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Social and Economic Impacts Of Growth of the Blue Crab Fishery In North Carolina

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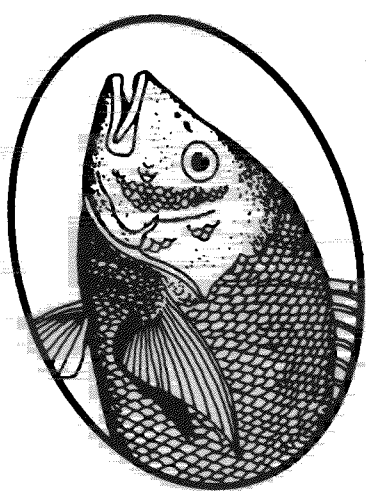

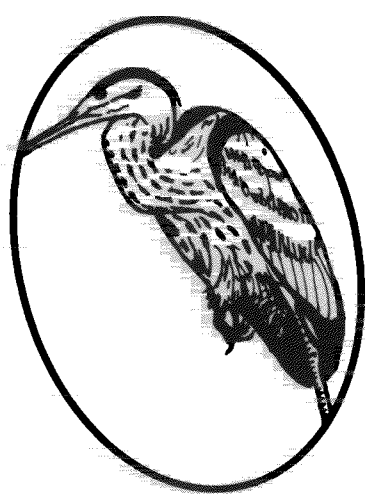

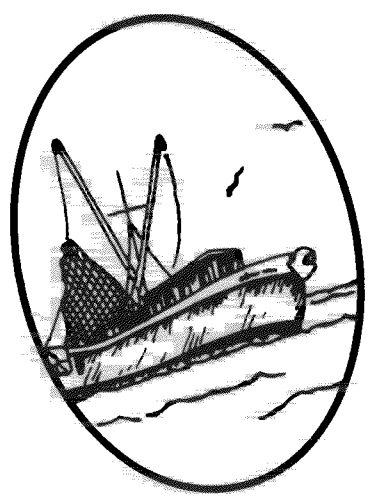

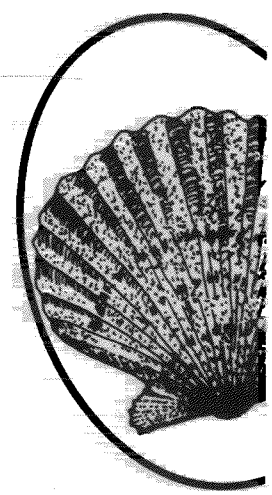

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Social and Economic Impacts of Growth of the Blue Crab Fishery in North Carolina

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Executive Summary

This analysis examines some of the social and economic parameters of the North Carolina blue crab fishery. The crab fisherman emerges as a hardworking local resident, with limited community involvement because of the intense nature of his work. His fishing effort focuses on crabbing, but flounder trawling, gill netting, and oystering also are important sources of income.

Spouses of fishermen play an important role in the family occupational structure. Many work full time and contribute an average of 27 percent to the total family income.

Some form of competition prevails among all fishermen; this is no different for the crabber. Competition exists between full-timers and part-timers, primarily over access to the resource. As the number of crabbers increases competition for space will continue to grow.

Another source of competition is evidenced between crab potters and trawlers. This concerns primarily an incompatibility in gear and fishing grounds.

Blue crabs are very important to North Carolina's seafood dealers. Development of this industry is of primary concern to many, especially those involved in the processing of crabs.

The blue crab fishery in North Carolina affects not only those who fish for crabs. It impacts among dealers, processors (along with a significant number of employees who work in the processing sector), managers and consumers.

Introduction

North Carolina ranks third on the Atlantic Coast in blue crab production. Pamlico Sound, the major production area for the South Atlantic, has yielded about 10 million pounds of crabs annually since 1970 (Terry Sholar, N.C. Division of Marine Fisheries Report, 1979). Since 1978, record landings have been reported in North Carolina. Participation in this fishery has increased in terms of the number of fishermen, and especially in terms of their fishing effort directed toward blue crabs. From the fishermen's viewpoint, it is a relatively inexpensive fishery to enter.

The expansion of this fishery is of growing concern to policymakers and managers. However, research on the social and economic impacts of growth in the crab fishery has not been available to assist them.

The purpose of this research was to examine, on a preliminary basis, the social and economic parameters of the crab fishery. Growth in the fishery refers to increased numbers of fishermen and increased effort directed toward the resource. Affected by this growth are the fishermen pursuing the species, fishermen in other fisheries, dealers, processors, managers and policymakers. These research efforts will provide information which will be useful in both the short-term management and long-term development of the crab fishery. The specific focuses of the study are: 1) competition among crab fishermen, i.e., estimation of social and economic impacts of growth in the blue crab fishery, the number of fishermen, number of pots, setting areas, and ownership of pots; 2) special problems between trawl and crab fishermen, i.e., competition for space; 3) competition between full-time and part-time crab fishermen; and 4) the effects of changes in stock abundance on occupational choices of crab fishermen, as well as their perceptions of and attitudes toward coastal zone and fisheries management initiatives to manage the resource. In this sense, the research is designed to present an overview of the blue crab fishery in North Carolina and to present some aspects of the sociocultural context in which it exists.

The project extended from February 1984 through December 1984. The design consisted of two phases. The first phase consisted of interviews directed toward a distributional sample of the harvesting sector (fishermen). An interview schedule was developed based on discussions with officials at the N.C. Division of Marine Fisheries, and on existing research (Sholar, 1979). The instrument contained structured, unstructured open-ended and personal history questions. The interviews were administered to a stratified sample of crab fishermen at pre-selected sites. The second phase consisted of key informant interviews. In-depth, open-ended interviews were conducted with selected members of the marketing sector (dealers and/or processors) who were actively involved in the fishery and were considered knowledgeable people in the crab fishery.

Background research revealed that crab potting is a relatively inexpensive venture compared to other fisheries, that it is a consistent and reliable fishery, and that it is less labor intensive than other fisheries. For these reasons, we hypothesized that more and more fishermen were entering the crab fishery, and this would result in increased competition for fishing space among

crab fishermen and trawl fishermen. Secondly, it was hypothesized that those fishermen entering the crab fishery do so in response to the availability of the crab resource and to fluctuations in the stocks of other fisheries. It has been suggested that the poor shrimp season of 1978 forced many fishermen to turn to crabbing as a means of support, and many chose to continue crabbing.

An examination of catch statistics in recent years illustrates fluctuations of the resource. The trend has been a steady increase in both landings and value. Blue crab landings (soft and hard shell) totalled 34,777,025 pounds in 1983, and were valued at $8,633,086.

North Carolina Crab Fishermen Survey Sample Procedures

Selection of Sample Ports.

Background information on North Carolina's crab fishery indicated that there are six counties in the state which consistently produce high amounts of crabs on a commercial basis. Those counties are Pamlico, Dare, Carteret, Hyde, Beaufort and Currituck. A review of landings and license data confirmed this. In the case of Currituck County, however, data could not be released by the DMF for reasons of confidentiality (too few fishermen to assure confidentiality). An examination of license data showed that Currituck County had the least number of licensed crab fishermen of the six counties and could be eliminated without creating a bias. Therefore, Currituck County was not included as a research site.

Consultation with members of the N.C. DMF staff, and careful study of landings, license and gear information confirmed that the remaining five counties (Pamlico, Dare, Hyde, Beaufort and Carteret) would provide a good geographical representation.

The second phase consisted of selecting locations from which the fishermen would be sampled. Based on several considerations, the principal investigator made the decision to sample the fishermen where they dock their boats and/or sell their catches. This strategy allowed for personal contact rather than an initial approach by phone. It was expected that this would produce a higher response rate. Second, the completion of interviews at one particular site in a given county would save an enormous amount of time and field costs. The selection of seafood dealers and/or docks was based on consultations with DMF personnel and an evaluation of the North Carolina state dealers license list. Only those dealerships where the purchase and/or processing of crabs occurs were considered as possible research sites. A list of the major blue crab processors in North Carolina published by the North Carolina State University Seafood Laboratory was a helpful source. Ten seafood dealers'docks were chosen as sites to conduct the structured interviews with fishermen. These included three locations in Beaufort County, two in Pamlico County, two in Hyde County, two in Dare County and one location in Carteret County.

Determining the Sample n's. The 1983 North Carolina state license list included 3,250 crab fishermen within the selected counties. Twenty-eight percent were in Beaufort County, 22 percent in Carteret County, 22 percent in Dare County, 15 percent in Pamlico County, and 13 percent in Hyde County.

The overall target n for commercial crab fishermen was 74. The proportion of the total number of crab fishermen within each county to the target n was calculated and the sample n's were as follows: 21 in Beaufort County, 16 in Carteret County, 16 in Dare County, 11 in Pamlico County, and 10 in Hyde County.

Based on the sample n's the number of full-time and part-time fishermen to be interviewed was determined by how the vessel licenses were distributed in each county. The resulting sample n's for full-time and part-time fishermen were as follows: 7 full-time and 14 part-time in Beaufort County, 8 full-time and 8 part-time in Carteret County, 16 full-time in Dare County, 11 full-time in Pamlico County, and 10 full-time in Hyde County. No part-time crab fishermen samples were drawn for Dare, Pamlico, or Hyde Counties. The number of licensed part-timers outnumber the full-timers almost 2 to 1 in Beaufort County. In Pamlico County the number of licensed part-timers is highest (1,257) of all five counties. It was felt that a representative part-time sample could be obtained from those two counties alone.

The original sample procedure was to be conducted on an intercept basis, that is, the interviewers would contact fishermen at the dock or seafood dealership where they sold their catches. In order to insure a random sample of fishermen from each location, selection was to be employed on a systematic basis. For example, if eight fishermen were reported to sell their catches at a selected location, and it had been determined that four interviews were to be conducted at that location, the researcher would divide four into eight, then select a number from a table of random numbers between one and two. If the number one was selected as the random number, the interviewer would contact the first fisherman that came to the dock, and every other one after that until the target n was accomplished. This sampling procedure was to be conducted at each of the selected locations.

During the actual field work several problems were encountered which required a change in strategy. The major difficulty was that the reported number of fishermen usually differed from the actual number of fishermen who came to the port on the day of the interview. A second problem encountered was that of locating part-time fishermen. It was discovered that in a particular location, the majority of part-time fishermen sell their catches to the same dealer. The researchers were unaware of this pattern prior to the actual field work. To deal with the full-timers, the decision was made to drop the systematic sampling procedure and to interview each fisherman who came in until the quota for that location was filled. As for the part-time fishermen, it was decided to interview as many as possible at the scheduled locations. If needed, additional locations would be added in order to contact more part-time fishermen.

Final Sample. The sample n for full-time commercial crabbers was 53. The sample n for part-time crabbers was 24, which provided a total of 77 interviews. Of those 77, six trawled for crabs and 73 used crab pots (2 respondents used pots and trawled). The final sample by county was as follows: Beaufort County had 7 full-time and 19 part-time commercial crabbers. The original sample n's were 7 full-time and 14 part-time. Five part-time crab fishermen were added in Beaufort County after attempts to contact part-timers in other counties were unsuccessful.

The final sample for Carteret County consisted of 9 full-time and 2 part-time commercial crabbers. The original sample n's were for 8 full-time and 8 part-time. In this case, 4 of the needed part-timers could not be contacted and one extra full-timer was interviewed.

The final sample in Dare County had 16 full-time and two part-time commercial crab fishermen. The original sample for Dare County consisted of 16 full-time and no part-time commercial crabbers. It was decided not to screen out the two part-timers here since the quota for part-time fishermen was not being met.

In Pamlico County there were a total of 1 part-time and 10 full-time fishermen. The original sample was for 10 full-timers and no part-timers.

The final sample for Hyde County consisted of 11 full-time fishermen. The original sample was for 10 full-timers and no part-timers.

Interviewing fishermen on an intercept basis proved to be an efficient interviewing method. As expected, there was a high response rate, and field costs, time, and energy were greatly reduced. The problems with sampling could be adjusted to accommodate this interviewing method if the study were repeated.

The final sample squares nearly perfectly in terms of the breakdown of full-timers and part-timers (70.1 vs. 29.9) estimated from full-time and part-time fishermen (all types) in the counties studied (70.3 vs. 29.7). However the sample was biased in regard to gear. The total population (of crab fishermen) is divided in the following manner: 15.6 percent use trawls, 81.9 percent use pots, 2.5 percent use trot lines. In our sample, 7.8 percent use trawls, 94.8 percent use pots, and 1.3 percent use trot lines. Keep in mind, therefore, that potters are over-represented and trot liners and trawlers are under-represented.

Demographic Characteristics of Crab Fishermen

This section examines North Carolina crab fishermen by presenting data on their social and economic profiles, including age, education, family background, work activities, gear, organizational involvement and relationships with other fishermen. We will also discuss such issues as how fishermen adapt to changes in the environment. These changes concern both the resource and management. The management of marine resources is discussed in terms of fishermen's perceptions of policies promulgated by the resource managers.

North Carolina crab fishermen range in age from 14 to 74 years. Most are in their 30s or younger, with the average age being 36 years. About 13 percent of the crab fishermen are 50 years or older. On the average, part-timers are slightly younger than their full-time counterparts ($\bar{x}$ = 33 vs. 37).

Ninety-nine percent of the sample are male, with 97 percent classified as racially white. An average of 77 percent are married (full-timers = 81 percent; part-timers = 67 percent). Average family size is 2.09 children. Families ranged from zero to eight children. Only 6.5 percent of the sample were divorced and 16.9 percent have never been married.

Sixty-five percent of the fishermen have had 12 years of education or more with the average being 11.9 years. Thus, the average crab fisherman basically has a high school education. Moreover, 32 percent have some formal education after high school (1 part-time fisherman who was a high school principal had 18 years of education and 1 full-time fisherman had 17 years). The average number of years of education for full-timers is 11.7 years and for part-timers the average is 12.3 years. Younger fishermen appear to be more educated. Fishermen

under 40 had an average of 13 years of education while those over 40 averaged 11 years of education. Most crab fishermen were born in North Carolina (84.4 percent) and raised here (96.1 percent). Nearly 91 percent were also raised in coastal counties. These figures varied slightly between full and part-time fishermen, with 83 percent of the full-timers born in the state and 94.3 percent raised here, as compared to 87.5 percent of the part-timers born in the state and 100 percent raised here. This illustrates a strong pattern which has been observed in the clam and oyster fishery and in the shrimp fishery in North Carolina. Namely, there is a strong relationship between where fishermen are born and raised, and where they now do business.

The spouses of fishermen play an important role in the family occupational structure. The percentage of spouses who work either in a full- or part-time capacity is 50.9 percent (full-timers = 21.9 percent; part-timers = 75.1 percent). Twenty-three percent of the full-time and 62.5 percent of the part-time fishermen's spouses work full-time. Conversely, 16.3 percent of the full-timer's spouses and 6.2 percent of the part-timer's spouses work part-time. The contribution of the spouse to the total family income is substantial, the average percentage being 27 percent.

Full-time fishermen's spouses contributed, on the average, 22 percent of the total family income while part-timers' spouses contributed 36.3 percent of the total family income.

Full-time respondents have fished full-time an average of 14 years. Of these same respondents, 44 percent also have fished on a part-time basis some time during their careers an average of 8.7 years. Fifty-six percent had never fished part-time. In comparison, 33.3 percent of the part-time respondents have fished part-time an average of 8 years while 33.3 percent have fished full-time an average of 18 years. Sixty-seven percent have never fished in a full-time capacity (one part-timer has fished in a full-time capacity for 20 years).

A significant variable influencing career choices of fishermen is family context. When asked questions regarding their entry into fishing, 65.4 percent of the full-time respondents reported beginning their fishing activities before completing high school; this compares to 45.8 percent for part-timers. Forty-six percent of the sample stated that a relative was responsible for their entry into fishing, as compared to 21 percent entering with a non-relative and 32.9 percent entering by themselves. When asked how they began crabbing, 26.9 percent of the full-timers and 20.8 percent of the part-timers indicated family tradition. A primary response was that they "just started to crab" (full-timers = 26.9 percent; part-timers = 25 percent).

Part-timers, as the term implies, spend the majority of their working time in occupations other than fishing (see Table 1). In order to calculate the percentage of time spent in the fishing work force for both full-time and part-time fishermen, we divided the total years in fishing by the total years in the work force (present age minus age when finished school = years in work force). According to our calculations, 46.4 percent of the sample spent 100 percent of their working time in fishing (Full-timers = 56 percent; Part-timers = 21 percent). The majority of full-timers (81 percent) spent half or more of their time in the work force in fishing, compared to only 47 percent of the part-timers (see Table 2).

Table 1
Part-time fishermen's
primary occupations

Occupation	Percentage
Professional/semi professional	20.9
Skilled workers	8.4
Laborers	16.7
Student	12.5
Maritime related	25.1
Fishing	16.7

Table 2

Crab fishermen's
percentage of working time
spent in fishing*

Percentage of Working Time in Fishing*	Percentage of Full-time	Percentage of Part-time	Percentage of Total
100	56	21	46.4
90-99	4	-	2.9
80-89	7	-	5.8
70-79	6	5.3	5.8
60-69	4	5.3	4.3
50-59	4	15.8	7.3
40-49	2	10.5	4.3
30-39	2	5.3	2.9
20-29	8	21.0	11.6
10-19	6	15.8	8.7
less than 10%	-	-	-

Full-timers N=50

Part-timers N=19

**Total N=69

*Working time in fishing equals the total number of years a respondent has fished occupationally.
**Eight respondents were still in the school system; therefore, their working time could not be calculated.

Fishing Activities

The preferred fishing activity of full-time crab fishermen is crabbing (52 percent). The second preferred activity is shrimp trawling (13.5 percent). Among part-timers, crabbing was also the preferred activity (75 percent), followed by sport fishing (8.3 percent). When asked why they preferred these activities, the overwhelming response of full- (63.5 percent) and part-timers (56.5 percent) was that they could work fewer hours and make more profit.

The respondents were asked whether the last full calendar year prior to interviewing (1983) was a "normal" year of fishing for them. Of the sample, 45.5 percent replied "no" (full-timers = 39.6 percent; part-timers = 58.3 percent). Eighty-three percent stated the reason for the unusual year was a poor harvest. The respondents were then asked whether their last year of fishing was a good, bad, or average year of fishing, with 54.8 percent stating it as average (full-timers = 56 percent; part-timers = 52.2 percent). When asked the question, "If you had a really bad year next year, what would you do?", 65.2 percent of the part-timers said it would not affect them. But the full-timer's main response was that they would stay in and get by somehow (56 percent). However, 24 percent of the full-timers said they would quit fishing and get a non-fishing related job.

In order to roughly estimate what fishermen earn from their fishing activities, we asked about how much one could earn given the respondent's experience and gear in good, average and bad fishing years (due to stock and harvest fluctuation). This is a reasonable way of approximating the average income without revealing the exact income of the respondents.

Average earnings for full-time fishermen range from $20,000 to $24,999 in a good year, somewhat lower in an average year ($15,000 to $19,999), and between $5,000 and $9,999 in a bad year. Seventeen percent felt they could earn more than $25,000 of taxable income in a good year (only 5.4 percent in an average year, however, and none in a bad year). Nearly 28 percent feel that more than $30,000 can be expected in a good year.

Even in a good year, under $5,000 is considered normal for some (all fishermen = 5.8 percent). This increases to 11.6 percent for an average year and 44.9 percent in a bad year. In fact, the highest income level which was expected in a bad year was less than $2,500.

The average part-time fisherman expects to earn between $5,000 and $10,000 in a good year (18.2 percent under $5,000; 18 percent at $25,000 and over); $5,000 to $10,000 in an average year and under $5,000 in a bad fishing year.

Of the full-time fishermen interviewed, 58 percent indicated that 100 percent of their total earnings come from fishing activities. Forty-two percent indicated from 25 percent to 95 percent of their total earnings come from fishing activities.

The average part-timer relies on fishing for about 40 percent of his total income (18.2 percent reported that their income relied exclusively on fishing). For 73 percent of the full-timers and 95.5 percent of the part-timers, sales from crabs provided the largest portion of their fishing earnings. Second in importance for earnings was gill netting for both full- and part-timers.

One hundred percent of the sample indicated that they usually sell their crab catches to a dealer. Full- and part-timers have been doing business with the same dealers for an average of 11.46 years. Fifty-one percent of the full-timers and 42 percent of the part-timers sell other harvested products to the same dealer to whom they sell their crab catches. Payment for catches is generally weekly (full-timers =86.8 percent; part-timers = 50.0 percent). Both full-time and part-time fishermen prefer to deal locally and with people they know. Full-timers indicated that honesty, dependability, convenience and good service were top priorities when considering their relationships with dealers. Price was indicated as a secondary reason. Part-timers felt that price, convenience, dependability and familiarity were of equal importance.

Crabbing Activities

Our respondents fished for crabs an average of 5.7 times per week. For full-timers, crabbing activities begin around 4 to 6 a.m. and most are back at the dock by 1 p.m. The average trip length is six to seven hours. Part-timers can be divided into two groups: those who crab in the mornings (56.4 percent between 4 and 8 a.m.), and those who crab in the afternoons between 4 and 6 p.m. (34.7 percent). This split between morning and afternoon results from the part-timer's primary occupational work schedule, and crabbing lends itself well to this type of adjustment. The average trip length is four hours.

Most of the fishermen crab alone (full-time = 77.4 percent; part-time = 87.5 percent). Of those who do not crab alone, 36.7 percent indicated they crabbed with friends or family members. Changes in crew size occur mainly as friends and relatives opt in and out of fishing as crew members. Less than 1 percent of their crab catch is kept for personal consumption according to 77 percent of the sample. This figure does not vary significantly for full-timers and part-timers.

Past and Future Adaptations

Fishermen employ various adaptive strategies for coping with changing conditions. As part of this overall analysis of the crab fishery, a series of questions designed to elicit responses concerning recent and anticipated future changes were asked. Differences occurred between full-timers and part-timers when asked whether their fishing activities had changed in any way over the past two years. Full-time fishermen have altered their fishing activities somewhat more than their part-time counterparts, as shown in Table 3. Table 4 indicates the various changes made, with gear alteration being the most prevalent adaptation. Fluctuations in catch, as well as profit and ease of operation are all important factors in the reasoning behind the changes which have occurred, especially for the full-timer (Table 5).

Table 3

Change in fishing activities

	All fishermen	Full-timers	Part-timers
YES	37.7	41.5	29.2
NO	62.3	58.5	70.8

Table 4

Types of changes which occurred

	All fishermen	Full-timers	Part-timers
Species mix	3.2	---	14.3
Fishing loc.	9.7	8.3	14.3
Fishing tech.	9.7	12.6	----
Changed boat	9.7	8.3	14.3
Gear alteration	19.4	16.7	28.6
Marketing	6.4	8.3	----
Crew change	3.2	4.2	----
Fished less	3.2	8.3	14.3
Fished more	9.7	---	14.3
Other	25.8	33.3	----

Table 5

Why changes occurred

	All fishermen	Full-timers	Part-timers
Health; aging	3.4	4.8	----
Catch down	20.7	23.8	12.5
Increase in effort	6.9	4.8	12.5
Decrease in effort	6.9	4.8	12.5
To increase catch	3.4	---	12.5
To increase profit	20.7	23.8	12.5
Boat-gear factors	6.9	4.8	12.5
Make job easier	17.3	23.8	----
Personal preference	10.4	9.5	12.5
Other	3.4	---	12.5

When asked about planned future changes in fishing activities within the next 2 years, 69.7 percent of the sample said they were not planning any changes (full-timers = 69.8 percent; part-timers = 70.8 percent). Of those who stated they were planning changes, full-time and part-time fishermen said increased catches and profit were the main reasons for any changes that would occur.

Fishing Craft and Gear

Eighty-seven percent of the fishermen sampled were the sole owners of the boat used for crabbing activities (full-timers = 84.9; part-timers = 91.7 percent). Of those fishermen who were not the sole owners of their boat, 20 percent of the boats were dealer owned. The average boat length for full-time respondents was 23.2 feet and 19.6 feet for part-timers. As to the type of hull, fiberglass was preferred (all fishermen = 66.2 percent; full-timers = 58.5 percent; part-timers = 83.3 percent), and outboard motors were clearly the most preferred engine type (75 percent) for both full and part-time fishermen.

The primary fisheries these boats were used for was consistent for both full-time and part-time fishermen. Seventy-eight percent of the respondents reported that crab potting was their most important fishing activity (full-timers = 69.8 percent; part-timers = 95.8 percent).

Based on a comparison of our sample and the 1983 state license data, a discrepancy exists concerning the number of crab pots used per fisherman. According to our sample of crab potters (n=73), the total number of pots equaled 15,614. This averages out to 214 pots per crab potter. The state totals list 7223 crab potters reporting 350,999 pots. Based on these numbers, the average number of pots per fisherman equals 48.5.

Regarding equipment, 56.6 percent of the full-timers utilize CB or VHF radios, as compared to 33.3 percent of the part-timers who owned radios. Surprisingly, depth finders are utilized by only 22 percent of the total sample. Only 9.4 percent of the full-timers and none of the part-timers use other electronic and radar navigational and fish finding aids (Table 6).

Table 6

Equipment and gear

Equipment	All fishermen	Full-timers	Part-timers
Depth finder*	22.1	22.7	20.9
Radio**	49.4	56.6	33.3
Other	6.5	9.4	---

*Includes nonrecording and paper recording

**Includes CB and VHF

Specific gear types owned and used during the previous year by fishermen on the boat used primarily for crabbing are as follows (Table 7):

Table 7

Types of gear used in the last year on boats used for crabbing

Gear	All fishermen	Full-timers	Part-timers
Shrimp trawl	18.2	18.9	16.7
Single	64.3	50.0	100.0
Double	35.7	50.0	---
Fish trawl	2.6	3.8	---
Scallop dredge	1.3	1.9	---
Crab trawl	7.8	9.4	4.2
Single	25.0	33.3	---
Double	75.0	66.7	100.0
Crab pots	94.8	94.3	95.8
Crab trot line	1.3	---	4.2
Channel net	1.3	1.9	---
Eel pots	1.3	---	4.2
Gill nets	49.4	47.2	54.2
Pound nets	18.2	17.0	20.8
Clam dredge	1.3	1.9	---
Clam kick	2.6	3.8	---
Oyster dredge	13.0	15.1	8.3
Flounder gig	7.8	11.3	---
Commercial hook and line	3.9	3.8	4.2
Seine (long haul)	1.3	1.9	---

Somewhat more variety is seen in gear type employed by full-timers than by part-time fishermen, which reflects fishing as the chief source of income for full-timers.

Full-time crab fishermen engaged in 3 major types of fishing in 1983 (Graph I). In order of percentages they are crab potting (49.9 percent), flounder trawling (9.2 percent), and gill netting (7.5 percent). Crab potting (56.1 percent), gill netting (13.0 percent), and oyster tong and rake (8.2 percent) represent the dominant fishing techniques used by part-time fishermen in 1983 (Graph II).

Involvement in Organizations

Community involvement among North Carolina crab fishermen is somewhat limited. Only 34.7 percent of the sample indicated that they were involved in community or social organizations (full-timers = 33.4 percent; part-timers = 36.3 percent). This low level of participation is not surprising in that existing literature suggests an apparent "community disinvolvement" associated with few social ties may be characteristic of fishing occupations (Nix and Kim, 1981). Most of their time is spent on the water or repairing boats and gear. There is little time for other activities. In comparison to community and social organizations, membership in fishermen's organizations is even lower. Only 11.8 percent of our sample participated in this type of formalized organization. This is in line with findings of Maiolo et al (1981 and 1983). Shrimp fishermen and clam and oyster fishermen exhibit the same low levels of participation. A significant portion of the sample subscribe to fishing publications. Over half (54.5 percent) receive at least one publication monthly. This is representative of both full- and part-time fishermen.

Competition Among Crab Fishermen

Space, gear and user competition prevails among fishermen, especially among crab fishermen. Not only is there competition between full and part-time fishermen concerning access, but there is also major gear competition between potters and trawlers.

According to the trawlers interviewed, 75 percent (100 percent part-timers, 67 percent full-timers) said the presence of crab pots presented a problem. Of those, sixty-seven percent (100 percent part-timers, 50 percent full-timers) claimed that crab pots limited their trawling area. The remaining 33 percent complained of pots drifting off shore and getting tangled in their nets.

When crab potters were asked the same question, 42 percent (36 percent part-timers; 45 percent full-timers) said the presence of crab trawls presented a problem for them. The potter's major complaint (75 percent part-timers, 76 percent full-timers) was that of trawlers destroying their pots. Both crab potters and trawlers were asked if the Division of Marine Fisheries had tried to do anything about these problems, and, if so, whether or not their attempts had been effective. Twenty-five percent of the trawlers, all of which were part-timers, said the Division of Marine Fisheries had tried to do something about these problems. However, they said the attempts had been ineffectve due

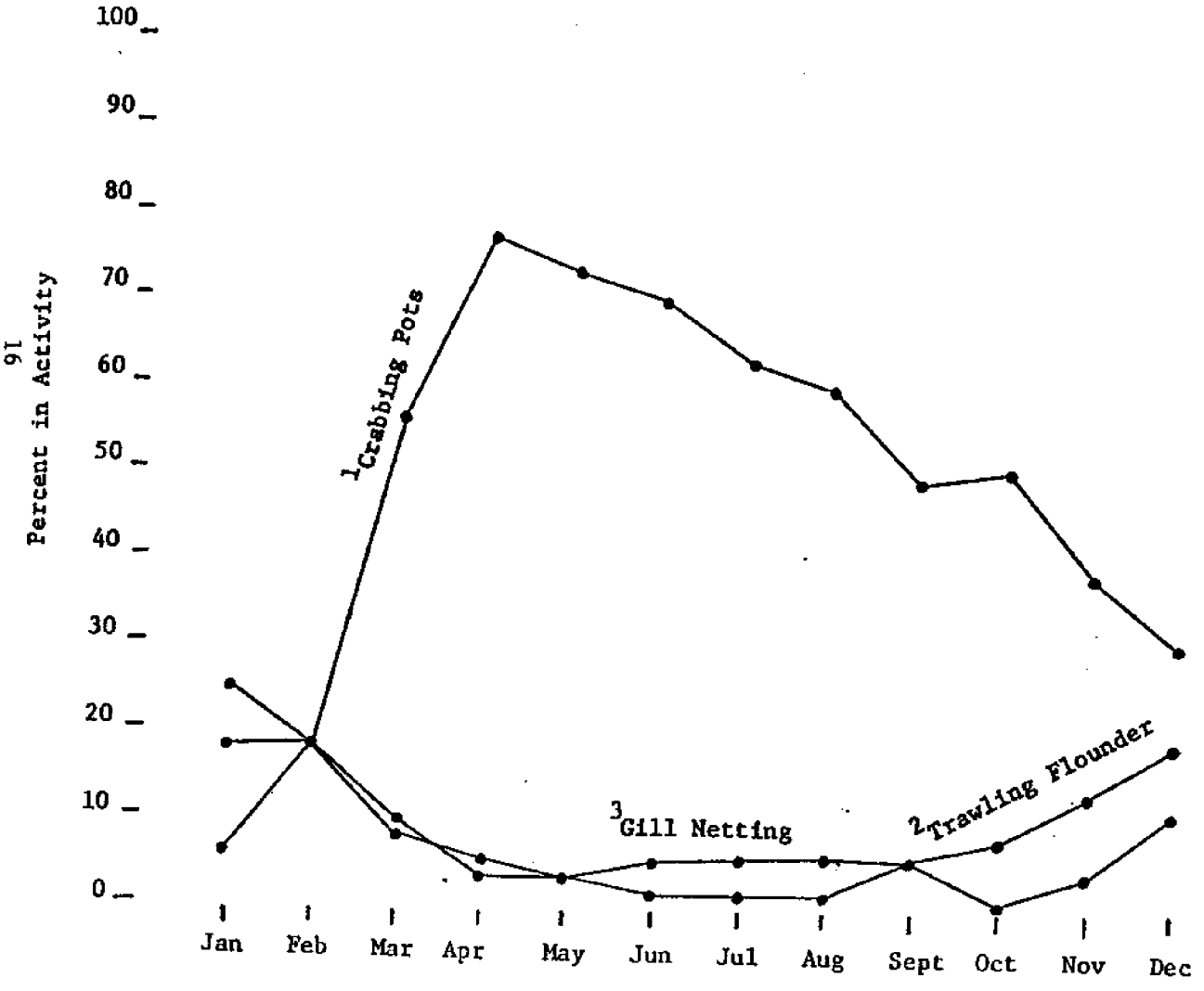
GRAPH I

FULL TIME

CRABBERS ACTIVITY CURVE

(Three Most Popular Activities)

1983



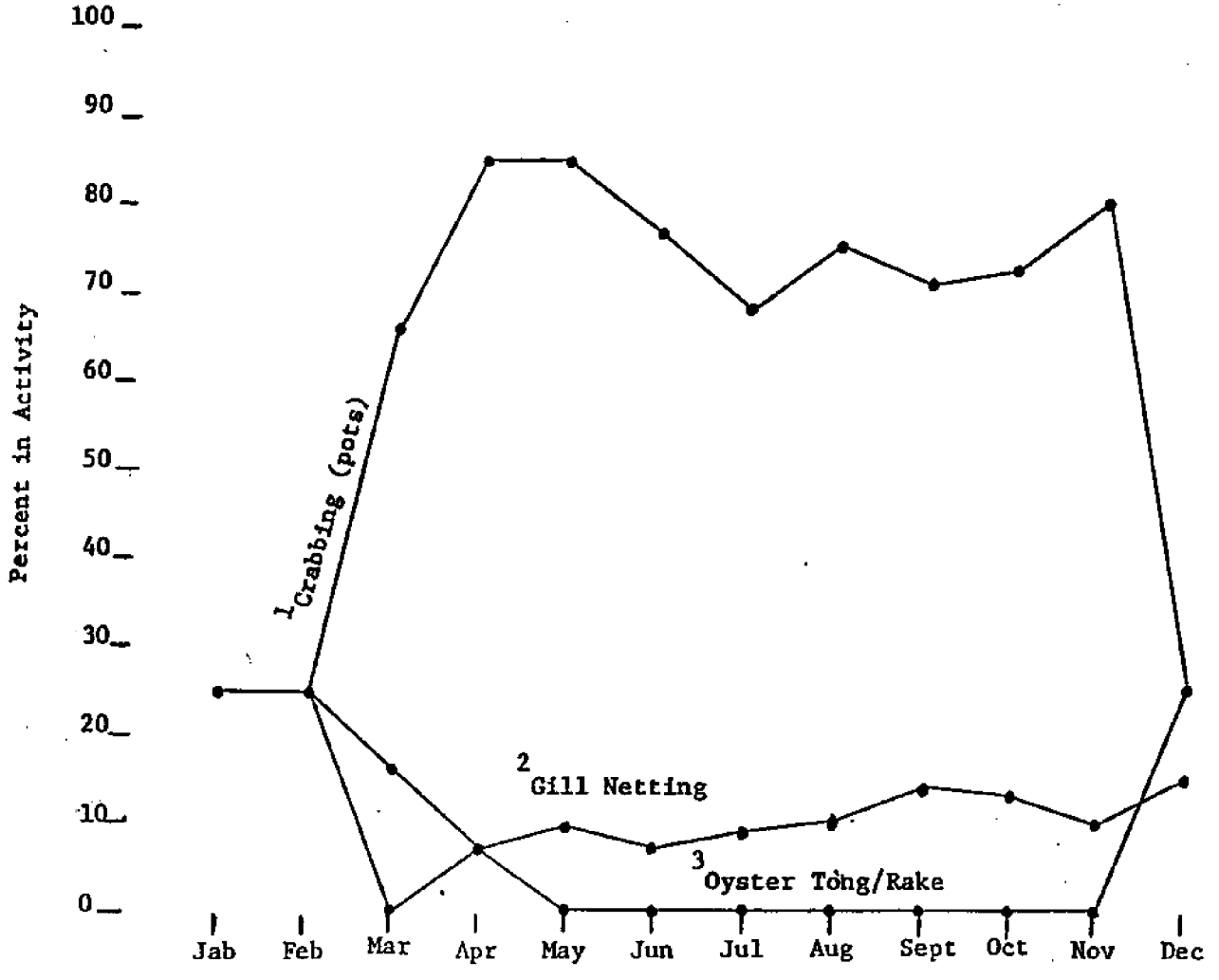
GRAPH II

PART TIME

CRABBERS ACTIVITY CURVE

(Three Most Popular Activities)

1983



to poor enforcement. Thirty-one percent of the potters (37 percent part-timers; 28 percent full-timers) said the Division of Marine Fisheries had tried to do something about the problems they were having with trawlers. Of those, 54 percent believed the help had been ineffective due to poor enforcement and politics, and that many times complaints simply are not voiced. On the other hand, forty-five percent said the help had been effective, due to good enforcement, restriction of pots to shallow water, restriction of trawlers to deeper waters, and the holding of public hearings.

Potters, ironically, depend on trawlers and long haulers for bait. When the crab potters were asked who catches the bait they use, 85 percent mentioned trawlers or long haulers. In accordance with this and the previous discussion of problems that trawlers present for potters, those potters who mentioned that trawling creates problems for them but realize that bait comes from the trawlers, were asked: "What can be done about the trawlers to solve the problem(s) without cutting off your supply of bait?" The majority (63 percent) of the respondents said nothing could be done. The second highest response (16 percent) said they should "try to get along." This suggests that the crab potters, even though they complain about trawlers, would rather leave things as they are than suggest some type of compromise or change.

Aside from the potters versus the trawlers competition, the subject of user competition was also researched in this study. Outside of a minority of crab trawlers who only crab for a short period of time between seasons, crab fishermen's major fishing efforts are directed toward crabbing (see crabbing activities). This suggests that among crab fishermen more competition may be viewed between fishermen with differing styles of participation (full-time, part-time, recreational) rather than between potters and trawlers per se.

In order to examine the working relationship between fishermen, the respondents were asked a series of open-ended questions designed to elicit their perceptions of what types of problems are created by different types of fishermen. Problems which occurred concerned primarily competition for space and gear conflicts. Forty-five percent of the full-timers felt that part-timers did in fact create problems for them, as compared with 25 percent of the part-time fishermen who said other part-timers created problems. The main source of the problems was part-time crab potters, according to 52.2 percent of the full-timers and 100 percent of the part-timers. When questioned as to what types of problems they felt were created, full-time fishermen responded most often that competition for space was the main problem. The part-time crabbers "get in our way," and there are "too many of them." The source of competition between part-timers, however was split between space and gear competition. It appears that stealing of crab pots and inadvertent destruction of pots are substantial problems occurring in the fishery.

Only 23.6 percent of our sample felt that full-time fishermen created problems for them (29.4 percent full-timers; 9.5 percent part-timers). The major problem cited (24 percent) was that of fishermen trawling through areas where crab pots are set. Other complaints were of pots being stolen and/or fished by full-time fishermen.

When asked if recreational fishermen created problems, 53.3 percent of the sample said yes (61.5 percent full-timers; 34.8 percent part-timers). The major complaint was against sport fishermen (35.0 percent). Space and gear competition were again the main problems, with 41 percent stating that sport fishermen fish their pots.

A series of joint frequency distributions were run in order to further analyze the competition found among potters and trawlers. A second set examined competition among crab fishermen with differing styles of participation. This procedure is similar to that used to analyze competition found among shrimp fishermen in North Carolina (Report to the Division of Marine Fisheries, 1985). There were no significant findings revealed when areas where fishermen from our sample set pots were compared with areas where trawling occurs. This was probably due to the small sample size of trawlers interviewed. Our previous discussion clearly indicated problems exist between potters and trawlers.

Table 8 indicates areas of competition by style of participation. The data indicate that competition for the resource between full-time and part-time fishermen is found in four areas: Pamlico River, Roanoke Sound, Croatan Sound, and the Cedar Island areas (see Appendix I). Among those, the major areas of competition are the Pamlico River and the Cedar Island areas, respectively. The data also indicate that there are mainly full-time fishermen competing for the resource in Ocracoke, Swan Quarter and the New River areas. Competition among part-time fishermen only is seen in the Pungo River area.

Table 8

Count
Row pct
Col pct
Tot pct

Style of participation by areas where crab pots are set

*Areas respondents set crab pots	Full-timers	Part-timers	Row totals
Albemarle Sound	----	----	----
Pamlico River	4 40.0 8.2 5.6	6 60.0 27.3 8.5	10 100.0
Pungo River	-----	12 100.0 54.5 16.9	12 100.0
Ocracoke	9 100.0 18.4 12.7	-----	9 100.0
Roanoke Sound	6 85.7 12.2 8.5	1 14.3 4.5 1.4	7 100.0
Croatan Sound	9 90.0 18.4 12.7	1 10.0 4.5 1.4	10 100.0
Swan Quarter	8 100.0 16.3 11.3	-----	8 100.0
Neuse River	6 100.0 12.2 8.5	-----	6 100.0
Cedar Island	7 77.8 14.3 9.9	2 22.2 9.1 2.8	9 100.0
Column Totals	49 100.0	22 100.0	71 100.0

*Areas respondents reported setting crab pots have been condensed from interview responses to more general areas. See Appendix I.

In order to better understand the types of fishermen competing for the resource as indicated in Table 8, frequency distributions were constructed which crossed the competitive and non-competitive areas by fishermen's reported style of participation with several demographic variables controlled. The resulting cross tabulations revealed the following findings (see table 9):

1. When age was examined, there was no competition found among the youngest fishermen (14-19). Competition was found to emanate from full-time fishermen between the ages of 20 and 48.

2. When years of education are examined separately, competition tends to emanate from full-time fishermen with 12 or fewer years of education. Both full-time and part-time fishermen with more than a high school education (13 to 18 years of education) were found in the competitive areas.

3. When occupation is controlled, competitive pressure emanates from part-time fishermen with jobs as laborers.

4. When county of residence is controlled, competition is found among full-time and part-time crab fishermen in Carteret and Beaufort Counties. Competition is found mainly among full-timers in Dare County (88 percent). No competition was found among crab fishermen in Pamlico or Hyde counties.

Table 9
Competitive areas and related variables

Competitive areas	Groups competing	Variables
Pamlico River	Full-time Crab Fishermen	FT fishermen 20-48 years of age
Roanoke Sound	Part-time Crab Fishermen	FT with 12 or less years of education.
Croatan Sound		FT and PT with 13-18 years of education.
Cedar Island		PT laborers
		FT and PT with port in Carteret and Beaufort Counties.
		FT with home port in Dare County.

Perceptions and Attitudes Toward Fisheries Management and Coastal Zone Policies

With increasing state and federal legislative policies concerning the management of fisheries indicated, the tendency is to remove fishing people and communities from the decision-making process concerning fisheries (Maiolo and Orbach, 1982, 1-16). It is important to understand how these management decisions affect coastal community members, especially those who depend on the marine resources for their livelihood. Compliance with management decisions is directly affected by the fishermen's views on policies and policymakers. Policies often have unexpected results once fishermen apply their own imaginative and innovative responses to them. In order for these results to be positive it becomes necessary to anticipate and understand the full range of responses that may arise.

The N.C. Division of Marine Fisheries (Morehead City) is charged with the management of marine fisheries resources in the state. Perceptions of their performance by crab fishermen can affect morale, compliance with regulations, and support for the DMF's operations. Table 11 reports our findings concerning how fishermen rated the DMF's performance on a zero to 10 scale. Zero equals the lowest score, indicating a poor overall level of service and performance, and 10 equals the highest score, representing an extremely good overall rating. Overall scores fell slightly above the middle of the rating scale, seen as percentages in Table 12. Full-timers rated the DMF's performance higher overall. The overall rating pattern, when compared to that of shrimp fishermen (Maiolo et al., 1981) and clam and oyster fishermen (Maiolo et al., 1983) indicates that crab fishermen appear to be more satisfied with the services and performance of the DMF than do shrimp and oyster fishermen.

When asked to provide their reasons for the overall rating (Table 13), the number one reason for the rating given was that DMF personnel were not helpful. Other reasons included "they try," "they don't bother me," "poor enforcement," "they (DMF) favor big boats," and (they're) "helpful," (see Table 13 for favorable and unfavorable response percentages).

Table 11

DMF ratings by crab fishermen (percentages)

Scores	All fishermen	Full-timers	Part-timers
Poor 0-3	15.3	14.0	18.6
Satisfactory 4-7	51.6	48.8	57.1
High 8-10	32.8	37.3	23.9

Table 12

Rating of the overall performance of the N.C. Division of Marine Fisheries

Sample	Mean score
All fishermen	6.0
Full-time fishermen	6.2
Part-time fishermen	5.7

Table 13

Favorable and unfavorable responses (percentages)

Response	All fishermen	Full-timers	Part-timers
Favorable	49.3	54.4	36.9
Unfavorable	50.7	45.6	63.2

To further investigate the view of management, fishermen were asked a series of questions concerning specific state governmental regulations. These included restricted geographical access, restricted seasons, and gear restrictions imposed on the shrimp, crab, shellfish and finfish fisheries. Responses were structured as "no opinion," "disapprove," and "approve." Table 14 shows the results.

Table 14

Evaluation of existing Division of Marine Fisheries policies (percentages)

Issue	All fishermen		Full-timers		Part-timers	
	Approve	Disapprove	Approve	Disapprove	Approve	Disapprove
Geographical restrictions on shrimp	72.0	10.7	76.9	9.6	60.9	13.0
Restricted seasons for shrimp	73.7	6.6	75.5	9.4	69.6	--
Restrictions on gear used for shrimp	61.8	13.2	62.3	13.2	60.9	13.0
Geographical restrictions on crab	52.7	32.4	51.0	33.3	56.5	30.4
Restricted seasons for crab	48.6	28.4	47.1	35.3	52.2	13.0
Restrictions on gear used for crab	69.7	17.1	69.8	17.0	69.6	17.4
Size restrictions on crab	97.2	2.8	95.9	4.1	100.0	--
Geographical restrictions on shellfish	76.7	9.6	74.5	13.7	81.8	--
Restricted seasons for shellfish	69.7	5.3	69.8	7.5	69.6	--
Restrictions on gear used for shellfish	65.8	14.5	64.2	17.0	69.2	8.7
Restrictions on gear used for finfish	64.5	13.2	60.4	13.2	73.9	13.0

The table reveals a general overall approval of regulations to conserve and manage resources. All restrictions concerning shrimp, shellfish and finfish were approved by a majority of full-time and part-time fishermen. Much support was given to size restrictions on crabs by all the respondents, and reasonably high ratings occurred on restrictions for gear used for crabs. Regulations concerning geographical restrictions and restricted seasons for crabs elicited mixed responses from the fishermen. It should be noted that all the responses were consistent between full-timers and part-timers.

The respondents were asked how they felt about limiting the number of pots per fishermen to 250 which is a number higher than the average for our sample. Responses were mixed (Table 15). Forty-seven percent of our sample agreed with this proposed measure (full-timers = 52 percent; part-timers = 37.5 percent).

Table 15

How fishermen feel about limiting the number of crab pots per fishermen to 250

Opinion	All fishermen	Full-timers	Part-timers
Agree	47.3	52.0	37.5
Disagree	31.1	24.0	45.8
No effect	5.4	6.0	4.2
Lower than 250	2.7	2.0	4.2
250 not enough	6.8	8.0	4.2
Part-timer limit only	2.7	2.0	--
Can't enforce	2.7	4.0	--
Depends on individual	1.4	2.0	--

Information regarding fisheries regulations is obtained by our respondents primarily from the DMF regulation booklet. They also receive much information by word of mouth and bulletins posted at the fish houses (Table 16). Many (68.8 percent) attend meetings on fisheries regulations (full-timers = 73.6 percent, part-timers = 58.3 percent). There is a high rate of involvement in the N.C. Division of Marine Fisheries meetings (52.6 percent full-timers, 57.1 percent part-timers) and Commercial Fishermen's Association meetings (full = 34.2 percent, part = 28.6 percent).

Table 16

How fishermen find out about fisheries regulations (percentages)

Source of information	All fishermen	Full-timers	Part-timers
Word of mouth	19.7	18.9	21.7
Fish house bulletins	18.4	18.9	17.4
Bulletins other than fish houses	1.3	1.9	--
DMF regulations book	43.3	45.3	39.1
Game Warden	2.6	1.9	4.3
Media (TV, newspaper, radio)	1.3	1.9	---
Other	13.2	11.3	17.4

North Carolina Crab Dealers

According to the 1983 North Carolina licensed seafood dealers list, there are approximately 817 licensed seafood dealers in North Carolina. Of those, 263 deal with crabs. About 17 percent of those dealers (the 263) process crabs, while the remaining 83 percent do not. Processed crab is crab meat that has been separated from the shell and packed fresh or canned. Unprocessed crab is simply the whole crab -- usually sold to someone else for processing. Processing crabs is a laborious undertaking. It is not surprising that only 17 percent of those who deal in crabs also process them. Actual processing will be discussed in more detail in the final section of this report.

In 1982 the Sociology, Anthropology and Economics Department at East Carolina University conducted a survey of North Carolina seafood dealers. This study was directed toward seafood businesses which dealt with shrimp. One of the main criteria was that the business bought and sold shrimp on a fairly regular basis. Even though the interview schedule emphasized shrimp dealers and their activities in dealing with shrimp, information was recorded concerning other seafood they handled, such as crabs. Of the 45 dealers interviewed, 25 dealt with crabs. Thirteen (52 percent) listed crab packing and wholesaling (buying from other dealers for resale) as major activities for their business. Ten (40 percent) listed crab picking as a major activity, while only 5 (20 percent) mentioned shedding crabs as a major activity. Five (29 percent) of the dealers interviewed indicated that packing, picking, shedding and wholesaling crabs were all major activities for their business. According to 8 (32 percent) of the dealers who dealt in crabs, 50 percent or more of their sales were from crabs.

Key Informant Interviews

As part of the preliminary research on North Carolina's crab industry, key informant interviews with crab dealers were conducted. Key informant interviews are in-depth, open-ended interviews conducted with a small number of individuals who are knowledgeable of the subject under investigation. Dealers were selected on the basis of their involvement in the crab fishery. Consultation with the Division of Marine Fisheries personnel, seafood dealers and fishermen aided in the selection of key informants.

A topical outline was used as an informal guide during interviewing in order to assure coverage of major points. The interview format was intentionally unstructured with open-ended in-depth explanations and interpretations being encouraged.

The goal of the key informant interviews was to obtain an overview of North Carolina's crab industry from the dealers' perspective. Specifically, we wanted to find out: 1) the importance of the blue crab fishery to North Carolina dealers; 2) production and marketing patterns of blue crabs; 3) perceived relationships between dealers and crab fishermen; and 4) dealers' views on the industry in North Carolina.

Ten key informant interviews with crab dealers were conducted; seven processed crab meat; three did not. It was the principal investigator's intention to interview crab dealers with various activities and degrees of involvement in the crab industry. To the best of our knowledge, this criterion was met.

According to the information gathered from key informants, there are no major differences among the nonprocessors. They generally are not dependent on crabs to maintain their business, although selling crabs is profitable to them. Anywhere from 10 to 50 percent of their business can come from crab sales depending on the supply and demand. Nonprocessors sell the bulk of their crabs to in-state processors. The jimmy crab market is generally very profitable for North Carolina dealers in the early spring since North Carolina's crab season begins before that in the North.

The crab fishery is very important to North Carolina crab processors, as was evidenced through visits with key informants. Processors are more dependent on the crab fishery since anywhere from 50 to 100 percent of their business comes from crab sales. In order for processors to manufacture fresh, pasteurized or canned crab meat, they must have large steamers (pressure cookers) used to cook the crabs and a picking room with willing and able crab pickers. The procedures for processing crabs are generally the same at all crab houses. First the crabs are brought in by the fishermen or trucks. They are placed in large stainless steel crates which hold about 600 pounds of crabs each. The crabs are put in the steaming rooms, generally two crates at a time (1,200 pounds of crab), and cooked at 240^{o}F for approximately 17 minutes. After the crabs have cooled to room temperature they are placed in a storage cooler at 38^{o}F until they are picked.

Crab pickers are paid by piecework --- in this case, by the pound. According to information given by the key informants, the average pay per pound to pickers was $1.28. The highest rate per pound paid among the key informants was $1.31; the lowest was $1.25. Dealers are required to meet the hourly minimum wage standard. However, most say that their pickers make more than minimum wage. The

least amount a picker was reported making an hour was $3.40, the highest was $9 to $10 an hour. The majority of pickers are black women. There are a few white women and black males but no white males who pick crabs according to the key informants. Pickers are required to pack the meat into its proper plastic container. There are four different types of crab meat sold. From most expensive to least expensive, they are: jumbo lump; chunks of backfin; backfin; solid white meat with little shell content; special or regular -- white body meat with high shell content; and claws -- dark meat.
The major wholesale markets for fresh crab meat are in Maryland, New York, Pennsylvania, Massachusetts and New Jersey. Several of the key informants mentioned that crab meat is not highly marketable in North Carolina and it should be promoted, especially in the western part of the state. Dealers agreed that if there were not plenty of out-of-state markets they would not be in the crab business.

There are four marketing exceptions to fresh picked crab meat in this state. One is the jimmy crab market. Jimmy crabs are large male blue crabs, 5 1/2 to 6 inches or more in size. They are generally steamed whole and picked by the consumer. Jimmy crabs are most profitable to North Carolina dealers and fishermen in the early spring but once they start showing up in Virginia and Maryland, the prices drop. The major market for jimmy crabs is in Baltimore, Maryland. Prices vary accordingly to supply and demand, from $15 per bushel to $35 when scarce.

Two similar exceptions to fresh crab meat are commercially sterilized and pasteurized crab. Both are canned; however, pasteurized crab meat must be kept refrigerated, while commercially sterilized crab meat can be kept on the shelf. Both are comparable in price. The major canning company in North Carolina was started by Sterling Harris in 1939. In 1947 he invented the so-called Harris machine. It separates the body meat of a crab from the shell. Machine picked crab meat is of lower quality than hand-picked meat which is one reason it is canned. Another reason is that the volume of meat content is much higher and it is more profitable to can the meat. Canned crab meat is sold primarily in grocery stores. Pasteurized meat is very popular in restaurants and will remain fresh for six months to a year if kept refrigerated.

The final exception to fresh picked crab is soft shell crabs. These crabs are freshly molted blue crabs. They are becoming more and more popular among dealers as well as consumers. Many dealers believe that developing shedding operations would be a worthy undertaking. Others say it is "too much trouble." Shedding pens must be under constant supervision. Several key informants were in the process of starting shedding operations. One informant who has been in the shedding business for 11 years commented that his business was one of the first of its type in the area, and that he plans to continue because it is very profitable. Soft crabs generally bring 10 to 20 cents more in wholesale price than other fresh crabs, including jimmys.

Services supplied by dealers to crab fishermen include such items as bait, ice, fuel, fishing supplies and boat ties. Gear is supplied if it is needed (many potters make their own pots). Many dealers provide funding for gear and boats to help set fishermen up in business. As one dealer put it, "It pays to be a good friend."

As stated above, dealers feel that North Carolina needs to promote the industry. In their opinion there is a stock abundance which could be utilized more efficiently and profitably, benefitting the dealers as well as the fishermen and consumers in this state. They feel the industry is growing, with catches as great as ever, and more people entering the fishery. Supply often exceeds demand and prices are low. In the eyes of the dealers, development of the industry in North Carolina has not kept pace with the overall growth experienced in the fishery.

Appendix I

Areas respondents set crab pots

Cedar Island Area
- Core Sound
- Cedar Island Bay

Swan Quarter Area
- Rose River
- Swan Quarter Bay
- Juniper Bay
- North Bluff Point

Ocracoke Area
- Ocracoke Inlet
- Hatteras Inlet
- Portsmouth Island
- Big Foot Slew Channel

Roanoke Sound
- Roanoke Inlet
- Shallow Bag Bay
- Hell's Gate

Pungo River
- Woodstock Point
- Pungo Shores
- Pungo Creek

Neuse River
- Bay River

Croatan Sound

Albemarle Sound

Pamlico River
- Reed Hammock
- Long Creek
- South Creek
- Indian Island

BIBLIOGRAPHY

1985 Maiolo, J.R. "A Socioeconomic Profile of Shrimp Fishermen in Selected Harvested Areas of North Carolina." Report to N.C. Division of Marine Fisheries. Department of Sociology, Anthropology, and Economics, East Carolina University, Greenville, North Carolina.

1980 Maiolo, J.R. and J. R. Bort. "The Sociocultural Context and Occupational and Marketing Structures of the North Carolina Shrimp Fishery." Second year report, Vol. III. Department of Sociology and Anthropology and Institute for Coastal and Marine Resources, East Carolina University, Greenville, North Carolina.

1982 Maiolo, J.R. and M.K. Orbach. Introduction (Section 1). In: Modernization and Marine Fisheries Policy, J.R. Maiolo and M.K. Orbach, eds., pp. 1-16. Ann Arbor, Michigan: Ann Arbor Science.

1983 Maiolo, J.R. and P. Tschetter. "Social and Economic Impacts of Coastal Zone Development on the Hard Clam and Oyster Fisheries in North Carolina." Department of Sociology, Anthropology, and Economics, East Carolina University, Greenville, North Carolina.

1981 Nix, H. and M. Kim. "Shrimp Fishing Off the Georgia Coast: A Sociological Analysis." The Institute of Community and Area Development. University of Georgia, Athens, Georgia (unpublished manuscript).

1979 Sholar, T.M. Blue Crab Fisheries of the Atlantic Coast. North Carolina Department of Natural Resources and Community Development, Division of Marine Fisheries, Washington, North Carolina.