recommendations to the General Assembly concerning possible new ways of managing our marine fisheries.

One particular concern in North Carolina, even before the moratorium was passed, was the increasing amount of effort -- in some cases fishermen, in some cases fishing vessels or gear such as crab traps -- in many of North Carolina's fisheries. These increases have often occurred in the face of constant or declining fish catches, but also in the face of increasing traditional regulatory measures. The result is less revenue and lower profits for fishermen, more crowding and conflict on the fishing grounds, possible effects on the fish stock or habitat, and greater difficulty in managing the state's fisheries.

In many other fisheries, both in the United States and around the world, where problems such as this have arisen, management systems known as limited entry, or limited access, have been created. The Moratorium Steering Committee asked us to explore, along with fishermen and others interested in the fisheries, the potential application of these limited entry systems for North Carolina's fishermen.

This project was developed in response to Sections I, III, and V of the Request for Proposals from the North Carolina Fisheries Moratorium Steering Committee (MSC), with a central focus on Section III concerning effort control and reduction. The objectives of the project were:

1) To assess the current state of North Carolina fisheries with respect to the relationship between effort, catch and landings, and the social and economic conditions in the fisheries:

2) To collect data on effort control or reduction systems which are currently in use in other fisheries, and their characteristics and efforts with respect to the needs of North Carolina fisheries;

3) To solicit, through an extensive series of public, fishery constituent workshops in locations throughout the state, the involvement of all of those involved or concerned with North Carolina fisheries in education and assessment concerning limited entry alternatives; and

4) To develop an evaluative framework through which the MSC, Marine Fisheries Commission, General Assembly, fishery constituent groups and the public may evaluate the appropriateness of various limited entry alternatives for North Carolina fisheries.

The first step achieving these objectives was an extensive set of interviews conducted all over North Carolina by researchers from East Carolina and Duke Universities. We conducted in-depth interviews with 388 people, 266 in person and 122 by telephone, stratified by area of the state and category of licenses held. The second step was to hold a series of workshops and meetings with

fishers and other fishery constituents in locations around the state. A total of 20 such meetings and workshops were held.

In Section 2 of the report we describe the methodology and approach we used in collecting current data on North Carolina fisheries and fisheries. In Sections 3-8 we present the results of this data collection, with a focus on those data which are directly relevant to the consideration of limited entry systems. In Section 9 we describe the conduct of the workshops, and the general outcomes of the workshop discussions. The final Section 10 is a summary discussion of the applications of our project results to the work of the MSC.

Section 2: Methodology

In this section we provide a brief description of the methods employed, including a description of the samples, survey instruments, analyses, and other methodological concerns in the primary data collection phase of the project. Further detail as to the methods and other relevant information can be found in the Appendices.

Samples

In the course of discussions with personnel from the NC Division of Marine Fisheries (DMF), three primary subpopulations were identified for study. The first of these subpopulations includes all individuals who hold both a North Carolina commercial vessel license and an endorsement to sell (ETS). The sample of this particular subpopulation will be referred to throughout the report as the Commercial ETS sample. The second subpopulation involves individuals who maintain an NC commercial vessel license but did not hold an ETS as of 1994. The sample of this subpopulation will be referred to as the Commercial Non-ETS sample. Finally, a smaller subpopulation consisting of individuals who do not hold a NC commercial vessel license, but who have a non-vessel ETS was sampled and is termed the Non-Vessel ETS sample.

Each of these subpopulations was identified from the North Carolina licensing database for 1994 maintained by DMF. The databases were obtained on disk from DMF and were converted into SYSTAT system files. Random samples were drawn from these databases using the random sampling routine found in SYSTAT.

Commercial ETS Sample. As noted above, this sample includes individuals possessing both a commercial vessel license and an ETS. The sample was stratified by six areas identified in earlier research as being distinct in terms of species/gear combinations and with respect to sociological, ecological and environmental differences (Orbach and Johnson 1991). Table 2.1 provides a breakdown of the counties designated in each of the areas. Sample size per strata was determined on the basis of the proportion of the subpopulation within these areas in the original database.

This is the largest of the three samples and all interviews in this sample except those in Area 6 were conducted in person. Area 6 (all inland counties) interviews, because of their rather diffuse geographical nature, were conducted by phone.

Table 2.1. Definition of study areas.

Area 1: Albemarle Area = Currituck, Camden, Pasquotank, Perquimans, Chowan, Bertie, Washington, and Tyrell Counties.
Area 2: Dare County
Area 3: Southern Area = Brunswick, Pender, Newhaven, and Onslow Counties.
Area 4: Pamlico Area = Craven, Pamlico, Beaufort, and Hyde Counties.
Area 5: Carteret County
Area 6: Inland Counties

Commercial Non-ETS Sample. The largest of the subpopulations, this sample was drawn from the 1994 database on the basis of individuals not having had an ETS as of that time. All interviews were conducted by phone with an attempt at a sample size of 100. Of the 100, 74 interviews were conducted by phone (see Appendix I for a breakdown of nonresponses).

Non-Vessel ETS Sample. This is the smallest of the subpopulations, and the smallest sample. Conducted by phone, interviews were attempted on an original random list of 50 names; of these, 20 were interviewed. Although a response rate of 40 percent was rather low, an examination of Appendix I shows that a rather high proportion of individuals in the sample were difficult to contact because of wrong numbers and unlisted numbers (possibly reflecting high degrees of mobility).

Table 2.2 provides a description of the various samples in the study including sample sizes, response rates, and other characteristics of the samples. The response rates were generally good and were hurt by an inability to reach some of the fishers from the original random sample. If these are taken into account the response rate is much higher (i.e., only counting refusals). See Appendix I for more details on the samples.

Table 2.2 Sample Sizes and Response Rates for Various Samples						
Sample	Original Sample	Number Interviewed	Number Deceased	Number That Could Not Be Contacted	Number of Replacements Used	Response Rate
Commercial ETS	315	266	2	43	25	85%
Inland ETS	40	28	0	11	0	70%
Commercial Non-ETS	107	74	0	24	0	70%
Non-Vessel ETS	50	20	0	27	0	40%

The Survey Instrument

Questions used in the survey were based on those used in the earlier work of Johnson and Orbach (1987, 1995) and were modified for the purposes of this study. Appendix II provides examples of the surveys used in the three samples. The two phone samples are variants of the interview schedule used in the personal interview samples (Commercial ETS). The instruments were designed to collect data on both the characteristics of license holders and the characteristics and nature of their fishing operations. Instruments were pretested and modified to ensure validity.

Nonresponse Bias

Given the importance of population parameter estimation based on sample values, it was important to reduce sample bias wherever possible. Interviewers were given instructions to make several attempts at contacting and interviewing sample respondents. If repeated attempts led to no contact, random replacements were made in order to reach target sample sizes for the given areas. In addition, refusals and individuals who were hard to contact were contacted later in the sample process and a limited amount of information collected from each of them in an attempt to reduce the bias of such parameter estimates as the number of fishermen, number of crab pots, yardage of gill net, etc. (see Holbert and Johnson, 1990). Thus, many of the estimates are given as

both a sample estimate and an adjusted estimate, where the adjusted estimate incorporates additional information about randomly selected fishers who were unable or unwilling to complete the entire survey, and estimates of the status of individuals who appeared to "vanish" (e.g., assumptions concerning status).

Analysis

Most of the data is presented as descriptive statistics. However, simple comparative analyses are provided where appropriate (e.g., T-tests, Kruskal-Wallis ANOVA, etc.). In the case of some population parameter estimates, 95 percent confidence intervals are used. In the section on network relations among fisheries, the network analytical package UCINET was used.

Full- Versus Part-Time Designation

Throughout this report the analysis is often done according full- versus part-time categories. Unless otherwise stated, full-time fishers are defined as those with self-reported earned income from commercial fishing of 50 percent or more. Part-time fishers are defined as those with a total earned income dependence on commercial fishing of less than 50 percent. Alternative definitions of these two statuses in this report are based on self-perceptions derived from peoples' own reports as to what category they believe they are in (e.g., full-time, part-time, recreational).

Section 3: Demographic Characteristics

In this chapter we provide background information on the demographic characteristics of the individuals interviewed from the main Commercial ETS Vessel sample. The primary focus will be individual and household characteristics reported in both aggregate form and by area and full-time and part-time status.

Individual Characteristics

As can be seen from Table 3.1, the vast majority of respondents were male. Of those interviewed, only 4.2 percent were female. Although most of the fishers in this sample were born in North Carolina (Table 3.2), approximately a fourth (21 percent) were not native to the state. This is not surprising given the amount of in-migration to the state in the past 15 years, particularly along the coast. Respondents were for the most part white with only 2.7 percent of the total sample being African-American (Table 3.3). The marital status of those interviewed tended to be primarily married (80.6 percent), with less than 2 percent of the respondents being divorced and 4.4 percent separated (see Table 3.4).

TABLE 3.1 Gender for Total Sample

N=261	Percent
1=Male	95.8
2=Female	4.2

TABLE 3.2 Birthplace Distribution for Total Sample

N=253	Percent
North Carolina	79
Out-of-state	21

TABLE 3.3 Distribution of Race for Total Sample

N=253	Percent
1= White/Caucasian	96.8
2= Hispanic	0
3= Black	2.7
4= Asian	0
5= Other	0.4

TABLE 3.4 Distribution of Marital Status for Total Sample*

N=252	Percent
1= Single	11.5
2= Divorced	1.98
3= Separated	4.4
4= Widowed	1.6
5= Married	80.6
6= Other	0

*** No Statistical Difference Between Full and Part Time Status**

For both full- and part-time fishers in the different areas the average age of the respondent ranges from a low of 41.2 for full-time fishers in area 1 to a high of 55 for part-time fishers in area 2 (see Table 3.5). There is a statistically significant difference between the mean age of full- and part-time fishers at the total sample level ($T=2.48$, $p<.01$). Part time fishers tend to be older on average than full-time fishers, reflecting the possible presence of retirees. It should be pointed out, however, that although the full-timers in most of the areas are younger on average there is no statistical difference in the mean ages of these groups by area.

TABLE 3.5 Age by Area and Status*

	Full Time			Part Time		
	$\bar{X}$	M	SD	$\bar{X}$	M	SD
Area 1	42.1 (N =22)	40	9.3	48.7 (N= 3)	50	18
Area 2	41.2 (N= 26)	39	13.4	55 (N= 7)	60	20.9
Area 3	44.6 (N= 42)	44	14.4	49.9 (N= 26)	51	14.8
Area 4	46 (N= 41)	48	14.3	52.5 (N= 10)	46	15.9
Area 5	50 (N= 38)	52	14.7	47.5 (N= 18)	44	13.8
Area 6	48 (N= 7)	39	14	50 (N= 21)	50	10.7

*** No Significant Difference by Area**
Comparison of Full and Part Time for Entire Sample: T=2.48, p < .01

Table 3.6 illustrates that at least 68 percent of the respondents have a high school education or beyond. Table 3.7 gives a breakdown of the mean education level of full-timers and part-timers by area. Although there is a statistically significant difference between full- and part-time when comparing the total sample, there is not a difference on an area by area basis. This is partly due to some of the small n's resulting from the disaggregation of the data into full- and part-time by area. Nevertheless, the part-time group tends to have slightly higher mean years of education when compared to the full-time fishers.

TABLE 3.6 Distribution of Education for Total Sample

N= 253	Percent
1= (1-8)	7.1
2= (9-11)	24.5
3= Graduate 12	32.8
4= Some college	16.2
5= College Grad.	7.9
6= Grad./Professional	2.8
7=Technical	8.7

TABLE 3.7 Years of Education by Status*

	Full Time			Part Time		
	$\bar{X}$	M	SD	$\bar{X}$	M	SD
Area 1	12.1 (N= 22)	12	2.3	15 (N= 3)	15	1.4
Area 2	11.8 (N= 26)	12	1.4	11.8 (N= 7)	12	1.7
Area 3	12 (N= 42)	12	2.4	12.4 (N= 26)	14	3.2
Area 4	11.9 (N= 41)	12	2.8	12.3 (N= 10)	12.5	2.2
Area 5	12 (N= 38)	12	2.4	12.1 (N= 18)	12	3
Area 6	11.4 (N= 7)	12	2.6	13.5 (N= 21)	14	2.4

*** Separate Variance T= 1.96, DF= 137.2 p< .05 for Total Sample**
No Significant Difference Between Groups on an Area by Area Basis

This variation in levels of education among full- and part-time fishers is further illustrated in Table 3.8. There is a high degree of variation in the percent of fishers in the various categories when compared across areas. In some areas like Carteret County, for example, there are more college graduates fishing among the ranks of the full-timers than among the part-timers. The opposite is true, for example, in the Southern area (Area 3) where far more part-timers (15.4 percent) than full-timers (2.4 percent) have a college education. Further, there is much variation between areas and status with respect to the number of fishers who have less than a high school education. Whereas the Southern area had a high number of part-timers with a college degree, it also had an exceptionably high number of fishers with less than a high school education (38.5 percent). Some of the individuals with less than a high school education may be older retirees, reflecting a segment of the sample where a 9th-grade education for this cohort in rural Eastern North Carolina may have been the standard. Nevertheless, there is a high degree of heterogeneity in the educational backgrounds of full- and part-time fishers, particularly on an area-by-area basis.

This heterogeneity in the educational backgrounds of both full- and part-time fishers has important implications in terms of the differential impacts of fisheries management. In some of the areas part-timers may be reasonably well educated and hold down a full-time job (e.g., "Cherry Pointers"). In other areas part-timers can be living on very little income and the small amount of money derived from part-time fishing is providing significantly more than additional income for "Christmas presents" or to help pay for a new car. Thus, this brief look at variations in education levels among fishers of different status and regions of the state illustrates the importance of viewing the fisheries in their social and economic context.

Household Characteristics

Table 3.9 provides a breakdown of the mean number of individuals living in a household by area and status. Although it appears that the full-time fishers live in households that are larger on

TABLE 3.8 Distribution of Education by Area and Status*

AREA 1

	Full-Time (N=21)	Percent	Part-Time (N=3)	Percent
1	(1-8)	4.8	(1-8)	0
2	(9-11)	28.6	(9-11)	0
3	Graduate 12	33.3	Graduate 12	33.3
4	Some College	19.1	Some College	66.7
5	College Grad.	0	College Grad.	0
6	Grad./Professional	0	Grad./Professional	0
7	Technical	14.3	Technical	0

AREA 2

	Full-Time (N=24)	Percent	Part-Time (N=6)	Percent
1	(1-8)	0	(1-8)	0
2	(9-11)	25	(9-11)	33.3
3	Graduate 12	54.2	Graduate 12	33.3
4	Some College	12.5	Some College	16.7
5	College Grad.	0	College Grad.	0
6	Grad./Professional	4.2	Grad./Professional	0
7	Technical	4.2	Technical	16.7

AREA 3

	Full-Time (N=42)	Percent	Part-Time (N=26)	Percent
1	(1-8)	4.8	(1-8)	15.4
2	(9-11)	28.6	(9-11)	23.1
3	Graduate 12	35.7	Graduate 12	7.7
4	Some College	21.4	Some College	30.8
5	College Grad.	2.4	College Grad.	15.4
6	Grad./Professional	2.4	Grad./Professional	3.9
7	Technical	4.8	Technical	3.9

AREA 4

	Full-Time (N=40	Percent	Part-Time (N=10)	Percent
1	(1-8)	10	(1-8)	10
2	(9-11)	30	(9-11)	10
3	Graduate 12	35	Graduate 12	30
4	Some College	7.5	Some College	10
5	College Grad.	10	College Grad.	0
6	Grad./Professional	5	Grad./Professional	0
7	Technical	2.5	Technical	40

AREA 5

	Full-Time (N=35	Percent	Part-Time (N=18)	Percent
1	(1-8)	2.86	(1-8)	5.6
2	(9-11)	31.4	(9-11)	22.2
3	Graduate 12	37.1	Graduate 12	38.9
4	Some College	8.6	Some College	11.1
5	College Grad.	14.3	College Grad.	5.6
6	Grad./Professional	0	Grad./Professional	5.6
7	Technical	5.7	Technical	11.1

AREA 6

	Full-Time (N=7)	Percent	Part-Time (N=21)	Percent
1	(1-8)	42.9	(1-8)	4.8
2	(9-11)	0	(9-11)	9.5
3	Graduate 12	28.6	Graduate 12	19.1
4	Some College	14.3	Some College	19.1
5	College Grad.	0	College Grad.	23.8
6	Grad./Professional	0	Grad./Professional	4.8
7	Technical	14.3	Technical	19.1

* Comparison of Total Sample by Full and Part Time $X^2 = 15.98$, DF= 6 $p<.01$

TABLE 3.9 Number Living in the Household by Area and Status*

	Full-time			Part-time		
	$\bar{X}$	M	SD	$\bar{X}$	M	SD
Area 1	3.4 **(N= 22)**	4	1.2	2.6 **(N= 3)**	2	1.2
Area 2	3.3 **(N= 26)**	3	1	2.8 **(N= 7)**	2.5	1
Area 3	2.4 **(N= 42)**	2	1.2	2.4 **(N= 26)**	2	0.9
Area 4	2.8 **(N= 41)**	3	1.1	2.6 **(N= 10)**	2.5	1
Area 5	2.7 **(N= 38)**	3	1	2.5 **(N= 18)**	2	0.9
Area 6	2.3 **(N= 7)**	2	1.8	2.8 **(N= 21)**	2	1.1

*** No Statistical Difference Between Groups by Area**

average than those of part-timers, differences between statuses are not statistically significant at either the total sample level or on an area-by-area comparison. Respondents who were full-time tended to be younger on average, possibly reflecting the presence of school-aged children in the house.

Table 3.10 shows the mean number of people currently working that live in the household. The only statistically significant difference lies between full- and part-time status for the Carteret County sample in which there are more individuals working that are members of the household among the full-timers than among the part-timers. This may be partially due to the availability of work in the area due to the influences of Morehead City and Cherry Point. For those working members of the household, Table 3.11 shows the mean number who work in some aspect of the commercial fishing industry. For all but one of the areas for both statuses the median number is 1. Although the full-time fishers tend to have more individuals in the household on average who work in commercial fishing in some manner, the difference is not statistically significant when compared by area.

A breakdown of the percent in the household engaged in commercial fishing by number for the entire sample is provided in Table 3.12. All but Area 3 (Southern Counties) have an average of at least one member in the household engaged in some aspect of commercial fishing. As is evident from the table, the more rural and isolated areas have the highest percent of households with more than one member engaged in commercial fishing.

An important aspect of fishing and the traditions that it entails concerns family involvement and dependency. Table 3.13 provides a more detailed breakdown of data in Table 3.12 showing the relationship between the respondent and other members of the household engaged in commercial fishing. As is obvious from the table, spouses are engaged in fishing on the average at some level in all the areas, particularly when taking into account spouses engaged in fishing with sons,

TABLE 3.10 Number Working in Household

	Full Time			Part Time		
	$\bar{X}$	M	SD	$\bar{X}$	M	SD
Area 1	1.7	2	0.78	1.6	2	0.58
	(N= 22)			**(N= 3)**		
Area 2	1.9	2	0.58	2	2	0.63
	(N= 26)			**(N= 7)**		
Area 3	1.6	2	0.62	1.6	2	0.7
	(N= 42)			**(N= 26)**		
Area 4	1.9	2	0.67	1.9	2	0.99
	(N= 41)			**(N= 10)**		
Area 5*	2	2	0.74	1.4	1	0.5
	(N= 38)			**(N= 18)**		
Area 6	1.3	1	0.81	1.6	2	0.6
	(N= 7)			**(N= 21)**		

*** $p < .01$**

TABLE 3.11 Number Who Fished in Household*

	Full-time			Part-time		
	$\bar{X}$	M	SD	$\bar{X}$	M	SD
Area 1	1.6 **(N= 22)**	1	1.1	1 **(N= 3)**	1	0
Area 2	1.4 **(N= 26)**	1	0.58	1.3 **(N= 7)**	1	0.51
Area 3	1.3 **(N= 42)**	1	0.52	1.1 **(N= 26)**	1	0.56
Area 4	1.5 **(N= 41)**	1	0.75	1.6 **(N= 10)**	1.5	0.7
Area 5	1.4 **(N= 38)**	1	0.74	1.1 **(N= 18)**	1	0.47
Area 6	1 **(N= 7)**	1	0	1.3 **(N= 21)**	1	0.72

*** No Statistically Significant Difference**

Table 3.12 Number in Household Engaged in Commercial Fishing (percent)

Area	None	1	2	3	4	5	N
Albemarle	0	66.7	25.0	0	4.2	4.2	24
Dare	0	66.7	30.0	3.3	0	0	30
South	2.9	75.0	19.1	2.9	0	0	68
Pamlico	0	56.0	34.0	8.0	2.0	0	50
Carteret	0	77.4	15.1	5.7	1.9	0	53

TABLE 3.13 Relationship to People in Household Engaged in Fishing (percent)

Albemarle

Self	Self & Spouse	Self & Son	Self, Spouse, Son & Daught.	Self, Spouse, Son & 2 Daugh
66.7	12.5	12.5	4.2	4.2

Dare

Self	Self & Spouse	Self & Sig. Oth.	Self & Son	Other Relative & Self
66.7	10.0	6.7	13.3	3.3

South

Self	Self & Spouse	Self & Father	Self & Son	Self, Son & Spouse	Self & Other Relative	Spouse & Other Relative	Son
75.8	15.2	1.5	1.5	1.5	1.5	1.5	1.5

Pamlico

Self	Self & Spouse	Self & Son	Self & Daught.	Self & Other Relative	Self, Son & Spouse	Self, Sig. Oth. & Son	Self, Son, Daught. & Spouse
58.0	20.0	10.0	2.0	2.0	4.0	2.0	2.0

Carteret

Self	Self & Spouse	Self & Father	Self & Son	Self, Son & Spouse	Self, Father & Other Relative
77.4	11.3	1.9	1.9	5.7	1.9

daughters, and others (e.g., other relative). For example, if the other multiple categories are taken into account the spouse is involved in at least approximately 21 percent of the households in the Albemarle area, 18.2 percent in Area 3, 26 percent in the Pamlico area, and 17 percent in Carteret County. Significant other, defined here as an individual of the opposite sex with whom the respondent co-habitates, is another important form of relationship found among members of the household, particularly for the Dare County area.

Approximately 21 percent of the households in the Albemarle area have at least one son or daughter involved in commercial fishing. For Dare County the percent is 13.3, for the Southern counties 4.5 percent, for the Pamlico area 20 percent, and for Carteret County 7.6 percent. Again, the 3 most rural areas have the highest participation of offspring still living at home involved in some aspect of the commercial fishing enterprise.

With respect to spouses, approximately 67 percent of the respondents' spouses worked either full or part-time (see Table 3.14). Among the coastal county full-time fishers the percent who have a spouse that worked was relatively the same. The most variation was among part-time fishers in the Carteret area (Area 5) where only 40 percent of the spouses worked. This difference between full and part-time in area 5 was evident in the discussion comparing the number working in the household above.

TABLE 3.14 Distribution of Spouse Working for Total Sample

N=215	Percent
1=Yes	66.98
2=No	33.02

Nonfishing Employment

For part-time fishers we would expect there to be a large percentage who engage in shore-based employment of some kind. Approximately 71 percent of part-time fishers stated they had shore-based employment of some type. For full-time fishers a surprising 33 percent stated they engaged on some type of shore-based work over the course of the year. Table 3.15 shows a breakdown of the types of non-fishing employment by full- and part-time fishers. The types of employment found among part-timers is highly diverse. The single largest type was construction and is logical given the seasonal and variable nature of occupations associated with this industry. Among full-timers construction was by far the largest type of employment followed by agricultural occupations, transportation (e.g., ferry operators), and retail (including seafood retail marketing). Jobs held by these full-timers are generally seasonal and highly variable. In addition, many can be done on the side or on weekends (e.g., boatbuilder, car mechanic) utilizing skills possibly learned in fishing.

Of the part-timers the largest single category was retired (22.5 percent). This comes as no surprise in that much of the anecdotal evidence pointed to the possible importance of fishing to aid in supplementing retirement incomes. In addition, some small number of part-time fishers (3.75) were on disability of some type (e.g., Vietnam Vet). Table 3.16 gives a breakdown of where retirees reside. Most, of course, live in the most highly populated areas such as the Southern counties

TABLE 3.15–Occupations for Full Time and Part Time Fishers Reporting Non-fishing Employment. (percent)

OCCUPATION	FULL TIME N=46	PART TIME N=80
HOSPITAL	-	1.25
BANKING	-	1.25
DATA PROCESSING/COMPUTER SERVICES	-	1.25
SCHOOLS/EDUCATION	-	2.5
RELIGIOUS SERVICES	-	1.25
ENVIRONMENTAL CONSULTING	-	1.25
ENGINEERING/ARCHITECTURE	-	1.25
REAL ESTATE OPERATORS/LESSORS	4.35	-
CONTRACTORS, CARPENTERS, CONSTRUCTION, REPAIR	34.78	11.25
SHIP/BOAT BUILDING & REPAIR	4.35	-
AUTO DEALER/REPAIR, MECHANICS	4.35	6.25
TRANSPORTATION/TRUCKING (includes ferry operators)	10.87	7.5
MANUFACTORING (includes newspaper, metals, chemicals, glass, textiles, machinery)	2.17	7.5
NET MAKER/GEAR REPAIR	-	1.25
FRESH/FROZEN PACKAGED FISH PROCESSING	4.35	1.25
AGRICULTURE PRODUCTION/SERVICES (includes dairy farming, horticultural/landscaping, fishing, forestry, hunting, trapping, game propagation)	13.05	7.5
MINING (chemical & mineral)	-	1.25
HOTELS/CAMPGROUNDS/TRAILER PARKS	2.17	2.5
RETAIL STORES	10.87	10
MEAT/FISH (SEAFOOD) RETAIL MARKETS	4.35	-
CIVIL SERVICE	-	7.5
STUDENT	2.17	-
HOUSEWIFE	2.17	-
DISABLED	-	3.75
RETIRED	-	22.5

Table 3.16--Retirees that are Part Time Fishers by Area. (percent)

	PERCENT
AREA 1 ALBEMARLE N=1	5.6
AREA 2 DARE N=2	11.11
AREA 3 SOUTHERN N=5	27.78
AREA 4 PAMLICO N=2	11.11
AREA 5 CARTERET N=5	27.78
AREA 6 INLAND/ETS N=3	16.67

and Carteret county. In addition, some retirees from inland counties are engaging in part-time fishing at some level.

The fact that 33 percent of the full-time fishers engage in shore-based work of some type further obscures the definition of just what exactly should be considered full-time. However, given the uncertainty of depending on mother nature for ones total livelihood, it makes sense to have an economic strategy that hedges and spreads the risk.

Section 4: Characteristics of the Fishing Operation

In this chapter we look briefly at the characteristics of the fishing operations including characteristics of the boat(s) and relationships between respondent and others on the boat(s). The information provided is intended to give an understanding of the nature of variation in fishing operations between full and part-time fishers by area.

Types of Fishermen: Self Report Versus 50 Percent Distinction

Table 4.1 provides a breakdown of self-reported or perceived categorical status of respondent by area. In all areas the largest category is full-time. As might be expected, the more isolated rural areas have the highest number of full-time fishers, while the more populated areas have the highest number of part-time fishers. A comparison of self-reported status to status based on percentage income dependence reveals some variation. Table 4.2 shows the percent of fishers by area who fall into one of three categories; greater than or equal to 50 percent income from commercial fishing, less than 50 percent of income from commercial fishing, and no income from commercial fishing. Although full-time is still the single largest category by area, there is a slight increase in what might be called "full-time" if such income criteria are used to distinguish full- and part-time. In all but one of the areas the number of full-time fishermen increases using the 50% definition. Area 1, the Albemarle area, has fewer fishermen by this criteria in the full-time category than assignment based on self-perception. Nevertheless the general proportions are similar between the two tables revealing only a slight difference between determination of status on the basis of categorical perception or percent income.

Figure 4.1 illustrates the distribution of percent income derived from commercial fishing by area by use of a boxplot. As was noted above, the more rural areas have distributions showing a much greater dependence on commercial fishing. Area 1 (Albemarle), 2 (Dare), and 4 (Pamlico) all

TABLE 4.1--Respondents Self Report of Status. (percent)

	FULL TIME	PART TIME	RECREATIONAL	OTHER
AREA 1				
N=25	92	8	0	0
AREA 2				
N=33	78.79	21.21	0	0
AREA 3				
N=68	51.47	33.82	7.35	7.35
AREA 4				
N=51	68.63	25.49	1.96	3.92
AREA 5				
N=56	57.14	37.5	3.57	1.79

TABLE 4.2 Percent Income From Commercial Fishing (Percent of Total for Area)

	Area 1 Albemarle	Area 2 Dare	Area 3 Southern	Area 4 Pamlico	Area 5 Carteret
0	0	3.33	22.39	6.00	3.70
<50	12.51	13.32	37.32	18.00	31.48
>50	87.49	86.68	62.68	82.00	68.52

FIGURE 4.1 BOXPLOT OF REPORTED INCOME DEPENDENCE

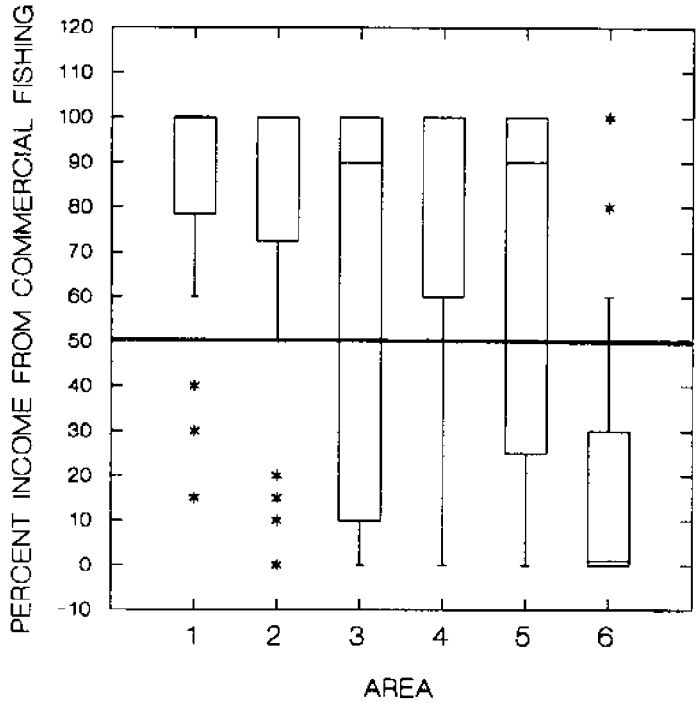


Figure 4.2 Distribution of Boat Lengths, Full Time

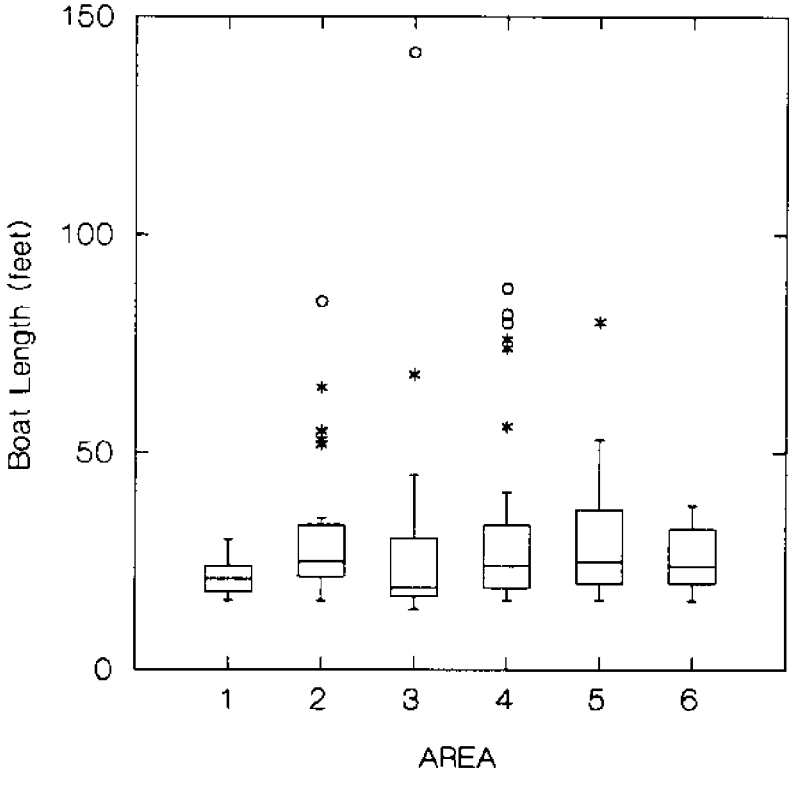
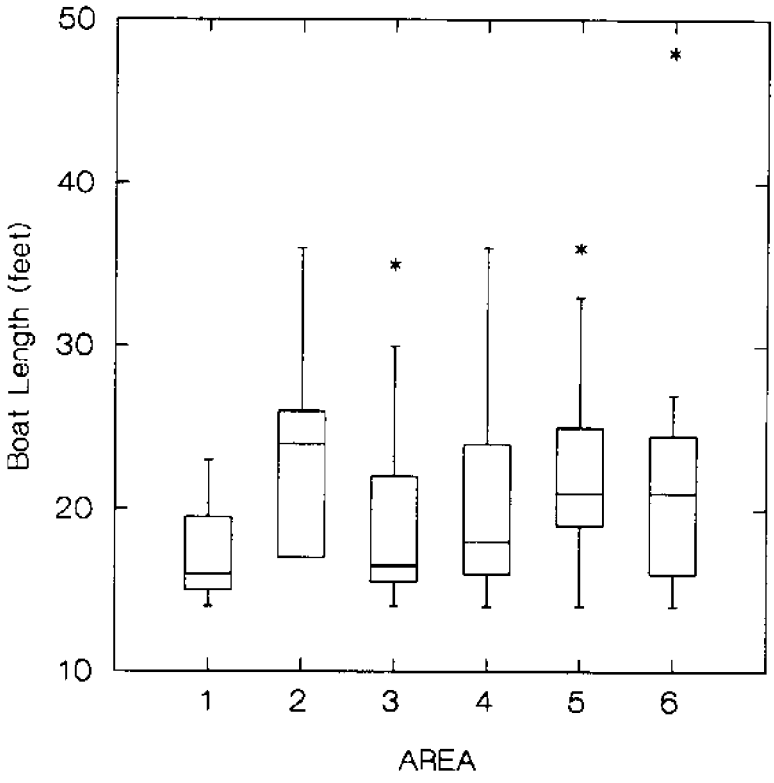


Figure 4.3 Distribution of Boat Lengths, Part Time



have more than 75 percent of the fishers from the sample earning 50 percent or more of their income from commercial fishing. The two coastal areas with the greatest population densities have some percentage of respondents with incomes less than 50 percent. Not surprisingly, Area 6 (Inland) has the vast majority of fishers in the sample earning less than 50 percent of their income from commercial fishing.

Tables 4.3 through 4.14 are presented to examine the possible differences in determining fishermen status on either a percent income basis or dollar amount landed threshold. Although determinations of fishermen's status can be made on the basis of any percentage income (e.g., 25 percent income from commercial fishing) or any dollar value for landings (e.g., $1000 or less), recent discussions have used the 50 percent or $5,000 figures for determinations of full- and part-time fishers. We will provide a brief comparison of the data provided in these tables using these threshold values as an example.

Remembering that the sample values are open to error in estimation due to sampling variability and potential sample bias and that license data may also be biased due to such matters as under reporting or other errors (Johnson and Orbach 1987); Table 4.15 provides a comparison of the different methods of determining status by area. With the exception of Area 6, there is some difference in the percentage of fishermen who would be determined to be part-time using the two different criteria. However, the relative values are similar in that areas with high numbers of fishers with landings valued less than $5,001 are also those having larger percentages of fishers with incomes from commercial fishing less than 50 percent. Again, these differences may be due to some degree of under reporting of landings, particularly given the relative recent introduction of the ETS system, or to variations in the total incomes of fishers.

Table 4.3 Albemarle Area sample distribution of percent of total income from commercial fishing*

N=24	Percent	Cumulative Percent
0%	0.0	0.0
1-10%	0.0	0.0
11-20%	4.17	4.17
21-30%	4.17	8.34
31-40%	4.17	12.51
41-50%	0.0	12.51
51-60%	4.17	16.68
61-80%	12.51	29.19
81-100%	70.81	100.0

*From commercial vessel license list with ETS license for 1994-95 license year.
Note: Does not include ETS license holders without commercial vessel license.

Table 4.4 DMF Breakdowns based on trip tickets, ETS licenses, and annual average price per unit of fish*

Value ($) of Dockside Sales	Percent	Cumulative Percent
0	14.07	14.07
1-500	15.41	29.48
500-1000	6.37	35.85
1001-2000	5.70	41.55
2001-3000	4.02	45.57
3001-4000	3.02	48.59
4001-5000	3.02	51.61
5001-10000	11.56	63.17
10001-20000	12.90	76.07
20001-30000	7.54	83.61
30001-40000	5.70	89.30
40001-50000	3.35	92.66
50001 and over	7.37	100.00

*Source: North Carolina Division of Marine Fisheries

Table 4.5 Dare County sample distribution of percent of total income from commercial fishing*

N=28	Percent	Cumulative Percent
0%	3.57	3.57
1-10%	3.57	7.14
11-20%	7.14	14.28
21-30%	0.00	14.28
31-40%	0.00	14.28
41-50%	7.14	35.7
51-60%	0.00	35.7
61-80%	19.05	54.75
81-100%	45.25	100.00

*From commercial vessel license list with ETS license for 1994-95 license year.
Note: Does not include ETS license holders without commercial vessel license.

Table 4.6 DMF Breakdowns based on trip tickets, ETS licenses, and annual average price per unit of fish*

Value ($) of Dockside Sales	Pecent	Cumulative Percent
0	13.41	13.41
1-500	12.39	25.80
500-1000	5.24	31.04
1001-2000	4.73	35.77
2001-3000	3.83	37.60
3001-4000	2.81	42.41
4001-5000	2.81	45.22
5001-10000	11.11	56.33
10001-20000	12.26	68.59
20001-30000	8.43	77.02
30001-40000	6.00	83.02
40001-50000	4.21	87.23
50001 and over	12.77	100.00

*Source: North Carolina Division of Marine Fisheries

Table 4.7 Southern coastal counties sample distribution of percent of total income from commercial fishing*

N=59	Percent	Cumulative Percent
0%	22.03	22.03
1-10%	3.57	25.60
11-20%	7.14	32.74
21-30%	3.39	36.13
31-40%	0.00	36.13
41-50%	1.69	37.82
51-60%	5.08	42.90
61-80%	3.38	46.28
81-100%	53.72	100.00

*From commercial vessel license list with ETS license for 1994-95 license year.
Note: Does not include ETS license holders without commercial vessel license.

Table 4.8 DMF Breakdowns based on trip tickets, ETS licenses, and annual average price per unit of fish*

Value ($) of Dockside Sales	Percent	Cumulative Percent
0	21.82	21.82
1-500	24.95	46.77
500-1000	8.57	55.34
1001-2000	9.60	64.95
2001-3000	6.01	70.95
3001-4000	3.54	74.49
4001-5000	2.82	77.31
5001-10000	8.62	85.93
10001-20000	6.01	91.94
20001-30000	2.67	94.61
30001-40000	1.49	96.10
40001-50000	1.03	97.13
50001 and over	2.87	100.00

*Source: North Carolina Division of Marine Fisheries

Table 4.9 Pamlico Area sample distribution of percent of total income from commercial fishing*

N=52	Percent	Cumulative Percent
0%	7.69	7.69
1-10%	0.00	7.69
11-20%	5.77	13.46
21-30%	3.84	17.30
31-40%	3.85	21.15
41-50%	1.92	23.07
51-60%	7.70	30.77
61-80%	1.92	32.69
81-100%	67.31	100.00

*From commercial vessel license list with ETS license for 1994-95 license year.
Note: Does not include ETS license holders without commercial vessel license.

Table 4.10 DMF Breakdowns based on trip tickets, ETS licenses, and annual average price per unit of fish*

Value ($) of Dockside Sales	Pecent	Cumulative Percent
0	16.72	16.92
1-500	12.10	29.02
500-1000	4.29	33.31
1001-2000	4.87	38.18
2001-3000	4.71	42.89
3001-4000	2.77	45.66
4001-5000	2.69	48.35
5001-10000	11.34	59.69
10001-20000	13.53	73.22
20001-30000	9.92	83.14
30001-40000	5.04	88.18
40001-50000	2.94	91.12
50001 and over	9.08	100.00

*Source: North Carolina Division of Marine Fisheries

Table 4.11 Carteret County sample distribution of percent of total income from commercial fishing*

N=51	Percent	Cumulative Percent
0%	3.92	3.92
1-10%	11.76	15.68
11-20%	7.84	23.52
21-30%	7.84	31.36
31-40%	1.96	33.32
41-50%	7.84	41.16
51-60%	1.96	43.12
61-80%	1.96	45.08
81-100%	54.92	100.00

*From commercial vessel license list with ETS license for 1994-95 license year.
Note: Does not include ETS license holders without commercial vessel license.

Table 4.12 DMF Breakdowns based on trip tickets, ETS licenses, and annual average price per unit of fish*

Value ($) of Dockside Sales	Pecent	Cumulative Percent
0	14.42	14.42
1-500	23.02	37.44
500-1000	8.26	45.70
1001-2000	9.21	54.91
2001-3000	5.89	60.80
3001-4000	4.13	64.93
4001-5000	3.18	68.11
5001-10000	9.95	78.06
10001-20000	8.46	86.52
20001-30000	4.94	91.46
30001-40000	2.23	93.69
40001-50000	0.81	94.50
50001 and over	5.48	100.00

*Source: North Carolina Division of Marine Fisheries

Table 4.13 Inland counties sample distribution of percent of total income from commercial fishing*

N=12	Percent	Cumulative Percent
0%	41.67	41.67
1-10%	33.33	75.00
11-20%	0.00	75.00
21-30%	0.00	75.00
31-40%	0.00	75.00
41-50%	0.00	75.00
51-60%	8.33	83.33
61-80%	8.33	91.66
81-100%	8.33	100.00

*From commercial vessel license list with ETS license for 1994-95 license year.
Note: Does not include ETS license holders without commercial vessel license.

Table 4.14 DMF Breakdowns based on trip tickets, ETS licenses, and annual average price per unit of fish*

Value ($) of Dockside Sales	Pecent	Cumulative Percent
0	27.52	27.57
1-500	24.82	52.39
500-1000	9.38	61.77
1001-2000	8.27	70.04
2001-3000	2.39	72.43
3001-4000	2.02	74.45
4001-5000	0.92	75.37
5001-10000	5.33	80.70
10001-20000	6.62	87.32
20001-30000	4.23	91.55
30001-40000	1.84	93.39
40001-50000	1.84	95.23
50001 and over	4.78	100.00

*Source: North Carolina Division of Marine Fisheries

TABLE 4.15--Comparison between Percent Income Delineation and Landings Threshold for a Part-Time Being Considered Less Than 50 percent of Income or $5,000 of Landings or Less.

	PERCENT < $5001 IN LANDINGS	PERCENT < 50 PERCENT OF INCOME FROM COMMERCIAL FISHING
AREA 1	51.61	12.51
AREA 2	45.22	16.65
AREA 3	77.3	59.71
AREA 4	48.35	24
AREA 5	78.06	35.18
AREA 6	75.37	75

Fishers, Crews, and Boats

Table 4.16 provides data on the mean number of years fished by status and area. There appears to be no definitive pattern in the average age by either status or area (e.g., part-time fishers have not fished on average longer than full-time fishers).

An important characteristic of fishing is the dependence of fishermen on dealers for aspects of their operation. Table 4.17 shows the percent of full- and part-time fishermen and their reported relationship with dealers. The vast majority of fishers, either full- or part-time, see themselves as independent. Area 2 (Dare) and Area 5 (Carteret) are the two areas with the largest percentage of full-time fishers with specific relationships with a dealer or dealers. This is not surprising in that some of the state's largest and most influential dealers can be found in these two areas. The lack of dealer relationships in the Albemarle area reflects the small-scale nature of the fishing operations in this area.

The majority of fishers interviewed were captain-owners of the first vessel reported (Table 4.18). Area 4 (Pamlico) had the largest percentage of non-operator owners for both full and part-time status. Very few of the respondents were crew, with Dare and Carteret having the largest percentages in this category. In addition, few respondents who were full-time were crew reflecting the small scale nature of most of the operations (see Tables 4.19 and 4.20 for boat size and value).

As we have seen, there has been variation by area with respect to the characteristics of fishers and their fishing operation. Variations in boat length is no exception, and as can be seen in Table 4.19 there is a high degree of variation in boat length and corresponding value by area for full time fishers. Figure 4.2 shows a boxplot of the distribution of boat lengths by area for the full-time respondents. Area 1 (Albemarle) has the least amount of variation in length reflecting relatively

TABLE 4.16 Number of Years Fished.

	Full-time			Part-time		
	$\bar{X}$	M	SD	$\bar{X}$	M	SD
Area 1	19	18	10.9(n=2)	16.7	20	5.8(n=3)
Area 2	22.1	18.5	13.6(n=26)	27.8	28.5	22.9(n=7)
Area 3	19.1	15	14.7(n=42)	19.2	15	18.2(n=26)
Area 4	22.6	20	13.8(n=41)	30.7	25	19.5(n=10)
Area 5	29.6	28	16(n=38)	20.9	18.5	15.8(n=18)
Area 6	13.7	12.5	4.7(n=7)	15.8	10	14.3(n=21)

***No Significant Difference for Comparison of Full and Part Time in Total Sample.**

TABLE 4.17--Percent of Fishermen who have a Specific Relationship with a Dealer or Consider Themselves Independent by Area and Status. (percent)

		SPECIFIC DEALER	INDEPENDENT	DEALER
AREA 1	FULL TIME N=20	0	100	0
	PART TIME N=3	0	100	0
AREA 2	FULL TIME N=24	12.5	87.5	0
	PART TIME N=5	0	100	0
AREA 3	FULL TIME N=42	2.38	95.24	2.38
	PART TIME N=22	13.64	86.36	0
AREA4	FULL TIME N=39	2.56	94.87	2.56
	PART TIME N=10	20	80	0
AREA 5	FULL TIME N=35	11.43	88.57	0
	PART TIME N=18	5.56	94.44	0

Table 4.18 Relationship of Respondent to Boat 1 by Area and Status (percent)

Full Time

	Area 1 N=21 (%)	Area 2 N=24 (%)	Area 3 N=42 (%)	Area 4 N=40 (%)	Area 5 N=35 (%)	Area 6 N=7 (%)
Non-operator Owner	0	4.17	4.76	12.5	2.86	14.29
Captain Owner	95.24	87.5	92.86	80	85.71	85.71
Captain	4.76	0	0	5	5.71	0
Crew	0	8.33	2.38	2.5	5.71	0
Other	0	0	0	0	0	0

Part Time

	Area 1 N=3	Area 2 N=5	Area 3 N=24	Area 4 N=10	Area 5 N=17	Area 6 N=19
Non-operator Owner	0	0	4.17	20	0	5.26
Captain Owner	100	100	95.83	80	94.12	89.47
Captain	0	0	0	0	0	5.26
Crew	0	0	0	0	5.88	0
Other	0	0	0	0	0	0

Table 4.19--Characteristics of Boat 1 by Area for Full Time Commercial (Income > = 50 percent) *

Area	$\bar{X}$	M	SD
Area One			
Length	21.24	21	4.1
Value	$8,190	$7,000	$7,100
N=21			
Area Two			
Length	32.21	25	17.16
Value	$68,931	$12,500	$110,136
N=26			
Area Three			
Length	27.3	19	21.7
Value	$23,000	$5,500	$40,538
N=42			
Area Four			
Length	31.05	24	20.39
Value	$41,715	$8,000	$83,476
N=41			
Area Five			
Length	30.4	25	13.88
Value	$38,506	$13,500	$76,786
N=37			
Area Six			
Length	26.14	24	8.65
Value	$26,971	$12,000	$34,721
N=7			

***Kruskal-Wallis Test Statistic for Boat Length=13.29. p=.02**

smaller operations (as we shall see in the next chapter on crab operations) with no extreme outliers. The distribution of boat lengths in Areas 2 (Dare) and 4 (Pamlico) is decidedly bimodal in the sense that there are a majority (75 percent or more) of the boats under 50 feet with a smaller set clustered between 50 and 75 feet. This reflects the dichotomy in these areas between boats employing different annual round strategies. Area 3 (Southern) has the lowest median boat length and yet has the largest boat length observed in any of the areas. However, boats in this area tend to be smaller on average indicating the predominance of sound and nearshore fishing. Finally, Area 5 (Carteret), although it does have some boats that are comparable in size to those found in areas 2 and 4, tends to have boats more in the 30 foot ranges with less variation.

The value of these boats varies greatly. Note that the standard deviations for corresponding mean values often exceeds the mean. Nevertheless, values and their distributions follow patterns similar to those described for boat lengths. This is not surprising given that boat length and value tend to be highly correlated ($r=0.81$, $p<0.0001$).

In contrast to the patterns observed among full-time fishers, part-time fishers show much less variation in either boat length or value by area. As can be seen in Table 4.20 and Figure 4.3 almost all boats are under 40 feet in length independent of the area. The exception is an outlier in Area 6 (Inland) that may be a large sportfisher (note the difference in mean value for the boats in this area as compared to those from other areas).

Not all fishermen fish exclusively from one boat. Table 4.21 provides an examination of boat lengths for up to 6 boats reported by the respondents. A large number of fishers both full and part-time are affiliated with more than one boat (primarily as non-operator owner or captain owner). Whereas there is little change in the mean boat length as one moves from boat 1 to boat 6 among the part-time fishers, the same is not the case for full-time fishers. This is due to the presence of large fishing operations where multiple boats of a large size (+50 feet) are common.

Table 4.20– Characteristics of Boat 1 by Area for Part Time Commercial (Income < = 50 percent) *

Area	$\overline{X}$	M	SD
Area One			
Length	17.7	16	4.73
Value	$1,900	$2,000	$656
N=3			
Area Two			
Length	24	24	7.84
Value	$9,960	$3,300	$10,114
N=5			
Area Three			
Length	18.88	16.5	5.59
Value	$5,861	$1,900	$9,484
N=10			
Area Four			
Length	20.6	18	6.59
Value	$5,022	$2,000	$5,171
N=			
Area Five			
Length	22.82	21	6.56
Value	$9,041	$6,000	$10,901
N=17			
Area Six			
Length	21.5	21	7.87
Value	$26,229	$12,500	$37,783
N=18			

***Kruskal-Wallis Test Statistic for Boat Length=7.91. p=0.161**

However, it is still important to note both the median values and standard deviations in drawing any conclusions about boat size.

The large amount invested by full-time fishers in boats alone was evident from an examination of Table 4.19. Surprisingly few of the boats for full-time fishers are financed. Table 4.22 provides the percentages of first boats reported financed by area for full-timers.

A general concern in understanding the impacts of any fisheries regulations or management effort relates to the impact of these factors on not only the boats' owners but those who run and work the boats. Table 4.23 gives a breakdown of the relationship between the respondent and others on the boat for the first boat reported. Both full- and part-time boats are included in this table.

An examination of this table by area reveals important patterns and confirms patterns observed in other sources of data. Area 1(Albemarle) has been previously characterized as having relatively smaller operations in which the fishers are mostly independent. Most boats in this area have no more than one crew member. Of these crew most are either a relative (son, brother, other relative) or friend with only a small percentage being "hired help."

Boats in Area 2 (Dare) have the majority of crew being hired help. Kinship as a basis for crew selection is not very prevalent. Area 4 (Pamlico) is again similar in characteristics to Area 2. Most crew are hired help, although a greater percentage of first crew members are family of some kind. Each of these areas reflect the extremes of both medium and large operations.

Area 3 (Southern) has a greater number of crew that are either family or friends. This is partly a result of the nature of the smaller operations found in this area. Area 5 (Carteret), although there is some reliance on hired help for crew, has the bulk of crew being either family or friends.

TABLE 4.21--Boat Length of up to 6 Boats Owned or Worked on By Status.

		MEAN	M	SD	N	PERCENT AFFILIATED WITH MORE THAN 1 BOAT
	BOAT 1	28.74	24.02	17.46	167	-
	BOAT 2	27.61	21.01	16.15	124	74
FULL TIME	**BOAT 3**	28.12	21.5	28.12	78	47.1
	BOAT 4	29.04	21	18.75	45	26.9
	BOAT 5	31.63	22	22.74	19	11.4
	BOAT6	36	22	26.14	5	3
	BOAT 1	20.87	18.5	6.69	78	-
	BOAT2	21.75	21	6.02	51	65.4
PART TIME	**BOAT3**	20.86	18.5	5.56	28	35.9
	BOAT4	20.8	19	4.71	10	12.8
	BOAT5	20.75	20	5.62	4	5.1
	BOAT6	-	20	-	1	1.3

TABLE 4.22 Percent of First Reported Boats that are Financed by Area and Full Time Status

	Full Time	N
Area 1	9.52	21
Area 2	8.33	24
Area 3	5.26	38
Area 4	11.76	34
Area 5	8.82	34
Area 6	14.29	7

TABLE 4.23 Respondents Relationship to Others on Boat 1 by Area (percent)

Area 1 (N= 24)

	Son	Father	Spouse/SE	Brother	Other Relative	Friend	Hired Help	Self	NA
Non-operator Owner	0	0	4.17	0	0	0	0	0	95.83
Captain-Owner	0	0	0	0	0	0	0	95.83	4.17
Captain	0	0	0	0	0	0	0	4.17	95.83
Crew 1	20.80	8	0	4.17	8.33	12.50	8.33	0	37.50
Crew 2	0	0	0	0	4.17	4.17	4.17	0	87.50
Crew 3	0	0	0	0	0	4.17	4.17	0	91.67
Crew 4	-	-	-	-	-	-	-	-	-

Area 2 (N= 30)

	Son	Father	Spouse/SE	Brother	Other Relative	Friend	Hired Help	Self	NA
Non-operator Owner	0	0	0	0	0	0	0	6.67	93.33
Captain-Owner	0	0	0	0	0	6.9	0	89.66	3.45
Captain	3.33	0	0	0	0	0	3.33	0	93.33
Crew 1	3.33	0	0	3.33	0	10	36.67	6.67	40
Crew 2	0	0	0	0	0	0	6.67	0	93.33
Crew 3	0	0	0	0	0	0	3.33	0	96.67
Crew 4	0	0	0	0	0	0	3.33	0	96.67

Area 3 (N= 66)

	Son	Father	Spouse/SE	Brother	Other Relative	Friend	Hired Help	Self	NA
Non-operator Owner	0	0	0	0	0	0	0	4.55	95.45
Captain-Owner	0	0	0	0	0	0	0	95.45	4.55
Captain	1.52	0	1.52	0	0	0	1.52	0	95.45
Crew 1	7.58	3.03	10.61	3.03	3.03	15.15	9.09	0	48.48
Crew 2	0	0	1.52	0	1.52	1.52	6.06	0	89.39
Crew 3	0	0	0	0	0	0	3.03	0	96.67
Crew 4	-	-	-	-	-	-	-	-	-

Area 4 (N= 49)

	Son	Father	Spouse/SE	Brother	Other Relative	Friend	Hired Help	Self	NA
Non-operator Owner	0	0	0	0	0	0	2.04	14.29	83.67
Captain-Owner	0	0	2.04	0	0	0	0	83.67	14.29
Captain	4.08	0	0	0	2.04	0	6.12	2.04	85.71
Crew 1	6.12	0	8.16	0	6.12	4.08	28.6	2.04	44.9
Crew 2	0	0	0	0	0	0	14.29	0	85.71
Crew 3	0	0	0	0	0	0	4.08	0	95.92
Crew 4	-	-	-	-	-	-	-	-	-

Area 5 (N= 52)

	Son	Father	Spouse/SE	Brother	Other Relative	Friend	Hired Help	Self	NA
Non-operator Owner	0	0	2	0	0	0	0	0	96
Captain-Owner	1.96	0	0	0	0	1.96	0	90.2	5.88
Captain	0	0	1.92	0	1.92	0	1.92	3.85	90.38
Crew 1	7.96	0	1.92	7.96	3.85	9.62	11.54	5.77	51.92
Crew 2	0	0	1.92	3.85	5.77	0	5.77	0	82.69
Crew 3	1.92	0	0	1.92	0	1.92	3.85	0	90.38
Crew 4	-	-	-	-	-	-	-	-	-

Section 5: Annual Round, Fishing History, Fishing Behavior, and Gear Conflicts

In this section we look at the historical participation in fishing of respondents, the annual round or seasonal switching of fishing activities, problems with gear, and perceived alternatives to their current fishing practices. In particular, this section will provide an indication of the presence of trends in fishing activities and will additionally provide models of the inter-relationships among fisheries in the various areas. As an economic and sociological enterprise, most fishing enterprises are dynamic, involving switching among a variety of gears and species from year to year and on a seasonal basis. This switching behavior both within and between years has profound implications for the proper management of any fishery or fisheries.

Five-Year Histories

Over the course of a fisher's lifetime, he may engage in a multitude of kinds of fishing. Changes in behavior may be due to such things as technological innovations (Johnson 1986), fluctuations in stocks, fish prices (Johnson and Orbach 1990), fisheries regulations, weather, environmental degradation, as well as a other factors. Figures 5.1 through 5.5 provide an examination of the historical participation of fishers interviewed over a five-year period with respect to major gears.

Fishing behavior for all fishers in Area 1 was relatively stable over a five-year period from 1991 to 1995. Figure 5.1 shows dramatically the longitudinal participation in gear use between primary and secondary gears. For the most part secondary gear use remained constant (e.g., long haul). For the two primary gears, pots and gill nets, the former increased slightly in terms of participants over this period while the latter showed more variation in participation. Fishers in this area move in and out of gill netting on an annual basis.

For historical participation in Area 2 all the gear types either stayed constant or experienced an increase over this period. Figure 5.2 reveals three clusters of gear. The primary gears include pots and gill net and each saw a steady increase in use among the sample fishers over this period. The second cluster includes hook-and-line, long haul, and trawl with all three types of gear experienc-

FIGURE 5.1 Five Year History, by Area and Gear Type

Area 1

YEAR	TRAWL	GILLNET	POUND NET	POTS	HOOK&LINE	LONG HAUL	GIG
1991	2	23	4	22	1	4	1
1992	2	23	4	22	1	4	1
1993	2	24	5	23	1	4	1
1994	1	22	4	23	1	4	1
1995	1	22	4	23	1	4	1

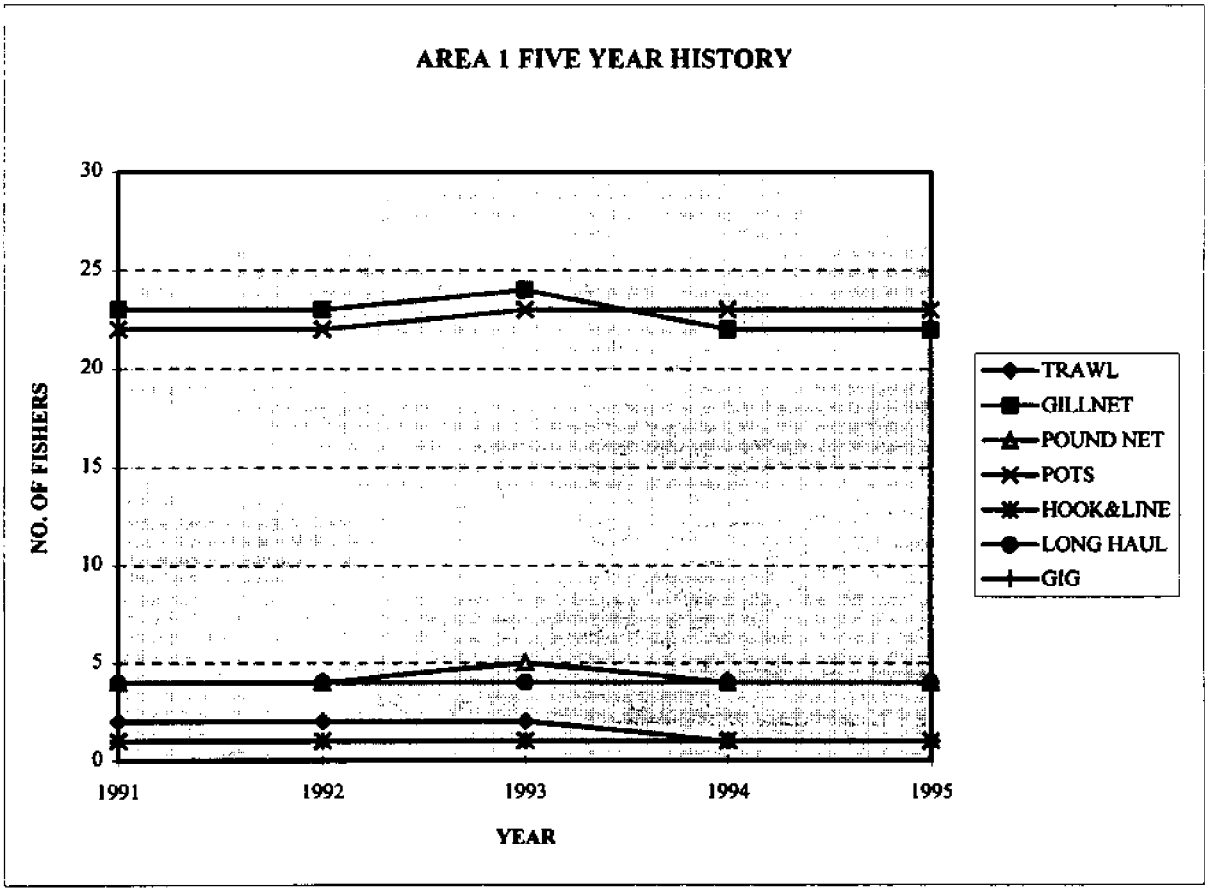


FIGURE 5.2 Five Year History, by Area and Gear Type

Area 2

YEAR	TRAWL	GILLNET	POUND NET	POTS	SHELLFISH, HAND HARVEST	HOOK&LINE	LONG HAUL
1991	8	18	2	20	0	12	8
1992	9	18	3	22	0	12	10
1993	8	20	3	24	0	11	9
1994	9	20	3	25	1	12	9
1995	9	22	3	25	1	12	9

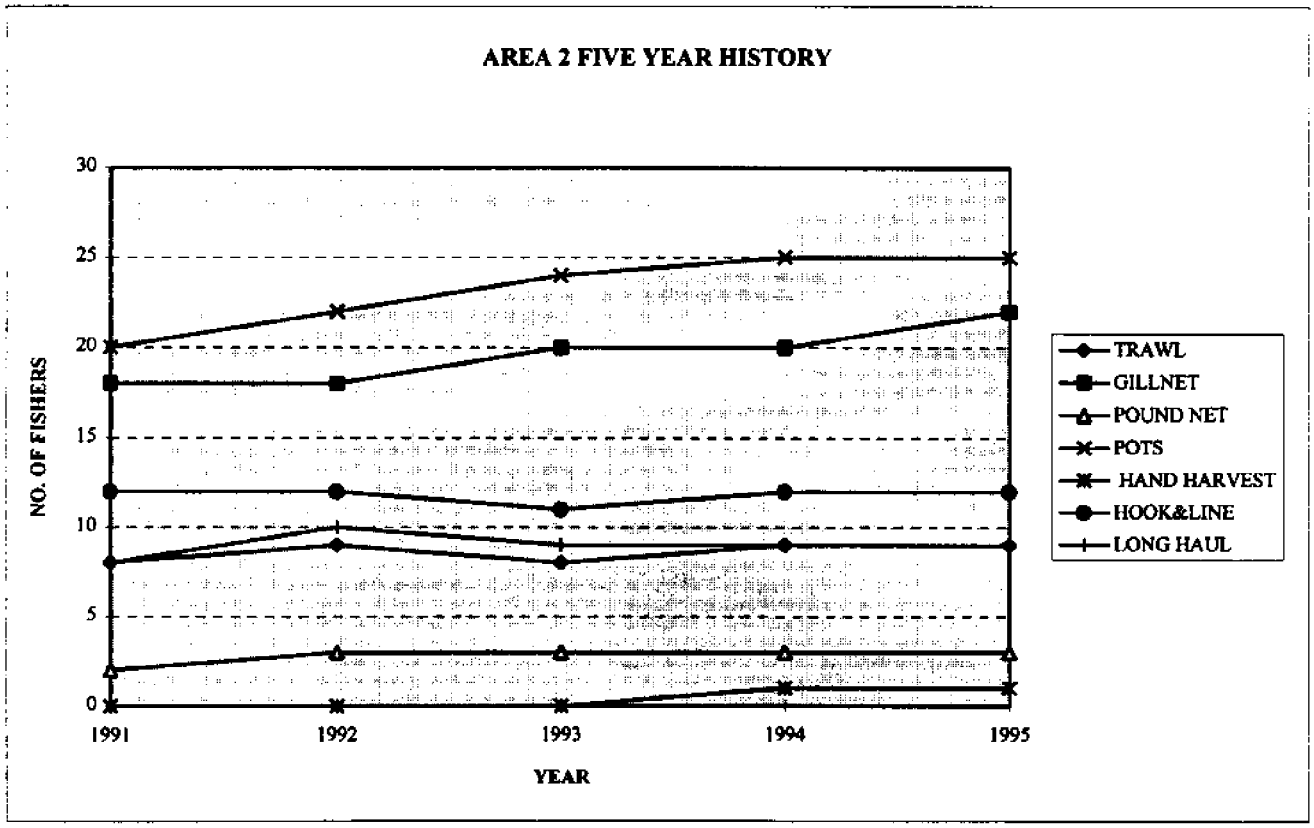


FIGURE 5.3 Five Year History, by Area and Gear Type

Area 3

YEAR	TRAWL	GILLNET	POTS	SHELLFISH, HAND HARVEST	HOOK&LINE	CHANNEL NETS	CAST NET
1991	27	37	12	40	39	2	3
1992	27	38	12	41	41	2	3
1993	30	39	13	41	48	2	3
1994	33	42	15	43	51	3	3
1995	30	45	18	43	50	3	3

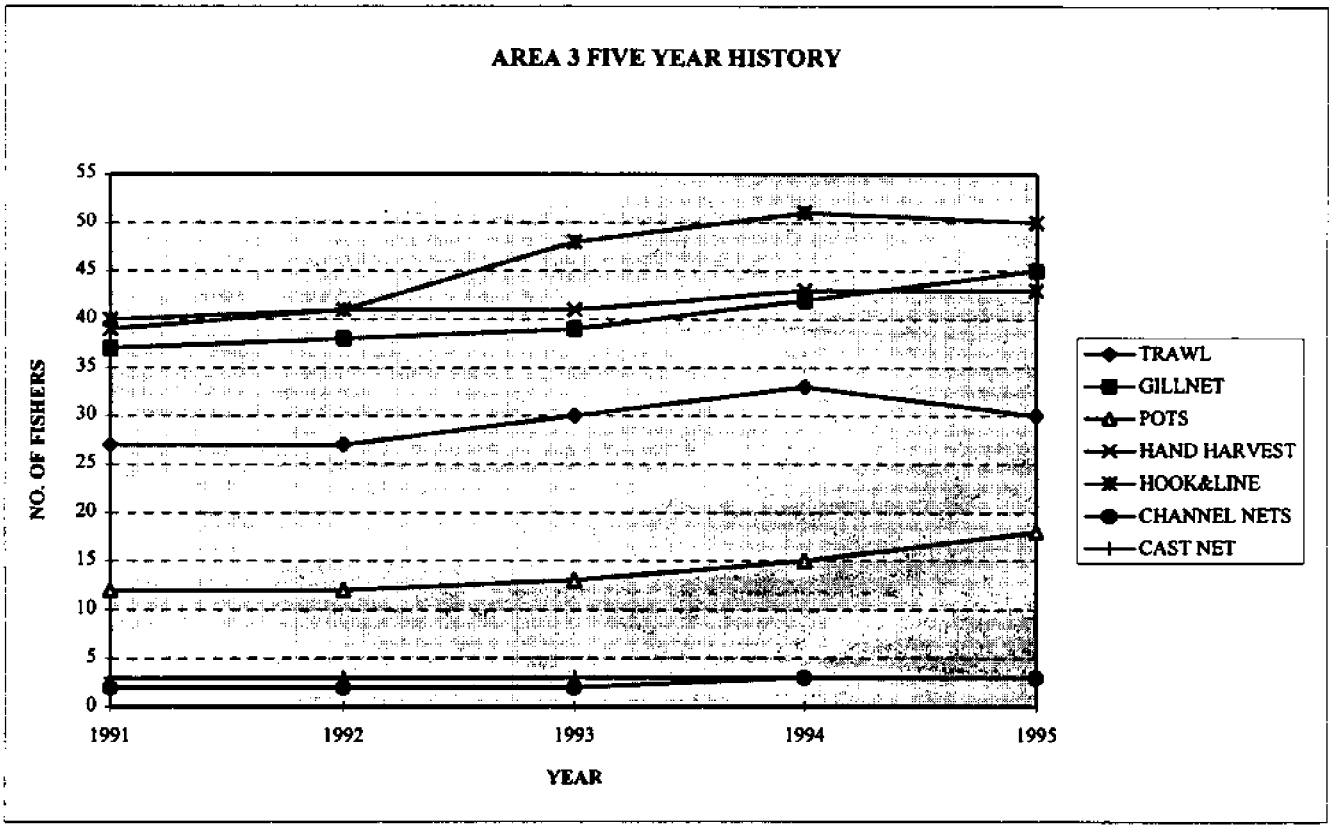


FIGURE 5.4 Five Year History, by Area and Gear Type

Area 4

YEAR	TRAWL	GILLNET	POUND NET	POTS	SHELLFISH, HAND HARVEST	SHELLFISH, MECHANICAL	LONG HAUL
1991	23	26	1	30	3	7	9
1992	24	28	3	31	8	3	9
1993	21	29	1	33	2	4	9
1994	18	28	0	37	2	4	9
1995	19	28	1	38	2	4	9

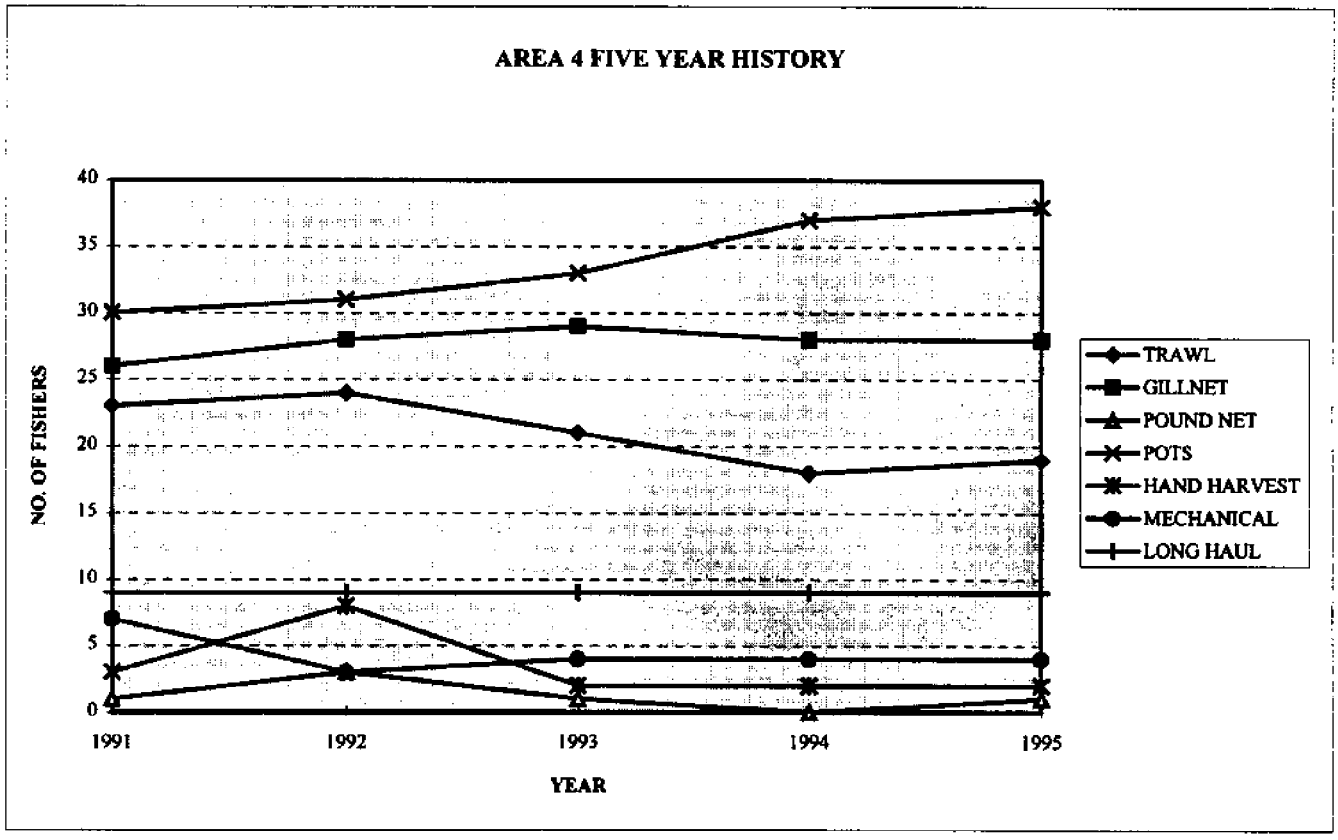
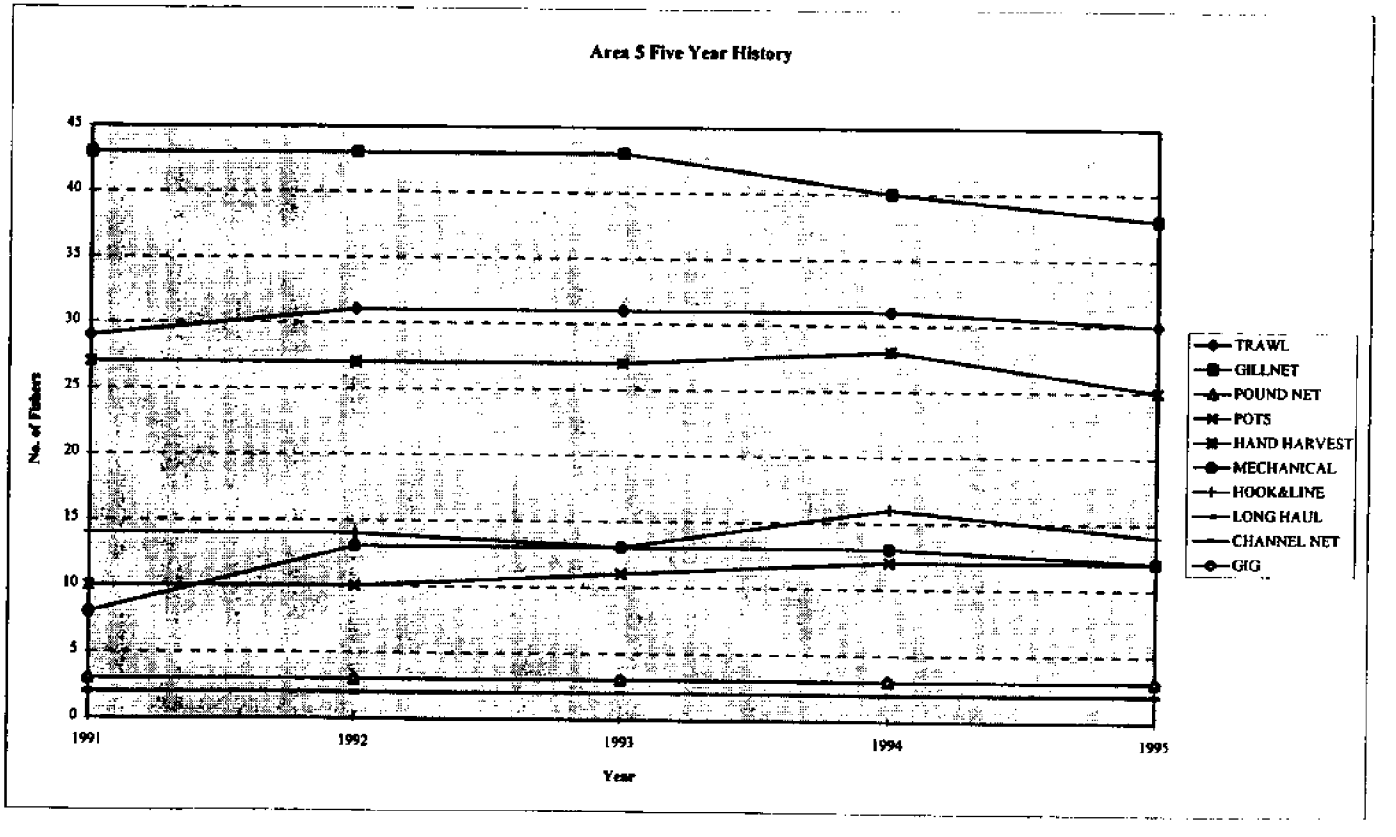


FIGURE 5.5 Five Year History, by Area and Gear Type

Area 5

YEAR	TRAWL	GILLNET	POUND NET	POTS	SHELLFISH, HAND HARVEST	SHELLFISH, MECHANICAL	HOOK&LINE	LONG HAUL	CHANNEL NET	GIG
1991	29	43	3	10	27	8	14	3	2	3
1992	31	43	3	10	27	13	14	3	2	3
1993	31	43	3	11	27	13	13	3	2	3
1994	31	40	3	12	28	13	16	3	2	3
1995	30	38	3	12	25	12	14	3	2	3



ing no net increase in participation from 1991 to 1995. Finally, a third minor cluster involves hand harvest of shellfish and pound nets.

Figure 5.3 illustrates the historical participation for fishers in Area 3. Although not as tightly clustered as the gears for Area 1, this area could be characterized as having a primary and secondary cluster of gears. The primary gears include hook-and-line, gill net, hand harvest of shellfish, and trawling. Of these four gear types all but one experienced increased participation over time. This was particularly true for hook-and-line. Although trawling is considered a primary gear, it increased at a slightly lower rate than the others. Among the secondary gears the observed increase in pot use is of primary importance. Over time this secondary gear could very well become a primary gear in the area; however, there may be some ecological and sociological limits on any further increases (i.e., space and conflicts).

Area 4 is no exception to the clustering of gear types. As can be seen in Figure 5.4, the primary gears include pots, gill nets and trawls. Of the primary gears, pots and gill nets both had net increases in participation over this period, although pots had an dramatic increase. Conversely, trawls experienced about an 18 percent decline in participation. The secondary gears, long haul, mechanical harvesting, hand harvesting, and pound nets, with the exception of hand harvesting, remained relatively constant.

Area 5 is the most different of the areas in terms of historical participation. Figure 5.5 reveals stratification in gear use, but not in the clear manner of the other areas. In addition, gear use over this period shows little in the way of dramatic change either in terms of increases or decreases. Of what might be considered the primary gears -- gill nets, trawls, and the hand harvest of shellfish -- all but one experienced a slight decline. Among the secondary gears -- hook-and-line, mechanical shellfish harvesting, and pots -- only the latter two experienced any increase.

In sum, there is variation by area in terms of increases or decreases in gear types from 1991 to 1995. Whereas gill net use increased in some areas it experienced declines in others. It is impor-

tant to note that pots were the only gear type to experience net increases in all five areas over this period.

Annual Rounds of Fishing

Fishers engage in various types of fishing throughout a given year. Fishers switch gears used and species sought, not only on a year-to-year basis, but within years as well. Table 5.1 shows the top five types of fishing in terms of participation in the year previous to the interviews for full-time fishers for each of the five coastal areas. In three of the five areas, crab potting is ranked first. The two areas where shrimp trawling is important includes Areas 3 and 5. In all areas gill netting of some type is within the top five.

Although Table 5.1 gives a feel for the individual types of gear and species combinations prevalent in these areas, it does not inform us as to the form of the combinations of types of fishing used throughout the year. For example, do fishers who crab pot in Area 1 also have a tendency to gill net for mullet or eel pot or all three? If someone pound nets in Area 2, what is the probability he also shrimp trawls? These questions are important in that they inform us as to nature of fishing strategies employed in an area and inform us as to the potential impacts of species specific management on fishers' flexibility and alternatives.

In order to examine annual round activities in a given area we will take a systems approach. Based on the patterns of fishers annual rounds, some fish gear species combinations are more related to one another than are others. That is from the observed patterns of fishers, for example, who crab pot in an area almost always gill net for mullet too, but do not tend to hook-and-line for ocean species. Thus we can view these patterns on a network basis in that fishing types are related to one another vis-à-vis the fishers themselves, as a network of relations among fisheries.

In each of the five areas network models of the relations among fisheries for full-time fishers was developed. These models were derived from the reported annual rounds of fishing for each area. Matrices for each of the areas were produced in a fisher-by-fishing activity form. These n x m

TABLE 5.1--Top Five Types of Fishing by Area for Full Time Fishers.

RANK	1	2	3	4	5
AREA 1	CRAB POT	GILL NET SOUND* FLOUNDER	EEL POT	GILL NET MULLET POUND NET	-
AREA 2	CRAB POT	GILL NET TRANS**	GILL NET SOUND	LONGHAUL	SHRIMP TRAWL GILL NET SHARKS POUND NET HOOK&LINE OCEAN***
AREA 3	SHRIMP TRAWL HAND CLAM	GILL NET MULLET	CRAB POT	HOOK&LINE OCEAN	GILL NET SOUND
AREA 4	CRAB POT	GILL NET FLOUNDER	SHRIMP TRAWL	GILL NET TRANS GILL NET SOUND	FLOUNDER TRAWL
AREA 5	SHRIMP TRAWL	HAND CLAM	GILL NET MULLET	CRAB POT	GILL NET SOUND

* **Sound species include: perch, herring, catfish, menhaden, spot, croaker.**

** **Trans. species include: bluefish, speckled trout, grey trout, drum.**

*** **Ocean species include: king mackrel, spanish mackrel, tuna, tile fish, dolphin, black bass.**

matrices were converted to n x n symmetrical matrices where cell values contained the number of times fishing type i was found in combination with fishing type j. The matrices were then transformed into binary matrices on the basis of a critical value threshold. A binary matrix in this form could be subjected to a variety of forms of network analysis (Johnson 1994).

Figures 5.6 through 5.10 show the network of relations among fisheries in each of the areas. The spatial relations among fisheries in the figures were derived using multidimensional scaling. Lines between fisheries reveal a relation between fisheries (i.e., they tend to show up together in annual rounds). Table 5.2 provides the types of fishing used in the analysis.

Figure 5.6 shows the network of relations among fisheries for Area 1. As seen in Table 5.1, crab potting is the most central fishery to this network of fisheries. These network of relations can be thought of in terms of cliques or clusters of fishing. All cliques in this area include crab potting in some way. However, some annual strategies involve fisheries that are exclusive to one another. The clique peeler pot, eel pot, crab pot, and gill net flounder is different than the clique long haul, gill net flounder, and crab pot. That is those fishers who engage in long hauling tend to engage in crab potting and gill netting flounder, but not in peeler pots or eel pots.

For the network of relations among fisheries for Area 2, crab potting is once again the most central fishery (i.e., the most prevalent). Figure 5.7 reveals that long hauling, gill netting flounder, and gill netting mullet occur dyadically with crab potting. Another combination includes crab potting, pound netting, gill netting trans and sound. An interesting aspect of this graph is the position of shrimp trawling (1) in relation to crab potting. Those fishers who shrimp trawl they tend to gill net for sharks but do not engage in crab potting.

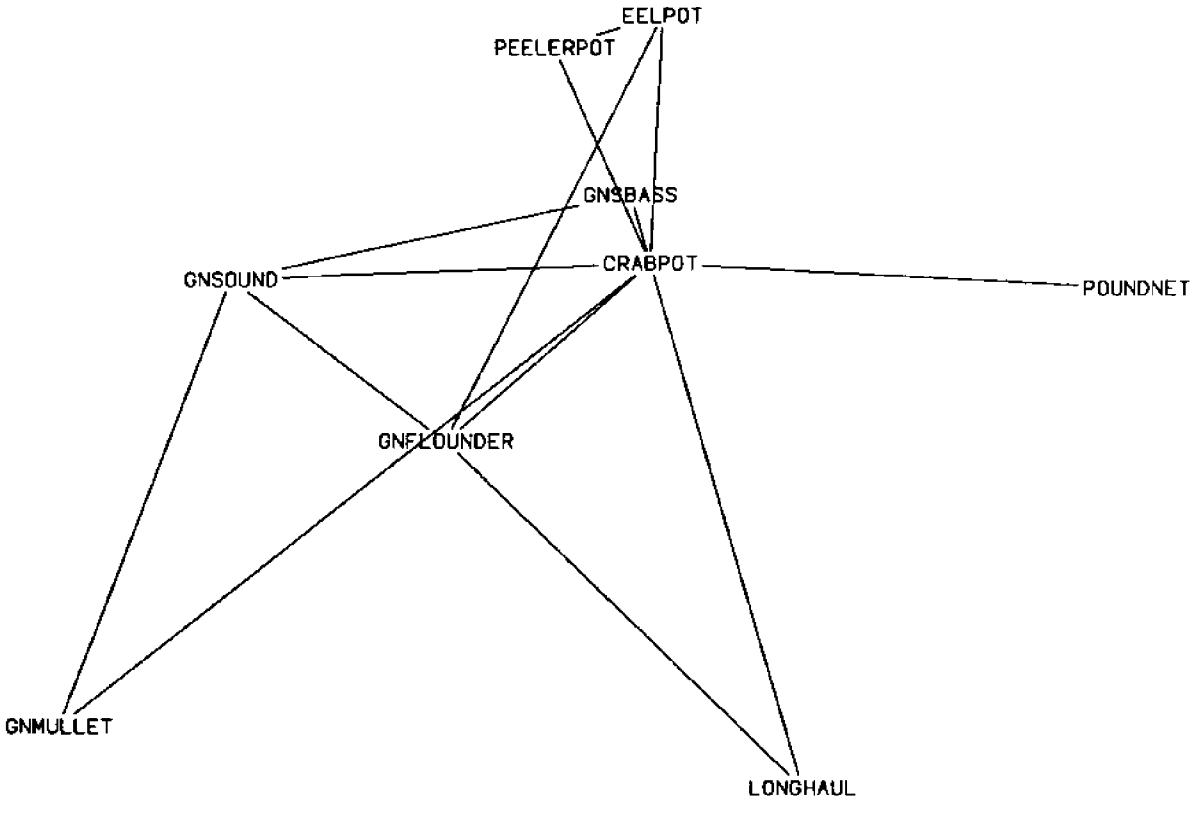
In contrast to the previous two areas, the graph in Figure 5.8 reveals several fisheries that dominate the network. In this case shrimp trawling (1) , hand clamming, and crab potting are all central to the network. Channel netting is a marginal fishery in the network and tends to occur in combination with hand clamming. This network shows much more complexity in the annual rounds of fishers than the previous two networks.

TABLE 5.2 Types of Fishing used in Analysis of Network Relations among Fisheries

1 SHRIMPTR= Shrimp Trawl
2 CRABTR= Crab Trawl
3 FLOUNDERTR= Flounder Trawl
4 GNOCEAN= Gill Net Ocean*
5 GNTRANS= Gill Net Trans*
6 GNSOUND= Gill Net Sound
7 GNMULLET= Gill Net Mullet
8 GNSHARK= Gill Net Shark
9 GNFLOUNDER= Gill Net Flounder
10 POUNDNET= Pound Net
11 CRABPOT= Crab Pot
12 PEELERPOT= Peeler Pot
13 EELPOT= Eel Pot
14 FISHPOT= Fish Pot
15 HCLAM= Hard Clam
16 HOYSTER= Hand Oyster
17 MOYSTER= Mechanical Oyster
18 MCLAM= Mechanical Clam
19 MSCALLOP= Mechanical Scallop
20 H&LOCEAN= Hook & Line Ocean
21 H&LTRANS= Hook & Line Trans
22 H&LSOUND= Hook & Line Sound
23 H&LSHARKS= Hook & Line Sharks
24 H&LFLOUNDER= Hook & Line Flounder
25 LONGTUNA= Longline Tuna
26 LONGHAUL= Longhaul
27 CHNET= Channel Net
28 FLGIG= Flounder Gig
29 GNSBASS= Gill Net Striped Bass
30 TROCEAN= Trawl Ocean
31 TRTRANS= Trawl Trans
32 TRSOUND= Trawl Sound
33 TRSCALLOP= Trawl Scallop
34 TRBUTTER= Trawl Butterfish
35 HSCALLOP= Hand Scallop
36 MCRAB= Mechanical Crab
37 LONGLOCEAN= Longline Ocean

* See Table 5.1 for species associated with these terms.

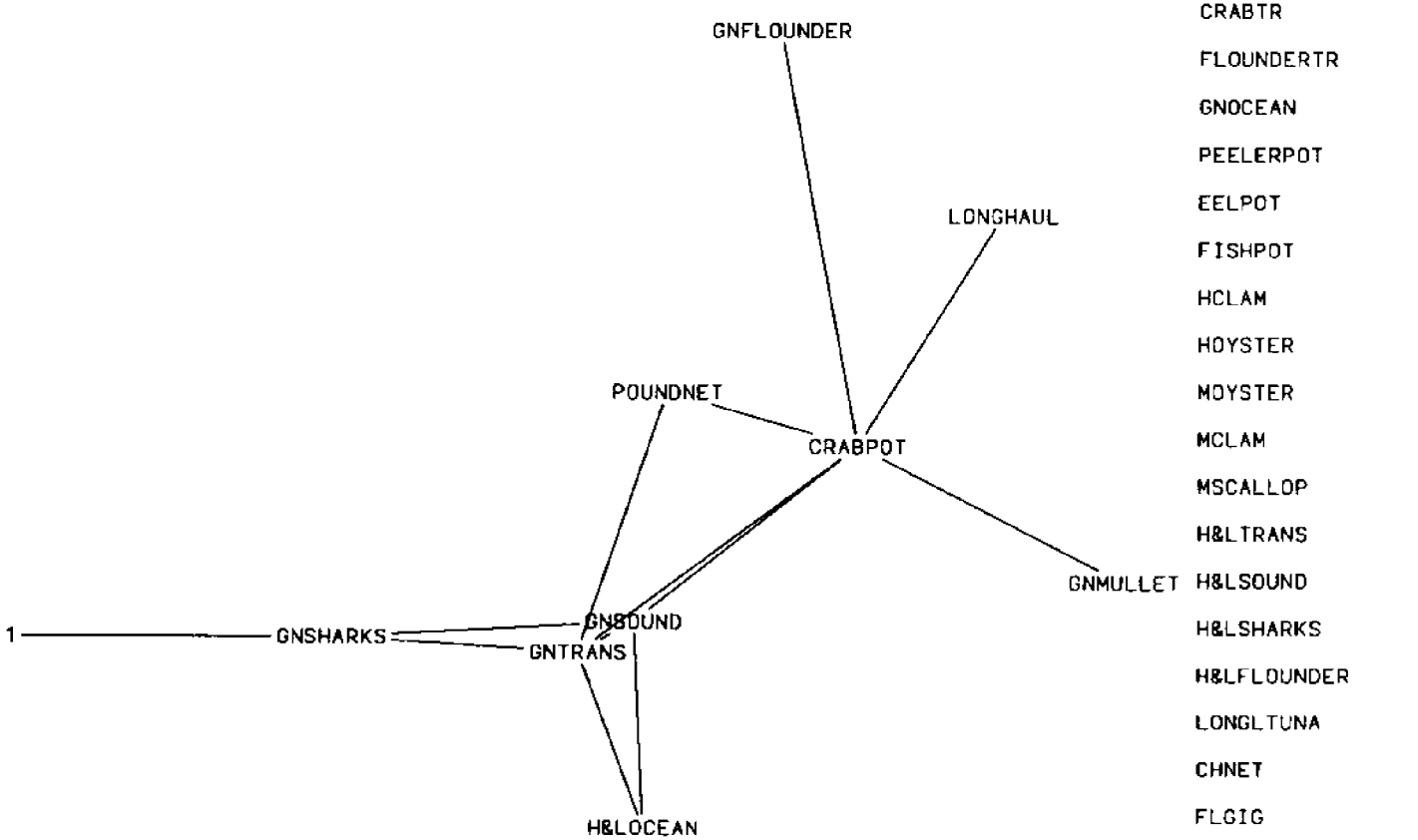
FIGURE 5.6 NETWORK RELATIONS AMONG FISHERIES, AREA 1



Marginal Fisheries

1 Shrimp Trawl
CRABTR
FLOUNDERTR
GNOCEAN
GNTRANS
GNSHARKS
FISHPOT
HCLAM
HOYSTER
MOYSTER
MCLAM
MSCALLOP
H&LOCEAN
H&LTRANS
H&LSOUND
H&LSHARKS
H&LFLOUNDER
LONGLTUNA
CHNET
FLGIG
TROCEAN
TRTRANS
TRSOUND
TRSCALLOP
TRBUTTER
HSCALLOP
MCRAB
LONGLOCEAN

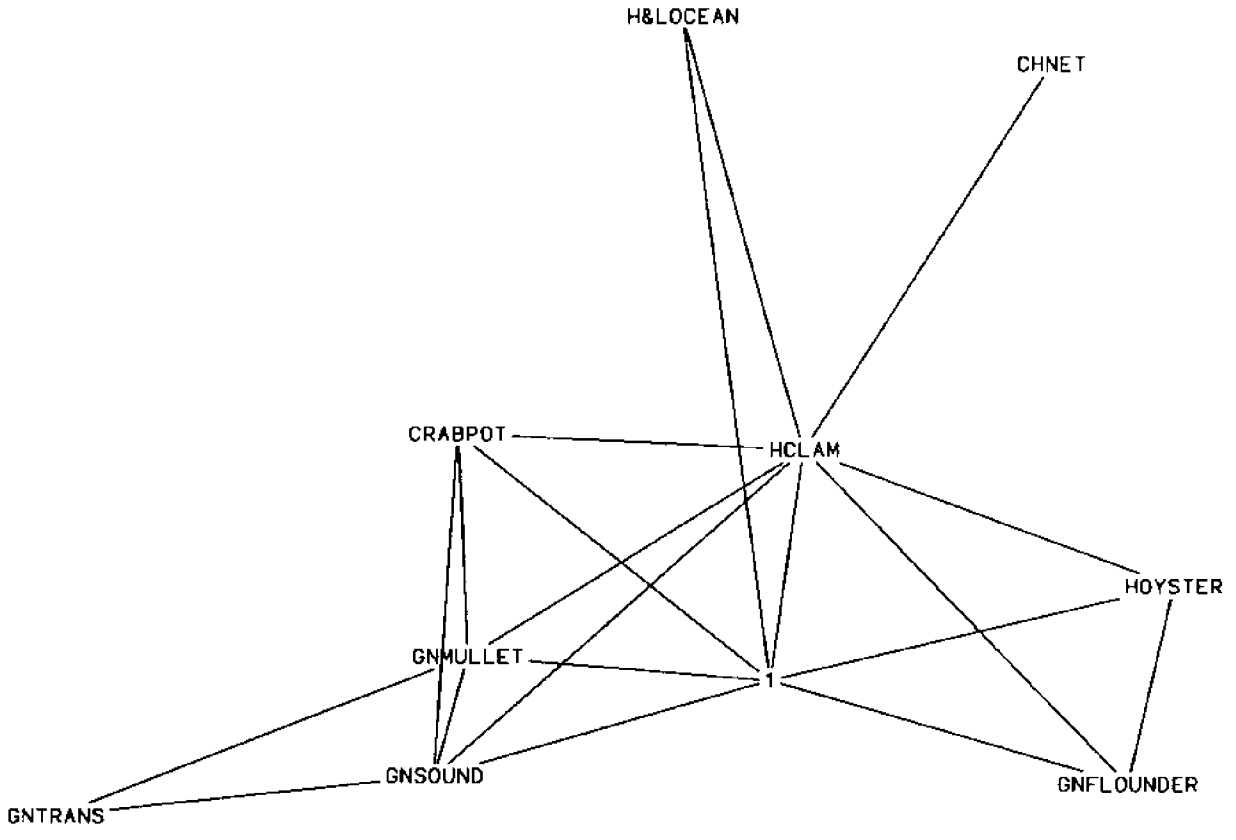
FIGURE 5.7 NETWORK RELATIONS AMONG FISHERIES, AREA 2



Marginal Fisheries

CRABTR
FLOUNDERTR
GNOCEAN
PEELERPOT
EELPOT
FISHPOT
HCLAM
HOYSTER
MOYSTER
MCLAM
MSCALLOP
H&LTRANS
H&LSOUND
H&LSHARKS
H&LFLOUNDER
LONGLTUNA
CHNET
FLGIG
GNSBASS
TROCEAN
TRTRANS
TRSOUND
TRSCALLOP
TRBUTTER
HSCALLOP
MCRAB
LONGLOCEAN

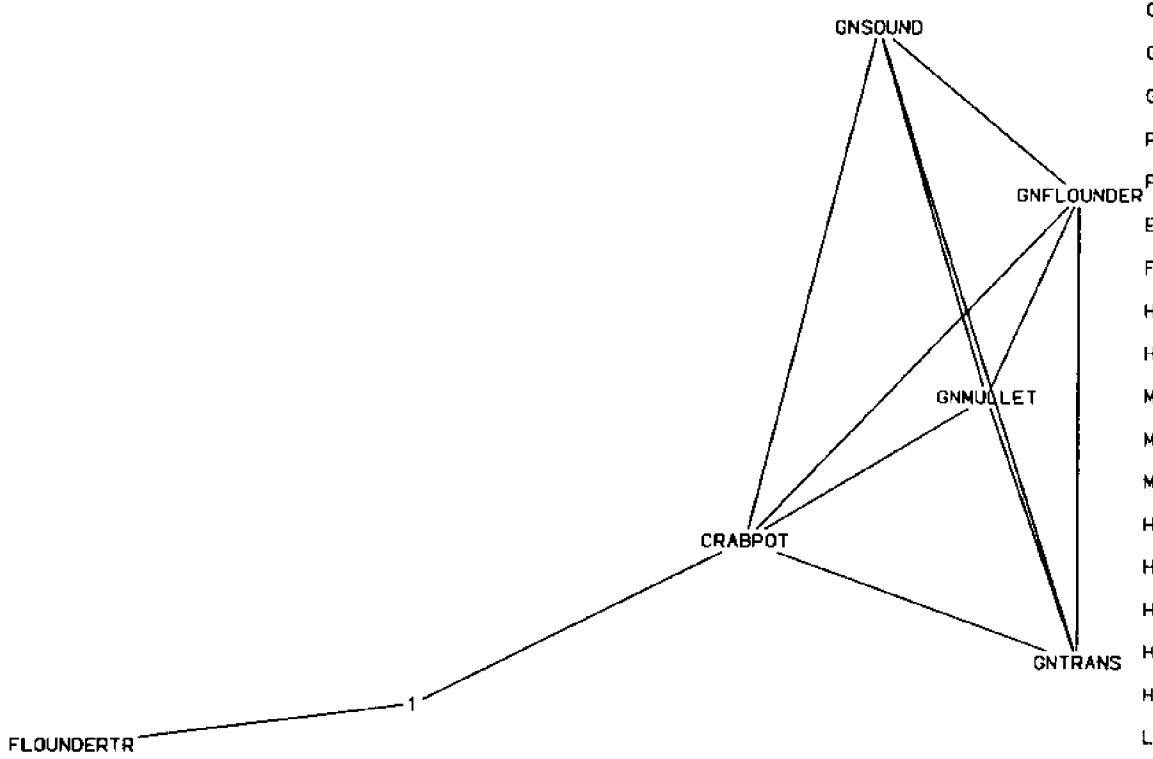
FIGURE 5.8 NETWORK RELATIONS AMONG FISHERIES, AREA3



Marginal Fisheries

CRABTR
FLOUNDERTR
GNOCEAN
GNSHARKS
POUNDNET
PEELERPOT
EELPOT
FISHPOT
MOYSTER
MCLAM
MSCALLOP
H&LTRANS
H&LSOUND
H&LSHARKS
H&LFLOUNDER
LONGLTUNA
LONGHAUL
FLGIG
GNSBASS
TROCEAN
TRTRANS
TRSOUND
TRSCALLOP
TRBUTTER
HSCALLOP
MCRAB
LONGLOCEAN

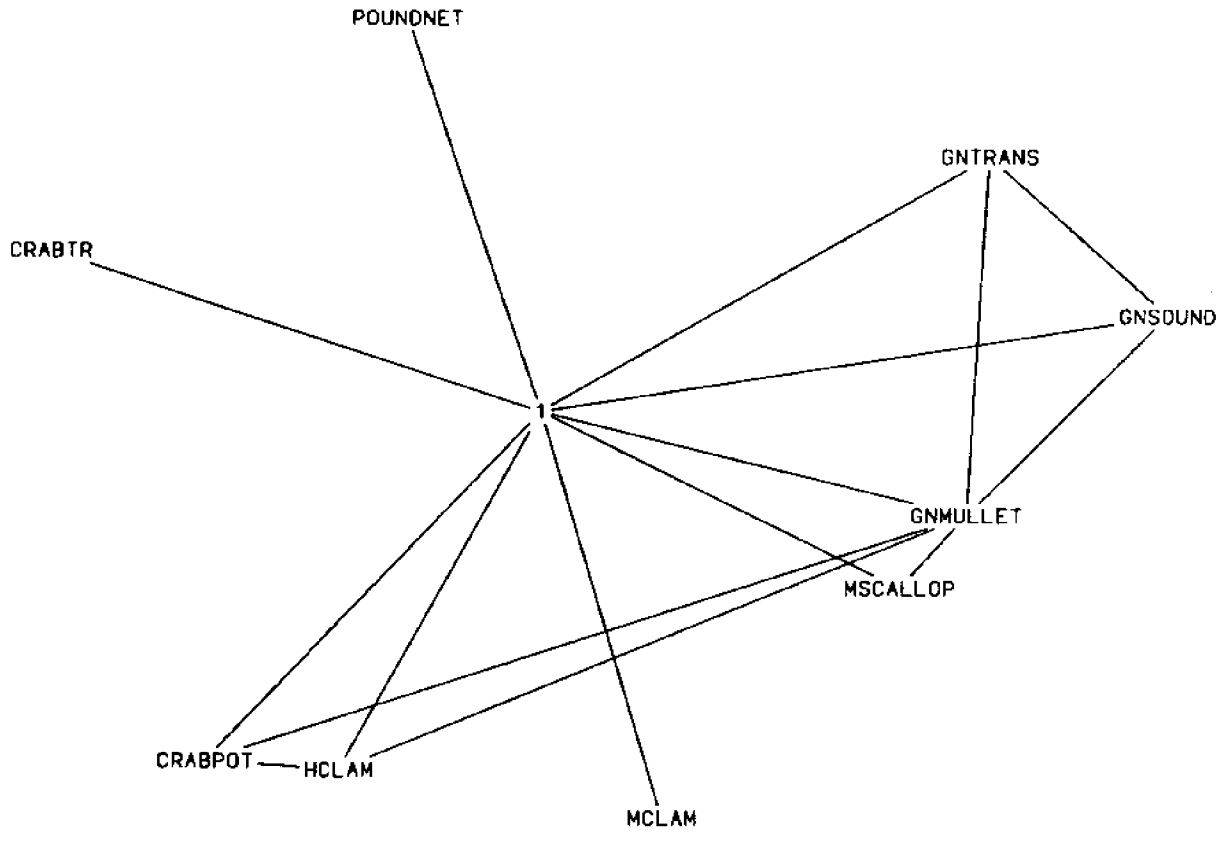
FIGURE 5.9 NETWORK RELATIONS AMONG FISHERIES, AREA 4



Marginal Fisheries

CRABTR
GNOCEAN
GNSHARKS
POUNDNET
PEELERPOT
EELPOT
FISHPOT
HCLAM
HOYSTER
MOYSTER
MCLAM
MSCALLOP
H&LOCEAN
H&LTRANS
H&LSOUND
H&LSHARKS
H&LFLOUNDER
LONGLTUNA
LONGHAUL
CHNET
FLGIG
GNSBASS
TROCEAN
TRTRANS
TRSOUND
TRSCALLOP
TRBUTTER
HSCALLOP
MCRAB
LONGLOCEAN

FIGURE 5.10 NETWORK RELATIONS AMONG FISHERIES, AREA 5



Marginal Fisheries

FLOUNDERTR
GNOCEAN
GNSHARKS
GNFLOUNDER
PEELERPOT
EELPOT
FISHPOT
HOYSTER
MOYSTER
H&LOCEAN
H&LTRANS
H&LSOUND
H&LSHARKS
H&LFLOUNDER
LONGLTUNA
LONGHAUL
CHNET
FLGIG
GNSBASS
TROCEAN
TRTRANS
TRSOUND
TRSCALLOP
TRBUTTER
HSCALLOP
MCRAB
LONGLOCEAN

Of all the areas, the graph of Area 4 is by far the simplest to understand. Figure 5.9 reveals that crab potting in this area is not only important because it is the most central fishery, it is also important because it links two distinct fishing strategies. There is one cluster of fisheries at the right that involves crab potting in combination with various forms of gill netting. This is opposed to shrimp trawling (1) which lies between flounder trawl and crab potting. Thus, there are two primary strategies in this area, one involving trawling and crab potting while the other involves gill netting and crab trawling. It is also important to note that this area is most at risk of the five since there are fewer alternative strategies available in the case of environmental change or new regulations.

For Area 5 shrimp trawling is by far the most central fishery to the area (Figure 5.10). In fact, almost all fishing strategies includes shrimp trawling in one way or another (note that shrimp trawling is linked to each of the other fisheries). Pound netting, crab trawling, and mechanized clamming are all fisheries that occur in combination with shrimp trawling but tend not to occur with other types of fishing. This graph shows vividly the vulnerability of fishermen in this area in that almost all fishing strategies are dependent on shrimp trawling. Any disruption of shrimping to this area could have profound impacts. It is also important to note that these fishers, and those from Area 3, regularly engage in shrimping in South Carolina and Georgia (see Johnson and Orbach 1990).

In sum, these graphs reveal important aspects of annual rounds and fishing strategies in each of the areas. In addition, analyses of this kind help in understanding the nature of impacts of both natural environmental change and changes resulting from fisheries management.

Fishery Conflicts and Problems Over Space and Gear

There are a variety of user group conflicts that occur along the coast. Some of these are between vastly different groups, as with commercial and recreational fishers. Other conflicts occur within groups as with conflicts for space between fixed gear fishers and mobile gear fishers. In this sub-

section we will look at problems encountered by fishers in terms of conflicts over space and the destruction of gear.

Table 5.3 shows the percent of full-time fishers who perceived there to be a problem concerning conflicts over space. Area 1 is the only area in which the majority of fishers feel there is problems over space. This is understandable given that this is primarily an area dominated by fixed gear types of fishing (e.g., crab pots). Area 4 has the second highest percentage and that reflects the possible problems existing between crab pots and shrimp trawls in the area.

If conflicts over space occur the gear most often involved, independent of area, is crab pots. Table 5.4 shows the breakdown of gears involved in conflicts by area. Gill net is the second most prevalent gear in Areas 2 and 4, while trawls is second in Area 3 and tied for first in Area 5. The presence of these fixed and mobile gears involved in conflicts over space is not surprising. However, it is important to note the mix of gears involved in these conflicts by area (note that Area 3 has the greatest diversity of gears involved).

Similarly, fishers were asked if there were any problems with the destruction of commercial gear in their area. Table 5.5 shows the percentages of fishers who said there were such problems in their area. Areas 1, 2, and 4 had the majority of fishers seeing a problem with gear destruction. Area 5 had the least amount of problems of this kind. Once again the gear experiencing the most problems is pots in all areas except Area 5 where the primary problem lies with the destruction of gill nets. Destruction of gill nets is also seen as a problem in Area 3 (see Table 5.6).

Although conflicts and actions associated with these conflicts (i.e., the destruction of gear) is generally thought of as a sport versus commercial problem, as we can see it is generally the case that destruction of commercial gear is most frequently attributed to other commercial fishers (Table 5.7). Area 3 is an exception to this trend, but that is somewhat understandable given the large number of recreational fishermen in the Wilmington area.

TABLE 5.3--Conflicts over Space by Area for Full Time fishers. (percent)

	YES	NO
AREA 1 N=19	57.89	42.11
AREA 2 N=23	34.78	65.22
AREA 3 N=42	33.33	66.67
AREA 4 N=40	42.5	57.5
AREA 5 N=35	34.29	65.71
AREA 6 N=7	14.29	85.71

TABLE 5.4--Gear Type Involved in Conflict over Space by Area for Full Time Fishers (percent)

GEAR TYPE	AREA 1 N=11	AREA 2 N=7	AREA 3 N=14	AREA 4 N=15	AREA 5 N=8
TRAWL	9.09	14.29	21.43	13.33	37.5
GILLNET	9.09	28.57	14.29	26.67	-
POUND NET	-	14.29	7.14	-	-
POTS	81.82	42.86	50	60	37.5
SHELLFISH (hand harvest)	-	-	-	-	-
MECHANICAL SHELLFISH	-	-	-	-	-
HOOK AND LINE	-	-	7.14	-	-
LONGLINE AND TROTLINE	-	-	-	-	-
LONG HAUL AND SWIPE NET	-	-	-	-	-
CHANNEL NETS	-	-	-	-	25

TABLE 5.5--Problems with Destruction of Commercial Gear by Area for Full Time fishers. (percent)

	YES	NO
AREA 1 N=21	66.67	33.33
AREA 2 N=23	52.17	47.83
AREA 3 N=42	45.24	54.76
AREA 4 N=39	53.85	46.15
AREA 5 N=35	37.14	62.86

TABLE 5.6--Gear Type Involved in Destruction by Area for Full Time Fishers (percent)

GEAR TYPE	AREA 1 N=14	AREA 2 N=12	AREA 3 N=17	AREA 4 N=21	AREA 5 N=12	AREA 6 N=2
TRAWL	7.14	-	11.76	-	8.33	-
GILLNET	14.29	8.33	29.41	14.29	58.33	50
POUND NET	7.14	-	-	-	8.33	-
POTS	71.43	91.67	52.94	85.71	25	50
SHELLFISH (hand harvest)	-	-	-	-	-	-
MECHANICAL SHELLFISH	-	-	-	-	-	-
HOOK AND LINE	-	-	-	-	-	-
LONGLINE AND TROTLINE	-	-	-	-	-	-
LONG HAUL AND SWIPE NET	-	-	-	-	-	-
CHANNEL NETS	-	-	5.88	-	-	-

TABLE 5.7 Party Responsible for Destruction of Gear by Area for Full Time Fishers (percent)

PARTY RESPONSIBLE	AREA 1 N=11	AREA 2 N=11	AREA 3 N=17	AREA 4 N=19	AREA 5 N=8	AREA 6 N=1
COMMERCIAL	63.64	54.55	35.29	63.16	62.5	100
RECREATIONAL/SPORT	27.27	27.27	41.18	15.79	12.5	0
DON'T KNOW	0	9.09	11.76	5.26	0	0
BOTH	9.09	9.09	11.76	15.79	25	0

Fishing Alternatives

An important concern in terms of the management process is the perceived alternatives fishers have under conditions of exclusion from a fishery. Respondents were asked the question, "If you could no longer fish for _____(fishery specified), would you fish for something else, get temporary shore-based work, get out of fishing entirely and find other employment, or don't know/ other?" Table 5.8 shows the percent distribution of responses to this question for both full- and part-time fishers.

The vast majority of fishers, both full- and part-time, would opt to shift effort to another species if given a choice. Full-time fishers are generally evenly split between getting temporary work or getting out of fishing entirely. Part-time fishers, on the other hand, would opt to get out of fishing entirely in lieu of temporary work.

An important concern is the type of species fishers would seek under these conditions. For Area 1 for both full- and part-time fishers there would be an overwhelming switch of effort to the harvesting of flounder. So for example, exclusion from crab potting in this area or displacement of any magnitude from crab potting would lead to increased effort in the taking of flounder.

The switching of effort in the other areas is less clear, but for full-time fishers in Area 2 crab is perceived as an alternative by some while a few finfish species would be targeted by others. Area 3, the area with the most diversity, also is the area showing the greatest mix of species fishers would target. For full-timers in Area 4 eel would be an important alternative and for the full-timers in Area 5 crabs, clams, and shrimp would see more effort (of course this is dependent on the species they could no longer fish for). This demonstrates the importance of understanding the linkages between fisheries to anticipate the switching of effort under certain management conditions.

TABLE 5.8 Responses to Question: "If You Could No Longer Fish in Fishery_____, Would You....?" by Area and Status (percent)

AREA	RESPONSE: FISH FOR SOMETHING ELSE	GET TEMPORARY SHORE-BASED EMPLOYMENT	GET OUT OF FISHING ENTIRELY AND FIND OTHER EMPLOYMENT	OTHER	DON'T KNOW
FULL TIME					
AREA 1 (N=18)	50	22.2	11.1	16.7	-
AREA 2 (N=22)	50	9.1	22.7	13.6	4.6
AREA 3 (N=39)	64.1	2.6	15.4	12.8	5.1
AREA 4 (N=35)	60	14.3	17.1	8.6	-
AREA 5 (N=32)	50	15.6	12.5	18.75	3.1
AREA 6 (N=5)	40	40	0	20	-
PART TIME					
AREA 1 (N=3)	33.3	0	33.3	33.3	-
AREA 2 (N=5)	100	0	0	0	0
AREA 3 (N=19)	52.6	0	31.6	15.8	0
AREA 4 (N=10)	60	0	20	20	-
AREA 5 (N=17)	35.5	5.9	35.3	23.5	0
AREA 6 (N=17)	82.4	0	11.8	5.9	-

TABLE 5.9 Fish Species that Would be Sought if Current Primary Species Could No Longer be Fished by Area and Status. (percent)

	FULL TIME					PART TIME				
SPECIES	AREA 1 N=7	AREA2 N=6	AREA 3 N=17	AREA4 N=9	AREA 5 N=11	AREA 1 N=1	AREA 2 N=4	AREA 3 N=9	AREA 4 N=3	AREA 5 N=5
SHRIMP	-	-	11.8	11.1	36.4	-	50	11.1	33.3	60
CLAM	-	-	5.9	-	27.3	-	-	11.1	-	40
OYSTER	-	-	-	-	9.1	-	-	-	-	-
SCALLOP	-	-	5.9	11.1	-	-	-	22.2	-	-
CRAB	14.29	50	23.5	11.1	27.3	-	-	33.3	33.3	-
PEELER CRAB	-	-	-	-	-	-	-	-	-	-
BLACK BASS	-	16.7	5.9	-	-	-	-	-	-	-
PERCH	14.29	-	-	-	-	-	-	-	-	-
CAT FISH	-	-	-	-	-	-	-	-	-	-
EEL	-	-	-	55.6	-	-	-	-	-	-
FLOUNDER	71.43	-	11.8	-	-	100	-	-	-	-
SPAINISH MACKREL		16.7	-	-	-	-	-	11.1	-	-
KING MACKREL	-	-	-	-	-	-	-	-	-	-
BLUEFISH	-	16.7	-	-	-	-	25	11.1	-	-
TROUT	-	-	-	-	-	-	-	-	-	-
MULLET	-	-	5.9	-	-	-	-	-	33.3	-
STRIPED BASS	-	-	-	-	-	-	-	-	-	-
SHAD	-	-	-	-	-	-	-	-	-	-
HERRING	-	-	-	-	-	-	-	-	-	-
CROAKER	-	-	-	-	-	-	25	-	-	-
SPOT	-	-	11.8	-	-	-	-	-	-	-
GROUPER	-	-	11.8	-	-	-	-	-	-	-
DOGFISH	-	-	-	11.1	-	-	-	-	-	-
TILE FISH	-	-	-	-	-	-	-	-	-	-
SPECKLED TROUT	-	-	-	-	-	-	-	-	-	-
SNAPPER	-	-	-	-	-	-	-	-	-	-
DRUM	-	-	-	-	-	-	-	-	-	-
TUNA	-	-	-	-	-	-	-	-	-	-
SAILFISH	-	-	5.9	-	-	-	-	-	-	-
MARLIN	-	-	-	-	-	-	-	-	-	-
WAHOO	-	-	-	-	-	-	-	-	-	-
SHARK	-	-	-	-	-	-	-	-	-	-
BUTTERFISH	-	-	-	-	-	-	-	-	-	-
DOLPHIN	-	-	-	-	-	-	-	-	-	-
BILLFISH	-	-	-	-	-	-	-	-	-	-
MENHAIDEN	-	-	-	-	-	-	-	-	-	-

Section 6: Perceptions of Limited Entry and Problems in the Fisheries

In this section we examine fishers' patterns of agreement with statements concerning limited entry and effort limitation. In addition, we examine the ranking of problems experienced by fishers in their areas. The general purpose of this section is to gain an understanding of the variations in perceptions and attitudes by different fishers in the different areas that may contribute to a better understanding of potential management efforts.

Section on Limited Entry Perceptions and Attitudes

In an attempt to gather data on fishermen's general knowledge and general attitudes towards the concept of limited entry, we asked them to respond to a series of ten statements with "agree," "disagree," or "do not know." The responses to these statements are summarized in Tables 6.1 through 6-10. These ten statements fell into four general categories.

The first category simply addressed the general function of limited entry. These two questions were, "license limitation restricts the number of fishermen or fishing units in a fishery," and "Limited entry directly controls the number of fishermen or fishing units in a fishery." (Table 6.2). In both cases, fishermen agreed with these statements in a ratio of three to one.

The second category attempted to gauge more detailed knowledge and perception concerning different aspects of limited entry systems. These statements were, "Individual transferable quotas (ITQ) allow large fishing operations to buy everyone else out of a fishery" (Table 6.3); "Limited entry is mostly concerned with the distribution of economic benefits from a fishery" (Table 6.4); "Limited entry is very difficult to administer and enforce" (Table 6.5); and "Limited entry gives managers less control over fishermen's lives" (Table 6.6) (note the reverse phrasing of this question). On the first three of these statements the responses were more evenly divided, probably reflecting both a lack of detailed knowledge of limited entry systems and differing opinions on these specific questions. On the forth, concerning manager's control over fishermen, 71% of the sample disagreed with the statement, indicating that they perceived that limited entry gives managers more control over fishermen.

TABLE 6.1 Percent Agreeing with the Statement, " *License limitation restricts the number of fishermen or fishing units in a fishery.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	90.5	9.5	0	100	0	0
N=	19	2		3		
Area 2	87.5	12.5	0	80	20	0
N=	21	3		4	1	
Area 3	89.2	8.1	2.7	72.7	18.2	9.1
N=	33	3	1	16	4	2
Area 4	65.8	23.7	10.5	40	30	30
N=	25	9	4	4	3	3
Area 5	67.7	23.5	8.8	77.8	22.2	0
N=	23	8	3	14	4	

TABLE 6.2 Percent Agreeing with the Statement, " *Limited entry directly controls the number of fishermen in a fishery.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	80.95	4.8	14.3	66.7	33.3	0
N=	17	1	3	2	1	
Area 2	87.5	12.5	0	80	20	0
N=	21	3		4	1	
Area 3	83.8	10.8	5.4	81.8	9.1	9.1
N=	31	4	2	18	2	2
Area 4	57.9	26.3	15.8	50	20	30
N=	22	10	6	5	2	3
Area 5	79.4	14.7	59	88.9	11.1	0
N=	27	5	2	16	2	

TABLE 6.3 Percent Agreeing with Statement, " *Individual Transferable Quotas (ITQ) allow large fishing operations to buy everyone else out of a fishery.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	76.2	19.1	4.8	33.3	66.7	0
N=	16	4	1	1	2	
Area 2	70.8	16.7	12.5	100	0	0
N=	17	4	3	5		
Area 3	35.1	37.8	27	54.6	22.7	22.7
N=	13	14	10	12	5	5
Area 4	34.2	52.6	13.2	40	40	20
N=	13	20	5	4	4	2
Area 5	44.1	47.1	8.8	61.1	22.2	16.7
N=	15	16	3	11	4	3

TABLE 6.4 Percent Agreeing with the Statement " *Limited entry is mostly concerned with the distribution of economic benefits from a fishery.*" by Area and Status

	Full Time			Part Time		
	agree	**disagree**	**don't know**	**agree**	**disagree**	**don't know**
Area 1	57.1	33.3	9.5	0	66.7	33.3
N=	12	7	2		2	1
Area 2	16.7	70.8	12.5	40	60	0
N=	4	17	3	2	3	
Area 3	45.95	29.7	24.3	36.4	45.5	18.2
N=	17	11	9	8	10	4
Area 4	42.1	36.8	21.1	40	10	50
N=	16	14	8	4	1	5
Area 5	38.2	44.1	17.7	38.9	50	11.1
N=	13	15	6	7	9	2

TABLE 6.5 Percent Agreeing with the Statement, " *Limited entry is very difficult to administer and enforce.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	14.3	80.9	4.8	33.3	33.3	33.3
N=	3	17	1	1	1	1
Area 2	29.2	66.7	4.17	0	80	20
N=	7	16	1		4	1
Area 3	56.8	37.8	5.4	50	31.8	18.2
N=	21	14	2	11	7	4
Area 4	52.6	34.2	13.2	30	30	40
N=	20	13	5	3	3	4
Area 5	47.1	41.2	11.8	61.1	38.9	0
N=	16	14	4	11	7	

TABLE 6.6 Percent Agreeing with the Statement, " *Limited entry gives fishery managers less control over fishermen's lives.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	19.1	71.4	9.5	0	66.7	33.3
N=	4	15	2		2	1
Area 2	8.3	79.2	12.5	0	100	0
N=	2	19	3		5	
Area 3	21.6	62.2	16.2	13.6	72.7	13.6
N=	8	23	6	3	16	3
Area 4	10.5	71.1	18.4	20	30	50
N=	4	27	7	2	3	5
Area 5	17.7	76.5	5.9	16.7	77.8	5.6
N=	6	26	2	3	14	1

TABLE 6.7 Percent Agreeing with the Statement, " *In cases where limited entry has been adopted, fishermen are happy with the system.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	42.86	14.3	42.86	0	0	100
N=	9	3	9			3
Area 2	41.7	33.3	25	20	60	20
N=	10	8	6	1	3	1
Area 3	46	29.7	24.3	22.7	50	27.3
N=	17	11	9	5	11	6
Area 4	26.3	36.8	36.8	10	50	40
N=	10	14	14	1	5	4
Area 5	32.4	38.2	29.4	27.8	61.1	11.1
N=	11	13	10	5	11	2

TABLE 6.8 Percent Agreeing with the Statement, " *Limited entry is fair to commercial fishermen.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	23.8	38.1	38.1	0	0	100
N=	5	8	8			3
Area 2	29.2	29.2	41.6	0	60	40
N=	7	7	10		3	2
Area 3	70.3	18.9	10.8	50	31.8	18.2
N=	26	7	4	11	7	4
Area 4	44.7	29	26.3	20	40	40
N=	17	11	10	2	4	4
Area 5	32.3	47.1	20.6	44.4	44.4	11.1
N=	11	16	7	8	8	2

TABLE 6.9 Percent Agreeing with the Statement, *"Limited entry can make fishermen better off in the long run."* by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	76.2	14.3	9.5	66.7	0	33.3
N=	16	3	2	2		1
Area 2	70.8	20.8	8.3	40	60	0
N=	17	5	2	2	3	
Area 3	83.8	16.2	0	72.7	18.2	9.1
N=	31	6		16	4	2
Area 4	57.9	23.7	18.4	40	20	40
N=	22	9	7	4	2	4
Area 5	61.8	32.4	5.9	72.2	27.8	0
N=	21	11	2	13	5	

TABLE 6.10 Percent Agreeing with the Statement, " *Limited entry may be appropriate to some of North Carolina's fisheries.* " by Area and Status

	Full Time			Part Time		
	agree	disagree	don't know	agree	disagree	don't know
Area 1	85.7	9.5	4.8	66.7	0	33.3
N=	18	2	1	2		1
Area 2	83.3	4.2	12.5	40	40	20
N=	20	1	3	2	2	1
Area 3	89.2	5.4	5.4	77.3	13.6	9.1
N=	33	2	2	17	3	2
Area 4	68.4	7.9	23.7	50	20	30
N=	26	3	9	5	2	3
Area 5	79.4	17.7	2.9	83.3	11.1	5.6
N=	27	6	1	15	2	1

The third category was included to measure attitudes towards outcomes and fairness of limited entry systems, with the statements, "In cases where limited entry has been adopted, fishermen are happy with the system" (Table 6.7) and "Limited entry is fair to commercial fishermen" (Table 6.8). On both of these questions, the agree/disagree responses were again more evenly divided, with higher percentages of "do not know" responses. Concerning fishermen being happy with existing systems, a significantly higher portion of part time fishermen responded in the negative.

However, in the final category, in which the statements were intended to elicit perceptions of the desirability of limited entry generally ("Limited entry can make fishermen better off in the long run") (Table 6.9), and potential applications of limited entry to North Carolina ("Limited entry may be appropriate to some of North Carolina's fisheries" (Table 6.10)), the "agree" responses were again high (70% and 78%, respectively).

In summary, the fishermen in our sample had a good general perception of the overall purpose of limited entry systems; there was some disagreement over the exact goals and outcomes of particular systems; and there was general agreement about the potential for positive outcomes from limited entry systems for some of North Carolina's fisheries.

Table 6.11 gives a breakdown of the problems ranked number one by fishers. Uniformly fishers no matter what status or area saw water quality as the most important problem for concern. For full-time fishers in Area 1, competition for space in the water was the second most frequently ranked number 1 problem. This of course reflects the nature of the gear primarily used in this area (crab pots). Area 2 full-timers saw the number of fishers and lack of a voice as a problem while those in Area 3 saw lack of enforcement of existing laws as second only to water quality and also viewed overcrowding as a problem. These perceived problems in Area 3 are understandable given the amount of development and the existence of recreational/commercial conflicts. Full-timers in Areas 4 and 5 saw either too many regulations, lack of a voice or both as problems.

TABLE 6.11 Problems Ranked as Number 1 by Area and Status (percent)

		Other people fishing your gear	Destruction & theft of gear	Competition for space in water	New entrants into fishery	Water quality	Fish prices	Price of fishing gear & boats	Lack of familiarity with fishing regulations	Lack of enforcement of existing laws	Too many fishing regulations	Too many people fishing	Shortage of dock space	Lack of voice in how fisheries are regulated	Difficulty in getting insurance
FT	Area 1 (N= 21)	4.76	0	14.3	0	52.4	4.8	0	0	0	9.5	9.5	4.8	0	0
	Area 2 (N= 23)	0	0	4.4	8.7	30.4	8.7	0	0	4.4	8.7	17.4	0	17.4	0
	Area 3 (N= 37)	8.1	2.7	8.1	2.7	21.6	5.4	0	0	18.9	10.8	16.2	0	2.7	0
	Area 4 (N= 38)	5.3	5.3	7.9	5.3	42.1	0	0	0	7.9	18.4	7.9	0	0	0
	Area 5 (N= 33)	3	0	6.1	0	30.3	9.1	0	0	3	15.2	15.2	0	15.2	3
PT	Area 1 (N= 3)	0	33.3	0	0	66.7	0	0	0	0	0	0	0	0	0
	Area 2 (N= 5)	20	0	0	0	20	40	0	0	0	20	0	0	0	0
	Area 3 (N= 19)	0	0	5.3	10.5	31.6	10.5	5.3	5.3	5.3	5.3	21.1	0	0	0
	Area 4 (N= 10)	0	0	0	0	70	0	0	0	0	20	10	0	0	0
	Area 5 (N= 17)	0	0	0	0	58.8	5.9	0	5.9	0	5.9	5.9	0	17.7	0

The breakdown of problems ranked second is presented in Table 6.12. Once again water quality is important showing that among most fishers water quality is among the top two concerns in their area. For most fishers either too many regulations or lack of a voice was important. For full-timers in Area 3 new entrance into fishing was second to water quality and this is in keeping with the discussion above concerning development and conflicts. Full-timers in Area 4 cited competition for space as a problem while those in Area 5 ranked fish prices highly.

In sum, next to water quality most fishers saw a lack of a voice in fisheries management or too many fishing regulations as the most problematic. Next to these concerns, issues of new entrants, competition for space, and overcrowding were seen as important.

TABLE 6.12 Problems Ranked as Number 2 by Area and Status (percent)

		Other people fishing your gear	Destruction & theft of gear	Competition for space in water	New entrants into fishery	Water quality	Fish prices	Price of fishing gear & boats	Lack of familiarity with fishing regulations	Lack of enforcement of existing laws	Too many fishing regulations	Too many people fishing	Shortage of dock space	Lack of voice in how fisheries are regulated	Difficulty in getting insurance
FT	Area 1 (N= 21)	4.8	9.5	4.8	4.8	23.8	14.3	0	4.8	0	23.8	4.8	0	4.8	0
	Area 2 (N= 23)	4.4	0	4.4	13	13	0	4.4	4.4	13	21.7	4.4	0	13	0
	Area 3 (N= 38)	0	5.3	5.3	13.2	21.1	7.9	7.9	5.3	7.9	10.5	7.9	0	7.9	0
	Area 4 (N= 37)	2.7	5.4	13.5	10.8	13.5	8.1	0	2.7	8.1	2.7	10.8	2.7	16.2	2.7
	Area 5 (N= 34)	0	0	8.8	2.9	14.7	11.8	5.9	2.9	8.8	23.5	5.9	0	14.7	0
PT	Area 1 (N= 3)	0	0	0	0	0	0	0	0	0	100	0	0	0	0
	Area 2 (N= 4)	0	25	0	0	25	0	25	0	0	25	0	0	0	0
	Area 3 (N= 19)	5.3	5.3	5.3	0	21.1	0	5.3	10.5	5.3	10.5	21.1	0	10.5	0
	Area 4 (N= 10)	10	20	0	20	10	10	0	10	0	10	0	0	10	0
	Area 5 (N= 17)	0	11.8	0	17.7	0	17.7	5.9	0	11.8	17.7	5.9	0	11.8	0

Section 7: Estimates of Gear and Fishers

In this section we briefly examine estimates of the amount of different types of gear and fishers. These estimates should aid in understanding the potential impacts of management efforts that attempt to control either the amount of a given gear or the number of fishers of a particular kind. We begin by attempting to estimate the number of full-time, part-time, and recreational fishers who have both an ETS and a commercial vessel license. This is followed by two examples of gear estimation. The first is estimates of crab pots and crabbers while the second concerns estimates of the amount of gill nets that could potentially be used in state waters. This data, for example, can help in answering questions such as: What would be the impact of a 100 yard limit on recreational use of gill net?

Estimating the Number of Fishers

In this subsection we provide a range of estimates of fishers based on the sample data. It should be pointed out that these estimates are subject to potential error due to both sampling variability and nonresponse bias. Although confidence intervals for estimates are not provided here, it is important to note that the estimates presented here are sample estimates and therefore may not always reflect true population parameters. We deal with the potential problems of nonresponse bias as described in the methods section. In attempting to take into account any problems associated with nonresponse bias informed judgments are made concerning the total n and sample adjustments are made accordingly (e.g., by gaining limited amounts of information about refusals). In order to show the possible influences of these potential errors, both sample estimates and adjusted estimates are provided. In addition, all estimates are compared with comparable DMF estimates where possible.

Table 7.1 provides estimates of full-time, part-time, and recreational fishers by area and for the state. Estimates were produced by using the respondents perceptions or self-reports of status. Proportions of the different statuses present in the sample were used to estimate proportions in the population from which the sample was drawn. Keeping in mind that these estimates are based on reported status (some individuals who perceive themselves as part-timers may, for example, be

TABLE 7.1 Estimate of Number of Full Time, Part Time, and Recreational Fishers by Area (based on self perception response) from Commercial ETS Sample

Albemarle/Area 1

	Sample (N= 27)			Sample (N= 32)*		
	Full	Part	Recreational	Full	Part	Recreational
Proportion	85	7.4	0	71.9	6.25	0
Estimate						
Number	497	43	0	421	37	0

Dare/Area 2

	Sample (N= 36)			Sample (N= 41)*		
	Full	Part	Recreational	Full	Part	Recreational
Proportion	72.2	19.4	0	63.4	17.1	0
Estimate						
Number	552	148	0	485	131	0

Southern Counties/Area 3

	Sample (N= 68)			Sample (N= 78)*		
	Full	Part	Recreational	Full	Part	Recreational
Proportion	51.5	33.8	7.35	45	29.5	6.4
Estimate						
Number	909	597	130	794	521	113

PamlicoArea 4

	Sample (N= 58)			Sample (N= 67)*		
	Full	Part	Recreational	Full	Part	Recreational
Proportion	60	24.1	1.7	52.2	20.9	1.5
Estimate						
Number	757	304	21	658	264	19

Carteret/Area 5

	Sample (N= 58)			Sample (N= 73)*		
	Full	Part	Recreational	Full	Part	Recreational
Proportion	55.2	36.2	3.4	43.8	28.8	2.7
Estimate						
Number	794	521	49	630	414	39

Inland/Area 6

	Sample (N= 29)		
	Full	Part	Recreational
Proportion	25	43	29
Estimate			
Number	100	171	115

Total

	Sample Estimate			Adjusted Estimate*		
	Full	Part	Recreational	Full	Part	Recreational
	3509	1613	200	2988	1367	171

* Adjusted for potential sample bias: assuming 'No contacts' are not seriously fishing

more recreational in nature), we estimate from the sample that there are 3,609 full-time fishers, 1,784 part-time fishers and 315 recreational fishers and for the adjusted sample estimate 3,088 full-time, 1,538 part-time and 286 recreational.

In a comparison of these estimates to DMF figures we find some commonalities but also some differences. Table 7.2 shows DMF data on numbers of fishers within categories of the estimated value of landings derived from trip tickets. If we consider part-time fishers to be anyone who has sold fish ($1.00 plus) but less than the $5,000 figure that has been proposed as a potential thresh-old, we see there are 1,686 individuals who fit this criteria. This is close to either our sample or estimate of 1,784 part-timers or the adjusted estimate of 1,538. If fishers with landings valued greater than $5,000 are considered full-time then there are 2,382 fishers who have landed, at least according to DMF records, fish valued at more than $5,000. Both study estimates exceed the DMF figure, but the adjusted estimate of 3, 088 is close and may could be closer if some other criteria was used other than self-reports of status (i.e., full or part-time).

The number of fishers having landed at least $1.00 is 5,363. Comparing this figure to the com-bined full and part-time estimates for the study yields a sample estimate of 5,393 and an adjusted estimate of 4,626. The DMF figure is bracketed within the two study estimates. Any differences between study and DMF figures is once again due to sampling variability and possible under reporting of landings. as mentioned in a previous section of the report, under reporting of land-ings is a distinct possibility, particularly given the relatively recent introduction of the ETS system.

Estimates of Crab Pots and Crabbers

In this subsection we briefly examine aspects of crab pot fishing in the state in terms of the amount of gear and fishers. Table 7.3 provides estimates of the number of crabbers and crab pots by area as well as a total estimate. These estimates are for coastal counties only and do not include recreational use of crab pots. It is important to note the importance of estimating gear on an area basis. Means and medians for the number of crab pots varies dramatically from area to area indicating differences in the nature of fishing operations. These mean estimates run from a

TABLE 7.2 Number of Commercial Fishermen for 1994/95 License Year [1,2]

VALUE ($) OF DOCKSIDE SALES	NUMBER OF FISHERMEN	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	1,176	18	1,176	18
1-500	1,295	19	2,471	38
501-1,000	472	7	2,943	45
1,001-5,000	1,214	19	4,157	64
5,001-10,000	635	10	4,792	73
10,001 AND UP	1,747	27	6,539	100

1. Preliminary data based on trip tickets, Endorsement to Sell licenses, and annual (1994) average price per unit of fish. Data are summarized to the fisherman level.
2. Based on 11 month period (August 1994-June 1995).

Source: North Carolina Division of Marine Fisheries (25 January 1996)

TABLE 7.3 Estimates of Crabpots by Area and Total (for Coastal Counties Only)**

Albemarle (Area 1)

	Number of Crabbers (estimated)	Estimated Pots ($\bar{X}$=388)	Estimated Pots (Median=345)
Sample	433	168,004	149,385
Adjusted*	389	150,932	134,025

Dare (Area 2)

	Number of Crabbers (estimated)	Estimated Pots ($\bar{X}$=330)	Estimated Pots (Median=250)
Sample	489	161,370	122,250
Adjusted*	429	141,570	107,250

Southern Counties (Area 3)

	Number of Crabbers (estimated)	Estimated Pots ($\bar{X}$=140)	Estimated Pots (Median=110)
Sample	311	43,540	34,210
Adjusted*	272	38,080	29,920

Pamlico (Area 4)

	Number of Crabbers (estimated)	Estimated Pots ($\bar{X}$=385)	Estimated Pots (Median=312)
Sample	826	318,010	275,712
Adjusted*	715	275,275	223,080

Carteret (Area 5)

	Number of Crabbers (estimated)	Estimated Pots ($\bar{X}$=144)	Estimated Pots (Median=175)
Sample	322	46,368	56,350
Adjusted*	256	36,864	44,800

Total

	Number of Crabbers (estimated)	Estimated Pots ($\bar{X}$)	Estimated Pots (Median)
Sample	2,381	737,292	637,907
Adjusted*	2,061	642,721	539,255

*Adjusted for potential sample bias assuming "no contacts" are not seriously engaged in commercial fishing.

**Estimates are for number of pots in the water during June.

high of 388 pots for the Albemarle area to a low of 140 for the Southern area. Estimates are made based on both mean and median values and using sample and adjusted sample proportions and are for full and part-time combined. Estimates of the number of crabbers was based on proportions found in the sample.

Estimates for the total numbers of fishers and pots is provided at the bottom of Table 7.3. These estimates range from 539,255 pots to 737,292 pots depending on criteria used in estimation. Once again for the sake of validation this data will be compared to DMF data and estimates. Figure 7.1 shows data on the number of crab pots reported on commercial vessel licenses over a 10 year period. The most recent date of 1994 yields a figure of 945,262 pots. This is over 200,00 pots higher than the highest study estimate. This figure of 945,262 pots should be viewed cautiously. Reported pots may not be truly indicative of actual pots. Johnson and Orbach (1987), for example, found a highly inflated estimate of spiny lobster traps because of both under and over-reporting and the same traps being reported several times (e.g., father and son would report the same 2,000 traps).

Another comparison can be made on the basis of the number of individual crabbers who landed at least $1.00's worth of crab using pots. Table 7.4 shows that 1,868 fishers did so according to trip ticket records. Table 7.5 provides estimates of the mean numbers of pots for full-time, part-time, and combined. Using these sample estimates we find that based on the combined sample mean there are 592,156 pots and based on the combined sample median 467,000 pots. Both these estimates are well within the range yielded by the study.

Given the discussions concerning the management of effort, particularly in the crab pot fishery, it is important to gain an understanding of the distribution of for both full and part-time fishers. As was seen in table 7.5 the mean number of pots used by part-timers is much less than full-timers. Figures 7.2 and 7.3 show histograms of the distribution of pots for the two statuses of fishers. As can be seen in Figure 7.2, most part-timers use less than 300 pots during the month of June (i.e., the month with greatest overall participation in the crab pot fishery). This is not true for full-time crabbers and Figure 2.3 reveals 50 percent of the fishers use less than 300 pots and 50 percent

TABLE 7.4 Estimates of Crabpots Based on Number of ETS's Landing >$0.00

Number Landings at Least $1.00	Estimated Pots ($\overline{X}$=317)	Estimated Pots (Median=250)
1,868*	592,156	467,000

*Source: Trip Ticket Program (NCDMF)

TABLE 7.5 Estimates of Central Tendency for Crab Pots for Full and Part Time Fishers (for the month of June)

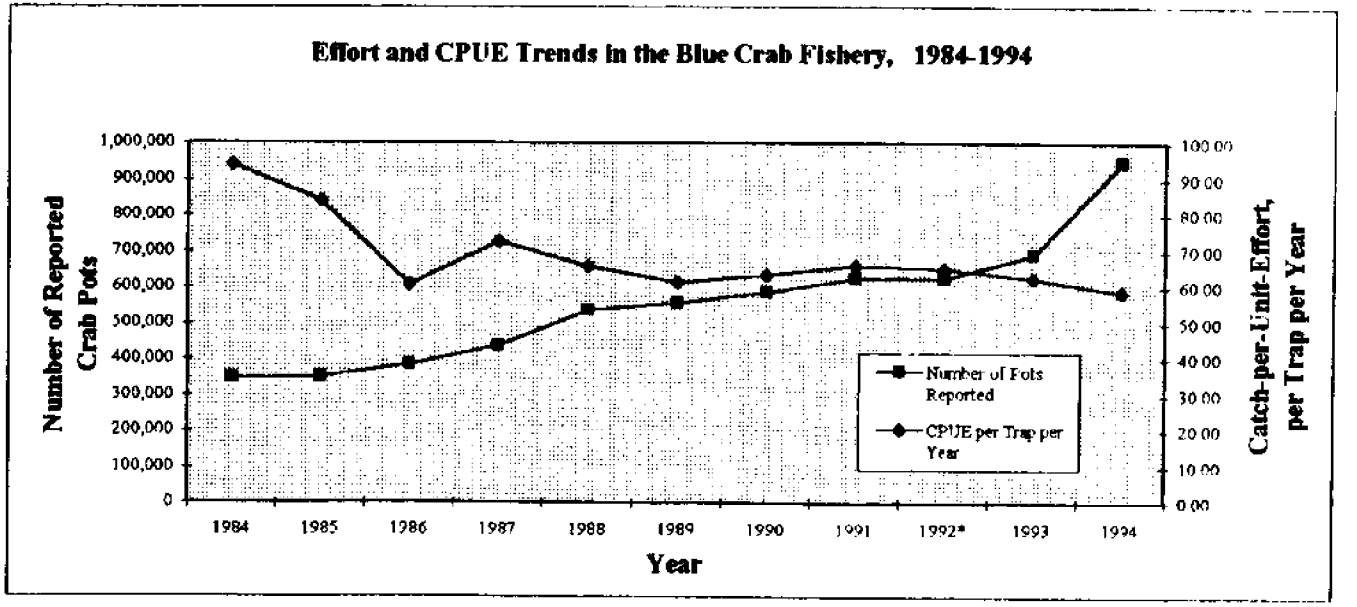
Full Time (N= 76)				Confidence Interval for 95 percent Confidence
	Mean	M	SD	level
	353.6	300	256.38	±58 pots

Part Time (N= 17)				Confidence Interval for 95 percent Confidence
	Mean	M	SD	level
	152	150	105.5	±50 pots

Combined (N=				Confidence Interval for 95 percent Confidence
	Mean	M	SD	level
	317	250	248.2	±51 pots

FIGURE 7.1: Catch-Per-Unit-Effort for the North Carolina Blue Crab Fishery

Year	Number of Pots Reported	CPUE per Trap per Year	Total Crab Harvest, All Gears	Percent Change in Number of Pots Reported
1984	345,536	94.03	32,490,769	-
1985	349,831	83.74	29,293,547	1.24%
1986	381,568	60.70	23,159,779	9.07%
1987	437,068	72.67	31,760,413	14.55%
1988	534,720	65.71	35,136,232	22.34%
1989	554,880	61.16	33,935,992	3.77%
1990	584,842	63.24	36,985,206	5.39%
1991	623,450	65.88	41,074,063	6.60%
1992*	623,450	64.97	40,507,415	-
1993	688,222	62.29	42,867,109	10.38%
1994	945,262	58.65	55,436,185	37.35%
Total Change 1984-1994	**599,726**		**22,945,416**	



Source: North Carolina Division of Marine Fisheries, unpublished Commercial Vessel Data

* No data available for 1992, therefore number reported is from prior year

Note: Harvest data for fishery based on total harvest by all gears (i.e., crab pots and crab trawling).
CPUE calculated using harvest figures for all gears.

FIGURE 7.2

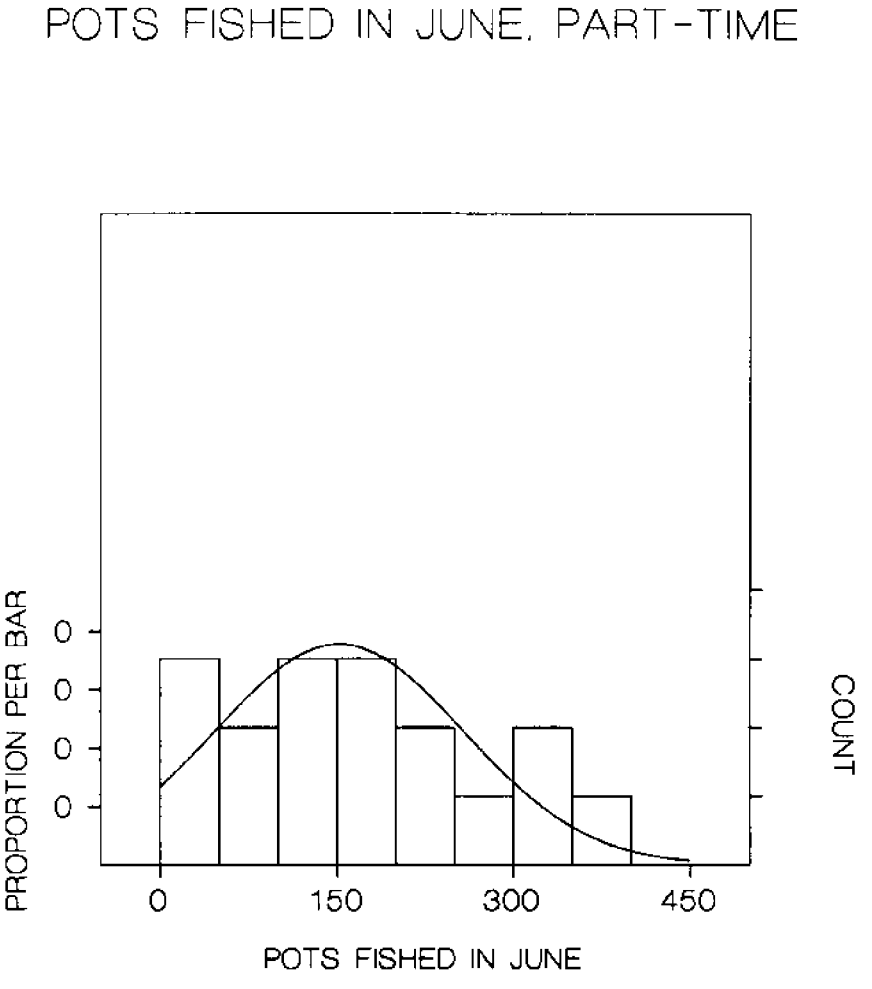
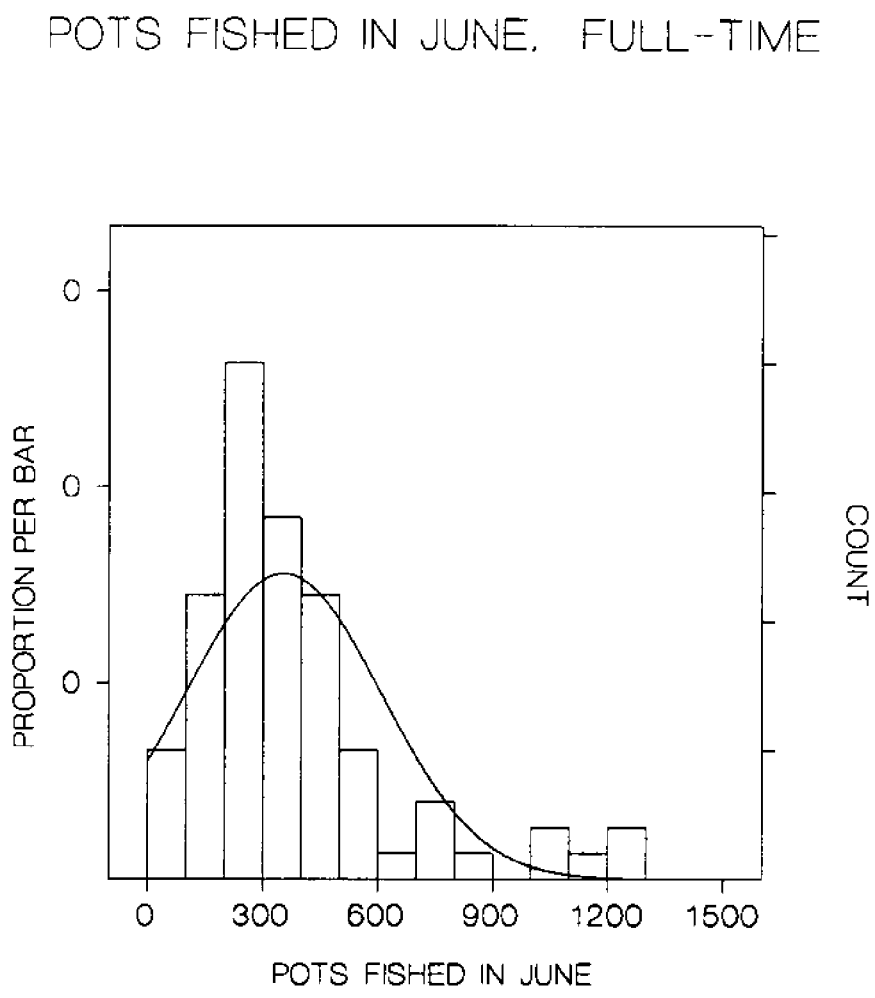

POTS FISHED IN JUNE, PART-TIME
PROPORTION PER BAR
0
0
0
0
COUNT
0
150
300
450
POTS FISHED IN JUNE

FIGURE 7.3


POTS FISHED IN JUNE. FULL-TIME
PROPORTION PER BAR
0
0
0
COUNT
0
300
600
900
1200
1500
POTS FISHED IN JUNE

more 300 pots. However, the vast majority use below 600 crab pots and this graph illustrates this well.

Estimates of Gill Nets

In this subsection we look briefly at gill net use. In this case we are attempting to estimate the total amount of gill net owned by any one fisher. Estimates are not for a particular kind of net (e.g., mullet) in the water at a given time, but rather the total amount of gill net of any kind "owned" and used throughout the course of a year. As we saw from the section on annual rounds, gill nets vary in importance and type from area to area. Table 7.6 gives sample estimates of the mean and median total yardage of gill net used by full-time, part-time and recreational fishers.

In a manner similar to Table 7.3, Table 7.7 provides a breakdown of estimates of total yardage by area for full and part-time combined. In addition, estimates of the amount of "recreational"-- based on self reports-- gill net is provided based on data obtained from the commercial non-ETS sample. Estimates again are based on both means and medians and adjusted and non-adjusted sample proportions.

Figures 7.4 through 7.13 give histograms of the distributions of yardage for recreational, full-time, and part-time fishers. These graphs help in determining potential impacts of net limitations discussed, for example, in the Preliminary Recommendations of the NC Moratorium Steering Committee (January 1996) such as a 100 yard limit for recreational gill nets. Figure 7.4 reveals that a limit of 100 yards, for example, would effect approximately 50 percent of the recreational fishers based on sample estimates. This can be done for any of limitation value for full or part-time. In addition, the examination of the impacts of various limits can be observed on an area by area basis. For example, a 1000 yard limit on commercial gill nets would have a very different impact in Area 1 or 2 than in Area 3. For Area 3 (Southern) a limit of this magnitude would impact less than 40 percent of the fishers, while the same limit in Area 1 (Albemarle) or Area 2 (Dare) would impact over 90 percent of the fishers.

TABLE 7.6 Estimates of Central Tendency for Gill Net Yardage for Full, Part Time, and Recreational Fishers

Full Time (N= 72)

Mean	M	SD	Confidence Interval for 95 percent Confidence level
1379.5	1000	1251.1	±289 yards

Part Time (N= 26)

Mean	M	SD	Confidence Interval for 95 percent Confidence level
852.3	550	859.7	±330.5 yards

Recreational (N= 26)

Mean	M	SD	Confidence Interval for 95 percent Confidence level
223.7	100	312.4	±120 yards

TABLE 7.7 Estimates of Yards of Gill Net by Area (includes full time and part time fishers) and Recreational

AREA	NUMBER OF GILL NETTERS (estimated)	ESTIMATED YARDAGE	ESTIMATED YARDAGE
AREA 1		$\overline{X}$=1,900	M=1,450
SAMPLE	345	655,500	556,700
ADJUSTED	293	500,250	424,850
AREA 2		$\overline{X}$=2,057	M=1,600
SAMPLE	321	660,297	582,131
ADJUSTED	283	513,600	452,800
AREA 3		$\overline{X}$=585	M=300
SAMPLE	600	351,000	310,050
ADJUSTED	530	180,000	159,000
AREA 4		$\overline{X}$=1,403	M=1,100
SAMPLE	391	548,573	478,082
ADJUSTED	341	430,100	375,100
AREA 5		$\overline{X}$=834	M=131
SAMPLE	676	563,784	440,220
ADJUSTED	532	338,000	266,000
AREA 6			
SAMPLE	143	83,655	42,900
RECREATIONAL	5562*	$\overline{X}$=224	M=100
		1,245,888	556,200

*** Estimate based on self-perception of status from the Non-ETS Commercial sample**

FIGURE 7.4

DISTRIBUTION OF YARDS OF GILL NETS. RECREATIONAL

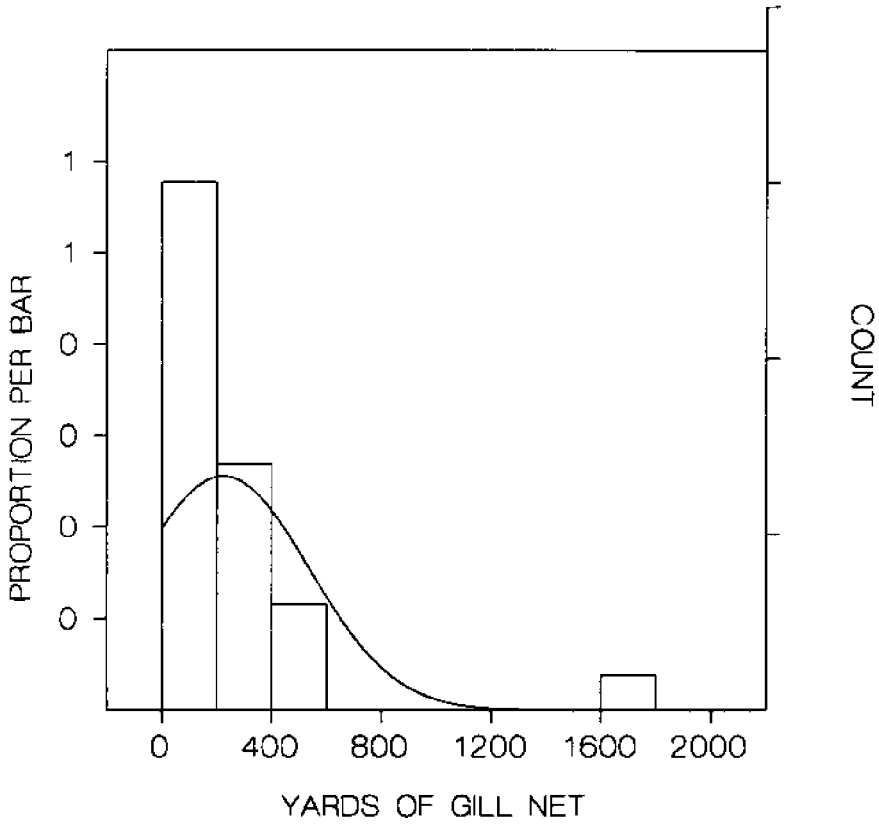


FIGURE 7.5

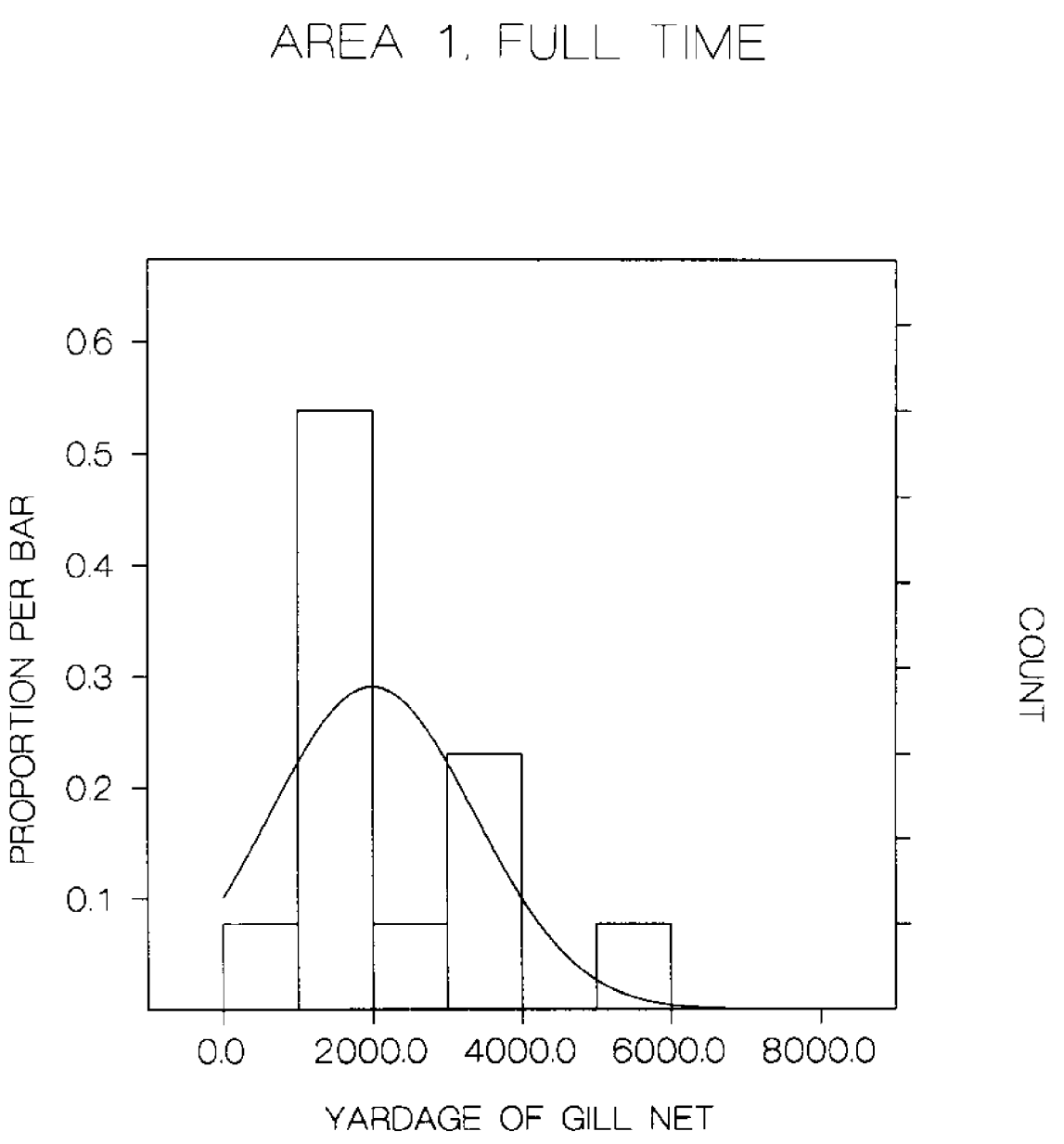

AREA 1, FULL TIME
PROPORTION PER BAR
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000.0
4000.0
6000.0
8000.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.6

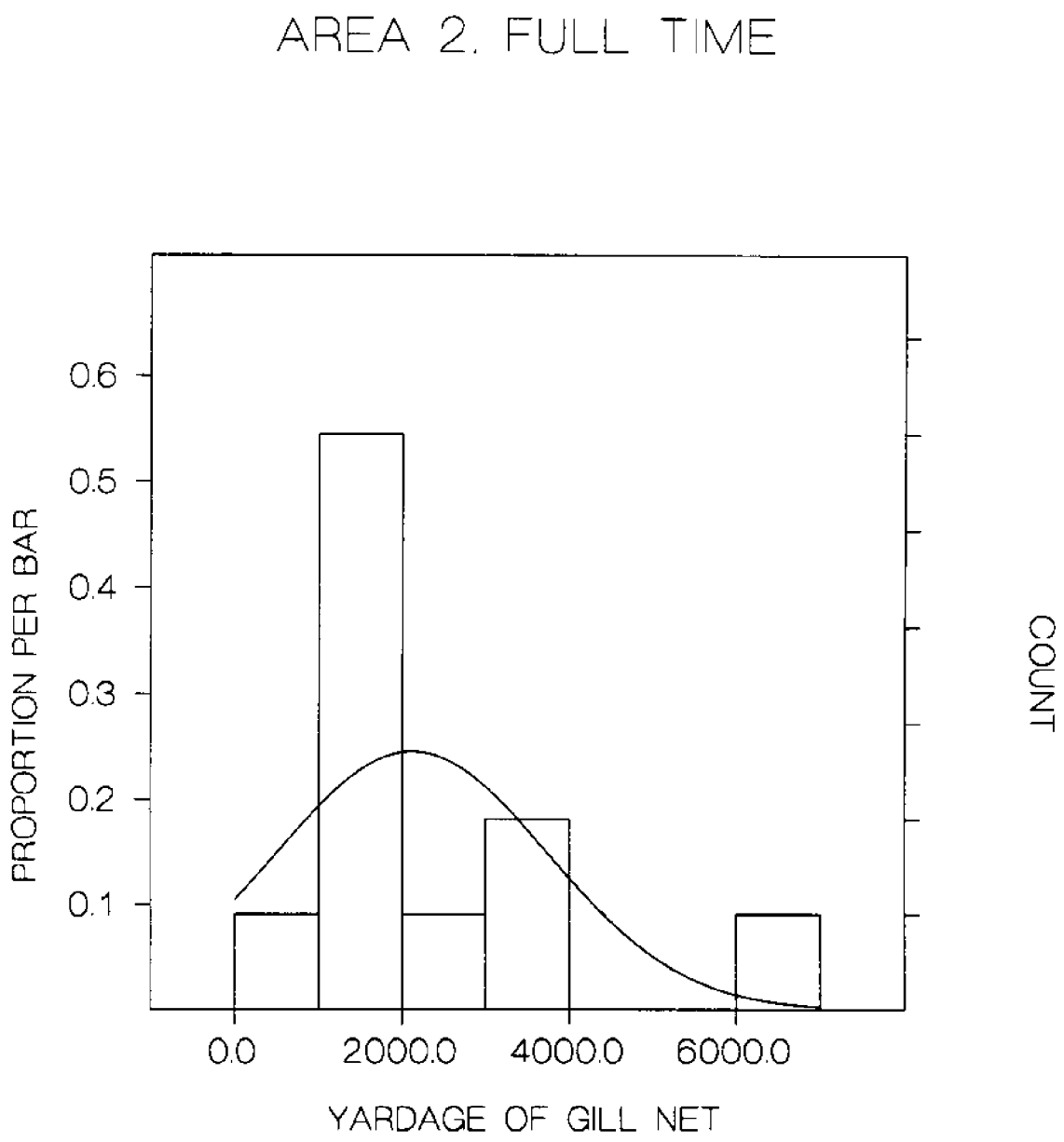

AREA 2. FULL TIME
PROPORTION PER BAR
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000.0
4000.0
6000.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.7

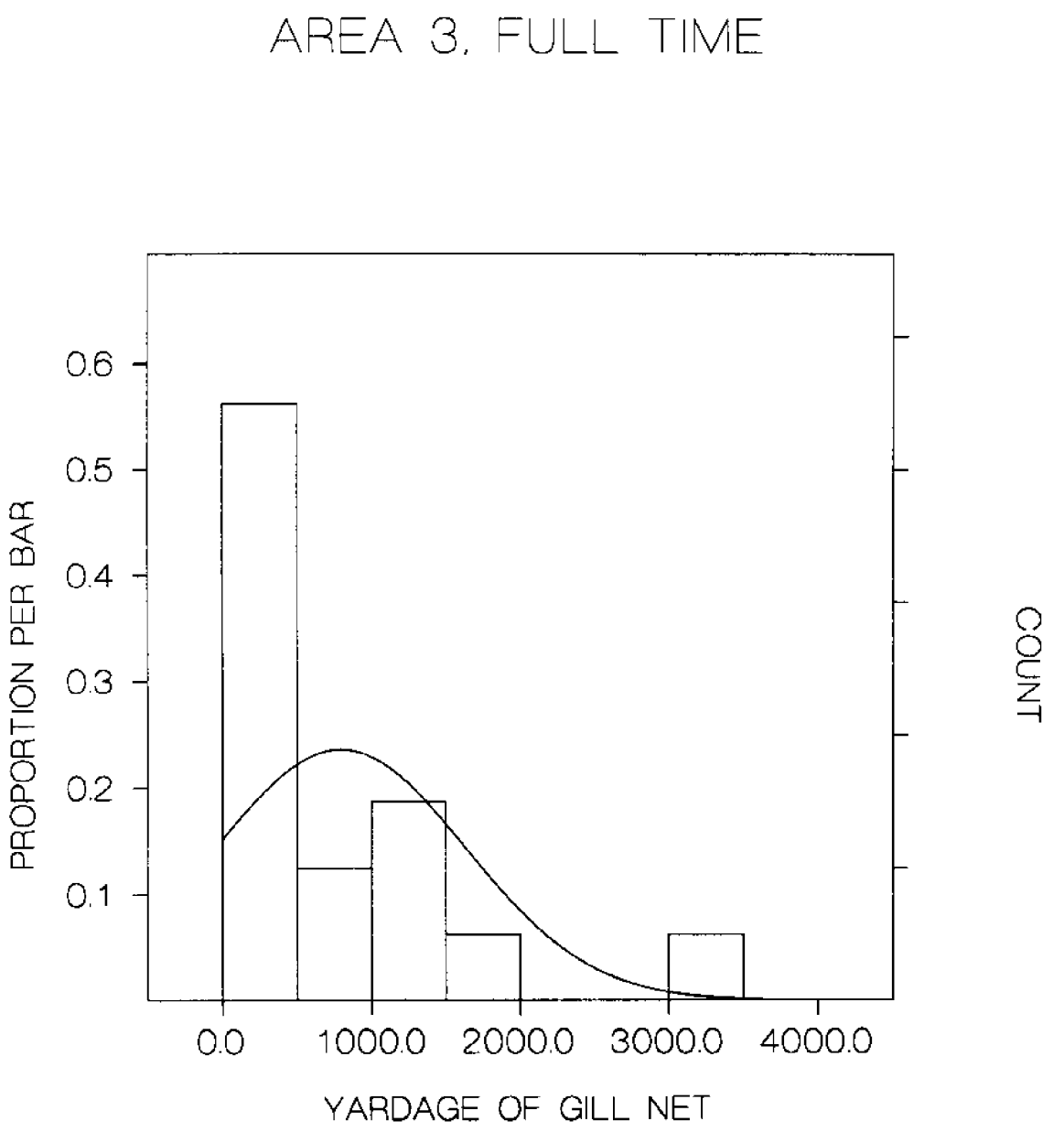

AREA 3, FULL TIME
PROPORTION PER BAR
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1000.0
2000.0
3000.0
4000.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.8

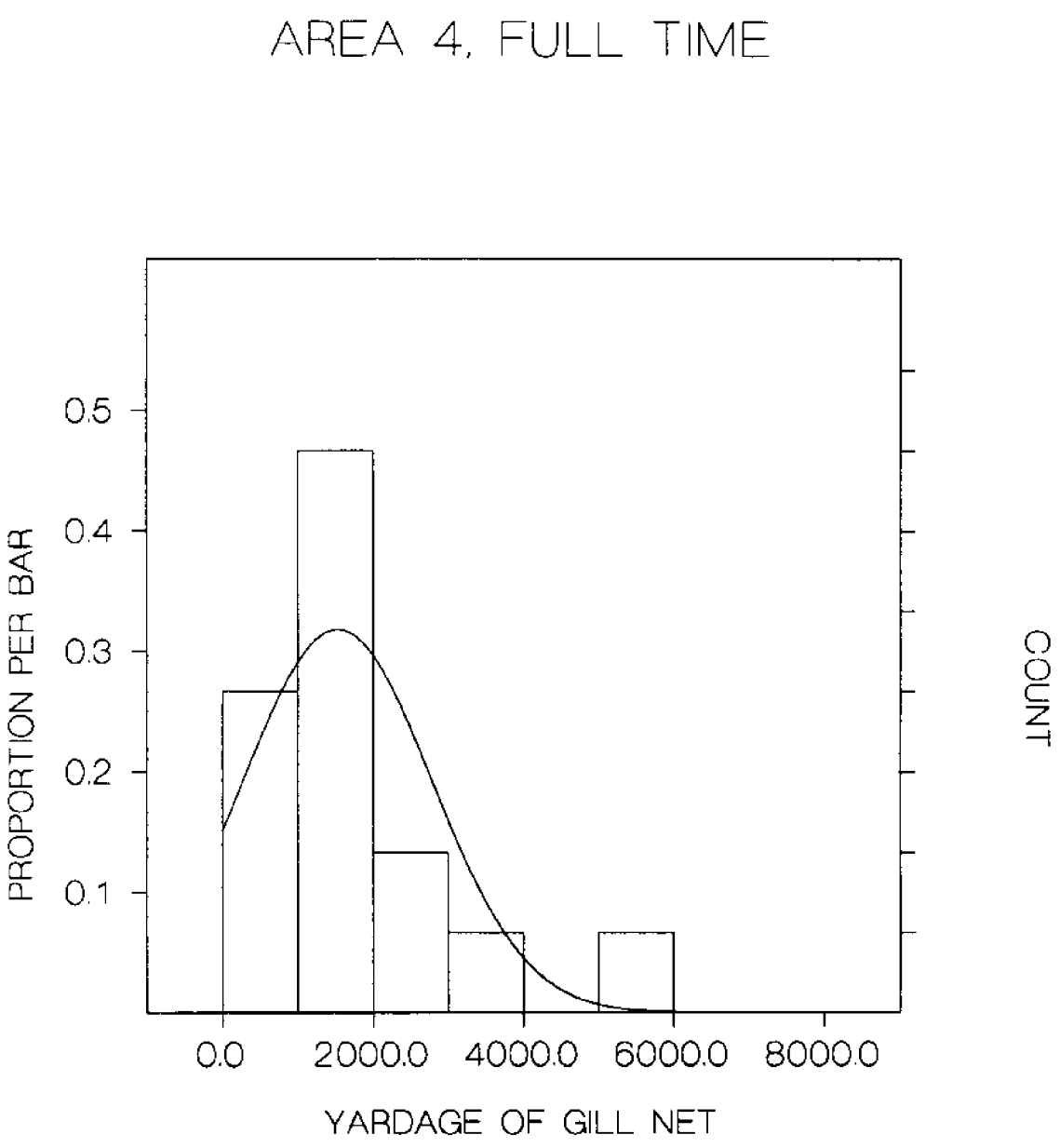

AREA 4, FULL TIME
PROPORTION PER BAR
0.5
0.4
0.3
0.2
0.1
COUNT
0.0
2000.0
4000.0
6000.0
8000.0
YARDAGE OF GILL NET

FIGURE 7.9

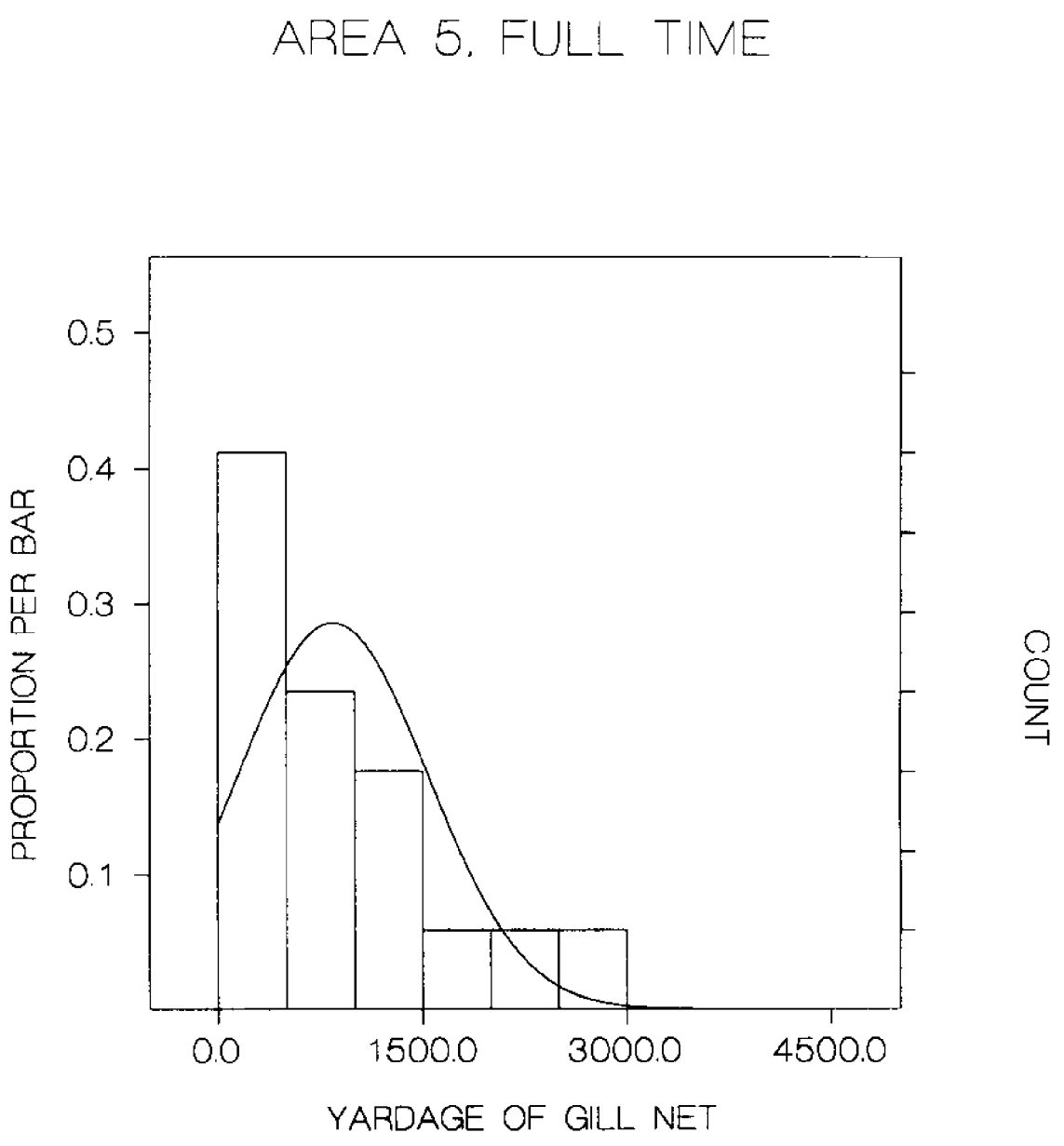

AREA 5, FULL TIME
PROPORTION PER BAR
0.5
0.4
0.3
0.2
0.1
0.0
1500.0
3000.0
4500.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.10

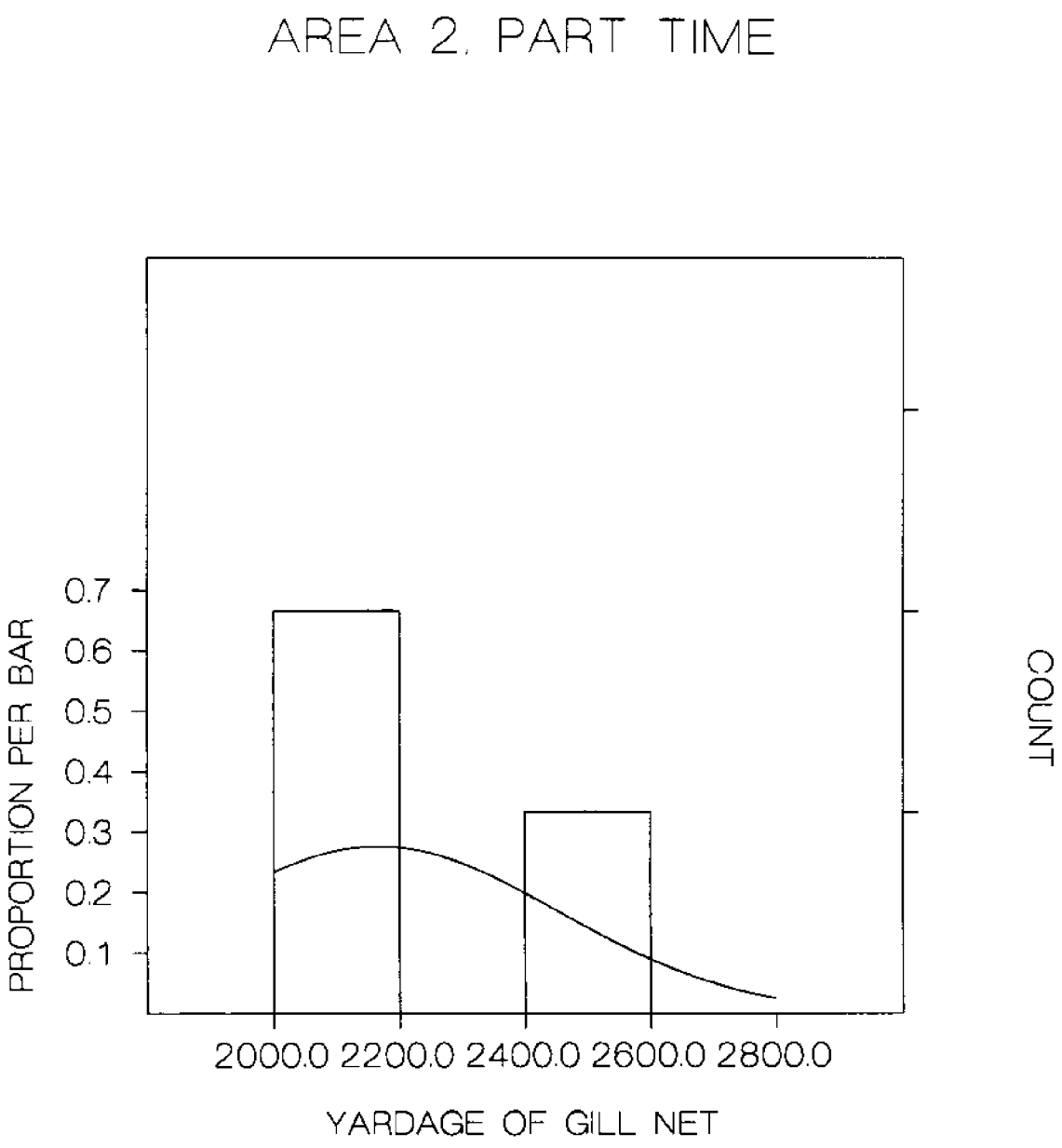

AREA 2, PART TIME
PROPORTION PER BAR
0.7
0.6
0.5
0.4
0.3
0.2
0.1
2000.0 2200.0 2400.0 2600.0 2800.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.11

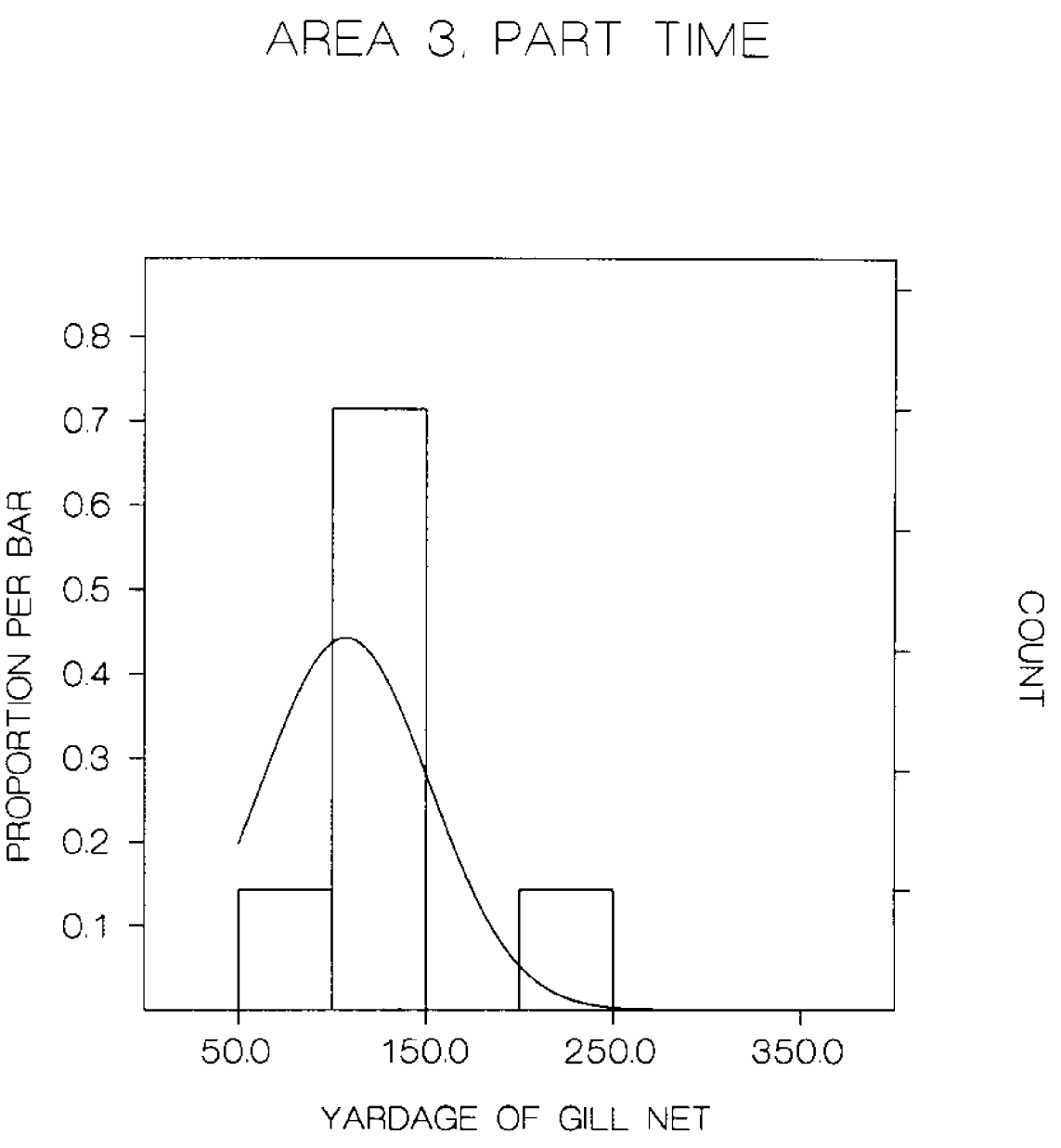

AREA 3, PART TIME
PROPORTION PER BAR
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
50.0
150.0
250.0
350.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.12

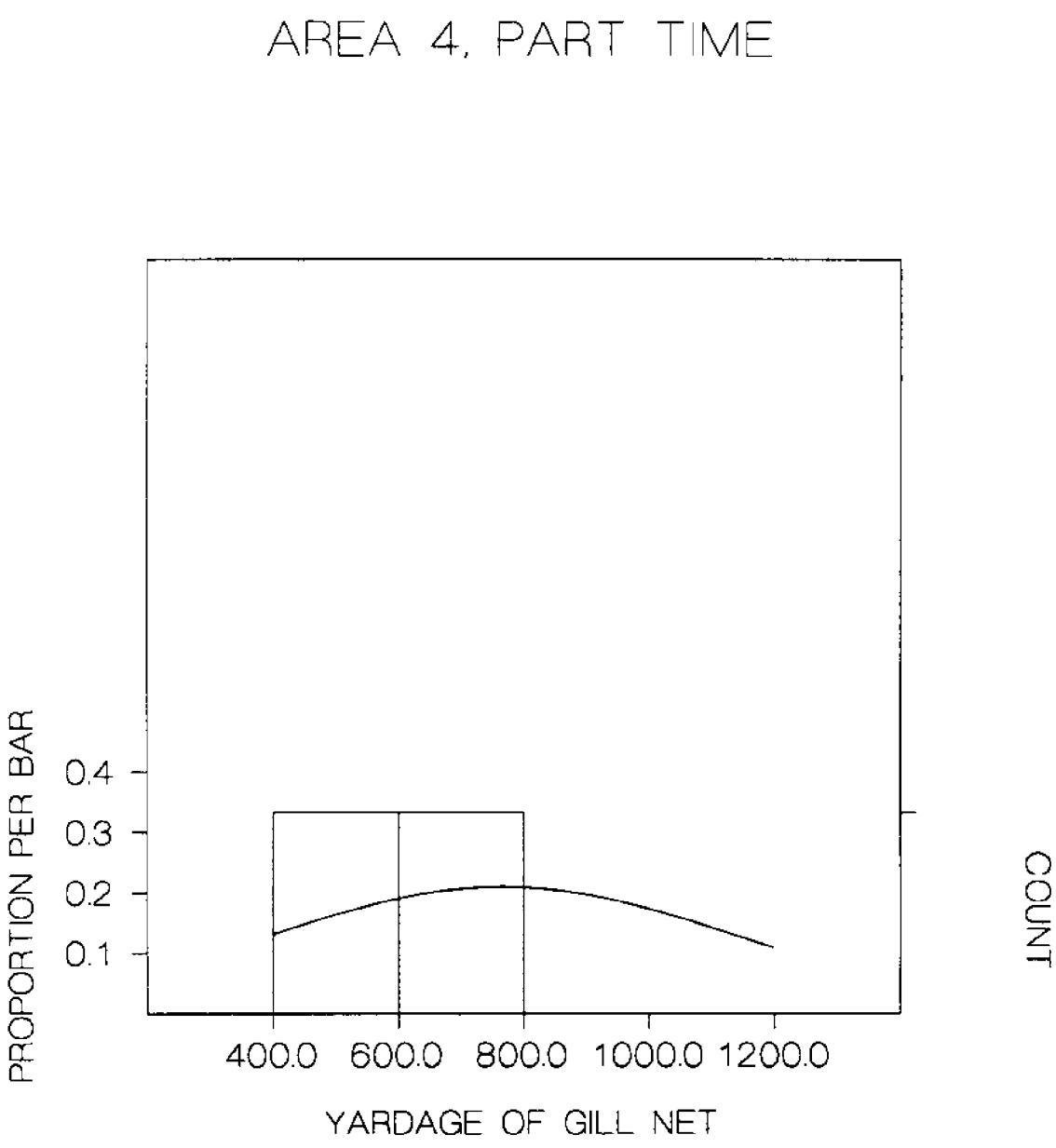
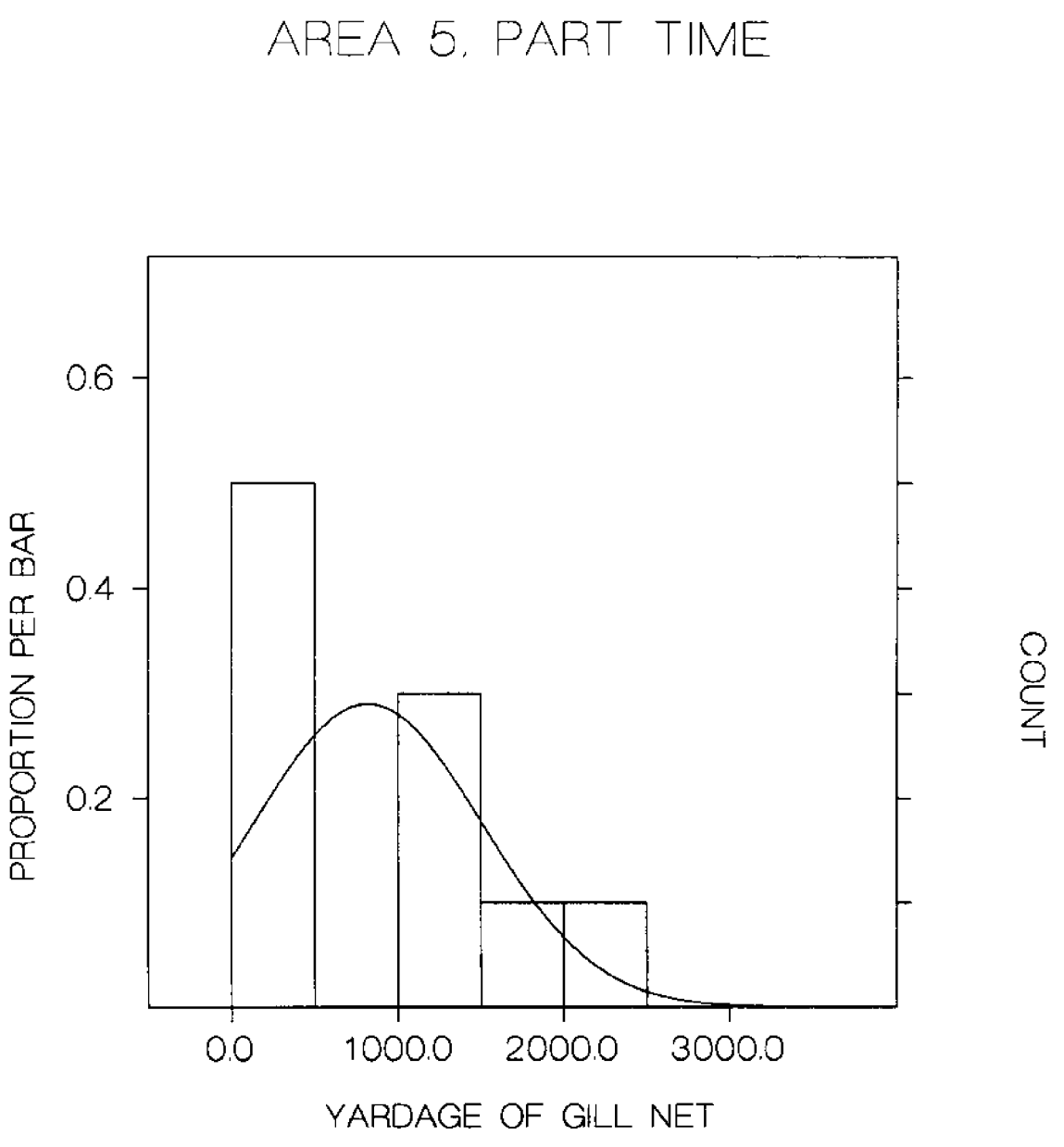

AREA 4, PART TIME
PROPORTION PER BAR
0.4
0.3
0.2
0.1
400.0
600.0
800.0
1000.0
1200.0
YARDAGE OF GILL NET
COUNT

FIGURE 7.13


AREA 5, PART TIME
PROPORTION PER BAR
0.6
0.4
0.2
0.0
1000.0
2000.0
3000.0
YARDAGE OF GILL NET
COUNT

Section 8: Non-Commercial ETS and Commercial Non-ETS Samples

This section provides a brief look at the two remaining samples. We are primarily interested in understanding the characteristics of the fishers interviewed in these two samples. The first involves individuals who have an ETS but do not have, at least on record, a commercial vessel license. These individuals have a right to sell fish but do not have the right to fish commercial gear from a boat that they own. The second sample is the largest and represents the vast majority of individuals holding a commercial vessel license. These are people who have a vessel license but do not, at least on record as of 1994, have an ETS. These individuals have a right to use commercial gear, but cannot legally sell their catch.

Non-Vessel ETS

Tables 8.1 and 8.2 provide a look at some of the characteristics of full and part-time fishers who have an ETS but no commercial vessel license. For those with incomes less than 50 percent from fishing, most employ rakes/tongs or hook and line, two types of gear that may not necessarily require a commercial vessel license (Table 8.1). It is also interesting to note that the vast majority of these fishers consider themselves recreational. Fisher 801, for example, is the cook on a headboat and sells catch caught by hook and line. Fishers 810 and 818 are both individuals who fish on headboats. The anomaly in this table is the individual who employs trawls and yet, by DMF records, does not have a commercial vessel license.

Table 8.2 shows the characteristics of fishers in this sample with incomes greater than 50 percent. Approximately half of these fishers are crew who have an ETS in order to sell fish obtained from the boats on which they work. Fisher 802 was the wife of a commercial fisher who used her husbands boat to catch bait to sell to recreational and sport fishers. The remaining fishers appear to be engaging in commercial activities without a vessel license.

Commercial Non-ETS

In this sample we concentrate on those individuals who considered themselves "recreational" fishers. Figure 8.1 is a graph displaying the distribution of residents on a county basis. Although respondents are split evenly between coastal and noncoastal counties (50 percent each) Individual coastal counties have the largest groups of recreational fishers.

Table 8.3 gives a detailed breakdown of types of fishing engaged in by these fishers. Whereas hook and line fishing is a large part of the gear employed, gill net fishing of some type is comparable in terms of the number of fishers using this gear. The section on gill net gear estimates provides more detail on the nature of gill net use among these fishers. These fishers employ a wide range of different kinds of commercial gear .

Table 8.1 Non-Vessel Sample : Individuals Earning 50 Percent or more of their Income From Commercial Fishing										
ID	Income derived from Com. Fishing	Fishing Status	Crew Position	Gear Used						
				Gillnet	Hook + Line	Rake/ Tongs	Pots	Gig	Long haul	Castnet
802	50%	Part-time	Captain							X
806	90%	Full- time	Captain owner	X		X		X		
808	100%	Part-time	Crew			X				
811	100%	Full- time	Crew	X					X	
812	50%	Part-time	Captain owner	X	X					
813	50%	Full- time	Captain owner			X				
814	80%	Full- time	Crew		X					
816	100%	Full- time	Captain owner	X			X			
819	100%	Full- time	Crew		X					
			Total	4	3	3	1	1	1	1

Table 8.2 Non-Vessel Sample : Individuals Earning Less than 50 Percent of their Income From Commercial Fishing							
ID	Income derived from Com. Fishing	Fishing Status	Crew Position	Gear Used			
				Gillnet	Hook + Line	Rake/ Tongs	Trawl
801	10%	Part-time	Crew		X		
803	0	Recreational				X	
804	0	Recreational	Captain-owner	X		X	
805	3%	Part-time				X	
807	0	Rec	Crew		X	X	
809	.	Part-time	Captain-owner				X
810	0	Recreational			X		
815	10%	Part-time				X	
817	25%	Part-time				X	
818	0	Recreational			X		
820	1%	Recreational	Crew		X		
			TOTAL	1	5	6	1

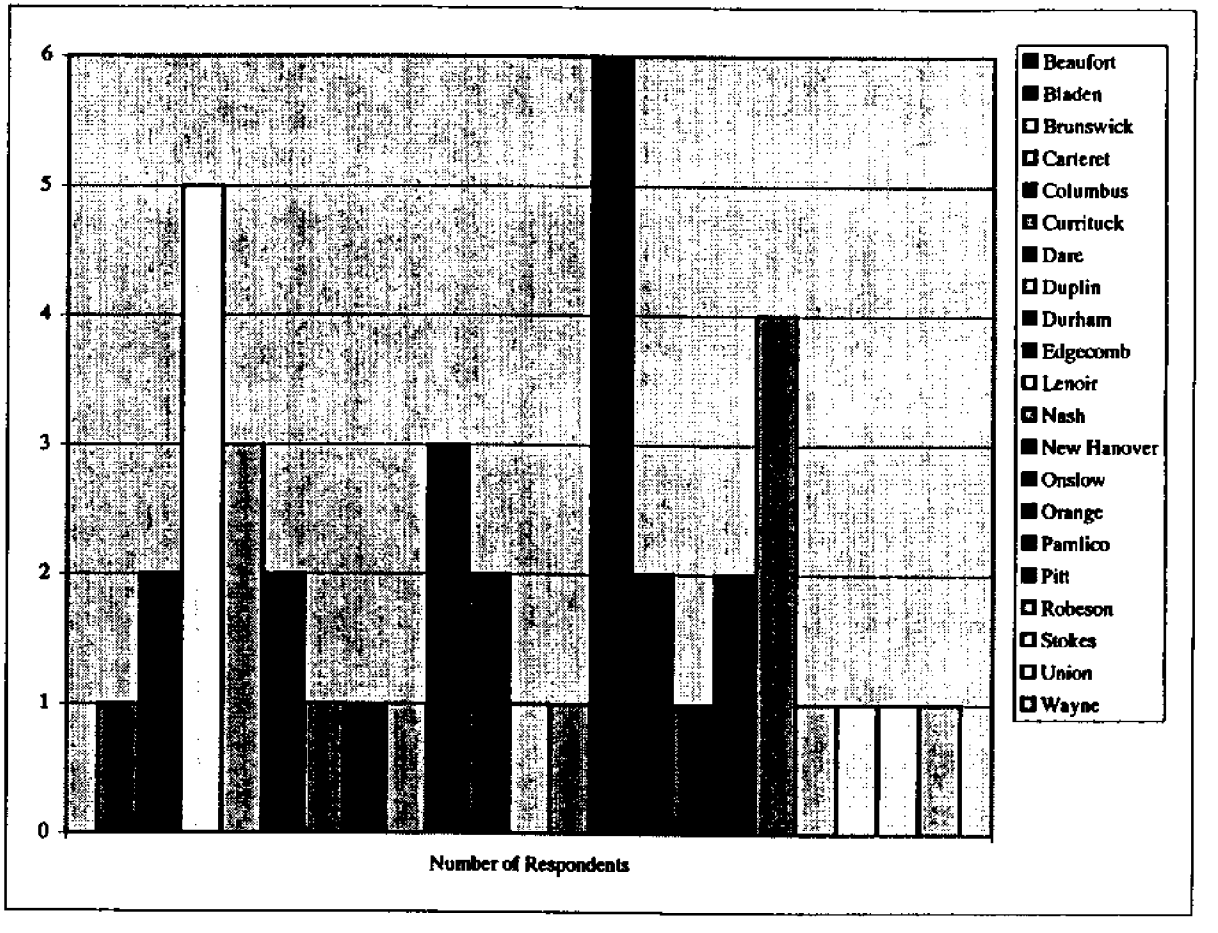
Table 8.3 Reported Annual Fishing Activity of "Recreational" Fishermen Holding a Commercial Fishing License but no Endorsement to Sell

ID	Trawl Shrimp	Crab Pot	Hand Harvest		Gig Flounder	Hook and Line					Gillnet					Yards of Gill net Used
			Oyster	Clam		Sound	Ocean	Trans	Flounder	S. Bass	Sound	Ocean	Trans	Flounder	Mullet	
701						X		X			X					100
702																.
703			X													.
704											X				X	100
705								X			X					50
709											X					100
710							X				X					100
711								X						X		200
712							X						X	X		.
713																.
715											X					100
717			X	X	X						X					100
719							X					X				100
720											X			X		460
721							X				X			X		425
724							X		X		X					50
725							X	X	X							.
726														X		100
729					X			X	X							.
730								X	X							.
731								X		X						.
733											X					50

ID	Trawl Shrimp	Crab Pot	Hand Harvest		Gig Flounder	Hook and Line					Gillnet					Yards of Gill net Used
			Oyster	Clam		Sound	Ocean	Trans	Flounder	S. Bass	Sound	Ocean	Trans	Flounder	Mullet	
736					X		X				X			X		1650
738					X						X			X		200
739			X	X	X						X					80
740					X						X			X		300
741							X									.
743											X					100
747					X			X								.
750		X												X		200
752						X					X					.
757		X							X		X			X		400
758		X					X		X							.
760							X			X				X		.
761											X			X		.
763		X								X	X					200
764	X														X	200
767											X					100
768		X														.
769	X										X			X		
770							X				X		X			200
773						X			X							.
Total	2	5	3	2	7	3	11	8	7	3	22	1	2	13	2	
Mean																100
St. Dev.																312.5

FIGURE 8.1 Recreational Respondents: Non-ETS Commercial Fishing License Holders by County

County	Number of Respondents
Beaufort	1
Bladen	2
Brunswick	5
Carteret	3
Columbus	2
Currituck	1
Dare	1
Duplin	1
Durham	3
Edgecomb	2
Lenoir	1
Nash	1
New Hanover	6
Onslow	2
Orange	1
Pamlico	2
Pitt	4
Robeson	1
Stokes	1
Union	1
Wayne	1



Section 9: Presentation of Workshop Results

One particular concern in North Carolina, even before the moratorium was passed, was the increasing amount of effort -- in some cases fishermen, in some cases fishing vessels or gear such as crab traps -- in many of North Carolina's fisheries. These increases have often occurred in the face of constant or declining fish catches, but also in the face of increasing traditional regulatory measures. The result is less revenue and lower profits for fishermen, more crowding and conflict on the fishing grounds, possible effects on the fish stock or habitat, and greater difficulty in managing the state's fisheries.

In many other fisheries, both in the United States and around the world, where problems such as this have arisen management systems known as limited entry, or limited access, have been created (Gimbel, 1994; Mollett, 1986). The Moratorium Steering Committee asked us to explore, along with fishermen and others interested in the fisheries, the potential application of these limited entry systems for North Carolina's fisheries. In North Carolina fisheries, the potential for limited entry systems is of particular concern because fishers and fisheries are closely interrelated through biological and ecological relationships, common fishing patterns, or other social or economic factors.

The first step in this process was to collect the data presented in Sections 3-8 of this report.

The second step was to hold three different series of workshops. The purposes of the first workshop series, held in August of 1995, were: 1) To discuss problems and issues in North Carolina fisheries; and 2) to discuss the concept of limited entry, or access, how it has been used in other fisheries, and what the effects of those limited entry systems have been. The purpose of the second workshop series, held in October of 1995, was to evaluate the potential impact of a number of alternatives, both limited entry-type and non-limited entry-type, on selected North Carolina fisheries. The purposes of the third workshop series, held in January of 1996, were to present the results of the evaluations from the second workshop, and to discuss further development of the concept of limited entry for North Carolina fisheries.

In addition to the five regularly scheduled workshops in each series, which were held in Manteo, Washington, Beaufort, Raleigh and Wilmington, we met, at their request, with the Hatteras and Carteret Auxiliaries of the North Carolina Fisheries Association after each workshop series and, also at their request, with groups of pound netters on Ocracoke and Cedar Islands and with a group of crab fishermen associated with the Blue Crab Data Gathering Project funded under the North Carolina Fishery Resource Grants Program. With the exception of the day-long Blue Crab Data Gathering Project meeting, the rest of the workshops began at 7:00 in the evening and lasted until discussion was concluded. The five scheduled workshops were advertised in local papers and electronic media, and special mailings were sent to the Sea Grant fisheries mailing list and to relevant fisheries policy and management groups. The comments from all of these workshops and meetings are included in the summaries below.

It is important to note that *The researchers from East Carolina and Duke have no stake in whether or not limited entry or any other specific form of management is adopted for any particular fishery, or for any North Carolina fishery at all.* There are many different ways to design a limited entry or access system. No one system is appropriate for all fisheries, and some fisheries may not need limited entry at all. The purpose of these workshops was to ensure a thorough discussion of the alternatives *before* any new law or policy is proposed.

What is Limited Entry, or Access?

Limited entry is a form of fisheries management where specific fishing privileges are assigned to specific fishermen or fishing vessels, and the total number or amount of those privileges is limited. Limited entry may occur in many different forms, depending on the nature of the fishery. All forms, however, limit participation in the fishery in some way (Rettig and Ginter, 1980).

Limited entry usually involves specifying one or more of the following things:

1) Which fishermen may participate in the fishery;
2) How much each fisherman may catch; or
3) How much gear each fisherman may use,

Why is Limited Entry, or Access, Used in Fisheries Management?

Some form of entry or access limitation is usually used because there are either too many fishermen or too much fishing gear in a fishery. By "too many" or "too much" we mean a lot more than would be necessary to catch the maximum available or allowable amount of fish. This can result in lower net incomes for fishermen, increased conflict and enforcement costs, and possible harm to the fish or the fish habitat.

The principal goals of limited entry are to raise or maintain the net incomes of fishermen, to reduce conflict and administrative costs associated with fishery, and to give fishermen more of a stake in conservation efforts by giving them specific (and exclusive) fishing privileges.

Where Else is Limited Entry Used Now?

There are currently limited entry or access systems either in place or under development on all coasts of the U.S. in such fisheries as salmon, halibut, sablefish, spiny lobster, surf clams, blue crabs, and in other countries such as Australia and New Zealand.

It is important to note that the term "limited entry" may mean any one of several very different kinds of management system. Some, such as the Alaska salmon fisheries, are "license limitation" systems which limit the number of fishermen or fishing vessels in the fishery. Others, such as the wreckfish fishery in the Southeast U.S., are based on "Individual Transferable Quotas" (ITQ) which restrict the amount of fish each fisherman may land each year. Still others, such as the spiny lobster system in Florida, are based on specific amounts of gear used by each fisherman. In the U.S. federal fishery management system, limited entry systems are authorized for development by the Department of Commerce and Regional Fishery Management Councils under Section 303(b)(6) of the Magnuson Fisheries Conservation and Management Act (MFCMA) of 1976, as amended. Section 303(b)(6) sets out six factors which must be considered in the development of any system of limited entry or access:

1) Present participation in the fishery;

2) Historical fishing practices in, and dependence on, the fishery;

3) The economics of the fishery;

4) The capability of the fishing vessels used in the fishery to engage in other fisheries;

5) The social and cultural framework relevant to the fishery; and

6) Other relevant factors.

There are currently approximately one dozen fisheries which have federal limited entry systems in some stage of approval or implementation, and several dozen limited entry systems in some form implemented under individual state jurisdiction (Gimbel, 1994).

It is also true that some form of limited entry or access is used in almost all other natural resource industries -- oil and gas, timber, grazing -- and in some of these industries has been used since the turn of the century. It is generally used in cases where a public trust resource (owned by "the public", as fish are) is used for private commercial purposes.

What are the Principal Forms of Entry, or Access Limitation?

There are currently three major forms of limited entry in use in fisheries:

1) License Limitation

This is where a limited number of licenses are issued to participate in the fishery in general, as is done in the salmon fishery in Alaska. License limitation has been used in cases where there are too many fishing operations for anyone to make a sufficient profit. What is limited is how many people, or fishing operations or vessels, are in the fishery. People generally enter and leave the fishery by buying and selling licenses from each other.

In the Alaska salmon fishery, for example, a "points" system was developed to decide which fishermen got licenses to fish at the beginning of the limited entry system in the 1970s. This "points" system took into account a fisherman's historic landings, whether the fisherman lived in a rural or urban area, and other factors. The licenses were specific to each gear (troll, seine, set net, etc.) and each area of Alaska (Bristol Bay, Prince William Sound, etc.). Licenses were issued to people, not corporations or vessels, and each fishermen could hold only one license in each gear/area (ie., a Bristol Bay set net, or Prince William Sound purse seine), to avoid anyone monopolizing the fishery. The licenses are sold on an open market, among fishermen (not to or from the government). The cost of these licenses varies according to how profitable the fishery is (the more profitable the fishery, the more the license costs), but they are generally fairly expensive because a fisherman has to buy a "whole" operation -- that is, a fisherman is either in or out of the fishery depending on whether or not they have a license. The profitability and other conditions in the fishery are monitored by the Alaska Limited Entry Commission set up by the Alaska legislature. There are actually more licenses now than there were at the beginning of the system, because the fishery has been judged to be able to support a larger number of fishermen now than in the 1970s (Rettig and Ginter, 1980; Muse, 1995).

2) Individual Transferable Quotas (ITQ)

This is where each fisherman is given a certain number, poundage or percentage of a total allowable quota, as is done in the South Atlantic wreckfish fishery (Gavin, 1994). What is specified is the amount of fish each fisherman may land and sell each year. Such systems are used when the principal issue is the amount of fish that may be taken. The amount each fisherman may take can be changed at any time by fishermen buying and selling ITQ shares from each other.

For example, in the South Atlantic wreckfish fishery each fisherman with wreckfish landings over a certain threshold amount in a qualifying period was issued ITQ shares, generally in the amount of the average of their landings in the qualifying period. As with the licenses in Alaska salmon, these ITQ are the property of the owner until the owner decides to sell or give them away. Each ITQ share allows the fisherman to land and sell a certain amount of wreckfish each year. ITQ

shares may be issued in fairly small denominations -- say 100 pounds -- which makes their cost fairly low. This enables fishermen to buy in or sell out, or adjust their landings each year, at much less cost than under a license limitation system where they have to buy in or sell out entirely.

3) Gear-based Effort Limitation

This is where what is limited is the amount of gear in the fishery, as in done in the Florida spiny lobster fishery. In this fishery, each fisherman was given "certificates" for a certain number of lobster traps. As with ITQ shares, the fishermen buy and sell these certificates from each other. Such systems are used when the amount of gear is the problem in the fishery, as opposed to the number of people or the amount of the catch.

In the Florida spiny lobster fishery, for example, trap "certificates" were issued to each fisherman based on their landings of lobster during a qualifying period. Each certificate is for the use of one trap, and as in the other two cases described above these certificates are the property of the owner until he or she decides to sell them. No fisherman may own or control more than 1.5% of the total number of trap certificates, to avoid any monopoly. Similar to the wreckfish ITQ but different from the Alaska salmon license limitation system, the spiny lobster trap certificates sell for fairly low prices, allowing fishermen to buy in or sell out or adjust their operations at fairly low cost. The spiny lobster trap certificate system has in addition a "reduction" feature -- the total number of certificates outstanding was reduced 10% each year across the board (that is, a fisherman who owns 1,000 certificates surrenders 100, a fisherman who owns 100 certificates surrenders 10, and so on) as long as the total lobster catch remained relatively constant. This feature was included because both fishermen and fishery managers felt that the same total catch of lobster could be taken with significantly fewer traps, and the reduction was halted in 1996 in order to evaluate the status of the system. Each fisherman, however, decides how many traps they will fish by buying and selling certificates (GMFMC, 1992).

Summary

The three limited entry systems set out above are examples of the different kinds of systems which have been used in different fisheries, all of which were designed to solve specific problems defined by both fishermen and fishery managers. All have achieved different results, and all have been revised and amended as new problems and issues emerged in the different fisheries and as different problems with the systems themselves became apparent. When we consider potential limited entry or access systems for North Carolina fisheries, it is important to learn from both the progress and the mistakes made in these other systems.

Questions with Respect to Limited Entry Systems

If any fishery in North Carolina were to be considered for some form of limited entry, the following questions must be addressed:

1) What is the problem that needs to be solved? Are there too many fishermen or fishing units in the fishery? Too much gear? Too much effort? Is the available amount of fishery resource too small for the number of fishermen in the fishery? Are there social or economic conflicts in the fishery, or among fisheries? Are fishermen spending more money than they need to in order to catch the available amount of the fishery resource?

2) What is the appropriate unit of effort to consider limiting? Number of fishermen or fishing vessels? Amount of gear?

3) If a limited entry or access system were set up, how would the initial fishing privileges be assigned? The answer to this question would depend on the problem we are trying to solve. The usual procedure is to issue the initial privileges -- licenses, ITQs, gear certificates -- on the basis of historical participation in the fishery, which of course must be documented. For example, if we decided to limited the number of fishermen we would need records of who had been in the fishery.

If the system were based on gear or catch, we would need records of those things for each individual fisherman or fishing unit.

4) How would fishermen get in or out of the fishery, or adjust their fishing operations? All limited entry systems must have a way for new fishermen to get into the fishery. The most common way to do this is to make the privileges marketable, so that fishermen buy and sell them from each other subject to anti-monopoly and certain other constraints. Alternatively, licenses could be surrendered to the state for reissue.

5) How would the system be administered, and how would it be paid for? It is difficult for fishery managers to administer and enforce even current fishery regulations, and limited entry systems are often initially expensive to set up and complex to administer. Provisions for paying for these administrative and enforcement costs would have to be made.

6) Are there special conditions in the fishery that would have to be taken into account? For example, in North Carolina fishermen often fish in several different fisheries through the year. If a limited entry or access systems were set up for certain fisheries, how would that affect other fisheries?

The Fisheries We Evaluated

As a result of our technical evaluations, and with the advice of the participants at the first workshop series, we selected three fisheries for evaluation at the second workshop. Limited entry may not be appropriate for any or all of these fisheries, and there may be other fisheries besides these for which limited entry alternatives should be discussed. The following fisheries were selected because 1) all of them show some evidence of effort above the level necessary to harvest the available resource; 2) they were all mentioned by at least some workshop participants; and 3) because they cover a range of different types of fishing.

We used this approach because to be well-developed and legally defensible any system of entry or effort limitation must be addressed towards specific problems, issues and objectives. More generic systems of entry or access limitation, such as those which might limit entry or effort in North Carolina fisheries as a whole without regard to specific fisheries, would have to identify the problems, issues, objectives and potential impacts of alternative approaches for such generic systems in the manner which we have done for our example fisheries. We did not consider such generic systems in this project.

1) The Crab Pot Fishery

The general consensus seems to be that although the crab catch fluctuates with environmental conditions, the total number of crab pots and fishermen in the crab fishery has been increasing (see Figure 7.1). The degree of increase varies from one part of the state to another, but some degree of economic inefficiency, social conflict, and possible biological impact appear to be present in the fishery statewide.

2) The Ocracoke-Core Sound Pound Net Fishery

Although the situation varies from one part of the state to another, in the Ocracoke-Core Sound area in particicular there is an increase in the number of pound nets being registered and set. Some of this increase appears to be due to fears over possible limitations on pound nets, and some is due to "reserving" or "protecting" space on the water.

3) The Ocean Summer Flounder Fishery

This fishery is presently under a state-by-state allocation quota established by the Regional Fishery Management Councils. In 1995 the North Carolina commercial fishing industry requested that a North Carolina state license limitation system be established for the fishery because of the quota being filled too quickly, and by in part by boats which had not traditionally been involved in the fishery in North Carolina. Such a temporary system was authorized by the General Assembly in

1995, and has been established by rule by the NC Marine Fisheries Commission. Under this system, the licenses to land summer flounder in North Carolina are limited to those fishermen who landed at least 1,000 pounds of summer flounder in two of the three years prior to the establishment of the system. Even with this temporary system in place, the North Carolina quota has still been filled in shorter and shorter time periods each year.

We would emphasize that all three of these fisheries have *both* a demonstrable excess of fishing effort with respect to the available fishery resource *and* some fishermen engaged in the fishery who requested a discussion of the potential application of limited entry systems to their fishery. At the second workshop, the majority of the discussion centered around the crab pot fishery. Pound nets were discussed briefly, and in more depth at separate meetings with pound net fishermen in Ocracoke and Cedar Island. The ocean summer flounder fishery, which is already under a temporary limited entry system, received little or no attention at the workshops because few workshop attendees engaged in that fishery. We will include it in this discussion because the questions concerning the continuation of the current limitation system are the same questions which must be addressed if limited access systems are to be applied to any of these fisheries.

The Objectives of a Limited Entry, or Access System

Through the workshop process, we developed a set of objectives towards which any potential limited entry or access system would be directed:

1) To control, or reduce, the effort in the fisheries under consideration so that the effort more closely matches the available fishery resource;

2) To increase stability in the fisheries, and promote maximum net incomes for fishermen;

3) To promote flexibility for fishermen in their fishing operations;

4) To avoid conflict among fishermen and between fishermen and other marine users;

5) To ensure that fishermen who have traditionally fished in the fisheries under consideration be able to continue to due so, as much as possible in their traditional fishing patterns; and

6) To make management of the fisheries more efficient and effective.

The Management Alternatives

At the second workshop series the following alternatives were presented for discussion, although not all alternatives were discussed at all workshop locations.

1) The Status Quo -- This is the "no change" alternative, meaning that the management systems currently in place for each fishery would remain in effect with no changes, with one important note: *The moratorium would no longer be in place*. We emphasized this at the workshops because the current moratorium cannot be permanent. At some point North Carolina either has to let the moratorium expire and go back to the previous open access situation, or design a new system which might control access.

2) An Income-Dependent Endorsement to Sell -- Many fishermen at the first workshop felt that effort would be reduced and controlled sufficiently by making possession of an Endorsement to Sell (ETS) dependent on having a certain minimum percentage of your personal income from commercial fishing. For our evaluation, we assumed that level of dependence to be 50% of an individual's *earned* income (that is, exclusive of such things as investment or retirement income).

3) License limitation -- Under this alternative, licenses to participate in the fishery would be issued to a number of "initial qualifiers". Initial qualifiers might be those fishermen who had a valid commercial fishing license over a qualifying period, probably three years (1994-97, for example), and had landed more than a certain amount of fish in at least two of those three years. These parameters could be adjusted to fit the objectives of initial allocation of privileges in any particular fishery. After the initial issuance of licenses, the total number of licenses would remain the same;

that is, they would not increase above the total number originally issued, unless a specific policy decision to do so were made. An appropriate method would be worked out for the transfer of these licenses.

4) Individual Transferable Quotas (ITQ) -- Under this alternative, each fishermen might be issued "quota shares," or ITQs, based on their average catch over a qualifying period (1994-97, for example). These ITQs would be issued in denominations of, for example, 100 pounds, so that a fisherman who had landed an average of 1,000 pounds of fish per year would be issued 10 100-pound ITQs. Each fisherman would then be limited to landing that amount of the limited species of fish per year. An appropriate method would be worked out to allow fishermen to change the amount of ITQ they held; that is, to change the amount of fish they were entitled to land and sell.

5) Gear Certificates -- Under this alternative, each fisherman might be issued certificates for the amount of gear they had used in the fishery under the qualifying period (1994-97, for example). Thus, a fisherman who has used 500 crab pots, a certain length of pound net lead and number of pounds, or a certain amount of flounder gear would be issued gear certificates in those amounts. An appropriate method would be worked out to allow fishermen to change the amount of gear each was allowed to use.

6) Other Alternatives -- At each workshop we encouraged participants to suggest other alternatives, or combinations of those noted above. These suggestions are summarized below.

Criteria for Evaluating the Alternatives

We listed specific criteria for considering the impact of each of the alternatives for each fishery at the second workshop:

1) Effort Control or Reduction -- Would the alternative control or reduce fishing effort?

2) Fishermen Flexibility -- Would the alternative give the fisherman flexibility to adjust their fishing operations?

3) Biological Impact -- Would the alternative have a noticeable effect on the fish population or habitat?

4) Economic Impact -- What would the economic impact of the alternative be on the individual fisherman and the industry as a whole (prices, net profits, marketability, etc.)?

5) Social Impact -- Would the alternative alter fishing patterns? Would it effect the fishermen's families or communities? Would it be fair and equitable to different groups of fishermen?

6) Enforcement and Administration -- Would the alternative be easy or difficult to put into place? Would it make regulations easier to enforce? Would it be difficult for the fishermen to comply with?

7) Impact on Other Fisheries -- How would the alternative for each fishery affect other fisheries or fishermen, especially fishermen who fish in several fisheries throughout the year?

8) Other Criteria -- Are there other things we should consider in terms of the potential impact of these alternatives?

It is important to note that in the workshops we did not ask the participants whether they PREFERRED each alternative, or whether they did or did not want to see each alternative ADOPTED as a law or policy. We were interested only in what the PROBABLE EFFECTS of each alternative might be.

Each participant had a handout on which they could record their own evaluation (see Appendix III-B). We recorded the group's evaluation and comments on a larger version of the chart for everyone to see.

The Results of the Evaluations

The following are the results of the discussions at the second workshops by fishery, noting differences from region to region where appropriate.

The Blue Crab Pot Fishery

'Status Quo' -- There was general consensus at all the workshops that under the 'status quo' option the trend would be negative in all areas of evaluation; that is, there would continue to be increasing numbers of pots and fishermen in the fishery, with negative consequences such as declining economic efficiency (i.e., catch per pot) and increased conflict among fishermen. It was noted that other fisheries such as gillnet, haul net, trawl and pound net fisheries would be negatively affected by increased numbers of pots.

Income-Dependent Endorsement to Sell (ETS) -- Most workshop participants felt that this alternative, if it were the only provision implemented, would either have little or no effect on actual effort control or reduction, or that any effect would be short-run; that is, that even if effort was reduced in the short run it would continue to rise in the long run even with the income-dependent ETS in place. The economic and social impacts would be generally positive for those who would qualify for the endorsement, but negative for those who would be excluded. The subsistence portion of these negative impacts would be somewhat addressed if the so-called 'dabbler's' license were developed for individuals to fish a certain number of crab pots with a no-sale provision, but a substantial number of individuals who currently fish crab pots and sell their catch would be prohibited from continuing to do so under this option. Some participants commented that this alternative might promote a more 'professional' fishery, and some commented that effort might be displaced into other fisheries.

License Limitation -- There was some question as to whether controlling the number of licenses alone would control or reduce the number of pots in the water. It was suggested at several of the workshops that the combination of license limitation and a limit on the number of pots per license

(similar to a program recently implemented in Maryland) would be a much more effective effort control, so that alternative was evaluated separately. It was noted that there would be a significant 'in/out' phenomenon associated with a license limitation system (good for those with licenses; bad for those without them), and that fisherman flexibility would be reduced (again, more flexible for those 'in'; less flexible for those 'out'). The potential for displacement of effort into other fisheries was mentioned, as was the positive effect of having a more professional fishery. It was also noted that a license limitation system alone, if the licenses were marketable among fishermen, might lead to significant costs of entry (the requirement to purchase a full license) compared to some of the other alternatives where smaller portions of a fishing operation (such as gear certificates) could be acquired through a similar system of marketability..

Individual Transferable Quotas (ITQ) -- This alternative was not evaluated at any of the workshops because there is no overall quota for blue crab, nor is one being contemplated. ITQs only makes sense in fisheries with a total annual quota which must be enforced and allocated. In the ocean summer flounder fishery, for example, where there is a quota, the issue of ITQs may arise.

Gear Certificates -- This alternative received very mixed evaluations. On the one hand, it is one option that would actually cap the total number of pots in the fishery. However, it would be extremely difficult to determine how to distribute the original gear certificates to reflect the number of pots each fisherman actually has in use because there is no formal, documented record of the number of pots each fisherman currently uses, and such a system may be costly and complex to set up, administer and enforce. It would, however, allow fishermen maximum flexibility in adjusting their fishing operations and allow new entrants to enter the fishery at relatively low cost.

License Share System -- This option, a combination of those alternatives discussed at the workshops, was developed at a separate meeting called by approximately 45 blue crabbers involved in the Blue Crab Data Gathering Project funded under the North Carolina Fishing Industry Grants Program after our third workshop series. One of the Principal Investigators on our project was invited to this meeting as a resource person. It is included here because it is essentially an exten-

sion of the alternatives and discussions of our workshop series, and because it is easily arrayed against the other limited entry alternatives against our evaluative criteria, as we have done in Figure 9.1 and Appendix IV. Under this system each fisherman would be issued licenses in quarter share increments, with each quarter license share limited to the use of 150 pots. A full license would be limited to 600 pots, hard crab and peeler pots combined, in the water at any given time. The initial shares would be issued based on the landings of each fishermen in a qualifying period, with quarter, half, three-quarter and full shares being issued to fishermen based on their historic catch level. Thereafter, licenses would be transferable in quarter-share increments. This new alternative arose out of three concerns in the discussion of license limitation: 1) the potentially high cost of full licenses if that were the only option; 2) the need to take into account the different sizes of crab fishing operations throughout the state; and 3) the need of fishermen to periodically adjust the size of their fishing operations and for new entrants to be able to enter the fishery at lower cost. This option has the features of the license limitation with a cap on pots, but provides flexibility in that the licenses are available in quarter-share increments which allows more flexibility and lower cost entry.

The detailed questions which would have to be addressed in the development of any potential limited entry system for the crab pot fishery are set out in Figure 9.2 and Appendix III-C.

Other Issues

Several other issues were mentioned with respect to any potential limited entry system for crab pots:

1) Consideration should be given to regional differences in the fishery. The possibility of different 'registration areas' was mentioned.

2) The issue of peeler pots was raised; how would peeler pots count in a limitation system?

3) The possibility of different limitations for full- and part-time fishermen was raised.

4) Some participants questioned whether it was fair to limit participation in one fishery but not others.

5) The possibility of some form of "owner/operator" provision was raised; that the owner or licensee would have to be present for the boat to fish.

6) A concern was raised over the potential for an increase in crab trawl effort after the total number of crab pots in the fishery had been limited. This would have the potential to shift a higher proportion of the crab catch to the trawl fishery, and would have to be addressed in a crab fishery management plan.

The Pound Net Fishery

At the second workshop, several pound net fishermen from the Ocracoke-Core Sound area asked that we meet with fishermen from their area to discuss the issue of the increasing number of pound nets in that area. We held two such meetings, using the same approximate format described above. In these workshops the discussion focused on three alternatives: 1) the status quo; 2) an income dependent ETS; and 3) some form of license limitation. The results are as follows.

The Status Quo

The analysis differed somewhat between participants at Ocracoke and Cedar Island. While both felt that the number of pound nets was increasing, and that some degree of problem was present (lower yields per net, conflict), the Ocracoke participants definitely felt that their area was "saturated" to capacity with pounds while the Cedar Island participants felt that the number of pounds in their area fluctuated with fish availability, weather, fish prices and other factors over the years. Effects of increasing number of pounds were noted on trawl and long haul fisheries.

Income-Dependent ETS

Participants in both locations felt that the income-dependent ETS would have no effect on the pound net issue, because virtually all of the current pound netters have high levels of dependence on commercial fishing and would qualify under any income-dependence criteria, as would any new entrant who wished to set out new pound net sets.

License Limitation

Participants in both locations felt that some form of limitation on people or pounds might have positive effects. The main difference was that the participants in Ocracoke brought up the idea of a cap on the number of pounds ("pockets") per fisherman/operation, while the Cedar Island participants brought up the idea of a density-based limitation: For example; 1) defining pound net areas; 2) "grandfathering" the current set-holders into the system; and 3) requiring that any further sets registered be a minimum distance from current sets.

Other Issues

1) Participants at both locations felt that the records of existing sets should be clarified and documented to reflect what was actually in the waters, as opposed to what was "on paper".

2) There was a general feeling that enforcement of existing pound net regulation could be more complete.

3) The possibility of some form of "owner/operator" provision was raised; that the registrant of the set would have to be present for the set to be fished.

4) The Ocracoke participants felt that some portion of the increase in pounds in their area was due to fishermen from outside of their area (from Core Sound, in particular), and expressed concern that the fishing alternatives from their Ocracoke base were limited.

The detailed questions which would have to be addressed in the development of any potential limited entry system for the pound net fishery are set out in Figure 9.3 and Appendix III-C.

The Ocean Summer Flounder Fishery

As noted above, there was very little discussion of the ocean summer flounder fishery at the workshops because very few workshop participants were familiar with that fishery. It is, however, currently under a license limitation system which was created through legislation intended to be a temporary stop-gap in the growth of the fishery until a more permanent system could be developed, potentially in conjunction with the moratorium. The questions which would have to be addressed in the development of any potential permanent limited entry system for ocean summer flounder are set out in Figure 9.4 and Appendix III-C.

Other Fisheries Discussed

At the Raleigh workshops the participants discussed the shrimp trawl fishery in terms of potential limited entry systems. The major concern at this workshop were the issues of bycatch and habitat impacts from trawling. After evaluation with the format described above, it was generally concluded that the limited entry systems under consideration would have little potential for impact on the bycatch and habitat problems compared to other management measures such as gear requirements (finfish excluders) and time and area restrictions.

Using the Results of the Workshops

Fishermen and fishery policy-makers and managers involved in each fishery or fishery system under consideration for limited entry or access must ultimately decide which limited entry or access system, if any, is appropriate for that fishery or system. Building upon the results of our workshops, for example, the crab fishermen involved in the Blue Crab Data Gathering Project have produced such a proposal which we have included in Figure 9.5. For the other fisheries such

as pound net and ocean summer flounder, discussions among fishery constituents and policy-makers and managers would have to center around the questions set out in Figures 9.3 and 9.4. The results of our data collection regarding fishermen's general attitudes towards and perceptions of limited entry are noted in Section 6 of this report.

We would once again emphasize that the approach we took in this project was to focus on *specific fisheries* where there is both a demonstrable excess of fishing effort and where fishermen have expressed some interest in the subject of limited entry or access. Discussion of entry or access limitations of a more general nature, such as for the commercial fishery as a whole in North Carolina, would have to be addressed towards a specific set of problems, issues and objectives such as those we have identified for our three example fisheries above. It would also be important in these discussions to take into account the relationships among fisheries in North Carolina, as demonstrated in Section 5 of this report. Any limitations on individual fisheries may have effects on other fisheries, both those which are directly related through biology, ecology or fishing patterns, and even on fisheries which are not directly related but may be affected through market factors or simple displacement effects.

Figure 9.1: Impact Matrix for Blue Crab Pot Fishery Limited Entry Alternatives

ALTERNATIVE	CRITERIA					
	1) EF/RD ST/LT	2) F/FLX ST/LT	3) BIO ST/LT	4) S/E ST/LT	5) A/E ST/LT	6) O/F ST/LT**
1) STATUS QUO	L/L	M/L	L/L	M/L	M/L	M/L
2) INC. DEP./ETS	M/L	M/L*	M/L	M/L*	M/L	L/L
3) LICENSE LIM.	M/L	M/L*	M/L	M/L*	M/M	M/L
4) ITQ	NA	NA	NA	NA	NA	NA
5) TRAP CERT.	H/H	M/H*	M/H	M/M*	L/M	M/M
6) LL W/POT CAP	H/H	M/L*	M/M	M/L*	M/M	M/M
7) LICENSE SHARES	H/H	M/H*	M/M	M/M*	M/M	M/M

ALTERNATIVES
1) STATUS QUO -- NO CHANGE IN CURRENT MANAGEMENT
2) INCOME DEPENDENT ENDORSEMENT TO SELL
3) LICENSE LIMITATION
4) INDIVIDUAL TRANSFERABLE QUOTAS
5) TRANSFERABLE TRAP CERTIFICATES
6) LICENSE LIMITATION WITH 300 POT CAP
7) LICENSE SHARE SYSTEM - 600 POT LIMIT IN 150 POT INCREMENTS

CRITERIA
1) EFFORT CONTROL OR REDUCTION POTENTIAL
2) FISHERMEN FLEXIBILITY
3) BIOLOGICAL IMPACT
4) SOCIO-ECONOMIC IMPACT
5) ADMINISTRATION AND ENFORCEMENT POTENTIAL
6) IMPACT ON OTHER FISHERIES

NOTES
(*) NEGATIVE FOR THOSE WITHOUT THE PRIVILEGE; POSITIVE FOR THOSE WITH THE PRIVILEGE
(**) SHORT TERM/LONG TERM

Figure 9.2: Blue Crab Pot Fishery Issues

1) The problem -- Too many pots, and to some extent too many fishermen, in the fishery
2) The appropriate unit of effort to limit -- Number of fishermen, and number of pots
3) How would initial privileges be assigned?
    A) Number of fishermen -- Issue original licenses to
        1) All holders of crab licenses?
        2) All holders of crab licenses with minimum landings?
            a) Any landings?
            b) Minimum landings (1,000 lbs; 6,000 lbs)?
            c) Minimum landings in two of three years?
    B) Licenses available in fractions, or "shares"?
    B) Number of pots -- Limit each licensee to
        1) 300/400/500/600? pots per license
        2) Gradually declining limit (600 first year; 500 second year; 400 third year)?
        3) Total limit per boat/operation?
4) How would licenses be transferred?
    A) Marketable licenses?
        1) With "apprenticeship" requirement?
        2) With anti-monopoly cap (no person could hold more than a certain number of licenses)?
    B) Non-marketable licenses?
        1) Must surrender to state for reissue
            a) By lottery
            b) To waiting list
        2) Transfer within immediate family?
5) How would the system be administered and paid for?
    A) Annual license fee?
    B) Annual fee for pot tags?
    C) If marketable licenses, license transfer fee?
6) Special conditions?
    A) Owner/operator requirement?
    B) 50% earned income requirement?

Figure 9.3: Ocracoke/Core Sound Pound Net Fishery Issues

1) The problem -- Too Many Pounds ("Pockets" and leads)
2) The appropriate unit of effort to limit -- Number of Pounds ("Pockets"; Lead Length)?
3) How would initial privileges be assigned?
    A) Issue licenses to current registrants?
        1) All current registrants?
        2) Current registrants with threshold qualification (landings; sets in use)?
    B) Limit number of pounds ("pockets")/lead length per license?
        1) 15 Pounds?
        2) Gradually declining limit per license (25 first year; 20 second year; 15 third year)?
4) How would licenses be transferred?
    A) Marketable licenses?
        1) With "apprenticeship" requirement"
        2) With "anti-monopoly" cap (no person could hold more than a certain number of licenses)?
    B) Non-marketable licenses
        1) Must surrender licenses to state for reissue
            a) By lottery?
            b) To waiting list
        2) Transfer within immediate family?
5) How would the system be administered and paid for?
    A) Annual license fee?
    B) Annual fee for pound tags (pounds would have to be tagged!)?
    C) If marketable licenses, license transfer fee?
6) Special conditions?
    A) Owner/operator requirement?
    B) Designated areas and density restrictions?

Figure 9.4: Ocean Summer Flounder Fishery Issues

1) The problem -- Too Many Fishing Units for Limited Quota
2) The appropriate unit of effort to limit -- Number of Fishing Units (and/or Landings per Unit)?
3) How would initial privileges be assigned?
    A) Issue licenses to current licensees?
        1) All current licensees?
        2) Current licensees with threshold qualification (landings)?
    B) Issue Individual Transferable Quota (ITQ) to current licensees based on landings history?
4) How would licenses be transferred?
    A) Marketable licenses?
        1) With "apprenticeship" requirement?
        2) With "anti-monopoly" cap (no person could hold more than a certain number of licenses)?
    B) Non-marketable licenses
        1) Must surrender licenses to state for reissue
            a) By lottery?
            b) To waiting list
        2) Transfer within immediate family?
    C) ITQ
        1) Marketable ITQ
            a) With "apprenticeship" requirement?
            b) With "anti-monopoly" cap (no person could hold more than a certain amount of ITQ)?
        2) Non-marketable ITQ?
5) How would the system be administered and paid for?
    A) If license limitation,
        1) Annual license fee?
        2) If marketable licenses, license transfer fee?
    B) If ITQ,
        1) Annual ITQ fee?
        2) If marketable ITQ, ITQ transfer fee?
6) Special conditions?

Figure 9.5: North Carolina Commercial Crab Pot Management Utilizing A License Share System

[Draft proposal of the Blue Crab Data Gathering Project group]

Goal: To perpetuate a sustainable and economically viable crab pot fishery for the future.

Objectives:

1) To encourage and support a professional commercial crab pot fishery.
2) To identify and document the individuals fishing pots for the blue crab.
3) To provide a management system for the blue crab through crab license stabilization and effort management.
4) To provide revenues dedicated to the enhancement, assessment and management of the North Carolina blue crab resource.

Principles of License Share System:

1) Licenses issued to current crab license holders with a history of landings in the crab pot fishery.

2) One full license allows the use of up to 600 pots. License shares available in increments of 150 (quarter license); 300 (half license); 450 (three quarters); and 600 (full).

3) License shares marketable among licensed commercial fishermen, including ability to transfer within families at no cost.

4) Limit of one full license per fisherman.

5) Initial license shares issued based on crab pot landings history.

6) License owner must be on board for vessel to use pots, with provisions for emergency use by designated individuals.

Procedure:

1) Above principles to be recommended to the Moratorium Steering Committee at April meeting for inclusion in public hearing draft.

2) Detail of system to be worked out by crab pot industry participants for inclusion in final Moratorium Steering Committee recommendations.

Section 10: Summary

In this section we will briefly summarize and discuss both the general characteristics of North Carolina fisheries and fishers emerging from the data collection phase of our project, and the major points regarding the potential for limited entry systems in North Carolina fisheries. In this discussion, we will emphasize those point of particular relevance to the charge of the Moratorium Steering Committee.

North Carolina Fisheries and Fishers

There are several summary points to be made concerning the general characteristics of North Carolina fisheries and fishers relevant to the charge of the Moratorium Steering Committee:

1) The vast majority of the commercially licenses fishing vessels, and by implication the fishers who use them, are not in fact engaged in commercial fishing in that they either do not sell any of their catch or they do not have a significant degree of economic dependence on the sale of their catch. This is borne out by the number of fishers who hold one or more Endorsements to Sell issued under the current system (6,539 in the 1994-95 license year, of which 1,176 recorded no sales of fish) compared to the number of commercial vessel licenses (21,941 in the 1994-95 license year, of which 6,298 listed themselves as full time commercial; 6,051 listed themselves as part time commercial; 9,338 listed themselves as pleasure fishermen, and 254 listed themselves as charter or headboat operations) (DMF, 1995). The principal reasons for holding a commercial vessel license even though the holder may have no intent to sell or to substantially depend on commercial fishing are these:

1) The current regulatory structure requires that any gear defined as "commercial" by the state, when used from a boat, requires the boat owner to obtain a commercial vessel license. Thus, when a recreational fisher wishes to use even a small amount of net, for example, from a vessel, they are required to obtain a commercial vessel license for that vessel. Such people have historically been recorded as "commercial" although they may have no intent to sell fish or substantially depend on commercial fishing.

2) Possession of a commercial vessel license entitles the holder to benefits such as exemption from certain fuel taxes, benefits generally designed to aid the commercial fishing industry.

3) In certain fisheries where there are different commercial and recreational size, season or catch limits, the possession of a commercial license may entitle the holder to catch or retain different amounts of fish.

4) In certain cases where a fisher holds both a commercial vessel license and an ETS, or before the creation of the ETS when the fisher held the commercial vessel license alone, the intent may be to create certain business situations where, for example, tax advantages acrue to the holders of these licenses even though their primary purpose is not to engage in the commercial fishing industry as a principal business or occupation.

These factors have historically combined to result in the apparent mismatch among the number of fishers with significant dependence on commercial fishing; the number of fishers with the ETS; and the number of fishers with commercial vessel licenses. The data relevant to these differences in economic dependence are contained in Section 4 of this report. Using this data, the specific impacts of options for definitions of 'a commercial fisherman,' levels of dependence required for obtaining an ETS, gear limitations and other options can be estimated for the use of the Moratorium Steering Committee.

It is important to note that fishers may gain benefits other than commercial dependence from fishing. The task of the Moratorium Steering Committee is to recommend a system of policy and management which takes into account the needs of these other fishers as well, and our data set contains information on both commercial and other fishers.

2) The fisheries and fishers of North Carolina are significantly interrelated through common patterns of "annual rounds" of fishing. As set out in Section 5, these patterns are relatively stable over time and vary from one section of the state to another.

3) The fishers of North Carolina are not a homogeneous group. For almost all of the demographic characteristics summarized in this report for which central tendency figures such as mean or median were reported, the standard deviation, a measure of the variation in the sample away from the mean, or average, was high. Some of this variation can be explained with reference to different categories of fisher. For example, differences in age, education, socio-economic status, household size, and average vessel size and value were noted between full time and part time or recreational fishers.

4) The full time commercial fishers have relatively low levels of education and training, which is reflected in their perceptions of their occupational alternatives outside of fishing.

5) There are significant regional differences in the characteristics of fishers. For example, the general characteristics of fishers and fishing in Carteret and New Hanover counties, which are more urbanized, differed from those of fishers and fishing in the Albemarle and Pamlico Sound areas, which are more rural. These differences reflect not only different fisheries and ecological characteristics of the areas, but also the different potential impacts of new management systems on the fishers and their communities.

The Potential for Limited Entry in North Carolina Fisheries

The discussion of the potential for some form of entry or access limitation in North Carolina fisheries is driven by two general factors. The first is a general fear of increasing numbers of fishers coming into North Carolina in general due to events occurring outside of North Carolina, in particular the Florida "net ban", the collapse of the New England groundfish fishery, access limitation programs in other states, and the perceived relative abundance of fish or lack of regulation in North Carolina fisheries.

The second factor is concern over specific fisheries in terms of the actual or potential effort which has or could be applied to these fisheries. These are fisheries where specific concern has devel-

oped over the mismatch between the amount of effort in the fishery and the available amount of the fishery resource. The blue crab, pound net and ocean summer flounder fisheries noted in Section 9 of this report are examples. The amount of excess effort in these fisheries has led variously to decreased net profits for fishers, increased competition and conflict among fishers for the fishery resource and for 'space,' increased difficulty in administration, monitoring and enforcement, and the potential for harmful biological or ecological effects.

The consideration of limited entry or access systems always involves tradeoffs. In any limited system, some fishers are 'in' and others are 'out' subject to the particular rules of the limited entry program, although the groups of people who hold these privileges must be able to change over time. When these systems are initially established, some form of documentation and some rule of inclusion/exclusion must be developed to distribute the initial privileges in the fishery. These privileges must be transferable in some form; no groups of people can be issued such privileges in perpetuity without the opportunity for others to obtain those privileges. Certain features such as safeguards against monopolies and the extraction of 'economic rent' in exchange for exclusive commercial access to public trust fishery resources may be designed into the systems. The decisions of the fishery policy-makers in North Carolina will be with respect to these tradeoffs. Is the 'benefit' of increasing the net incomes of highly-economically dependent commercial fishermen worth the 'cost' of limiting access to the fishery? Are the biological and ecological 'benefits' of reducing, for example, the number of crab pots in North Carolina waters worth the 'cost' of monitoring and enforcing a gear limitation system? Is the 'benefit' of the protection of historical participation in the ocean summer flounder fishery worth the 'cost' of permanently establishing a license limitation system in that fishery? Are the 'benefits' of limiting the use of pound nets in the Ocracoke-Core Sound area to reduce social conflict among fishers worth the 'cost' of such a system? The data in this report will assist in estimating the potential dimensions of such tradeoffs.

The Form of Limited Entry Programs

There are two general options for the establishment of limited entry programs. The first is through the creation of general authority, as was done in the federal Magnuson Fisheries Conser-

vation and Management Act (MFCMA). Under the MFCMA, the Secretary of Commerce and the Regional Fishery Management Councils may create limited entry or access systems subject to the seven "national standards" of that act and the specific provisions of Section 303(b)(6) of the MFCMA concerning limited entry or access systems. Section 303(b)(6) sets out six factors which must be considered in the development of any system of limited entry or access:

1) Present participation in the fishery;
2) Historical fishing practices in, and dependence on, the fishery;
3) The economics of the fishery;
4) The capability of the fishing vessels used in the fishery to engage in other fisheries;
5) The social and cultural framework relevant to the fishery; and
6) Other relevant factors.

The North Carolina General assembly could establish such general authority, perhaps with specific legislative oversight provisions, with the responsibility for the development of such programs delegated to the Marine Fisheries Commission, the Department of Environment, Health and Natural Resources (DEHNR) or some other entity.

Second, each specific limited entry or access program could be established in detail legislatively. This is in fact how the vast majority of the existing state limited entry systems have been established -- by legislation detailing the characteristics of the system and delegating certain functions within the system, usually to the principal state fishery policy agency.

Limited entry systems which appear to fulfill their stated goals have been developed under both processes. The important feature of any limited entry policy system is that the goals, objectives, standards and procedures for the creation and operation of the system be clearly specified by whichever approach is chosen.

Support for Limited Entry in North Carolina?

As we reported in Section 6, 70% of our random sample of fishers, stratified by area of the state, who held both a commercial vessel license and an ETS agreed with the statement, "Limited entry can make fishermen better off in the long run," and 78% agreed with the statement, "Limited entry may be appropriate to some of North Carolina's fisheries." Included in this report is a general outline of a proposal for one such limited entry system (Appendix IV) for the blue crab pot fishery, a proposal which was developed subsequent to our workshop discussions by a group of crab fishermen with the intent of asking that the proposal be included in the report of the Moratorium Steering Committee for public comment. For this specific fishery, survey responses from 239 North Carolina blue crab fishermen reported that 82% supported or conditionally supported (that is, would support if fishermen had input to the design of the system) pot limits and 71% supported or conditionally supported license limitation for the blue crab fishery (Stroud, 1995).

Limits on Overall Participation, or by Fishery?

A central question before the Moratorium Steering Committee is whether -- if any limited entry system is desirable at all -- to attempt to control fishing effort by limiting *overall* participation in North Carolina fisheries, or to create systems for specific fisheries or fishery complexes.

In the overall approach, a cap might be set on the total number of commercial fishing licenses in North Carolina, which in the future would presumably be the equivalent of the current ETS system. Fishery-specific systems would be those such as the blue crab pot fishery proposal references in this report. It would also be possible to develop compatible systems for 'fishery clusters' of interrelated fisheries. There are several features of the comparison of these approaches which deserve comment:

1) Although excess effort can be demonstrated in some of our fisheries, there is currently not a demonstrable excess of effort in all of our fisheries. The impetus for the overall approach comes primarily from fear of new entrants, in particular those from other states, once the morato-

rium is lifted, rather than a demonstrated current excess of fishing effort in North Carolina fisheries generally. The objectives of any proposed overall limitation system would have to reflect this situation.

2) There is a general concern over the impact of fishery specific limited entry systems on the flexibility of fishers with respect to their 'annual rounds' of fishing. Here there are tradeoffs. It is most common for such systems to grant the initial privileges to those fishers with a recent history in the fishery, for example in the three years prior to the initiation of the system. Thereafter the privileges are traded either through a market-type system or some other mechanism. Those fishers who have fished in the limited fishery, for example the blue crab pot fishery, as part of their 'annual round' would be able to continue to do so, and the fishery would be 'stabilized' at that number of participants or amount of gear. Fishers who wished to enter the fishery thereafter would have to obtain privileges to do so, a common occurrence in other such systems. The tradeoff is between efficiency, stability and profitability in the fishery and open access for all fishers.

3) Care would have to be exercised concerning how any system of restricted privileges, overall or fishery-specific, would provide for actual effort control. In general, limiting the number of participants alone does not control fishing effort, because each unit can use increasing amounts of gear, time, etc. This is particularly true if the limitation is on an overall number of participants who would be allowed to participate in any fishery, because the potential for large effort shifts into any given fishery under such a system would be great. On the other hand, a fishery-specific approach may lead to a situation where, over time, all fisheries would eventually be brought under some form of limited entry. This is because in a situation of increasing overall effort potential each limited fishery would tend to displace potential effort into other fisheries, which would then have to be limited.

One option would be to create fishery-specific limited entry systems for all of North Carolina's fisheries at the same time, before the moratorium is lifted. This may be possible but would be

very difficult, because there may not currently be justification for such limitation in all fisheries, which would make support for such systems from the fishers questionable.

4) Attention must be devoted to the question of how any limitation system would actually function in the on-going distribution of fishing privileges. For example, in a fishery-specific system where the limited units, say crab pots, are similar in their economic fishing potential a market system for those privileges may easily develop. In an overall license limitation system for all fisheries, however, a market system would be difficult to envision because each license could be attached to such a wide range of fishing operations -- say a 100-foot trawler to a 20-foot skiff -- that a market mechanism for the trading of such licenses would be hard to imagine, except one where all of the licenses would eventually be bought by large operations with greater access to capital. In this sense, fishery-specific systems would be much easier to develop which both limited effort and provided flexibility for fishers.

Major Options for the Development of Limited Entry Systems

In summary, the major options available for the development of limited entry systems for North Carolina fisheries, if such systems are desired, are: 1) Legislative development of fishery-specific systems; or 2) Legislatively-created authority for the development of limited entry systems, with authority delegated to a body such as the Marine Fisheries Commission or DEHNR, perhaps with the stipulation that such systems could only be approved in the context of an approved fishery management plan for the subject fishery. Either approach would have to clearly specify the goals, objectives, standards and procedures for the creation of such systems. Either approach could produce either overall or fishery-specific systems. All alternative form of entry or access limitation should be considered in each case, and the impact of those alternatives clearly analyzed based on adequate biological, economic and social data. Finally, involvement of the fishing constituencies in the development of limited entry systems, as we have done with the workshops in this project, is critical to adequate design and acceptance of any potential system.

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Appendix I

Moratorium Interview Log

Commercial ETS

ID	Interviewed	Quick Interview	Quit Claim	Declined	No Contact	Deceased	Moved No #
101	X						
102	X						
103	X						
104	X						
105	X						
106	X						
107	X						
108	X						
109	X						
110	X						
112	X						
111	X						
119	X						
124	X						
121	X						
							X
113	X						
			X				
							X
122	X						
							X
114	X						
				X			
							X
				X			
125		X					
							X
			X				
120	X						
123	X						
116	X						
117	X						
118	X						
201	X						
202	X						
203	X						
204	X						
205	X						
206	X						

207	X						
208	X						
209	X						
210	X						
211	X						
212	X						
216	X						
228	X						
222	X						
218	X						
224	X						
223	X						
225	X						
							X
							X
231		X					
229	X						
							X
221	X						
							X
226	X						
232		X					
233		X					
215	X						
220	X						
214	X						
			X				
				X			
							X
						X	
			X				
							X
230	X						
217	X						
213	X						
227	X						
219	X						
323	X						
329	X						
307	X						
311	X						
312	X						
326	X						
324	X						

322	X						
325	X						
321	X						
304	X						
305	X						
302	X						
306	X						
308	X						
310	X						
313	X						
301	X						
318	X						
327	X						
316	X						
309	X						
303	X						
334	X						
331	X						
317	X						
315	X						
333	X						
328	X						
320	X						
330	X						
335	X						
332	X						
319	X						
337	X						
				X			
338	X						
336	X						
							X
				X			
359	X						
341	X						
353	X						
339	X						
345	X						
352	X						
360	X						
				X			
343	X						
						X	
344	X						

				X			
356	X						
367		X					
358	X						
342	X						
				X			
350	X						
340	X						
346	X						
				X			
348	X						
				X			
					X		
				X			
357	X						
363		X					
347	X						
361	X						
349	X						
365		X					
							X
				X			
					X		
369		X					
362		X					
					X		
					X		
368		X					
366		X					
					X		
					X		
364		X					
				X			
354	X						
355	X						
351	X						
422	X						
					X		
440	X						
435	X						
420	X						
406	X						
432	X						
408	X						

405	X						
418	X						
403	X						
407	X						
409	X						
404	X						
441	X						
437	X						
444	X						
438	X						
423	X						
446	X						
			X				
434	X						
421	X						
425	X						
433	X						
424	X						
412	X						
411	X						
410	X						
431	X						
442	X						
443	X						
447	X						
448	X						
402	X						
401	X						
419	X						
					X		
445	X						
428	X						
413	X						
429	X						
430	X						
414	X						
					X		
450		X					
439	X						
416	X						
449		X					
							X
			X				
			X				

							X
							X
							X
							X
			X				
			X				
							X
			X				
			X				
							X
454		X					
							X
				X			
417	X						
436	X						
426	X						
415	X						
427	X						
505	X						
503	X						
506	X						
519	X						
549	X						
550	X						
504	X						
					X		
520	X						
508	X						
501	X						
518	X						
502	X						
536	X						
522	X						
538	X						
517	X						
546	X						
509	X						
545	X						
510	X						
537	X						
511	X						
512	X						
516	X						
544	X						

513	X						
542	X						
514	X						
551	X						
541	X						
547	X						
539	X						
543	X						
524	X						
523	X						
548	X						
515	X						
525	X						
540	X						
521	X						
527	X						
552	X						
531	X						
507	X						
529	X						
535	X						
532	X						
528	X						
533	X						
526	X						
534	X						
530	X						
556		X					
					X		
553	X						
					X		
555		X					
				X			
							X
							X
							X
							X
			X				
							X
							X
			X				
							X
							X
							X

							X
556		X					
							X
				X			
				X			
							X
							X
TOTAL	238	18	13	16	9	2	34

*Missing ID number indicates cases in wich individual was not interviewed

Moratorium Interview Log: Inland ETS				
ID #	Interviewed	Declined	Wrong/ unlisted #	Unable to contact
601	X			
602	X			
604	X			
603	X			
606	X			
605	X			
608	X			
612	X			
613	X			
611	X			
610	X			
609	X			
607	X			
				X
614	X			
620	X			
			X	
			X	
		X		
			X	
			X	
626	X			
621	X			
628	X			
627	X			
616	X			
615	X			
619	X			
			X	
625	X			

624	X			
622	X			
			X	
617	X			
			X	
623	X			
				X
				X
618	X			
			X	
Total	28	1	8	3

Moratorium Interview Log: Commercial Non-ETS				
ID #	Interviewed	Declined	Wrong/ unlisted #	Unable to contact
701	X			
702	X			
703	X			
704	X			
705	X			
706	X			
708	X			
709	X			
710	X			
711	X			
712	X			
713	X			
714	X			
715	X			
716	X			
717	X			
718	X			
719	X			
720	X			
721	X			
722	X			
723	X			
724	X			
725	X			
726	X			
727	X			
728	X			
729	X			
730	X			

731	X			
732	X			
733	X			
734	X			
735	X			
736	X			
737	X			
738	X			
739	X			
740	X			
741	X			
742	X			
743	X			
744	X			
745	X			
746	X			
747	X			
748	X			
749	X			
750	X			
751	X			
752	X			
753	X			
754	X			
755	X			
756	X			
757	X			
758	X			
759	X			
760	X			
761	X			

762	X			
763	X			
764	X			
765	X			
766	X			
767	X			
768	X			
769	X			
770	X			
771	X			
772	X			
773	X			
774	X			
775	X			
				X
		X		
		X		
			X	
				X
			X	
		X		
			X	
			X	
		X		
				X
			X	
				X
				X
			X	
			X	
		X		
				X

				X
		X		
				X
			X	
				X
				X
		X		
		X		
			X	
			X	
			X	
				X
			X	
		X		
				X
Total	74	9	12	12

Moratorium Interview Log: ETS/NO-VESSSEL				
ID #	Interviewed	Declined	Wrong/ unlisted #	Unable to contact
801	X			
			X	
				X
			X	
			X	
802	X			
			X	
			X	
		X		
			X	
			X	
		X		
803	X			
			X	
804	X			
			X	
			X	
805	X			
			X	
			X	
806	X			
			X	
807	X			
808	X			
809	X			
			X	
810	X			
811	X			
			X	

812	X			
			X	
813	X			
814	X			
815	X			
		X		
			X	
			X	
			X	
816	X			
817	X			
818	X			
			X	
			X	
				X
			X	
819	X			
820	X			
			X	
				X
			X	
Total	20	3	24	3

Appendix II

Moratorium Study

Date:_____

Name of Respondent:_____

Address:_____

Phone:_____

ID:_____

This page will be detached

We are conducting a study of the social, cultural, and economic aspects of the North Carolina fisheries in conjunction with the North Carolina Fisheries Moratorium Steering Committee. Your participation in this study will help in assessing the potential social and economic impacts of different management options being considered for the period after the moratorium is over. This interview should take approximately 45 minutes.

Information you give will be strictly confidential. All information from this project will be presented in summary form, with no individuals identified.

If you have any questions, please call Mike Orbach at Duke University Marine Lab at (919) 504-7606 or Jeffrey Johnson at East Carolina University at (919) 328-6220.

Moratorium Study

Date:_____
Location:_____
Interviewer:_____

I. DEMOGRAPHICS

We would first like to ask you some questions to help us assess the potential social and economic impact of management alternatives.

1. ID_____

2. Gender_____

3. Age_____ (How old are you?)

4. Place of birth_____ (Where were you born?)
(If answer to 4 is not in the U.S., then ask question 4A).

4A. How long have you lived in the U.S.?_____
4B. Where were your parents born? Mother_____ Father _____

5. Place of residence_____ (Where do you currently live?)

6. Ethnicity_____ (Do you consider yourself:
1. Caucasian/white ___
2. Hispanic ___
3. Black ___
4. Asian ___
5. Other _____)

7. Education (What is your highest level of education, including any technical training?
NOTE: Probe for exact year or level. Mark numeric value)
A. Grade school level _____
B. High school level _____
C. College # of years _____ degree _____
D. Graduate or professional school level # of years _____ degree _____
E. Tech School (specify) _____

8. Marital status (What is your current marital status?)
A. Single, never married ____
B. Separated ____
C. Divorced ____
D. Widowed ____
E. Married ____
F. Other _____

9. Children Yes____ No____
A. Number of sons_____ (How many sons?)
B. Number of daughters_____ (How many daughters?)

10. Spouse Work? Yes____, No____ (Does your wife/husband work?)
(If yes, ask 10A)

10A. Wife's/Husband's Occupation_____ (What is his/her occupation?)
(NOTE: Probe for involvement in fishery business)

10B. Spouse work full time or part time?
Full _____ Part_____

11. Number of people living in household_____ (How many people live with you on a permanent basis including yourself?)

12. Number of working persons living in household_____ (Of those living with you, how many contribute income to the household including yourself?)

12A. Of these, how many are engaged in some aspect of the fishing industry?_____
(NOTE: Probe for the following information for each person engaged in fishing.)
Person 1: Relationship_____
Person 2: Relationship_____
Person 3: Relationship_____
Person 4: Relationship_____

12B. Father's occupation (if retired, what he did while working)_____

12C. Mother's occupation (if retired, what she did while working)_____

II. BOAT AND FISHING RELATED QUESTIONS

13. Do you consider yourself a:
A. Full-time commercial fisherman____
B. Part-time commercial fisherman____
C. Recreational/sport fisherman____
D. Other (specify_____)

13A. If commercial fisherman, how many years have you been a commercial fisherman?
_____

14. Are you engaged in any shore-based/non-fishing employment?
yes _____ no _____
(if yes, what?_____)

14A. What percentage of your total income is from commercial fishing? _____

FISHERIES SECTION We would like to ask you about the fisheries you were involved with last year and during the last five years.

15a. ANNUAL ROUND (most recent year, note year)

Fishery (gear type, location, species, time, # of boats used)	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	% of Fishing Income
1													
2													
3													
4													
5													
6													
7													

15B. 5-Year Fishing History

Fishery	1990	1991	1992	1993	1994
	1991	1992	1993	1994	1995

(gear, time, species, location)

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

9 _____

10 _____

11 _____

Other work?

12 _____

13 _____

16. Are you a member of a fishermen's organization(s)? _____
Which ones? _____

16A. Where do you keep your boat or boats? _____

16B. Where do you sell your catch? _____

17. Do you have a relationship with a specific dealer or dealers or do you consider yourself independent?_____

If specific relation:
17A. Does the dealer provide you with docking space?_____

17B. Does the dealer supply you with ice, bait, or other necessities?_____
If so, which ones?_____

17C. Does the dealer provide you with credit or loans?_____

18. What are the most important problems or issues in the fisheries you engage in?

19. Have you experienced any problems with other fishermen in terms of:

19A. Destruction of your gear, whether intentionally or unintentionally?_____
Type gear destroyed_____
Type fisherman responsible_____

Describe:

19B. Actual or potential (close calls) conflicts due to competition for space in or on the water?
Yes_____ No_____
Fishery or fisheries in question_____

Describe:

19C. Do you currently have or foresee any problems with boat dockage, gear storage, or the loading or unloading of gear?_____

19D. If so, what kinds of problems?_____

20. Have you considered entering other fisheries? Which ones? Why?

Fishery # _____: Gear Use Pattern
(Specify year, see attached instruction)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Gear												

Estimate of total catch by species by month

Species	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												

Supplemental Instructions

For the following gear, ask:

1. Trawl
   a. type (species and/or net type, eg. shrimp, finfish, skimmer, flynet)
   b. number per boat
   c. size (total headrope length, all nets together)
   d. average duration of each trawl (in water)
   e. average number of trawls per trip (day)
   f. average number of fishing hours per trip
   g. average total trip length (hours, days)
   h. average number of trips fished per month

2. Gillnet
   a. type (species and or net type, eg. flounder, shad, set, sink, drift)
   b. size: length (cork/leadline) and depth
   c. average soak time (ie., time between pulls)
   d. average number of sets/pulls per day
   e. average number of days fished per month

3. Pound Net
   a. type (species, eg. flounder, herring, menhaden, shrimp)
   b. number of sets fished per month
   c. average length per set (leads and pounds)
   d. average number of pounds per set
   e. average number of harvests per set per month

4. Pots
   a. type (eg. crab, fish, eel)
   b. average number in water per month
   c. average number of pots pulled per day
   d. average number of days on which pots pulled per month

5. Shellfish (hand harvest)
   a. gear type (eg. hand rake, bull rake)
   b. average hours fished per day
   c. average days fished per month

6. Mechanical Shellfish (oyster dredge, clam dredge/kicker, scallop dredge)
   a. gear type and size
   b. hours fished per day
   c. days fished per month

7. Hook and Line (troll and bandit -- note which one)
   a. number of lines and hooks per line
   b. average hours fished per day

c. average number of days fished per month

8. Longline and Trotline
   a. Length
   b. Number of hooks
   c. average soak time
   d. average number of sets per trip
   e. average total trip length (hours, days)
   f. average number of trips per month

9. Long Haul and Swipe Nets
   a. size (cork/leadline) and depth
   b. average number of sets per trip
   c. average number of trips per month

10. Channel Nets
   a. size (total headrope length)
   b. average soak time
   c. average number of sets per trip
   d. average number of trips per month

For each fishery you were engaged in last year (refer to question 15A), we would like to ask you some things about the boat, gear, crew, and nature of the fishing operation.

21. **Fishery #1** _____

A. Name of boat used _____
NC commercial fishing vessel license # _____

B. Are you the:
Non-operator Owner _____
Captain Owner _____
Captain _____
Crew _____

C. Length _____ D. Building Materials _____

E. Age _____ F. Length Owned _____ G. Financed? _____

H. Value (excluding gear) _____

I. What is your relationship with each of the people associated with the boat in this fishery?
   a. Non-operator Owner: Relationship _____
   b. Captain Owner: Relationship _____
   c. Captain: Relationship _____
   d. Crew 1: Relationship _____
   e. Crew 2: Relationship _____
   f. Crew 3: Relationship _____
   g. Crew 4: Relationship _____

J. Please give the type, size, and amount of gear you use in this fishery.
(see attached sheet)

K. What percent of your gross fishing income is earned from this fishery? _____

L. When you begin this fishery each year, what factors are involved in making your decision?

M. When you leave this fishery each year, what factors are involved in making your decision?

N. If for some reason you could no longer fish in this fishery, would you:
   1. fish for something else (if so, what?) _____
   2. get temporary shore-based work (if so, what?) _____
   3. get out of fishing entirely or find other employment (if so, what?) _____
   4. other _____

O. If you were to engage in one of these activities (refer to N), do you think you could generate:
   1. More income than you did last year from fishing for _____
   2. About the same
   3. About 3/4 as much
   4. About 1/2 as much
   5. About 1/4 as much
   6. Nothing at all

P. Could you perform these activities:
   1. Near where you presently live?
   2. Within driving distance?
   3. Somewhere within the state, but would require a move?
   4. Somewhere outside the state

22. **Fishery #2** _____
   A. Name of boat used _____
      NC commercial fishing vessel license # _____
   B. Are you the:
      Non-operator Owner _____
      Captain Owner _____
      Captain _____
      Crew _____
   C. Length _____ D. Building Materials _____
   E. Age _____ F. Length Owned _____ G. Financed? _____
   H. Value (excluding gear) _____
   I. What if your relationship with each of the people associated with the boat in this fishery?
      a. Non-operator Owner: Relationship _____
      b. Captain Owner: Relationship _____
      c. Captain: Relationship _____
      d. Crew 1: Relationship _____
      e. Crew 2: Relationship _____
      f. Crew 3: Relationship _____
      g. Crew 4: Relationship _____

J. Please give the type, size, and amount of gear you use in this fishery.
(see attached sheet)

K. What percent of your gross fishing income is earned from this fishery? _____

L. When you begin this fishery each year, what factors are involved in making your decision?

M. When you leave this fishery each year, what factors are involved in making your decision?

N. If for some reason you could no longer fish in this fishery, would you:
1. fish for something else (if so, what?) _____
2. get temporary shore-based work (if so, what?) _____
3. get out of fishing entirely or find other employment (if so, what?) _____
4. other _____

O. If you were to engage in one of these activities (refer to N), do you think you could generate:
1. More income than you did last year from fishing for _____
2. About the same
3. About 3/4 as much
4. About 1/2 as much
5. About 1/4 as much
6. Nothing at all

P. Could you perform these activities:
1. Near where you presently live?
2. Within driving distance?
3. Somewhere within the state, but would require a move?
4. Somewhere outside the state

23. **Fishery #3** _____

A. Name of boat used _____
NC commercial fishing vessel license # _____

B. Are you the:
Non-operator Owner _____
Captain Owner _____
Captain _____
Crew _____

C. Length _____ D. Building Materials _____

E. Age _____ F. Length Owned _____ G. Financed? _____

H. Value (excluding gear) _____

I. What is your relationship with each of the people associated with the boat in this fishery?

a. Non-operator Owner: Relationship _____
b. Captain Owner: Relationship _____
c. Captain: Relationship _____
d. Crew 1: Relationship _____
e. Crew 2: Relationship _____
f. Crew 3: Relationship _____
g. Crew 4: Relationship _____

J. Please give the type, size, and amount of gear you use in this fishery.
(see attached sheet)

K. What percent of your gross fishing income is earned from this fishery? _____

L. When you begin this fishery each year, what factors are involved in making your decision?

M. When you leave this fishery each year, what factors are involved in making your decision?

N. If for some reason you could no longer fish in this fishery, would you:
   1. fish for something else (if so, what?) _____
   2. get temporary shore-based work (if so, what?) _____
   3. get out of fishing entirely or find other employment (if so, what?) _____
   4. other _____

O. If you were to engage in one of these activities (refer to N), do you think you could generate:
   1. More income than you did last year from fishing for _____
   2. About the same
   3. About 3/4 as much
   4. About 1/2 as much
   5. About 1/4 as much
   6. Nothing at all

P. Could you perform these activities:
   1. Near where you presently live?
   2. Within driving distance?
   3. Somewhere within the state, but would require a move?
   4. Somewhere outside the state

24. **Fishery #4** _____

A. Name of boat used _____
   NC commercial fishing vessel license # _____

B. Are you the:
   Non-operator Owner _____
   Captain Owner _____
   Captain _____
   Crew _____

C. Length _____ D. Building Materials _____

E. Age _____ F. Length Owned _____ G. Financed? _____

H. Value (excluding gear) _____

I. What is your relationship with each of the people associated with the boat in this fishery?
   a. Non-operator Owner: Relationship _____
   b. Captain Owner: Relationship _____
   c. Captain: Relationship _____
   d. Crew 1: Relationship _____
   e. Crew 2: Relationship _____
   f. Crew 3: Relationship _____
   g. Crew 4: Relationship _____

J. Please give the type, size, and amount of gear you use in this fishery.
(see attached sheet)

K. What percent of your gross fishing income is earned from this fishery? _____

L. When you begin this fishery each year, what factors are involved in making your decision?

M. When you leave this fishery each year, what factors are involved in making your decision?

N. If for some reason you could no longer fish in this fishery, would you:
   1. fish for something else (if so, what?) _____
   2. get temporary shore-based work (if so, what?) _____
   3. get out of fishing entirely or find other employment (if so, what?) _____
   4. other _____

O. If you were to engage in one of these activities (refer to N), do you think you could generate:
   1. More income than you did last year from fishing for _____
   2. About the same
   3. About 3/4 as much
   4. About 1/2 as much
   5. About 1/4 as much
   6. Nothing at all

P. Could you perform these activities:
   1. Near where you presently live?
   2. Within driving distance?
   3. Somewhere within the state, but would require a move?
   4. Somewhere outside the state

25. **Fishery #5** _____

A. Name of boat used _____
   NC commercial fishing vessel license # _____

B. Are you the:
Non-operator Owner _____
Captain Owner _____
Captain _____
Crew _____

C. Length _____ D. Building Materials _____

E. Age _____ F. Length Owned _____ G. Financed? _____

H. Value (excluding gear) _____

I. What is your relationship with each of the people associated with the boat in this fishery?
   a. Non-operator Owner: Relationship _____
   b. Captain Owner: Relationship _____
   c. Captain: Relationship _____
   d. Crew 1: Relationship _____
   e. Crew 2: Relationship _____
   f. Crew 3: Relationship _____
   g. Crew 4: Relationship _____

J. Please give the type, size, and amount of gear you use in this fishery.
(see attached sheet)

K. What percent of your gross fishing income is earned from this fishery? _____

L. When you begin this fishery each year, what factors are involved in making your decision?

M. When you leave this fishery each year, what factors are involved in making your decision?

N. If for some reason you could no longer fish in this fishery, would you:
   1. fish for something else (if so, what?) _____
   2. get temporary shore-based work (if so, what?) _____
   3. get out of fishing entirely or find other employment (if so, what?) _____
   4. other _____

O. If you were to engage in one of these activities (refer to N), do you think you could generate:
   1. More income than you did last year from fishing for _____
   2. About the same
   3. About 3/4 as much
   4. About 1/2 as much
   5. About 1/4 as much
   6. Nothing at all

P. Could you perform these activities:
   1. Near where you presently live?
   2. Within driving distance?
   3. Somewhere within the state, but would require a move?
   4. Somewhere outside the state

26. **Fishery #6** _____

A. Name of boat used _____
NC commercial fishing vessel license # _____

B. Are you the:
Non-operator Owner _____
Captain Owner _____
Captain _____
Crew _____

C. Length _____ D. Building Materials _____

E. Age _____ F. Length Owned _____ G. Financed? _____

H. Value (excluding gear) _____

I. What is your relationship with each of the people associated with the boat in this fishery?
   a. Non-operator Owner: Relationship _____
   b. Captain Owner: Relationship _____
   c. Captain: Relationship _____
   d. Crew 1: Relationship _____
   e. Crew 2: Relationship _____
   f. Crew 3: Relationship _____
   g. Crew 4: Relationship _____

J. Please give the type, size, and amount of gear you use in this fishery.
(see attached sheet)

K. What percent of your gross fishing income is earned from this fishery? _____

L. When you begin this fishery each year, what factors are involved in making your decision?

M. When you leave this fishery each year, what factors are involved in making your decision?

N. If for some reason you could no longer fish in this fishery, would you:
1. fish for something else (if so, what?) _____
2. get temporary shore-based work (if so, what?) _____
3. get out of fishing entirely or find other employment (if so, what?) _____
4. other _____

O. If you were to engage in one of these activities (refer to N), do you think you could generate:
1. More income than you did last year from fishing for _____
2. About the same
3. About 3/4 as much
4. About 1/2 as much
5. About 1/4 as much
6. Nothing at all

P. Could you perform these activities:
1. Near where you presently live?
2. Within driving distance?
3. Somewhere within the state, but would require a move?
4. Somewhere outside the state

We would now like to ask you a few questions about your views and attitudes towards fishing and fisheries management.

27. Please rank the above fisheries (refer to question 15A) from best to worst in terms of enjoyment.
1. _____ (Most enjoyable)
2. _____
3. _____
4. _____
5. _____
6. _____ (Least enjoyable)

28. Please check the 5 most important problems from the following list. Then rank then from 1 to 5 in order of importance with 1 being the most important.

_____ Other people fishing your gear
_____ Destruction and theft of gear
_____ Competition for space in water
_____ New entrants into fishery
_____ Water quality
_____ Fish prices
_____ Price of fishing gear and boats
_____ Lack of familiarity with fishing regulations
_____ Lack of enforcement of existing laws
_____ Too many fishing regulations
_____ Too many people fishing
_____ Shortage of dock space
_____ Lack of voice in how fisheries are regulated
_____ Difficulty in getting insurance

29. Do you agree or disagree with the following statements:

1. License limitation restricts the number of fishermen or fishing units in a fishery.
   Agree Disagree

2. Individual Transferable Quota (ITQ) allow large fishing operations to buy everyone else out of a fishery.
   Agree Disagree

3. Limited entry is mostly concerned with the distribution of economic benefits from a fishery.
   Agree Disagree

4. Limited entry can make fishermen better off in the long run.
   Agree Disagree

5. Limited entry directly controls the number of fishermen in a fishery.
   Agree Disagree

6. Limited entry gives fishery managers less control over fishermen's lives.
   Agree Disagree

7. Limited entry is very difficult to administer and enforce.
   Agree Disagree

8. Incases where limited entry has been adopted, fishermen are happy with the system.
Agree Disagree

9. Limited entry is fair to commercial fishermen.
Agree Disagree

10. Limited entry may be appropriate to some of North Carolina's fisheries.
Agree Disagree

Appendix III-A

FACTORING FISHERMEN INTO FISHERIES MANAGEMENT:

LIMITED ENTRY OPTIONS FOR NORTH CAROLINA'S FISHERIES

The first in a series of workshops moderated by

Dr. Michael K. Orbach
Duke University Marine Lab

Sponsored by

The North Carolina Fisheries Moratorium Steering Committee

through the

North Carolina Sea Grant College Program

August, 1995

I) WHY ARE WE HAVING THESE WORKSHOPS?

All around the world fishing industries and communities are changing. Some of these changes are due to natural fluctuations in the fishery resource or habitat. Some are due to changing fishery regulations. Some are due to changing conditions in the U.S. and international markets for fish. Some are due to the changing character of coastal regions in the U.S., regions which were once mostly commercial fishing oriented but which are increasingly oriented towards leisure, tourism and retirement. Some are due to normal internal changes in the fishing industry itself.

These changes have brought considerable attention to the subject of marine fisheries, in a variety of ways. The situation of the New England groundfish fishery; the Florida net ban; the listing of Pacific salmon species as threatened or endangered; the increased authority of the Atlantic States Marine Fisheries Commission; all of these events and many more contribute to the pressures now being felt in North Carolina's fisheries.

In response to these pressures, in 1994 the North Carolina General Assembly passed a bill creating a two-year moratorium on the issuance of new commercial vessel licenses. This moratorium was meant to slow down the effects of these pressures while a group created by that same moratorium bill, the Fisheries Moratorium Steering Committee, develops a set of recommendations to the General Assembly concerning possible new ways of managing our marine fisheries. The project under which these workshops are being conducted is part of the work of the Moratorium Steering Committee.

One particular concern in North Carolina, even before the moratorium was passed, was the increasing amount of effort -- in some cases fishermen, in some cases fishing vessels or gear such as crab traps -- in many of North Carolina's fisheries. These increases have often occurred in the face of constant or declining fish catches. The result is less revenue and lower profits for fishermen, more crowding and conflict on the fishing grounds, possible effects on the fish stock or habitat, and greater difficulty in managing the state's fisheries.

In many other fisheries, both in the United States and around the world, where problems such as this have arisen management systems known as limited entry, or limited access, have been created. The Moratorium Steering Committee has asked us to explore, along with fishermen and others interested in the fisheries, the potential application of these limited entry systems for North Carolina's fisheries.

The first step in this process is an extensive set of interviews being conducted all over North Carolina by researchers from East Carolina and Duke Universities. There are approximately 21,000 commercial vessel licenses issued in North Carolina, but only slightly over 6,000 fishermen hold 'Endorsements to Sell' which allow them to sell their catch commercially. It thus appears that we have many more fishermen with commercial vessel licenses, and possibly much more gear, than we need to land the available commercial catch. The purpose of these interviews is to document who these people with commercial licenses are, their patterns of fishing, and their involvement with and dependence on commercial fishing.

The second step is to hold three different series of workshops, of which this is the first. The purposes of this first workshop series are:

1) To discuss problems and issues in North Carolina fisheries, and

2) to discuss the concept of limited entry, or access, how it has been used in other fisheries, and what the effects of those limited entry systems have been.

The second workshop series, to be held in October, will ask participants to evaluate different alternatives for limited entry or access in North Carolina fisheries. The third workshop series, to be held in November, will present the results of the evaluations from the second workshop and discuss further development of the concept of limited entry for North Carolina fisheries. ***The researchers from East Carolina and Duke have no stake in whether or not limited entry is adopted for any particular fishery, or for any North Carolina fishery at all.*** **There are many**

different ways to design a limited entry or access system. No one system is appropriate for all fisheries, and some fisheries may not need limited entry at all.

The purpose of these workshops is to ensure a thorough discussion of the alternatives *before* any new law or policy is proposed.

II) WHAT IS LIMITED ENTRY, OR ACCESS?

Limited entry is a form of fisheries management where specific fishing privileges are assigned to specific fishermen or fishing vessels, and the total number or amount of those privileges is limited. Limited entry may occur in many different forms, depending on the nature of the fishery. All forms, however, limit participation in the fishery in some way.

Limited entry usually involves specifying one or more of the following things:

1) **Which fishermen may participate in the fishery;**
2) **How much each fisherman may catch; or**
3) **How much gear each fisherman may use,**

III) WHY IS LIMITED ENTRY OR ACCESS USED IN FISHERIES MANAGEMENT?

Some form of entry or access limitation is usually used because there are either too many fishermen or too much fishing gear in a fishery. By "too many" or "too much" we mean a lot more than would be necessary to catch the maximum available or allowable amount of fish. This can result in lower net incomes for fishermen, increased conflict and enforcement costs, and possible harm to the fish or the fish habitat.

The principal goals of limited entry are to raise or maintain the net incomes of fishermen, to reduce conflict and administrative costs associated with fishery, and to give fishermen more of a stake in conservation efforts by giving them specific (and exclusive) fishing privileges.

IV) WHERE ELSE IS LIMITED ENTRY USED NOW?

There are currently limited entry or access systems either in place or under development on all coasts of the U.S. in such fisheries as salmon, halibut, sablefish, spiny lobster, surf clams, blue crabs, and in other countries such as Australia and New Zealand.

It is important to note that the term "limited entry" may mean any one of several very different kinds of management system. Some, such as the Alaska salmon fisheries, are "license limitation" systems which limit the number of fishermen or fishing vessels in the fishery. Others, such as the wreckfish fishery in the Southeast U.S., are based on "Individual Transferable Quotas" (ITQ) which restrict the amount of fish each fisherman may land each year. Still others, such as the spiny lobster system in Florida, are based on specific amounts of gear used by each fisherman.

It is also true that some form of limited entry or access is used in almost all other natural resource industries -- oil and gas, timber, grazing -- and in some of these industries has been used since the turn of the century. It is generally used in cases where a public trust resource (owned by "the public", as fish are) is used for private commercial purposes.

V) WHAT ARE THE PRINCIPAL FORMS OF ENTRY, OR ACCESS LIMITATION?

There are currently three major forms of limited entry in use in fisheries:

1) License Limitation

This is where a limited number of licenses are issued to participate in the fishery in general, as is done in the salmon fishery in Alaska. License limitation has been used in cases where there are too many fishing operations for anyone to make a sufficient profit. What is limited is how many people, or fishing operations or vessels, are in the

fishery. People generally enter and leave the fishery by buying and selling licenses from each other.

In the Alaska salmon fishery, for example, a "points" system was developed to decide which fishermen got licenses to fish at the beginning of the limited entry system in the 1970s. This "points" system took into account a fisherman's historic landings, whether the fisherman lived in a rural or urban area, and other factors. The licenses were specific to each gear (troll, seine, set net, etc.) and each area of Alaska (Bristol Bay, Prince William Sound, etc.). Licenses were issued to people, not corporations or vessels, and each fishermen could hold only one license in each gear/area (ie., a Bristol Bay set net, or Prince William Sound purse seine), to avoid anyone monopolizing the fishery. The licenses are sold on an open market, among fishermen (not to or from the government). The cost of these licenses varies according to how profitable the fishery is (the more profitable the fishery, the more the license costs), but they are generally fairly expensive because a fisherman has to buy a "whole" operation -- that is, a fisherman is either in or out of the fishery depending on whether or not they have a license. The profitability and other conditions in the fishery are monitored by the Alaska Limited Entry Commission set up by the Alaska legislature. There are actually more licenses now than there were at the beginning of the system, because the fishery has been judged to be able to support a larger number of fishermen now than in the 1970s.

2) Individual Transferable Quotas (ITQ)

This is where each fisherman is given a certain number, poundage or percentage of a total allowable quota, as is done in the South Atlantic wreckfish fishery. What is specified is the amount of fish each fisherman may land and sell each year. Such systems are used when the principal issue is the amount of fish that may be taken. The amount each fisherman may take can be changed at any time by fishermen buying and selling ITQ shares from each other.

For example, in the South Atlantic wreckfish fishery each fisherman with wreckfish landings over a certain threshold amount in a qualifying

period was issued ITQ shares, generally in the amount of the average of their landings in the qualifying period. As with the licenses in Alaska salmon, these ITQ are the property of the owner until the owner decides to sell or give them away. Each ITQ share allows the fisherman to land and sell a certain amount of wreckfish each year. These ITQ shares are issued in fairly small denominations – say 100 pounds – which makes their cost fairly low. This enables fishermen to buy in or sell out, or adjust their landings each year, at much less cost than under a license limitation system where they have to buy in or sell out entirely.

3) Gear-based Effort Limitation

This is where what is limited is the amount of gear in the fishery, as in done in the Florida spiny lobster fishery. In this fishery, each fisherman was given "certificates" for a certain number of lobster traps. As with ITQ shares, the fishermen buy and sell these certificates from each other. Such systems are used when the amount of gear is the problem in the fishery, as opposed to the number of people or the amount of the catch.

In the Florida spiny lobster fishery, for example, trap "certificates" were issued to each fisherman based on their landings of lobster during a qualifying period. Each certificate is for the use of one trap, and as in the other two cases described above these certificates are the property of the owner until he or she decides to sell them. No fisherman may own or control more than 1.5% of the total number of trap certificates to avoid any monopoly. Similar to the wreckfish ITQ but different from the Alaska salmon license limitation system, the spiny lobster trap certificates sell for fairly low prices, allowing fishermen to buy in or sell out or adjust their operations at fairly low cost. The spiny lobster trap certificate system has in addition a "reduction" feature – the total number of certificates outstanding is being reduced by up to 10% each year across the board (that is, a fisherman who owns 1,000 certificates surrenders 100, a fisherman who owns 100 certificates surrenders 10, and so on) as long as the total lobster catch remains relatively constant. This feature was included because both fishermen and fishery managers felt that the same total catch of lobster could be taken with

significantly fewer traps. Each fisherman, however, decides how many traps they will fish by buying and selling certificates.

Summary

The three limited entry system set out above are examples of the different kinds of system which have been used in different fisheries, all of which were designed to solve specific problems are defined by both fishermen and fishery managers. All have achieved different results, and all have been revised and amended as new problems and issues emerged in the different fisheries and as different problems with the systems themselves became apparent. When we consider potential limited entry or access systems for North Carolina fisheries, it is important to learn from both the progress and the mistakes made in these other systems.

VI) WHAT QUESTIONS DO WE NEED TO ASK IN CONSIDERING A LIMITED ENTRY OR ACCESS SYSTEM FOR A PARTICULAR FISHERY OR SET OF FISHERIES?

In order to discuss the potential for limited entry or access in North Carolina fisheries we need to ask the following questions, whose answers will vary from fishery to fishery:

1) What is the problem that needs to be solved?

Are there too many fishermen or fishing units in the fishery? Too much gear? Too much effort? Is the available amount of fish too small for the number of fishermen in the fishery? Are there social or economic conflicts in the fishery, or among fisheries? Are fishermen spending more money than they need to in order to catch the available amount of fish?

2) What is the appropriate unit of effort to consider limiting?

Number of fishermen or fishing vessels? Amount of gear? Amount of catch?

3) If a limited entry or access system were set up, how would the initial fishing privileges be assigned?

The answer to this question would depend on the problem we are trying to solve. The usual procedure is to issue the initial privileges -- licenses, ITQs, gear certificates -- on the basis of historical participation in the fishery, which of course must be documented. For example, if we decided to limited the number of fishermen we would need records of who had been in the fishery. If the system were based on gear or catch, we would need records of those things.

4) How would fishermen get in or out of the fishery, or adjust their fishing operations?

All limited entry systems must have a way for new fishermen to get into the fishery. The most common way to do this is to make the privileges marketable, so that fishermen buy and sell them from each other subject to anti-monopoly and certain other constraints.

5) How would the system be administered, and how would it be paid for?

It is difficult for fishery managers to administer and enforce even current fishery regulations, and limited entry systems are often initially expensive to set up and complex to administer. Provisions for paying for these administrative and enforcement costs would have to be made.

6) Are there special conditions in the fishery that would have to be taken into account?

For example, in North Carolina fishermen often fish in several different fisheries through the year. If a limited entry or access systems were set up for certain fisheries, how would that affect other fisheries?

VII) ISSUES IN NORTH CAROLINA FISHERIES

Attached to this document is a graph of the estimated number of crab pots in use and the total landings of crab in North Carolina. What the

graph appears to show is that the total crab catch could be taken with significantly fewer crab pots. For example, in 1980 the crab catch of approximately 35 million pounds was taken with about 200,000 pots. In 1990 approximately the same catch was taken with almost 600,000 pots. Thus, fishermen are using many more pots to take the same amount of crab. This is the kind of situation where both fishermen and fishery managers begin to think about limited entry or access in some form.

A second kind of issue arises in the pound net fishery, where there are increasing numbers of pound net sets being registered. These sets may not be increasing the total pound net landing as fast as they are taking up bottom and water column space. This can create conflict among commercial fishermen, and between commercial fishermen and recreational fishermen and other boaters.

A third kind of issue arises in the trawl and gill net fisheries. When effort increases in these fisheries, factors such as bycatch levels as well as competition with other fishing gears come into play.

As a general issue, when situations such as the New England groundfish fishery decline and the Florida net ban occur, the potential for fishermen from these locations coming into North Carolina to fish increases, thus increasing competition and conflict over our own state's limited space and resources.

Our question at this workshop is this: *How many fisheries in North Carolina show issues of these kinds?*

VIII) OPEN DISCUSSION OF NORTH CAROLINA FISHERIES

See Selected North Carolina Fisheries chart (attached)

IX) WHERE DO WE GO FROM HERE?

After this first series of workshops the East Carolina and Duke researchers, with the help of industry advisors, will put together a number of alternatives for management in North Carolina fisheries. For comparison, we will include some alternatives that are not formal

not formal limited entry systems, such as an income-dependence criteria for the Endorsement to Sell. We will also identify a number of criteria by which these alternatives might be evaluated. For example, what would be the effect of each alternative on the fish catch? On the flexibility for fishermen? On the net incomes of fishermen? On administration and enforcement?

Then, at the second series of workshops in October, we will ask fishermen and other workshop participants to help us evaluate each alternative according to those criteria. The third series of workshops in November will be to present the result of the evaluation for further discussion.

Finally, the results of the entire project, including the results of our interviews with fishermen, will be presented to the Moratorium Steering Committee, the Marine Fisheries Commission, and the Joint Legislative Study Commission on Fisheries and Aquaculture. ***It is important to note that at no time will East Carolina or Duke researchers tell the agencies or committees what the*** **fishermen** ***want to do -- we will rely on the fishermen to do that themselves, individually and through their organizations.*** **Our job is to facilitate discussion of these issues in the fishing community and among those concerned with fisheries in general, and to provide the fishermen, managers and policy-makers, and the public with the best possible set of information for their further deliberations. If action is initiated on any of these ideas, everyone will have additional opportunity for input through the normal public policy process.**

FOR MORE INFORMATION ABOUT LIMITED ENTRY
OR ABOUT THESE WORKSHOPS, PLEASE CONTACT

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OR YOUR LOCAL SEA GRANT MARINE ADVISORY SERVICE

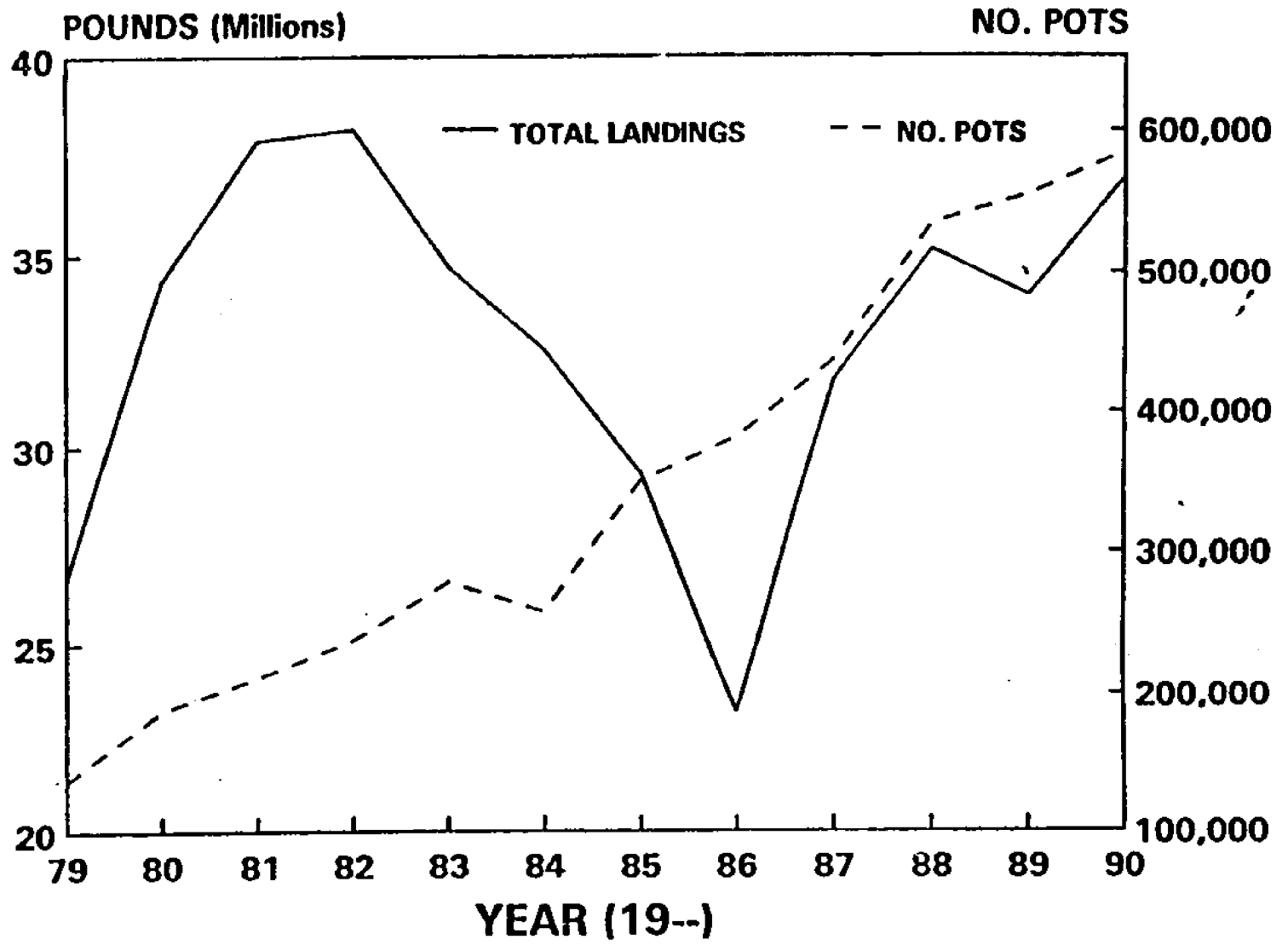

Figure Commercial landings of blue crabs in North Carolina and fishing effort expressed as the number of crab pots estimated in use, 1979-1990.

SELECTED NORTH CAROLINA FISHERIES

FISHERY	*CONDITION*			
	PEOPLE?	GEAR?	ECON?	SOC?
CLAM				
HAND				
MECHANICAL				
CRAB POT				
FLOUNDER				
GILLNET				
FLOUNDER				
HERRING/SHAD				
PELAGIC				
SPOT				
HOOK AND LINE				
TROLL				
BANDIT				
OYSTER				
HAND				
MECHANICAL				
POUND NET				
FLOUNDER				
OTHER				
STRIPED BASS				
TRAWL				
SHRIMP				
FINFISH				

SELECTED NORTH CAROLINA FISHERIES CHART

This chart is intended to focus discussion on the trends in effort and economic and social factors in selected fisheries of North Carolina.

FISHERY

Along the left side of the chart are some of the principal fisheries in North Carolina. Some of these are defined by gear (ie., crab pot); others by fish species (ie., striped bass); and others by a combination of gear and species (ie., flounder pound).

CONDITION

The column headings are for the following questions for each fishery:

> **PEOPLE -- What are the trends in the number of people, kinds of people, vessels and fishing operations in the fishery?**
>
> **GEAR -- What are the trends in the kinds and amount of gear used in the fishery, by individual fishermen and overall in the fishery?**
>
> **ECONOMICS -- What are the trends in the revenues, costs and profitability of the fishery?**
>
> **SOCIOLOGY -- What are the trends in things such as conflict over space on the bottom or in the water?**

USING THE CHART

At each workshop, we will ask the participants to comment on those fisheries in their area, with which they are the most familiar, and any others on which they would like to comment.

The comments from all of the workshops will be assembled, and used to develop potential management alternatives, both limited entry and non-limited entry, for evaluation at the second workshop.

Appendix III-B

FACTORING FISHERMEN INTO FISHERIES MANAGEMENT:

LIMITED ENTRY OPTIONS FOR NORTH CAROLINA'S FISHERIES

The second in a series of workshops moderated by

Dr. Michael K. Orbach
Duke University Marine Lab

Sponsored by

The North Carolina Fisheries Moratorium Steering Committee

through the

North Carolina Sea Grant College Program

October, 1995

I) WHY ARE WE HAVING THESE WORKSHOPS?

All around the world fishing industries and communities are changing. Some of these changes are due to natural fluctuations in the fishery resource or habitat. Some are due to changing fishery regulations. Some are due to changing conditions in the U.S. and international markets for fish. Some are due to the changing character of coastal regions in the U.S., regions which were once predominately commercial fishing oriented but which are increasingly oriented towards leisure, tourism and retirement. Some are due to normal internal changes in the fishing industry itself.

These changes have brought considerable attention to the subject of marine fisheries, in a variety of ways. The situation of the New England groundfish fishery; the Florida net ban; the listing of Pacific salmon species as threatened or endangered; the increased authority of the Atlantic States Marine Fisheries Commission; all of these events and many more contribute to the pressures now being felt in North Carolina's fisheries.

In response to these pressures, in 1994 the North Carolina General Assembly passed a bill creating a two-year moratorium on the issuance of new commercial vessel licenses. This moratorium, which was extended by the 1995 General Assembly until 1997, was meant to slow down the effects of these pressures while a group created by that same moratorium bill, the Fisheries Moratorium Steering Committee, develops a set of recommendations to the General Assembly concerning possible new ways of managing our marine fisheries. The project under which these workshops are being conducted is part of the work of the Moratorium Steering Committee.

One particular concern in North Carolina, even before the moratorium was passed, was the increasing amount of effort -- in some cases fishermen, in some cases fishing vessels or gear such as crab traps -- in many of North Carolina's fisheries. These increases have often occurred in the face of constant or declining fish catches. The result is less revenue and lower profits for fishermen, more crowding and

conflict on the fishing grounds, possible effects on the fish stock or habitat, and greater difficulty in managing the state's fisheries.

In many other fisheries, both in the United States and around the world, where problems such as this have arisen management systems known as limited entry, or limited access, have been created. The Moratorium Steering Committee has asked us to explore, along with fishermen and others interested in the fisheries, the potential application of these limited entry systems for North Carolina's fisheries.

The first step in this process is an extensive set of interviews being conducted all over North Carolina by researchers from East Carolina and Duke Universities. There are approximately 21,000 commercial vessel licenses issued in North Carolina, but only slightly over 6,000 fishermen hold 'Endorsements to Sell' which allow them to sell their catch commercially. It thus appears that we have many more fishermen with commercial vessel licenses, and possibly much more gear, than we need to land the available commercial catch. The purpose of these interviews is to document who these people with commercial licenses are, their patterns of fishing, and their involvement with and dependence on commercial fishing.

The second step is to hold three different series of workshops, of which this is the second. The purposes of the first workshop series, held in August, were: 1) To discuss problems and issues in North Carolina fisheries; and 2) to discuss the concept of limited entry, or access, how it has been used in other fisheries, and what the effects of those limited entry systems have been. The purpose of this second workshop series is:

To evaluate the potential impact of a number of alternatives, both limited entry-type and non-limited entry type, on selected North Carolina fisheries.

The third workshop series, to be held in December or January, will present the results of the evaluations from the second workshop and discuss further development of the concept of limited entry for North

Carolina fisheries. ***The researchers from East Carolina and Duke have no stake in whether or not limited entry or any other specific form of management is adopted for any particular fishery, or for any North Carolina fishery at all.*** **There are many different ways to design a limited entry or access system. No one system is appropriate for all fisheries, and some fisheries may not need limited entry at all.**

The purpose of these workshops is to ensure a thorough discussion of the alternatives *before* any new law or policy is proposed.

II) COMMENTS FROM THE FIRST WORKSHOP

A number of general comments emerged from the first workshop series concerning the status of fisheries and fisheries management in North Carolina:

1) There is general concern in the industry over such things as the proposals for "net bans" and public perceptions of the condition of the fisheries. Many people felt that the public perceptions may not accurately reflect the actual condition of the fisheries, and that the role of habitat and water quality in fisheries issues was not well recognized.

2) The increases in fishing effort, in particular in certain types of fishing gear, are not solely due to full time commercial fishermen but also to part time commercial and recreational fishermen using "commercial gear", as defined by the state of North Carolina.

3) Increases in fishing effort are not uniform in all of North Carolina's fisheries. Effort in some fisheries has remained relatively constant, and has gone down in some fisheries.

4) A number of events occuring outside of North Carolina may be "driving" management considerations inside of North Carolina: The situation in the New England groundfish fishery; the Florida net ban; quotas and other restrictions implemented by the Regional Fishery Management Councils or the Atlantic States Marine Fisheries Commission.

5) The current moratorium has created some dislocation and reduced flexibility for commercial fishermen. However, the general feeling seemed to be that now that we have the moratorium we should consider very carefully, with full constituent (commercial, recreational, etc.) input, the management system we want to put into place after the moratorium is lifted.

6) Many workshop participants raised the issue of "defining" commercial fishermen as having potential to address many of the problems in the fisheries involving excessive effort, social and economic conflict, and other issues.

7) Any potential limited entry system should consider the fact that most North Carolina fishermen participate in several fisheries throughout the year, and should be designed to restrict this flexibility as little as possible.

III) THE CURRENT WORKSHOP

Our job at this second workshop series is to get your comments on a number of different alternatives for management in three different "example" fisheries in which concern over excessive effort has been raised. Some of the alternatives involve limited entry; others do not.

We will first describe the general objectives for any new management system. We will then describe the general nature of the alternatives, and the criteria and method we will use to evaluate those alternatives.

Objectives

Based on the comments at the first workshop series, our objectives in considering the management alternatives are these:

1) To control, or reduce, the effort in the fisheries under consideration so that the effort more closely matches the available fishery resource;

2) To increase stability in the fisheries, and promote maximum net incomes for fishermen;

3) To promote flexibility for fishermen in their fishing operations;

4) To ensure that fishermen who have traditionally fished in the fisheries under consideration be able to continue to due so, as much as possible in their traditional fishing patterns;

5) To make management of the fisheries more efficient and effective.

The Fisheries to be Evaluated

We have selected the fisheries listed below for evaluation at this workshop. Limited entry may not be appropriate for any or all of these fisheries, and there may be other fisheries besides these for which limited entry alternatives should be discussed. The following fisheries were selected because 1) all of them show some evidence of effort above the level necessary to harvest the available resource; 2) they were all mentioned by at least some workshop participants; and 3) because they cover a range of different types of fishing.

1) The Crab Pot Fishery

The general concensus seems to be that although the crab catch fluctuates with environmental conditions, the total number of crab pots and fishermen in the crab fishery has been increasing. The degree of increase varies from one part of the state to another, but some degree of economic inefficiency, social conflict, and possible biological impact appears to be present in the fishery.

2) The Pound Net Fishery

Although the situation varies from one part of the state to another, in some areas there is an increase in the number of pound nets being registered and set. Some of this increase appears to be due to fears over possible limitations on pound nets, and some is due to "reserving" or "protecting" space on the water.

3) The Ocean Summer Flounder Fishery

This fishery is presently under a state allocation quota established by the Regional Fishery Management Councils. The North Carolina commercial fishing industry requested that a license limitation system be established for the fishery because of the quota being filled too quickly, and by boats which had not traditionally been involved in the fishery in North Carolina. A temporary system is in the process of being established by the NC Marine Fisheries Commission.

We can discuss the potential application of limited entry to other fisheries in addition to these if the workshop participants wish to, but we would like to cover at least these three fisheries. *These three fisheries are only used as examples for this discussion. If specific proposals for any fisheries were to be developed, further discussion would have to be held with consituents involved in those fisheries to develop much more detailed proposals.*

The Management Alternatives

The following alternatives will be evaluated for each fishery. We may add alternatives at the workshops, but we would like to evaluate all of the below alternatives for each fishery in order to discuss the full range of alternatives. To simplify the discussion, we have made assumptions about the structure of each alternative. *The alternatives set out below are simplified versions, only for the purpose of this discussion.* If an actual proposal for limited entry in any of these or other fisheries were to be developed, much more detailed discussion of alternatives and impacts would be required. The alternatives presented here are strictly for the purposes of this discussion.

1) The Status Quo

This is the "no change" alternative, meaning that the management systems currently in place for each fishery would remain in effect with no changes.

2) An Income-Dependent Endorsement to Sell

Many fishermen feel that effort would be reduced and controlled sufficiently by making possession of an Endorsement to Sell (ETS) dependent on having a certain minimum percentage of your income from commercial fishing. For our evaluation, we will assume that level of dependence would be 50% of an individual's *total* income.

3) License limitation

Under this alternative, licenses to participate in the fishery would be issued to a number of "initial qualifiers". Initial qualifiers might be those fishermen who had a valid commercial fishing license over a qualifying period, probably three years (1994-97, for example), and had landed more than a certain amount of fish in at least two of those three years. After the initial issuance of licenses, the total number of licenses would remain the same and fishermen would get in or out of the fishery by buying and selling these licenses from each other. The licenses would be given free to initial qualifiers, and the cost of the licenses on the open market after that could be expected to be between one and two year's gross revenue from that fishery. Licenses would probably have to be broken down into different categories depending on the size of the fishing operation (boat length, net size, amount of catch).

4) Individual Transferable Quotas

Under this alternative, each fishermen might be issued "quota shares", or ITQs, based on their average catch over a qualifying period (1994-97, for example). These ITQs would be issued in denominations of, say, 100 pounds, so that a fisherman who had landed an average of 1,000 pounds of fish per year would be issued 10 100-pound ITQs. Each fisherman would then be limited to landing that amount of the limited species of fish per year, unless they purchased ITQs from another fisherman. A 100-pound ITQ could be expected to sell for between one and two times the value of that 100 pounds of fish.

5) Gear Certificates

Under this alternative, each fisherman might be issued certificates for the amount of gear they had used in the fishery under the qualifying period (1994-97, for example). Thus, a fisherman who has used 500 crab pots, a certain length of pound net lead and number of pounds, or a certain amount of flounder gear would be issued gear certificates in those amounts. Fishermen would then buy and sell these gear certificates if they wished to expand or reduce their fishing operations. Gear would have to be tagged in some fashion to facilitate enforcement. These certificates could be expected to sell for between one and two times the value of the annual production of that piece of year (one crab pot; one pound net set; 25 feet of trawl net headrope) in the fishery.

6) Other Alternatives

Are there other alternatives we should consider to control or reduce effort in this fishery?

<u>Criteria for Evaluating the Alternatives</u>

We would like to consider the impact of each of the alternatives for each fishery in the following categories:

1) Effort Control or Reduction -- Would the alternative control or reduce fishing effort?

2) Fishermen Flexibility -- Would the alternative give the fisherman flexibility to adjust their fishing operations?

3) Biological Impact -- Would the alternative have a noticable effect on the fish population or habitat?

4) Economic Impact -- What would the economic impact of the alternative be on the individual fisherman and the industry as a whole (prices, net profits, marketablity, etc.)?

5) Social Impact -- Would the alternative alter fishing patterns? Would it effect the fishermen's families or communities? Would it be fair and equitable to different groups of fishermen?

6) Enforcement and Administration -- Would the alternative be easy or difficult to put into place? Would it make regulations easier to enforce? Would it be difficult for the fishermen to comply with?

7) Impact on Other Fisheries -- How would the alternative for each fishery affect other fisheries or fishermen, especially fishermen who fish in several fisheries throughout the year?

8) Other Criteria -- Are there other things we should consider in terms of the potential impact of these alternatives?

Method of Evaluation

We would like to evaluate each of the options according to these criteria with a "++", "+", "0", "-" or "--" on the attached matrix charts. For example, if an option would have a very negative economic impact we would fill in the box across from the option and under the "Economic Impact" column with a "--". In addition, we can add any comments or qualifying statements to the box, such as "it would affect some fishermen one way and other fishermen in a different way".

It is important to note that we are not asking at this point whether we LIKE each alternative, or whether we do or don't want to see each alternative ADOPTED as a law or policy. Here we are interested in what we think the PROBABLE EFFECTS of each alternative might be.

Each of you can record our evaluation on your own sheets. We will record the group's evaluation on a larger version of the chart for everyone to see. After the second series of workshops is over, we will put all of the evaluations from the workshops together.

IV) WHERE DO WE GO FROM HERE?

After this second series of workshops we will compile all of the evaluations from all five workshop locations. The third series of workshops in December or January will be to present the results of the evaluation for further discussion.

Finally, the results of the entire project, including the results of our interviews with fishermen, will be presented to the Moratorium Steering Committee, the Marine Fisheries Commission, and the Joint Legislative Study Commission on Fisheries and Aquaculture. *It is important to note that East Carolina or Duke researchers will NOT tell the agencies or committees what the FISHERMEN want to do -- we will rely on the fishermen to do that themselves, individually and through their organizations.* Our job is to facilitate discussion of these issues in the fishing community and among those concerned with fisheries in general, and to provide the fishermen, managers and policy-makers, and the public with the best possible set of information for their further deliberations. If action is initiated on any of these ideas, everyone will have additional opportunity for input through the normal public policy process.

FOR MORE INFORMATION ABOUT LIMITED ENTRY OR ABOUT THESE WORKSHOPS, PLEASE CONTACT

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OR YOUR LOCAL SEA GRANT MARINE ADVISORY SERVICE

Limited Entry Alternatives for the North Carolina Crab Pot Fishery

East Carolina/Duke University Effort Management Project
North Carolina Fisheries Moratorium Steering Committee
October 1995

Alternatives	Criteria							
	Effort Control/ Reduction	Fisherman Flexibility	Biological Impact	Economic Impact	Social Impact	Administration & Enforcement	Other Fisheries	Other
Status Quo								
Income Dependent ETS								
License Limitation								
Individual Transferable Quotas								
Transferable Gear Certificates								
Other								

++ = Very Positive
+ = Positive
0 = Neutral
- = Negative
-- = Very Negative
? = Questionable/Don't Know

Limited Entry Alternatives for the North Carolina Pound Net Fishery

East Carolina/Duke University Effort Management Project
North Carolina Fisheries Moratorium Steering Committee
October 1995

Alternatives	Criteria							
	Effort Control/ Reduction	Fisherman Flexibility	Biological Impact	Economic Impact	Social Impact	Administration & Enforcement	Other Fisheries	Other
Status Quo								
Income Dependent ETS								
License Limitation								
Individual Transferable Quotas								
Transferable Gear Certificates								
Other								

++ = Very Positive
+ = Positive
0 = Neutral
- = Negative
– = Very Negative
? = Questionable/Don't Know

Limited Entry Alternatives for the North Carolina Ocean Summer Flounder Fishery

East Carolina/Duke University Effort Management Project
North Carolina Fisheries Moratorium Steering Committee
October 1995

Alternatives	Criteria							
	Effort Control/ Reduction	Fisherman Flexibility	Biological Impact	Economic Impact	Social Impact	Administration & Enforcement	Other Fisheries	Other
Status Quo								
Income Dependent ETS								
License Limitation								
Individual Transferable Quotas								
Transferable Gear Certificates								
Other								

++ = Very Positive
+ = Positive
0 = Neutral
- = Negative
– = Very Negative
? = Questionable/Don't Know

Appendix III-C

WORKSHOP #3

FACTORING FISHERMEN INTO FISHERIES MANAGEMENT:

LIMITED ENTRY OPTIONS FOR NORTH CAROLINA'S FISHERIES

The third in a series of workshops moderated by

Dr. Michael K. Orbach
Duke University Marine Lab

Sponsored by

The North Carolina Fisheries Moratorium Steering Committee

through the

North Carolina Sea Grant College Program

January, 1996

I) WHY ARE WE HAVING THESE WORKSHOPS?

All around the world fishing industries and communities are changing. Some of these changes are due to natural fluctuations in the fishery resource or habitat. Some are due to changing fishery regulations. Some are due to changing conditions in the U.S. and international markets for fish. Some are due to the changing character of coastal regions in the U.S., regions which were once predominately commercial fishing oriented but which are increasingly oriented towards leisure, tourism and retirement. Some are due to normal internal changes in the fishing industry itself.

These changes have brought considerable attention to the subject of marine fisheries, in a variety of ways. The situation of the New England groundfish fishery; the Florida net ban; the listing of Pacific salmon species as threatened or endangered; the increased authority of the Atlantic States Marine Fisheries Commission; all of these events and many more contribute to the pressures now being felt in North Carolina's fisheries.

In response to these pressures, in 1994 the North Carolina General Assembly passed a bill creating a two-year moratorium on the issuance of new commercial vessel licenses. This moratorium, which was extended by the 1995 General Assembly until 1997, was meant to slow down the effects of these pressures while a group created by that same moratorium bill, the Fisheries Moratorium Steering Committee, develops a set of recommendations to the General Assembly concerning possible new ways of managing our marine fisheries. The project under which these workshops are being conducted is part of the work of the Moratorium Steering Committee.

One particular concern in North Carolina, even before the moratorium was passed, was the increasing amount of effort -- in some cases fishermen, in some cases fishing vessels or gear such as crab traps -- in many of North Carolina's fisheries. These increases have often occurred in the face of constant or declining fish catches. The result is less revenue and lower profits for fishermen, more crowding and

conflict on the fishing grounds, possible effects on the fish stock or habitat, and greater difficulty in managing the state's fisheries.

In many other fisheries, both in the United States and around the world, where problems such as this have arisen management systems known as limited entry, or limited access, have been created. The Moratorium Steering Committee has asked us to explore, along with fishermen and others interested in the fisheries, the potential application of these limited entry systems for North Carolina's fisheries.

The first step in this process is an extensive set of interviews being conducted all over North Carolina by researchers from East Carolina and Duke Universities. There are approximately 21,000 commercial vessel licenses issued in North Carolina, but only slightly over 7,500 fishermen hold 'Endorsements to Sell' which allow them to sell their catch commercially, and only 6,000 of those sold any fish at all during the 1994-95 license year! It thus appears that we have many more fishermen with commercial vessel licenses, and possibly much more gear, than we need to land the available commercial catch. The purpose of these interviews is to document who these people with commercial licenses are, their patterns of fishing, and their involvement with and dependence on commercial fishing.

The second step is to hold three different series of workshops, of which this is the third. The purposes of the first workshop series, held in August of 1995, were: 1) To discuss problems and issues in North Carolina fisheries; and 2) to discuss the concept of limited entry, or access, how it has been used in other fisheries, and what the effects of those limited entry systems have been. The purpose of the second workshop series, held in October of 1995, was to evaluate the potential impact of a number of alternatives, both limited entry-type and non-limited entry-type, on selected North Carolina fisheries. The purposes of this third workshop series are

to present the results of the evaluations from the second workshop, and to discuss further development of the concept of limited entry for North Carolina fisheries.

In addition to the five scheduled workshops, which were held in Manteo, Washington, Beaufort, Raleigh and Wilmington, we met, at their request, with the Hatteras and Carteret Auxiliaries of the North Carolina Fisheries Association after each workshop series and, also at their request, with groups of pound netters on Ocracoke and Cedar Islands. Their comments are included in the summaries below.

It is important to note that *The researchers from East Carolina and Duke have no stake in whether or not limited entry or any other specific form of management is adopted for any particular fishery, or for any North Carolina fishery at all.* There are many different ways to design a limited entry or access system. No one system is appropriate for all fisheries, and some fisheries may not need limited entry at all.

The purpose of these workshops is to ensure a thorough discussion of the alternatives *before* any new law or policy is proposed.

II) COMMENTS FROM THE FIRST WORKSHOP

As we did in the handout for the second workshop, we will first summarize a number of general comments that emerged from the first workshop series concerning the status of fisheries and fisheries management in North Carolina:

1) There is general concern in the industry over such things as the proposals for "net bans" and public perceptions of the condition of the fisheries. Many people felt that the public perceptions may not accurately reflect the actual condition of the fisheries, and that the role of habitat and water quality in fisheries issues was not well recognized.

2) The increases in fishing effort, in particular in certain types of fishing gear, are not solely due to full time commercial fishermen but also to part time commercial and recreational fishermen using "commercial gear", as defined by the state of North Carolina.

3) Increases in fishing effort are not uniform in all of North Carolina's fisheries. Effort in some fisheries has remained relatively constant, and has gone down in some fisheries.

4) A number of events occurring outside of North Carolina may be "driving" management considerations inside of North Carolina: The situation in the New England groundfish fishery; the Florida net ban; quotas and other restrictions implemented by the Regional Fishery Management Councils or the Atlantic States Marine Fisheries Commission.

5) The current moratorium has created some dislocation and reduced flexibility for commercial fishermen. However, the general feeling seemed to be that now that we have the moratorium we should consider very carefully, with full constituent (commercial, recreational, etc.) input, the management system we want to put into place after the moratorium is lifted.

6) Many workshop participants raised the issue of "defining" commercial fishermen as having potential to address many of the problems in the fisheries involving excessive effort, social and economic conflict, and other issues.

7) Any potential limited entry system should consider the fact that most North Carolina fishermen participate in several fisheries throughout the year, and should be designed to restrict this flexibility as little as possible.

III) THE EVALUATIONS FROM THE SECOND WORKSHOP

Our objective at the second workshop was to get your comments on a number of different alternatives for management in three different "example" fisheries in which concern over excessive effort has been raised. Some of the alternatives involved limited entry; others did not.

We first described the general objectives for any new management system, which were as follows:

Objectives

1) To control, or reduce, the effort in the fisheries under consideration so that the effort more closely matches the available fishery resource;

2) To increase stability in the fisheries, and promote maximum net incomes for fishermen;

3) To promote flexibility for fishermen in their fishing operations;

4) To avoid conflict among fishermen and between fishermen and other marine users;

5) To ensure that fishermen who have traditionally fished in the fisheries under consideration be able to continue to due so, as much as possible in their traditional fishing patterns;

6) To make management of the fisheries more efficient and effective.

The Fisheries We Evaluated

We selected three fisheries for evaluation at the second workshop. Limited entry may not be appropriate for any or all of these fisheries, and there may be other fisheries besides these for which limited entry alternatives should be discussed. The following fisheries were selected because 1) all of them show some evidence of effort above the level necessary to harvest the available resource; 2) they were all mentioned by at least some workshop participants; and 3) because they cover a range of different types of fishing.

1) The Crab Pot Fishery

The general consensus seems to be that although the crab catch fluctuates with environmental conditions, the total number of crab pots and fishermen in the crab fishery has been increasing. The degree of increase varies from one part of the state to another, but some degree of economic inefficiency, social conflict, and possible biological impact appears to be present in the fishery.

2) The Pound Net Fishery

Although the situation varies from one part of the state to another, in some areas there is an increase in the number of pound nets being registered and set. Some of this increase appears to be due to fears over possible limitations on pound nets, and some is due to "reserving" or "protecting" space on the water.

3) The Ocean Summer Flounder Fishery

This fishery is presently under a state allocation quota established by the Regional Fishery Management Councils. The North Carolina commercial fishing industry requested that a license limitation system be established for the fishery because of the quota being filled too quickly, and by boats which had not traditionally been involved in the fishery in North Carolina. A temporary system is in the process of being established by the NC Marine Fisheries Commission.

At the second workshop, the majority of the discussion centered around the crab pot fishery. Pound nets were discussed at separate meetings with pound net fishermen in Ocracoke and Cedar Island. The ocean summer flounder fishery, which is already under a temporary limited entry system, received little or no attention at the workshops because few attendees engaged in that fishery; we will include it in this discussion because the questions concerning the continuation of the current limitation system are the same questions which must be addressed if limited access systems are to be applied to any of these fisheries.

<u>The Management Alternatives</u>

The following alternatives were presented for discussion, although not all alternatives were discussed at all workshop locations.

1) The Status Quo -- This is the "no change" alternative, meaning that the management systems currently in place for each fishery would remain in effect with no changes, with one important note: *The*

moratorium would no longer be in place. **We emphasized this at the workshop because the current moratorium cannot be permanent. At some point we either have to let the moratorium expire and go back to the previous open access situation, or design a new system which might control access.**

2) An Income-Dependent Endorsement to Sell -- Many fishermen at the first workshop felt that effort would be reduced and controlled sufficiently by making possession of an Endorsement to Sell (ETS) dependent on having a certain minimum percentage of your income from commercial fishing. For our evaluation, we assumed that level of dependence to be 50% of an individual's *earned* income.

3) License limitation -- Under this alternative, licenses to participate in the fishery would be issued to a number of "initial qualifiers". Initial qualifiers might be those fishermen who had a valid commercial fishing license over a qualifying period, probably three years (1994-97, for example), and had landed more than a certain amount of fish in at least two of those three years. After the initial issuance of licenses, the total number of licenses would remain the same; that is, they would not increase above the total number originally issued. An appropriate method would be worked out for the transfer of these licenses.

4) Individual Transferable Quotas (ITQ) -- Under this alternative, each fishermen might be issued "quota shares", or ITQs, based on their average catch over a qualifying period (1994-97, for example). These ITQs would be issued in denominations of, say, 100 pounds, so that a fisherman who had landed an average of 1,000 pounds of fish per year would be issued 10 100-pound ITQs. Each fisherman would then be limited to landing that amount of the limited species of fish per year. An appropriate method would be worked out to allow fishermen to change the amount of ITQ they held; that is, to change the amount of fish they were entitled to land and sell.

5) Gear Certificates -- Under this alternative, each fisherman might be issued certificates for the amount of gear they had used in the fishery under the qualifying period (1994-97, for example). Thus, a fisherman who has used 500 crab pots, a certain length of pound net lead and

number of pounds, or a certain amount of flounder gear would be issued gear certificates in those amounts. An appropriate method would be worked out to allow fishermen to change the amount of gear each was allowed to use.

6) Other Alternatives -- At each workshop we encouraged participants to suggest other alternatives, or combinations of those noted above. These suggestions are summarized below.

Criteria for Evaluating the Alternatives

We listed specific criteria for considering the impact of each of the alternatives for each fishery:

1) Effort Control or Reduction -- Would the alternative control or reduce fishing effort?

2) Fishermen Flexibility -- Would the alternative give the fisherman flexibility to adjust their fishing operations?

3) Biological Impact -- Would the alternative have a noticeable effect on the fish population or habitat?

4) Economic Impact -- What would the economic impact of the alternative be on the individual fisherman and the industry as a whole (prices, net profits, marketability, etc.)?

5) Social Impact -- Would the alternative alter fishing patterns? Would it effect the fishermen's families or communities? Would it be fair and equitable to different groups of fishermen?

6) Enforcement and Administration -- Would the alternative be easy or difficult to put into place? Would it make regulations easier to enforce? Would it be difficult for the fishermen to comply with?

7) Impact on Other Fisheries -- How would the alternative for each fishery affect other fisheries or fishermen, especially fishermen who fish in several fisheries throughout the year?

8) Other Criteria -- Are there other things we should consider in terms of the potential impact of these alternatives?

It is important to note that we did not ask the participants whether they LIKED each alternative, or whether they did or did not want to see each alternative ADOPTED as a law or policy. We were interested only in what the PROBABLE EFFECTS of each alternative might be.

Each participant had a handout on which they could record their own evaluation. We recorded the group's evaluation and comments on a larger version of the chart for everyone to see.

IV) THE RESULTS OF THE EVALUATIONS

We will present the results of the discussion at the second workshop by fishery, noting differences from region to region where appropriate.

The Crab Pot Fishery

'Status Quo' -- There was general consensus at all the workshops that under the 'status quo' option the trend would be negative in all areas of evaluation; that is, there would continue to be increasing numbers of pots and fishermen in the fishery, with negative consequences such as declining economic efficiency (ie., catch per pot) and increased conflict among fishermen. It was noted that other fisheries such as gillnet, haul net, trawl and pound net fisheries would be negatively affected by increased numbers of pots.

Income-Dependent Endorsement to Sell -- Most workshop participants felt that this alternative would either have little or no effect on actual effort control or reduction, or that any effect would be short-run; that is, that even if effort was reduced in the short run it would continue to rise in the long run. The economic and social impacts were generally positive for those who would qualify for the endorsement, but negative for those who would be excluded. The subsistence portion of these negative impacts would be somewhat addressed if the so-called 'dabbler's' license were developed for individuals to fish a certain

number of crab pots with a no-sale provision, but a substantial number of individuals who currently fish crab pots and sell their catch would be prohibited from continuing to do so under this option. Some participants commented that this alternative might promote a more 'professional' fishery, and some commented that effort might be displaced into other fisheries.

License Limitation -- There was some question as to whether controlling the number of licenses alone would control or reduce the number of pots in the water. It was suggested at several of the workshops that the combination of license limitation and a limit on the number of pots per license (similar to the Maryland program) would be a much more effective effort control. It was noted that there would be a significant 'in/out' phenomenon associated with a license limitation system (good for those with licenses; bad for those without them), and that fisherman flexibility would be reduced (again, more flexible for those 'in'; less flexible for those 'out). The potential for displacement of effort into other fisheries was mentioned, as was the positive effect of having a more professional fishery.

Individual Transferable Quotas (ITQ) -- This alternative was not evaluated at any of the workshops for any of the fisheries because in the crab and pound net fisheries the issue was not the number of crabs or fish harvested. ITQ only makes sense in fisheries with a total annual quota which must be enforced and allocated. In the ocean summer flounder fishery, where there is a quota, the issue of ITQ may arise.

Gear Certificates -- This alternative received very mixed evaluations. On the one hand, it is one option that would actually cap the total number of pots in the fishery. However, it would be extremely difficult to determine how to distribute the original gear certificates to reflect the number of pots each fisherman actually has in use, and would be a costly and complex system to set up, administer and enforce.

Other -- As noted above, it was suggested by many workshop participants that a combination of license limitation and pot limits per licensee or vessel might be appropriate. We will return to this option below.

Other Issues

Several other issues were mentioned with respect to any potential limited entry system for crab pots:

1) Consideration should be given to regional differences in the fishery. The possibility of different 'registration areas' was mentioned.

2) The issue of peeler pots was raised; how would peeler pots count in a limitation system?

3) The possibility of different limitations for full- and part-time fishermen was raised.

4) Some participants questioned whether it was fair to limit participation in one fishery but not others.

5) The possibility of some form of "owner/operator" provision was raised; that the owner or licensee would have to be present for the boat to fish.

The Pound Net Fishery

At the second workshop, several pound net fishermen from the Ocracoke-Core Sound area asked that we meet with fishermen from their area to discuss the issue of the increasing number of pound nets in that area. We held two such meetings, using the same approximate format described above. In these workshops the discussion focused on three alternatives: 1) the status quo; 2) an income dependent ETS; and 3) some form of license limitation. The results are as follows.

The Status Quo

The analysis differed somewhat between participants at Ocracoke and Cedar Island. While both felt that the number of pound nets was increasing, and that some degree of problem was present (lower yields per net, conflict), the Ocracoke participants definitely felt that their

area was "saturated" to capacity with pounds while the Cedar Island participants felt that the number of pounds in their area fluctuated with fish availability, weather and fish prices over the years. Effects of increasing number of pounds were noted on trawl and long haul fisheries.

Income-Dependent ETS

Participants in both locations felt that the income-dependent ETS would have no effect on the pound net issue, because virtually all of the current pound netters have high levels of dependence on commercial fishing and would qualify under any income-dependence criteria.

License Limitation

Participants in both locations felt that some form of limitation on people or pounds might have positive effects. The main difference was that the participants in Ocracoke brought up the idea of a cap on the number of pounds ("pockets") per fisherman/operation, while the Cedar Island participants brought up the idea of a density-based limitation: For example; 1) defining pound net areas; 2) "grandfathering" the current set-holders into the system; and 3) requiring that any further sets registered be a minimum distance from current sets.

Other Issues

1) Participants at both locations felt that the records of existing sets should be clarified and documented to reflect what was actually in the waters, as opposed to what was "on paper".

2) There was a general feeling that enforcement of existing pound net regulation could be more complete.

3) The possibility of some form of "owner/operator" provision was raised; that the registrant of the set would have to be present for the set to be fished.

4) The Ocracoke participants felt that some portion of the increase in pounds in their area was due to fishermen from outside of their area, and expressed concern that the fishing alternatives from their Ocracoke base were limited.

Other Fisheries Discussed

At the Raleigh workshop the participants discussed the shrimp trawl fishery in terms of potential limited entry systems. The major concern at this workshop were the issues of bycatch and habitat impacts from trawling. After evaluation with the format described above, it was generally concluded that the limited entry systems under consideration would have little potential for impact on the bycatch and habitat problems compared to other management measures such as gear requirements (finfish excluders) and time and area restrictions.

V) FURTHER CONSIDERATION OF LIMITED ENTRY/CONTROLLED ACCESS

If any of the fisheries discussed above (crab pot, pound net, ocean summer flounder) were to be considered for some form of limited entry, the following questions must be addressed:

1) What is the problem that needs to be solved?

Are there too many fishermen or fishing units in the fishery? Too much gear? Too much effort? Is the available amount of fish too small for the number of fishermen in the fishery? Are there social or economic conflicts in the fishery, or among fisheries? Are fishermen spending more money than they need to in order to catch the available amount of fish?

2) What is the appropriate unit of effort to consider limiting?

Number of fishermen or fishing vessels? Amount of gear? Amount of catch?

3) If a limited entry or access system were set up, how would the initial fishing privileges be assigned?

The answer to this question would depend on the problem we are trying to solve. The usual procedure is to issue the initial privileges -- licenses, ITQs, gear certificates -- on the basis of historical participation in the fishery, which of course must be documented. For example, if we decided to limited the number of fishermen we would need records of who had been in the fishery. If the system were based on gear or catch, we would need records of those things.

4) How would fishermen get in or out of the fishery, or adjust their fishing operations?

All limited entry systems must have a way for new fishermen to get into the fishery. The most common way to do this is to make the privileges marketable, so that fishermen buy and sell them from each other subject to anti-monopoly and certain other constraints. Alternatively, licenses could be surrendered to the state for reissue.

5) How would the system be administered, and how would it be paid for?

It is difficult for fishery managers to administer and enforce even current fishery regulations, and limited entry systems are often initially expensive to set up and complex to administer. Provisions for paying for these administrative and enforcement costs would have to be made.

6) Are there special conditions in the fishery that would have to be taken into account?

For example, in North Carolina fishermen often fish in several different fisheries through the year. If a limited entry or access systems were set up for certain fisheries, how would that affect other fisheries?

For our three fisheries under consideration, then, we would need to ask all of these questions. Tables 1-3 at the end of this handout contain a series of questions for each of the fisheries we have discussed at the

workshop, as examples of the kinds of details that would have to be considered to further design limited entry or access systems for any of these fisheries. The purpose of these tables is not to advocate the adoption of any of these systems, but to allow workshop participants to further explore the potential effects of such systems.

IV) WHERE DO WE GO FROM HERE?

The results of our project, including the results of our interviews with fishermen, will be presented to the Moratorium Steering Committee, the Marine Fisheries Commission, and the Joint Legislative Study Commission on Fisheries and Aquaculture. ***It is important to note that East Carolina or Duke researchers will NOT tell the agencies or committees what the FISHERMEN want to do -- we will rely on the fishermen to do that themselves, individually and through their organizations.*** **Our job is to facilitate discussion of these issues in the fishing community and among those concerned with fisheries in general, and to provide the fishermen, managers and policy-makers, and the public with the best possible set of information for their further deliberations. If action is initiated on any of these ideas, everyone will have additional opportunity for input through the normal public policy process.**

FOR MORE INFORMATION ABOUT LIMITED ENTRY OR ABOUT THESE WORKSHOPS, PLEASE CONTACT

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OR YOUR LOCAL SEA GRANT MARINE ADVISORY SERVICE

Table 1: Crab Pot Fishery (Issues for Discussion Only)

1) The problem -- Too many pots, and to some extent too many fishermen, in the fishery

2) The appropriate unit of effort to limit -- Number of fishermen, and number of pots

3) How would initial privileges be assigned?

- **A) Number of fishermen -- Issue original licenses to**
  - **1) All holders of crab licenses?**
  - **2) All holders of crab licenses with minimum landings?**
    - **a) Any landings?**
    - **b) Minimum landings (1,000 lbs; 6,000 lbs)?**
    - **c) Minimum landings in two of three years?**
- **B) Number of pots -- Limit each licensee to**
  - **1) 300 pots per license**
  - **2) Gradually declining limit (500 first year; 400 second year; 300 third year)?**
  - **3) Total limit per boat/operation?**

4) How would licenses be transferred?

- **A) Marketable licenses?**
  - **1) With "apprenticeship" requirement?**
  - **2) With anti-monopoly cap (no person could hold more than a certain number of licenses)?**
- **B) Non-marketable licenses?**
  - **1) Must surrender to state for reissue**
    - **a) By lottery**
    - **b) To waiting list**
  - **2) Transfer within immediate family?**

5) How would the system be administered and paid for?

- **A) Annual license fee?**
- **B) Annual fee for pot tags (pots would have to be tagged!)?**
- **C) If marketable licenses, license transfer fee?**

6) Special conditions?

- **A) Owner/operator requirement?**

Table 2: The Ocracoke/Core Sound Pound Net Fishery (Issues for Discussion Only)

1) The problem -- Too Many Pounds ("Pockets" and leads)
2) The appropriate unit of effort to limit -- Number of Pounds ("Pockets"; Lead Length)?
3) How would initial privileges be assigned?
- **A) Issue licenses to current registrants?**
  - **1) All current registrants?**
  - **2) Current registrants with threshold qualification (landings; sets in use)?**
- **B) Limit number of pounds ("pockets")/lead length per license?**
  - **1) 15 Pounds?**
  - **2) Gradually declining limit per license (25 first year; 20 second year; 15 third year)?**

4) How would licenses be transferred?
- **A) Marketable licenses?**
  - **1) With "apprenticeship" requirement"**
  - **2) With "anti-monopoly" cap (no person could hold more than a certain number of licenses)?**
- **B) Non-marketable licenses**
  - **1) Must surrender licenses to state for reissue**
    - **a) By lottery?**
    - **b) To waiting list**
  - **2) Transfer within immediate family?**

5) How would the system be administered and paid for?
- **A) Annual license fee?**
- **B) Annual fee for pound tags (pounds would have to be tagged!)?**
- **C) If marketable licenses, license transfer fee?**

6) Special conditions?
- **A) Owner/operator requirement?**
- **B) Designated areas and density restrictions?**

Table 3: Ocean Summer Flounder Fishery (Issues for Discussion Only)

1) The problem -- Too Many Fishing Units for Limited Quota
2) The appropriate unit of effort to limit -- Number of Fishing Units (and/or Landings per Unit)?
3) How would initial privileges be assigned?
- **A) Issue licenses to current licensees?**
  - **1) All current licensees?**
  - **2) Current licensees with threshold qualification (landings)?**
- **B) Issue Individual Transferable Quota (ITQ) to current licensees based on landings history?**

4) How would licenses be transferred?
- **A) Marketable licenses?**
  - **1) With "apprenticeship" requirement?**
  - **2) With "anti-monopoly" cap (no person could hold more than a certain number of licenses)?**
- **B) Non-marketable licenses**
  - **1) Must surrender licenses to state for reissue**
    - **a) By lottery?**
    - **b) To waiting list**
  - **2) Transfer within immediate family?**
- **C) ITQ**
  - **1) Marketable ITQ**
    - **a) With "apprenticeship" requirement?**
    - **b) With "anti-monopoly" cap (no person could hold more than a certain amount of ITQ)?**
  - **2) Non-marketable ITQ?**

5) How would the system be administered and paid for?
- **A) If license limitation.**
  - **1) Annual license fee?**
  - **2) If marketable licenses, license transfer fee?**
- **B) If ITQ,**
  - **1) Annual ITQ fee?**
  - **2) If marketable ITQ, ITQ transfer fee?**

6) Special conditions?

Appendix IV

SYNOPSIS OF THE POTENTIAL FOR A LIMITED ENTRY SYSTEM IN THE NORTH CAROLINA BLUE CRAB POT FISHERY

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"Effort Management in North Carolina Fisheries:
A Total Systems Approach"

Presented to the NC Fisheries Moratorium Steering Committee
Morehead City, NC
April, 1996

Introduction

This synopsis is summarized from the materials developed from the research and workshops conducted under the project "Effort Management In North Carolina Fisheries: A Total Systems Approach" funded by the Moratorium Steering Committee, with additional input from a workshop of crab fishery participants active in the Blue Crab Data Gathering project under the North Carolina Fishery Resource Grants program. This project involved extensive data collection and interviews with over 250 fishermen, and 21 workshops across the state.

Objectives

The objectives of any potential limited entry system in the blue crab pot fishery would be:

1) To control, or reduce, the effort in the crab pot fishery so that the effort more closely matches the available fishery resource;

2) To increase stability in the crab pot fishery, and promote maximum net incomes for fishermen;

3) To promote flexibility for fishermen in their fishing operations;

4) To avoid conflict among fishermen and between fishermen and other marine users;

5) To ensure that fishermen who have traditionally fished in the crab pot fishery be able to continue to due so, as much as possible in their traditional fishing patterns;

6) To make management of the crab pot fishery more efficient and effective.

General Condition of the Crab Pot Fishery

The general consensus seems to be that although the crab catch fluctuates with environmental conditions, the total number of crab pots and fishermen in the crab fishery has been increasing at a rate much greater than the increase in the crab catch itself (see Figure 1). The degree of increase varies from one part of the state to another, but some degree of economic inefficiency, social conflict, and possible biological and ecological impact appears to be present in the fishery throughout the state.

The Management Alternatives

1) The Status Quo -- This is the "no change" alternative, meaning that the management systems currently in place for the crab pot fishery would remain in effect with no changes, with one important note: *The moratorium would no longer be in place*. We emphasized this at the workshops because the current moratorium cannot be permanent. At some point we either have to let the moratorium expire and go back to the previous open access situation, or design a new system which might control access.

2) An Income-Dependent Endorsement to Sell -- Many fishermen at the first workshop felt that effort would be reduced and controlled sufficiently by making possession of an Endorsement to Sell (ETS), crab license or, under a revised license system, the basic commercial fishing license, dependent on having a certain minimum percentage of your income from commercial fishing. For our evaluation, we assumed that level of dependence to be 50% of an individual's *earned* income.

3) License Limitation -- Under this alternative, licenses to participate in the fishery would be issued at the beginning of the system to a number of "initial qualifiers". Initial qualifiers might be those fishermen who had a valid commercial fishing license over a qualifying period, probably three years (1994-97, for example), and had landed more than a certain amount of crab in at least two of those three years. After the initial issuance of licenses, the total number of licenses would remain the same; that is, they would not increase above the total number

originally issued. An appropriate method would be worked out for the transfer of these licenses over time.

4) Individual Transferable Quotas (ITQ) -- Under this alternative, each fishermen might be issued "quota shares", or ITQs, based on their average catch over a qualifying period (1994-97, for example). These ITQs would be issued in denominations of, say, 100 pounds, so that a fisherman who had landed an average of 1,000 pounds of crab per year would be issued 10 100-pound ITQs. Each fisherman would then be limited to landing that amount of crab per year. An appropriate method would be worked out to allow fishermen to change the amount of ITQ they held; that is, to change the amount of crab they were entitled to land and sell.

5) Gear Certificates -- Under this alternative, each fisherman might be issued certificates for the amount of gear they had used in the fishery under the qualifying period (1994-97, for example). Thus, a fisherman who has used 400 crab pots would be issued gear certificates in those amounts. An appropriate method would be worked out to allow fishermen to transfer these certificates.

6) License Limitation with a Limit on the Number of Pots Per License -- Under this alternative, each fishermen would be issued licenses as in alternative (3) but each licensee would be limited to a certain number of pots per license.

7) License Share System -- Under this system each fisherman would be issued licenses in quarter share increments, with each quarter license share limited to the use of 150 pots. A full license would be limited to 600 pots, hard crab and peeler pots combined, in the water at any given time. The initial shares would be issued based on the landings of each fishermen in a qualifying period, with quarter, half, three-quarter and full shares being issued to fishermen based on their historic catch level. Thereafter, licenses would be transferable in quarter-share increments.

Criteria for Evaluating the Alternatives

We listed specific criteria for considering the impact of each of the alternatives for the blue crab fishery:

1) Effort Control or Reduction -- Would the alternative control or reduce fishing effort?

2) Fishermen Flexibility -- Would the alternative give the fisherman flexibility to adjust their fishing operations?

3) Biological Impact -- Would the alternative have a noticeable effect on the crab population or habitat?

4) Socio-economic Impact -- What would the economic impact of the alternative be on the individual fisherman and the industry as a whole (prices, net profits, marketability, etc.)? Would the alternative alter fishing patterns? Would it effect the fishermen's families or communities? Would it be fair and equitable to different groups of fishermen?

5) Enforcement and Administration -- Would the alternative be easy or difficult to put into place? Would it make regulations easier to enforce? Would it be difficult for the fishermen to comply with?

6) Impact on Other Fisheries -- How would the alternative for the crab pot fishery affect other fisheries or fishermen, especially fishermen who fish in several fisheries throughout the year?

It is important to note that we did not ask the participants whether they LIKED each alternative, or whether they did or did not want to see each alternative ADOPTED as a law or policy. We were interested only in what the PROBABLE EFFECTS of each alternative might be.

Results of the Evaluation for the Blue Crab Pot Fishery

'Status Quo' -- There was general consensus at all the workshops that under the 'status quo' option the trend would be negative in all areas of

evaluation; that is, there would continue to be increasing numbers of pots and fishermen in the fishery, with negative consequences such as declining economic efficiency (ie., catch per pot) and increased conflict among fishermen. It was noted that other fisheries such as gillnet, haul net, trawl and pound net fisheries would be negatively affected by increased numbers of pots.

Income-Dependent Endorsement to Sell -- Most workshop participants felt that this alternative, if it were the only provision implemented, would either have little or no effect on actual effort control or reduction, or that any effect would be short-run; that is, that even if effort was reduced in the short run it would continue to rise in the long run. The economic and social impacts were generally positive for those who would qualify for the endorsement, but negative for those who would be excluded. The subsistence portion of these negative impacts would be somewhat addressed if the so-called 'dabbler's' license were developed for individuals to fish a certain number of crab pots with a no-sale provision, but a substantial number of individuals who currently fish crab pots and sell their catch would be prohibited from continuing to do so under this option. Some participants commented that this alternative might promote a more 'professional' fishery, and some commented that effort might be displaced into other fisheries.

License Limitation -- There was some question as to whether controlling the number of licenses alone would control or reduce the number of pots in the water. It was suggested at several of the workshops that the combination of license limitation and a limit on the number of pots per license (similar to the Maryland program) would be a much more effective effort control, so that alternative was listed above and evaluated separately in Table 2. It was noted that there would be a significant 'in/out' phenomenon associated with a license limitation system (good for those with licenses; bad for those without them), and that fisherman flexibility would be reduced (again, more flexible for those 'in'; less flexible for those 'out'). The potential for displacement of effort into other fisheries was mentioned, as was the positive effect of having a more professional fishery. It was also noted that a license limitation system alone might lead to significant costs of

entry (the requirement to purchase a full license) compared to some of the other alternatives.

Individual Transferable Quotas (ITQ) -- This alternative was not evaluated at any of the workshops because the issue was not the number of crabs harvested. ITQ only makes sense in fisheries with a total annual quota which must be enforced and allocated. In the ocean summer flounder fishery, for example, where there is a quota, the issue of ITQ may arise.

Gear Certificates -- This alternative received very mixed evaluations. On the one hand, it is one option that would actually cap the total number of pots in the fishery. However, it would be extremely difficult to determine how to distribute the original gear certificates to reflect the number of pots each fisherman actually has in use, and would be a costly and complex system to set up, administer and enforce. It would, however, allow fishermen maximum flexibility in adjusting their fishing operations and allow new entrants to enter the fishery at relatively low cost.

License Share System -- This option was developed at the workshop with the blue crabbers involved in the Blue Crab Data Gathering project. It arose out of three concerns in the discussion of license limitation: 1) the potentially high cost of full licenses if that were the only option; 2) the need to take into account the different sizes of crab fishing operations throughout the state; and 3) the need of fishermen to periodically adjust the size of their fishing operations and for new entrants to be able to enter the fishery at lower cost. This option has the features of the license limitation with a cap on pots, but provides flexibility in that the licenses are available in quarter-share increments which allows more flexibility and lower cost entry.

Other Issues

Several other issues were mentioned with respect to any potential limited entry system for crab pots:

1) Consideration should be given to regional differences in the fishery. The possibility of different 'registration areas' was mentioned.

2) The issue of peeler pots was raised; how would peeler pots count in a limitation system?

3) The possibility of different limitations for full- and part-time fishermen was raised.

4) Some participants questioned whether it was fair to limit participation in one fishery but not others.

5) The possibility of some form of "owner/operator" provision was raised; that the owner or licensee would have to be present for the boat to fish.

6) A concern was raised over the potential for an increase in crab trawl effort after the total number of crab pots in the fishery had been limited. This would have the potential to shift a higher proportion of the crab catch to the trawl fishery, and would have to be addressed in a crab fishery management plan.

<u>Questions with Respect to Limited Entry Systems</u>

If the blue crab pot fishery were to be considered for some form of limited entry, the following questions must be addressed:

1) What is the problem that needs to be solved?

Are there too many fishermen or fishing units in the fishery? Too much gear? Too much effort? Is the available amount of crab too small for the number of fishermen in the fishery? Are there social or economic conflicts in the fishery, or among fisheries? Are fishermen spending more money than they need to in order to catch the available amount of crab?

2) What is the appropriate unit of effort to consider limiting?

Number of fishermen or fishing vessels? Amount of gear?

3) If a limited entry or access system were set up, how would the initial fishing privileges be assigned?

The answer to this question would depend on the problem we are trying to solve. The usual procedure is to issue the initial privileges -- licenses, ITQs, gear certificates -- on the basis of historical participation in the fishery, which of course must be documented. For example, if we decided to limited the number of fishermen we would need records of who had been in the fishery. If the system were based on gear or catch, we would need records of those things.

4) How would fishermen get in or out of the fishery, or adjust their fishing operations?

All limited entry systems must have a way for new fishermen to get into the fishery. The most common way to do this is to make the privileges marketable, so that fishermen buy and sell them from each other subject to anti-monopoly and certain other constraints. Alternatively, licenses could be surrendered to the state for reissue.

5) How would the system be administered, and how would it be paid for?

It is difficult for fishery managers to administer and enforce even current fishery regulations, and limited entry systems are often initially expensive to set up and complex to administer. Provisions for paying for these administrative and enforcement costs would have to be made.

6) Are there special conditions in the fishery that would have to be taken into account?

For example, in North Carolina fishermen often fish in several different fisheries through the year. If a limited entry or access systems were set up for certain fisheries, how would that affect other fisheries?

For blue crab pot fishery, then, we would need to ask all of these questions. Tables 1 contains a series of such questions, as examples of the kinds of details that would have to be considered to further design limited entry or access systems for the blue crab pot fishery. The purpose of this table is not to advocate the adoption of any of these systems, but to further explore the potential effects of such systems.

Table 2 is an attempt to make a general evaluation of the different alternatives under both short- and long-term conditions, using "high, "medium" and "low" categories. For example, a "high" on the effort control or reduction criterion means that the alternative has a high potential for controlling or reducing effort. A "low" on the socio-economic impact criterion means that the alternative has the potential for a negative socio-economic impact.

It is important to note that the full evaluation of each alternative is dependent on the answer to many of the questions in Table 1, and therefore that Table 2 should be used only to array the different features of the alternatives against one another, not to indicate a single "best" system.

The choice of a recommended system, if any, will depend on the input from the blue crab and other fishery participants and the judgment of the Moratorium Steering Committee.

Table 1: Details of a Potential Limited Entry System for the Blue Crab Pot Fishery

1) The problem -- Too many pots, and to some extent too many fishermen, in the fishery
2) The appropriate unit of effort to limit -- Number of fishermen, and number of pots
3) How would initial privileges be assigned?
- **A) Number of fishermen -- Issue original licenses to**
  - **1) All holders of crab licenses?**
  - **2) All holders of crab licenses with minimum landings?**
    - **a) Any landings?**
    - **b) Minimum landings (1,000 lbs; 6,000 lbs)?**
    - **c) Minimum landings in two of three years?**
- **B) Licenses available in fractions, or "shares"?**
- **B) Number of pots -- Limit each licensee to**
  - **1) 300/400/500/600? pots per license**
  - **2) Gradually declining limit (600 first year; 500 second year; 400 third year)?**
  - **3) Total limit per boat/operation?**

4) How would licenses be transferred?
- **A) Marketable licenses?**
  - **1) With "apprenticeship" requirement?**
  - **2) With anti-monopoly cap (no person could hold more than a certain number of licenses)?**
- **B) Non-marketable licenses?**
  - **1) Must surrender to state for reissue**
    - **a) By lottery**
    - **b) To waiting list**
  - **2) Transfer within immediate family?**

5) How would the system be administered and paid for?
- **A) Annual license fee?**
- **B) Annual fee for pot tags?**
- **C) If marketable licenses, license transfer fee?**

6) Special conditions?
- **A) Owner/operator requirement?**
- **B) 50% earned income requirement?**

Table 2: Impact Matrix for Blue Crab Pot Fishery Limited Entry Alternatives

ALTERNATIVE	CRITERIA					
	1) EF/RD ST/LT	2) F/FLX ST/LT	3) BIO ST/LT	4) S/E ST/LT	5) A/E ST/LT	6) O/F ST/LT**
1) STATUS QUO	L/L	M/L	L/L	M/L	M/L	M/L
2) INC. DEP./ETS	M/L	M/L*	M/L	M/L*	M/L	L/L
3) LICENSE LIM.	M/L	M/L*	M/L	M/L*	M/M	M/L
4) ITQ	NA	NA	NA	NA	NA	NA
5) TRAP CERT.	H/H	M/H*	M/H	M/M*	L/M	M/M
6) LL W/POT CAP	H/H	M/L*	M/M	M/L*	M/M	M/M
7) LICENSE SHARES	H/H	M/H*	M/M	M/M*	M/M	M/M

ALTERNATIVES
1) STATUS QUO -- NO CHANGE IN CURRENT MANAGEMENT
2) INCOME DEPENDENT ENDORSEMENT TO SELL
3) LICENSE LIMITATION
4) INDIVIDUAL TRANSFERABLE QUOTAS
5) TRANSFERABLE TRAP CERTIFICATES
6) LICENSE LIMITATION WITH 300 POT CAP
7) LICENSE SHARE SYSTEM - 600 POT LIMIT IN 150 POT INCREMENTS

CRITERIA
1) EFFORT CONTROL OR REDUCTION POTENTIAL
2) FISHERMEN FLEXIBILITY
3) BIOLOGICAL IMPACT
4) SOCIO-ECONOMIC IMPACT
5) ADMINISTRATION AND ENFORCEMENT POTENTIAL
6) IMPACT ON OTHER FISHERIES

NOTES
(*) NEGATIVE FOR THOSE WITHOUT THE PRIVILEGE; POSITIVE FOR THOSE WITH THE PRIVILEGE
(**) SHORT TERM/LONG TERM

Figure 1

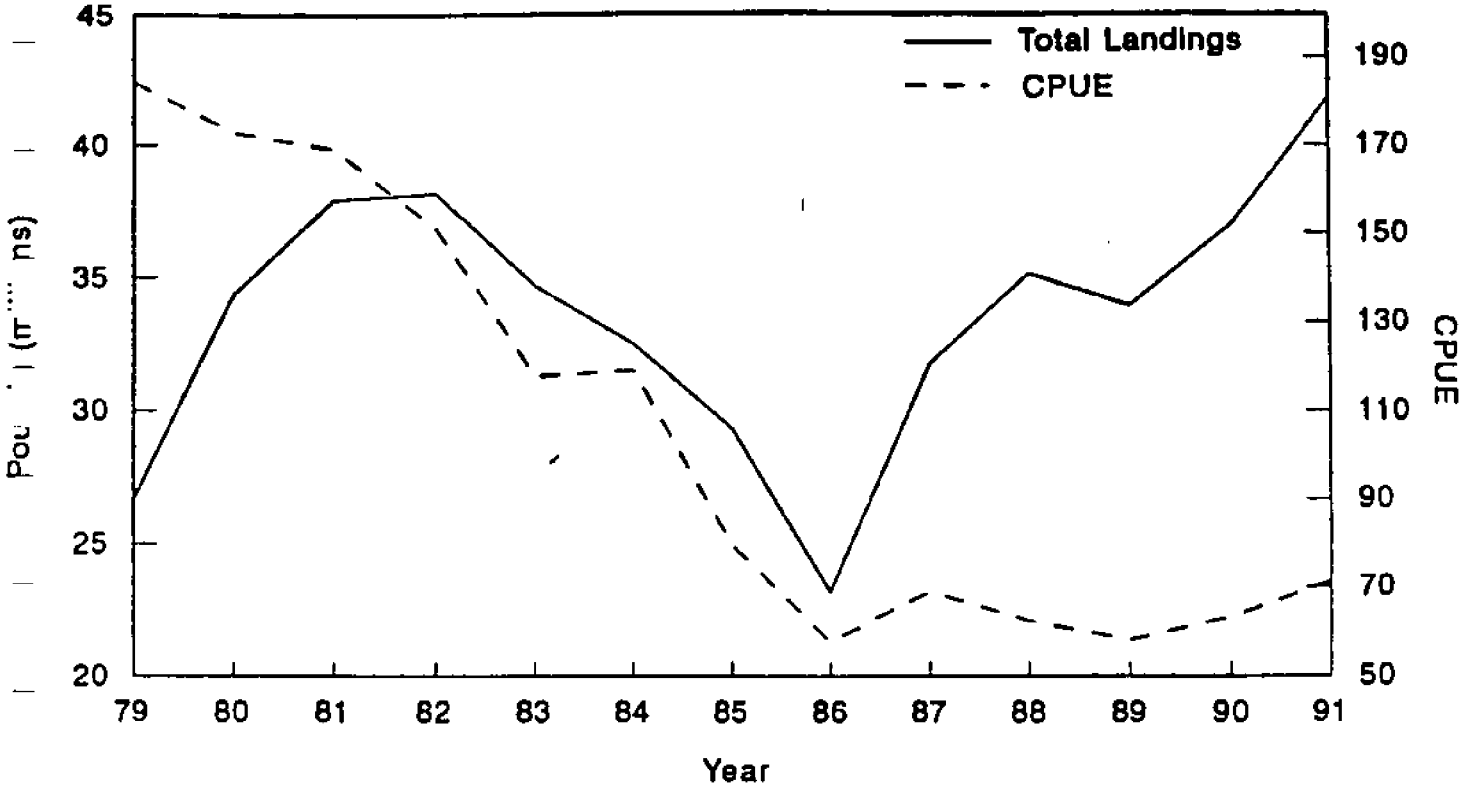

Figure 4. Commercial landings of blue crabs in North Carolina and catch-per-unit-effort (CPUE) for crab pots 1979-91.

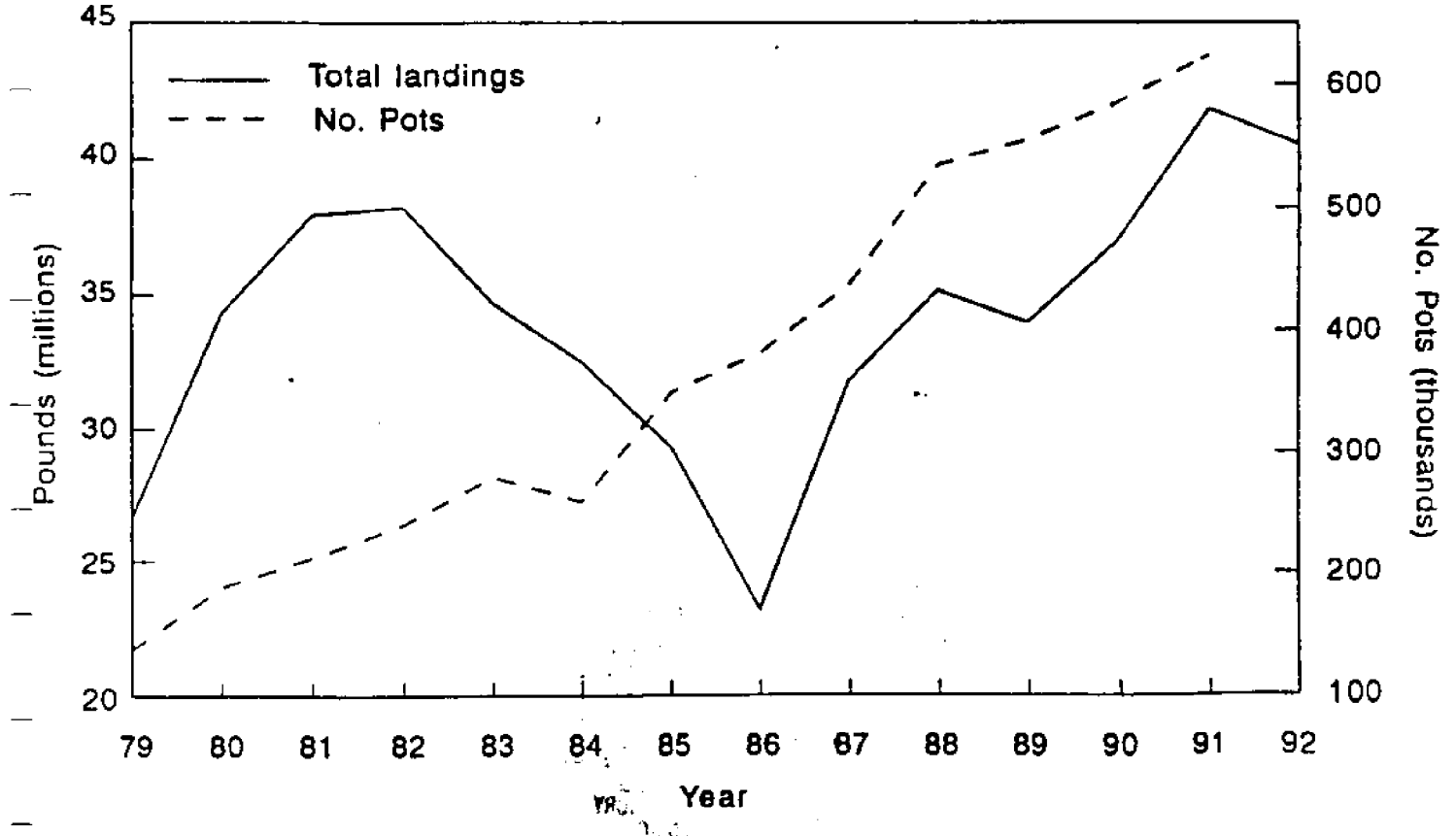

Figure 5. Commercial landings of blue crabs in North Carolina and fishing effort expressed as the number of crab pots estimated in use, 1979-92.