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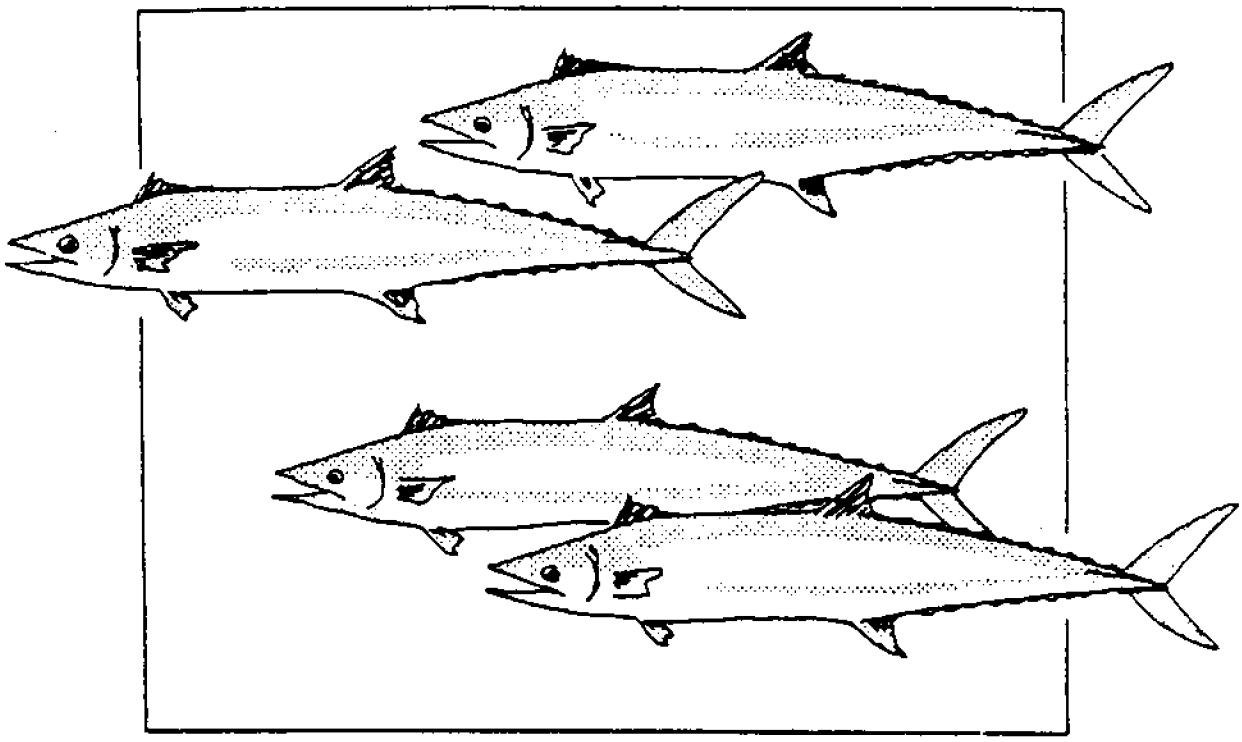

Information-Seeking Behavior, Fishing Knowledge, and Diffusion of Fishing Innovations Among Marine Recreational Fishermen in North Carolina

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UNC Sea Grant Publication Number 92-05

COMMUNICATION NETWORKS IN MARINE RECREATIONAL FISHING:

INFORMATION-SEEKING BEHAVIORS, FISHING KNOWLEDGE, AND DIFFUSION OF FISHING INNOVATIONS AMONG MARINE RECREATIONAL FISHERMEN IN NORTH CAROLINA

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EXECUTIVE SUMMARY

The primary goal of this project was to improve the efficiency of the communication system used to disseminate information to marine recreational fishermen (MRF). To accomplish this goal, several research tasks were completed, including a content analysis of fisheries brochures, newsletters and other publications; a panel evaluation of a random sample of fisheries publications; an on-site survey of marine recreational fishermen conducted to identify information needs and information-seeking behaviors, and to examine their relationships to fisheries knowledge and specialization; and a second on-site survey to examine the diffusion of two fishing innovations. Below is a summary of results as related to specific project objectives.

Objective 1: To identify and evaluate the MRF information dissemination system in North Carolina.

* A total of 253 disguised requests for information were sent to a variety of different coastal and fisheries organizations in North Carolina. From these requests, 166 individual pieces of information (brochures, newspapers, publications, etc.) about marine recreational fishing were received.

* A multitude of organizations distribute MRF information. Nine different types of organizations provided information in response to the disguised information requests. It is obvious that tourism organizations are much more oriented to the mail distribution of MRF information than are the fishing businesses.

* The primary types of information provided in the fishing brochures and pamphlets focused on where, when, the sport, and how to catch fish. Very little information was provided on the food character, storage and cleaning of fish or on how to prepare different types of fish.

* The quality of the fishing publications was rated between 6 and 7 on a 1-to-10 scale ranging from extremely unattractive to extremely attractive.

* Two panels evaluated a random sample of 10 fishing publications. Communications students and fishermen used different criteria to evaluate the sample of publications. For communications students, the most important criterion of publication quality was overall attractiveness. For fishermen, four measures were used to evaluate overall quality: informative, attention-getting, listing of fishing resources and listing of available services.

Objective 2: To identify marine recreational fishing information-seeking behaviors, the sources of information used, and the knowledge and use of selected marine recreational fishing information by different types of marine recreational fishermen in North Carolina.

* A self-administered survey questionnaire was developed and administered on site to a sample of 517 marine recreational fishermen during June through October, 1988. Interview days were randomly assigned to 32 sites, including piers, surf fishing areas, marinas, bridges, and boat access ramps, throughout the NC coastal region. The survey response rate was 96.3 percent.

* The respondents were asked to rate seven major types of fishing information on both importance to fishing success and difficulty of obtaining dimensions. An importance-performance analysis indicated that information on where to catch fish and which bait and tackle to use were considered major failures of the current information dissemination system. The other five types of information were all classified as trivial successes.

* Of the survey respondents, 62.1 percent sought information prior to leaving home on the surveyed fishing trip; 74.3 percent sought information after arriving at the coast.

* The primary sources of information prior to leaving home were friends and relatives, coastal bait and tackle shops, coastal piers, other coastal residents, and coastal charter and party boat operators.

* The primary sources of information used after arriving at the coast were bait and tackle shops, piers, other local residents and marinas.

* On a 0 to 10 self-rated scale of marine recreational fishing knowledge, the average survey respondent rated his knowledge at 5.0. An objective test of fishing knowledge, with a possible range of scores from 0 to 15, resulted in an average score of 6.73. The correlation between the two measures was .452.

* There were no consistent relationships between either measure of fishing knowledge and information-seeking behavior, measured both as the number of sources used and by usage of each specific type of information.

* A measure of fishing specialization was developed including a composite score and five dimensions: (1) fishing experience, (2) equipment, (3) external involvements, (4) centrality to life, and (5) site and species specialization. On the composite score, with a possible range of 0 to 12, the mean score was 4.72 with a median of 4.0. Only 6.4 percent of the respondents scored nine or greater.

* Overall specialization showed no relationship with information-seeking behavior. The external involvements dimension was, however, related to the number of information sources used prior to leaving home. Further, with increasing external involvements, the probability of using coastal fishing businesses for information prior to leaving home increased significantly.

* A weak relationship also existed between the external involvements dimension and the number of information sources used after arriving at the coast. However, when examining the probability of using each major type of information, the most important variable was the centrality to life dimension. With increasing centrality, the probability of using each type of information also increased. At the highest level of centrality, however, usage of each type of information actually decreased, indicating some type of threshold effect.

* Using data from the 1989 survey discussed under objective 3, the relationship between specialization and fishing catch per unit of effort (hour) was examined. The results indicate that catch increases with specialization. However, when corrected by the amount of time spent fishing, there were no relationships between either overall or the dimensions of fishing specialization and catch per unit of effort.

Objective 3: To model the diffusion of selected marine recreational fishing innovations.

* Using the same sampling procedures as in 1989, on on-site survey was conducted between Sept. 15, 1989, and Nov. 19, 1989, with a sample of 400 marine recreational fishermen.

* Awareness, information sources, and adoption was measured for two fishing innovations: (1) The Underutilized Species Program and (2) The Satellite Surface Water Temperature Program. These innovations were identified through consultations with UNC Sea Grant Marine Advisory personnel and members of the Raleigh (N.C.) Saltwater Fishing Club.

* For the Underutilized Species Program, 14.8 percent of the respondents were aware of the program; the primary sources of information were pier operators and bait and tackle shop operators. Of those aware of the program, 49.1 percent had subsequently changed their fishing behaviors.

* For the Satellite Surface Water Temperature Program, 6.4 percent of the respondents were aware of the program. The primary sources of information were friends and relatives and coastal fishing businesses. Of those aware of the program, 26.1 percent had subsequently changed their fishing behaviors.

* As hypothesized, the low-involvement (underutilized species program) innovation relied on significantly different information sources and had a substantially higher adoption rate than the high-involvement innovation (satellite surface water temperature program).

Objective 4: To develop guidelines for the dissemination of marine recreational fishing information.

* Guidelines for communicating with marine recreational fishermen are recommended focusing on the following marketing/communications concepts.

    a. target audiences
    b. catch per unit of effort
    c. primary sources of information
    d. primary information needs / wants
    e. fishing brochure evaluation criterion
    f. timing of information search
    g. diffusion of innovations

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CHAPTER 1

INTRODUCTION

Communication is an important but poorly understood component of marine recreational fisheries (MRF) management (Moore, 1984; Trixier, 1985). Three distinct pressures to improve communications with recreational fishermen exist and will grow significantly over the next decade. First, the combined commercial and recreational harvest of some fish stocks is approaching or exceeding the optimum production capacities. In response, MRF managers are both attempting to shift fishing pressure to alternative, underutilized species and beginning to implement catch and/or size regulations. The success of both efforts is dependent upon the MRF manager's ability to communicate with recreational fishermen (Johnson & Griffith, 1985; Manfredo, Baas & Lee, 1986).

Second, environmental education is an increasingly important component of MRF management. Concern over the angler's ability to properly take care of their catch has historically resulted in numerous educational publications and programs. Since the success of the increasingly popular underutilized species programs is particularly dependent upon changing angler perceptions of such species and on teaching new preparation and cooking techniques (Murray, Johnson & Griffith, 1986), educational programs focusing on these species will probably grow significantly in the near future. Further, MRF environmental education is specifically targeted by the Wallop-Breaux amendment to the Federal Aid in Sport Fish (Dingell-Johnson) Act. However, prior to spending Wallop-Breaux monies on environmental education, a state must have an environmental education plan approved by the U.S. Fish and Wildlife Service. An important aspect of that planning effort is the establishment of procedures for evaluating program success. Across the board, the planning, implementation, and evaluation of these environmental education programs will require a much better understanding of communicating with marine recreational fishermen.

Third, tourism promotion and development by coastal zone communities is growing very rapidly with both positive and negative consequences for marine

recreational fishing (Miller & Ditton, 1986). From a positive perspective, much of this development focuses on marine recreational fishing. Effectively communicating the MRF opportunities of a region is an important component of most coastal tourism marketing campaigns and should contribute significantly to commercial MRF enterprises, including charter and party boats, marinas, and fishing piers (Fesenmaier & Roehl, 1987). From a negative perspective, increasing coastal zone development is creating, in some cases, land-use conflicts, particularly concerning recreational real estate development and protection of estuarine nursery areas (Ditton & Miller, 1986). In order to create the necessary political opposition to inappropriate developments, MRF managers must be able to effectively communicate the potential loss of MRF opportunities with both local and non-local recreational fishermen (Range, 1982).

Unfortunately, a recognized, formal channel of communications with marine recreational fishermen does not exist in North Carolina. Unlike freshwater fishing, marine recreational fishing does not require a state license. Consequently, it is not possible to uniformly distribute fishing regulations and brochures. Nor is it possible to use a license registration file as a means of identifying the names and addresses of marine recreational fishermen for informational mailings and surveys. Thus, the available means of getting information both to and from marine recreational fishermen are dependent upon informal, and in many cases, nebulous communication networks.

This problem is further complicated by the variety of organizations and agencies attempting to communicate with marine recreational fishermen. As reflected in figure 1.1, a wide variety of information suppliers exist in marine recreational fishing. Because of the jurisdictional boundaries of saltwater fishing, both federal and state resource management agencies are involved in MRF management in North Carolina. Additionally, tourism organizations at the state and local level actively promote and distribute information on marine recreational fishing. Finally, private businesses and non-profit organizations are major sources of information for marine recreational fishermen.

Similarly, there is a wide variety of fishermen involved in marine

recreational fishing (figure 1.1). Previous research has classified recreational users by both activity and setting characteristics. The most common activity classification schemata include experience (number of years), avidity (frequency of participation) and level of specialization (setting, equipment and experience preferences). The setting classification systems focus on where fishermen are interviewed, typically the fishing site, tournaments or on such targeted species as billfish and bluefish.

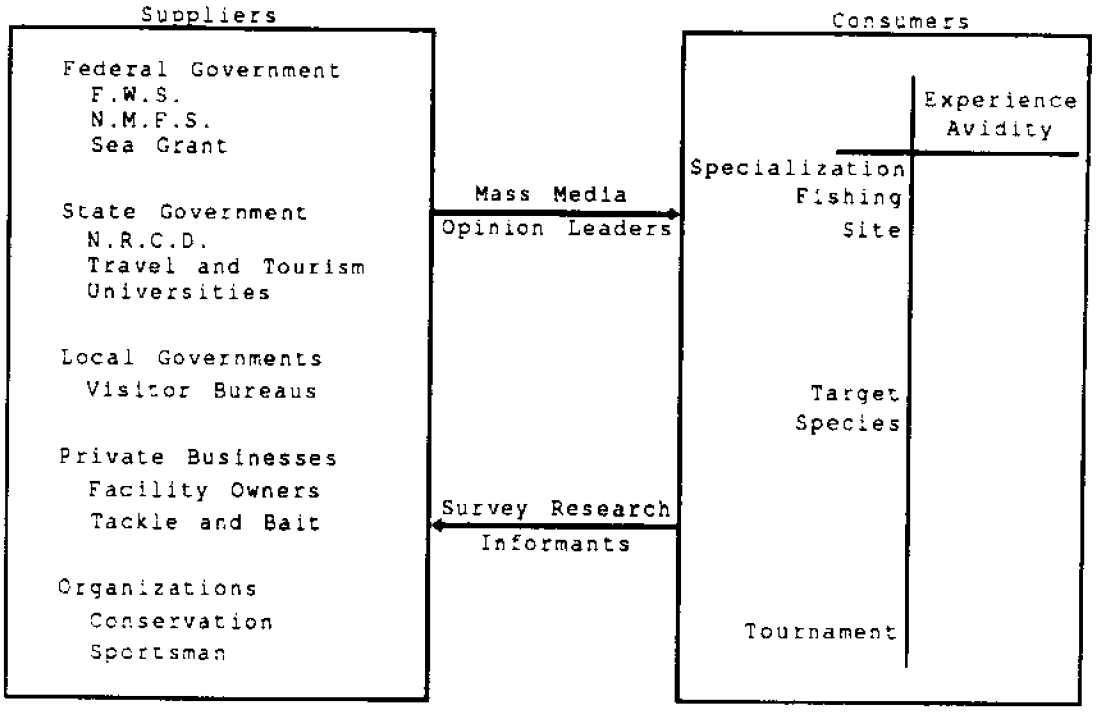

Figure 1.1

Communication Suppliers and Consumers in Marine Recreational Fishing

STUDY PURPOSE AND OBJECTIVES

With the primary goal of improving the efficiency of this complicated communication system, this project is an assessment and evaluation of the marine recreational fishing information dissemination system in North Carolina. The specific project objectives were to:

1. Identify and evaluate the MRF information dissemination system in North Carolina,
2. Identify MRF information-seeking behaviors, the sources of information used, and the knowledge and use of selected MRF information by different types of marine recreational fishermen in North Carolina,
3. Examine the diffusion of selected MRF innovations to different types of MRF fishermen, and
4. Develop guidelines for the dissemination of MRF information.

ORGANIZATION OF THE STUDY REPORT

To accomplish these study objectives, several interrelated tasks were completed. First, a content analysis and panel evaluation of MRF brochures was conducted to identify the primary informational content of the brochures being distributed to North Carolina marine recreational fishermen. Second, an on-site survey of marine recreational fishermen was conducted throughout the coastal zone of North Carolina to identify MRF information-seeking behaviors and related information. Third, a second on-site survey was conducted to examine the diffusion of two selected MRF technologies. Fourth, using the information attained from these various efforts along with the available information on MRF communications and brochure development, structural guidelines for communicating with marine recreational fishermen were developed. The following four chapters present the methodology and results of each of these efforts.

CHAPTER 2

CONTENT ANALYSIS AND EVALUATION OF BROCHURES

As the first step in examining the MRF communications system, a content analysis and evaluation was conducted of the fishing brochures and information being distributed by different types of organizations in North Carolina. The specific objectives of this task were to:

1. identify the existing MRF information dissemination system,
2. determine the types of information generally available to marine recreational fishermen,
3. determine if the available information focuses on specific species and, if so, to identify which species, and
4. evaluate the quality of the presentation of information.

METHODOLOGY

To accomplish these objectives, two specific research efforts were completed. First, simulated requests for fishing information were sent to a cross section of coastal North Carolina businesses with interests in fishing and/or tourism development. The mailing date for the request letters was April 1, 1988. All responses received within 10 weeks, on or before June 9, 1988, were included in the analyses. The purpose of these requests was to determine the nature and types of MRF information being distributed. Second, two expert panels were asked to evaluate a random sample of 10 of the fishing brochures received by the above mailings. Specifically, a group of upper level undergraduate communications students at North Carolina State University and members of the Raleigh (N.C.) Saltwater Fishing Club were asked to evaluate the brochures on their presentation merits.

Table 2.1 shows the distribution of organizations from which fishing information was requested. These organizations were identified from several sources. Specifically, the information sources used included the available fishing guides, the UNC Sea Grant College Program, the N.C. Department of Natural Resources and Community Development, the National Marine Fisheries Service, the North Carolina Division of Travel and Tourism, the membership directory of the Travel Council of North Carolina, the American Automobile Association and several chamber of commerce directories, including the 1988 World-Wide Chamber of Commerce Directory.

Table 2.1
Distribution of Information Requests and Response
by Type of Organization

Type of Organization	Number of Requests	Number of Responses	Response Rate
Real Estate Management Firms	53	86	162.3
Tourism Promotion Agencies	26	21	80.8
Charter and/or Head Boat Operators	19	15	78.9
Fisheries Management Agencies	8	4	50.0
Marinas	20	6	30.0
Fishing Clubs	7	2	28.6
Bait and Tackle Shops	63	9	14.3
Fishing Piers	36	4	11.1
Newspapers and Coastal Magazines	21	2	9.5
Unable to Determine	--	17	--
Total	253	166	65.6

Table 2.1 also shows the distribution of response by type of organization. Most notable is the response of the real estate management organizations. Although only 53 requests for information were sent to these firms, 86 responses were received for a response rate of 162.3 percent. It is common practice for tourism promotion agencies to publish a "tip sheet" listing the names and addresses of individuals who request information from them. These sheets are distributed to member organizations that can respond by sending information specific to their business. The additional real estate and the "unable to determine" responses probably resulted from such systems.

With the exception of the charter and head boat operators, the response rate for the fishing businesses was relatively low, indicating only a marginal interest in marketing efforts geared at influencing the fisherman before he or she leaves home. The three primary fishing businesses of bait and tackle shops, marinas and fishing piers had a combined response rate of only 16.0 percent.

The information received from the various sources was initially culled to include only that specific to marine recreational fishing. This fishing information was then analyzed by content to determine the nature and types of information being distributed. As a method of analyzing written communications, content analysis involves coding the communication relative to a series of carefully selected criteria (Babbie, 1986). These criteria can be either factual/manifest or

perceptual/latent in nature. Factual criteria involve examining the communication to see whether or not it contains specific information, e.g. does it contain any information concerning fishing regulations. Perceptual criteria involve examining the communication and making a judgement as to quality of its presentation of a particular concept or issue, e.g., the "image" of marine recreational fishing portrayed by the information.

The criteria used in this project included both factual and perceptual items. Factual items included whether or not the mailing includes information on "where to catch fish." Only one perceptual item, "the attractiveness of the literature (quality of presentation)," was examined. For the factual items, two graduate students coded all of the responses. Reliability and validity of the factual content analysis was relatively simple. In all judgmental situations, the two students worked together to code the information. However, to maintain the reliability of the "attractiveness" item, all of the responses were coded by one graduate student as a means of keeping the coding as consistent as possible. To enhance validity, that student was both experienced in brochure preparation and focusing her masters project on brochure development procedures. The content analysis results were entered into the NCSU mainframe computer and verified by the NCSU Computing Center staff.

RESULTS OF THE FISHING INFORMATION CONTENT ANALYSIS

No one type of information predominated in the fishing brochures. Where to catch fish was the most frequently communicated type of information, but still was found in only 28.3 percent of the brochures (table 2.2). In order of priority, the most prevalent types of information included where to catch fish, when (time of year) to catch fish and promotional messages on the sport or challenge of marine recreational fishing. The least common types of information included when (time of day) to catch fish, the food character of fish, how to clean and store one's catch and how to cook different types of fish. Considerable variance existed in the foci of the different types of information. Specifically, the information on how to catch fish, when (time of day) to catch fish and food character or taste tended to

focus on particular species. By comparison, the information on where to catch fish, the sport or challenge of fishing and fishing laws and regulations tended to be presented generically for all types of fish. This was particularly surprising for the fishing laws and regulations, which in North Carolina tend to be organized by species. As would be expected, the available information tends to be of a promotional nature, focusing on attracting more people to fishing rather than helping them to become better fishermen.

Table 2.2
Types of Information In Fishing Brochures

Type of Fishing Information	Frequency	Percent of Response
Where to Catch Fish		
yes	47	28.3
no	119	71.7
total	166	100.0
type of information		
general terms only	38	80.9
maps of fishing areas	9	19.1
figures on how to select a fishing site	0	0.0
both maps and figures	0	0.0
total	47	100.0
species focus		
generic to all types of fish	28	59.6
presented for particular types of fish	19	40.4
total	47	100.0
When (Time of Year) to Catch Fish		
yes	37	22.3
no	129	77.7
total	166	100.0
species focus		
generic to all types of fish	10	27.0
presented for particular types of fish	27	73.0
total	37	100.0
Sport or Challenge of Fishing		
yes	34	20.5
no	132	79.5
total	166	100.0
species focus		
generic to all types of fish	20	58.8
presented for particular types of fish	14	41.2
total	34	100.0
How to Catch Fish		
yes	20	12.0
no	146	88.0
total	166	100.0
type of information		
general terms only	4	20.0
types of tackle to use	4	20.0
best baits to use	1	5.0
both baits and tackle	11	55.0
total	20	100.0
species focus		
generic to all types of fish	7	35.0
presented for particular types of fish	13	65.0
total	18	100.0

Table 2.2 (cont)
Types of Information In Fishing Brochures

Type of Fishing Information	Frequency	Percent of Response
Fishing Laws and Regulations		
yes	13	7.8
no	153	92.2
total	166	100.0
species focus		
generic to all types of fish	7	53.8
presented for particular types of fish	6	46.2
total	13	100.0
When (time of Day) to Catch Fish		
yes	11	6.6
no	155	93.4
total	166	100.0
species focus		
generic to all types of fish	11	100.0
presented for particular types of fish	0	0.0
total	11	100.0
Food Character / Taste of Fish		
yes	11	6.6
no	155	93.4
total	166	100.0
species focus		
generic to all types of fish	4	36.4
presented for particular types of fish	7	63.6
total	11	100.0
Storage and Cleaning of Fish		
yes	11	6.6
no	155	93.4
total	166	100.0
species focus		
generic to all types of fish	10	90.9
presented for particular types of fish	1	9.1
total	11	100.0
How to Cook Fish		
yes	3	1.8
no	163	98.2
total	166	100.0
species focus		
generic to all types of fish	2	66.7
presented for particular types of fish	1	33.3
total	3	100.0

The species most likely to be specifically identified in the fishing brochures were king mackerel and bluefish (table 2.3). Along with Spanish mackerel, these species were also the most likely to be discussed in terms of specific fishing methods and techniques. However, red snapper was the species most likely to be presented in the brochure pictures.

Table 2.3
Presentation of Information by Species
(Percentage Distributions, N=166)

	Type of Information			
Species	No Information	Lists Species	Includes Pictures of Species	Information on Fishing for Species
King Mackerel	65.2	23.9	2.6	8.4
Bluefish	67.7	20.0	1.3	11.0
Flounder	75.2	16.3	2.0	6.6
Dolphin	75.5	16.8	2.6	5.2
Marlin	75.5	18.1	2.6	3.8
Spanish Mackerel	75.6	14.7	1.9	7.7
Spotted Sea Trout	76.6	14.9	2.6	5.8
Spot	77.3	14.9	1.3	6.4
Croaker	81.0	11.8	1.3	5.9
Striped Sea Bass	81.0	13.7	1.3	4.0
Red Snapper	81.5	15.2	3.3	0.0
Tuna	81.7	13.7	2.0	2.6
Drum	82.4	7.2	2.6	1.3
Grouper	85.6	12.4	1.3	0.7
Shark	94.0	4.6	0.7	0.7

In addition to the factual information provided in tables 2.2 and 2.3, the fishing brochures were also evaluated on the basis of their quality of presentation (table 2.4). On a 1 to 10 scale ranging from 1 = extremely unattractive to 10 = extremely attractive with 5 = average, the mean score was 5.78. Of the brochures, 78.9 percent were scored between 5 and 8, 19.3 percent at less than 5, and only 1.8 percent at 9 or above.

Table 2.4
Fishing Brochure Quality of Information

Quality Rating	Frequency	Percent
1 - 2 (extremely unattractive)	13	7.8
3 - 4	19	11.4
5 - 6 (average)	71	42.8
7 - 8	60	36.1
9 - 10 (extremely attractive)	3	1.8
Total	166	99.9*

*deviation from 100.0 due to rounding

RESULTS OF THE FISHING INFORMATION PANEL EVALUATION

As previously described, two panels were asked to evaluate a sample of 10 fishing brochures randomly selected from the mailing response. Specifically, 10 members of the undergraduate communications student club at North Carolina State University and 10 members of the Raleigh Saltwater Fishing Club were asked to evaluate the sample of brochures. The panel members were asked to evaluate each brochure on seven criterion using a 1 to 5 scale ranging from 1 = extremely poor to 5 = extremely good. The criteria that were selected, based on two publications on brochure development (Cook, 1987; Maas, 1981), were (1) attractiveness, (2) informativeness, (3) attention draw, (4) image portrayed of the area/business, (5) quality of listings of fishing resources, (6) quality of directions to fishing area/marina, and (7) quality of listings of available services. Additionally, the respondents were asked to rank the brochures from 1 = worst to 10 = best. After eliminating incomplete and unusable responses, 115 brochure evaluations were analyzed, 70 by the communications majors and 45 by the saltwater fishing club members.

Table 2.5 shows the distribution of scores for the seven brochure criterion. Overall, both panels evaluated the brochures as being relatively informative and attention-getting, but lacking in directions to the fishing area/marina. The panel of saltwater fishermen tended to rate the brochures higher on informativeness, image portrayed of the area/business, the listing of available services and attractiveness, but were particularly critical of the brochures on the criterion of directions to fishing area/business.

Table 2.5
Distribution of Panel Scores on Brochure Criterion

Raleigh	Panel			
	NCSU Communications Students		Saltwater Fishing Club	
Brochure Criterion	mean	sdev	mean	sdev
informative	3.77	0.89	4.20	0.79
attention getter (front cover only)	3.61	0.94	3.64	1.21
image portrayed of area/business	3.50	1.02	3.87	1.04
listing of fishing resources	3.46	0.96	3.42	1.63
listing of available services	3.36	1.14	3.84	1.26
directions to fishing area/marina	3.16	1.26	2.78	2.07
attractiveness	3.13	1.44	3.47	1.22

In order to better understand the factors that influence fishing brochure quality, a multiple regression analysis was next conducted to examine the relationships between the brochure criterion ratings and the overall brochure rankings. Table 2.6 presents these results. Both models performed relatively well with r-square values in excess of .60. However, the variables that contributed to the overall quality ratings varied significantly between the two panels. For the panel of communications students, the only variable contributing significantly to the overall rating was the measure of brochure attractiveness. For the saltwater fishermen panel, four variables related significantly to the overall measure of quality: informative, attention getter, the listing of fishing resources and the listing of available services.

Table 2.6
Regression Results for Contribution of
Brochure Criterion to Overall Brochure Quality

	Panel			
	NCSU Communications Students		Raleigh Saltwater Fishing Club	
Brochure Criterion	beta	t	beta	t
Model r-square value		.604		.641
attractiveness	.632	3.76***	.019	0.37
informative	-.293	1.53	.257	2.80**
attention getter (front cover only)	.101	0.61	.241	2.67**
image portrayed of area/business	.144	0.80	.075	0.88
listing of fishing resources	.163	1.70	.357	3.22**
directions to fishing area/marina	-.038	0.48	.014	0.18
listing of available services	.184	1.23	.145	1.92*
intercept	-.291	0.33	-.309	0.75

*significant at alpha=.05
**significant at alpha=.001
***significant at alpha=.0001

CONCLUSIONS

In this initial phase of the research project, our primary purposes were to identify the available sources of information on marine recreational fishing, to examine the types of information being distributed and to evaluate the quality of that information. Prior to discussing the results of these efforts, four important limitations should be noted. First, due to budget reductions, it was not possible

to personally travel to the coastal region to identify the sources of MRF information. We were restricted to mailed requests for information. Obviously, the on-site information distribution system is equally if not more important.

Second, although several sources were used, it is unreasonable to assume that our listing of potential information sources was exhaustive. It is very likely that important sources of information were not included in our original mailing. However, the responses from the tourism promotion agencies and real estate firms probably included most available sources of information. Hence, while the extent of this limitation is not clearly known, it is generally felt to be relatively minor.

Third, the panels used for evaluation of the fishing brochures were convenient samples. The group of undergraduate communications students were the available membership of their student association. The saltwater fishing panel was comprised of members of the Raleigh Saltwater Fishing Club. Clearly, more representative samples, particularly of the saltwater fishermen, may have significantly affected these results. However, the available budget limited our ability to compensate a statewide sample for the travel expenses necessary to meet to evaluate the brochures.

Relative to the objectives of this phase of the research, the following results were identified. First, it is obvious that a multitude of organizations distribute information on marine saltwater fishing in North Carolina. Nine different types of organizations were surveyed, all of which responded with MRF information. It is obvious that the tourism-related organizations, e.g., tourism promotion agencies and real estate management firms, are much more oriented to the mail distribution of MRF information than are the fishing businesses. Undoubtedly, the fishing businesses tend more to the verbal distribution of information to fishermen after they arrive in the coastal area. From a promotional viewpoint, the fisheries businesses may well benefit from a closer relationship with the tourism organizations. Most of the tourism organizations promote fishing as a coastal attraction. To the extent that a fishing business can create a complementary partnership with these organizations, it should benefit the business's sales.

The primary types of information provided in the brochures and pamphlets

received from the mailed requests focused on where, when, the sport and how to catch fish. The information on where to catch fish was presented in a relatively general format. However, the information on when, the sport, and how to catch fish tended to focus on specific species as would be appropriate. Very little information was available on food character, storage and cleaning of fish or how to cook different types of fish. Clearly, the available information tends to focus on promoting the sport of marine recreational fishing as opposed to improving care and treatment of the catch.

As would be expected given their popularity, the most frequently listed species in the fishing brochures and pamphlets were king mackerel, bluefish, flounder, dolphin, and marlin. Surprisingly, red snapper, tuna and drum were mentioned much less frequently. Although these particular species represent major fish stocks for North Carolina, they were less likely to be mentioned in the fishing information.

Finally, the quality of the fishing brochures and pamphlets was judged average, between 6 and 7 on a 1-10 scale ranging from extremely unattractive to extremely attractive. More importantly, two panels evaluated a random sample of the brochures and pamphlets on seven criterion, resulting in average scores in the 3.5 to 4.0 level on a one to five scale. Generally, both panels rated the brochures as being relatively attractive and attention-getting, but lacking in directions to the fishing area/marina. For communications students the most important determinant of overall perceived quality was the measure of brochure attractiveness. However, for the panel of saltwater fishermen, four measures significantly affected overall perceived quality: informative, attention-getting, listing of fishing resources and listing of available services. The important conclusion of these findings is that different audiences obviously use different criteria to judge the overall quality of fishing brochures and pamphlets. Clearly, individuals preparing such brochures need to clearly identify the target audience, the relevant information and then pretest the brochure with a selection of that audience.

CHAPTER 3

INFORMATION-SEEKING BEHAVIORS BY MARINE RECREATIONAL FISHERMEN IN NORTH CAROLINA

The next phase of this research project involved a survey of marine recreational fishermen, concerning their MRF information-seeking behaviors. The specific objectives of this survey were to:

1. determine the nature, extent and timing of MRF information-seeking behaviors,
2. identify the sources of MRF information used both in the coastal zone and, for tourists, prior to leaving home,
3. determine the perceived and actual levels of knowledge of selected MRF information,
4. examine the relationships between knowledge of selected MRF information and information-seeking behavior, and
5. determine if differences exist in information-seeking behaviors and sources of information between MRF fishermen categorized on the basis of fishing specialization.

METHODOLOGY

To accomplish these objectives a self-administered survey questionnaire was developed and administered to a sample of 517 MRF fishermen during June through October, 1988. Instrumentation was accomplished through personal interviews with a convenience sample of MRF fishermen and two on-site instrument pretests. Specifically, a draft instrument was prepared and circulated for comment to a convenience sample of 15 known MRF fishermen in the Raleigh metropolitan area, research colleagues at NCSU and other universities, and my graduate research associates. The basis for this draft instrument was previous MRF fishing survey instruments, previous tourism behavior survey instruments and the available literature on knowledge of MRF fishing. Specifically, a search of the available literature was used to develop an initial list of items which could potentially measure MRF knowledge. Based on the comments of these individuals and of other colleagues and graduate students, a second draft of the instrument was prepared. This instrument was administered to a sample of 43 MRF fishermen contacted at piers, bridges, marinas and other fishing sites in the Outer Banks region of North Carolina. The primary request made of these fishermen was to review the instrument

and identify any questions they did not clearly understand. Although no analysis was conducted of the data collected from this pretest, each question was examined to identify any problems on the part of the pretest sample in understanding the questions or in responding. Of particular importance was assuring that the provided response categories were inclusive of the range of possible responses. The second and final instrument pretest was administered on-site to a sample of 56 MRF fishermen, again in the Outer Banks area of North Carolina. The primary purposes of this pretest were twofold. First, it was important to determine if the corrections in question wording and response categories were adequate. Second, an item analysis of the fishing knowledge test was conducted to assure its reliability. Specifically, a factor analysis and Cronbach alpha reliability analysis were conducted. The results indicated that the fishing knowledge test was unidimensional, only one factor had an eigenvalue greater than 1.0, and that the scale, after deletion of two items, had a Cronbach alpha reliability coefficient of .721. A copy of the final instrument is included in the appendix.

The final data collection was accomplished through on-site interviews with fishermen. Working with the National Marine Fisheries Service, 32 interview sites, ranging throughout the North Carolina coastal region, were identified. Included in the final sample of interview sites were 12 piers, nine surf fishing sites, seven marinas, two bridges and two access ramps. Two one-week periods were randomly selected from the period from June through September 10, 1988, for data collection. During each of these periods, two graduate research assistants traveled to the interview sites and spent a minimum of three hours at each site interviewing the available fishermen. Additionally, two weekends were selected in October 1988. On each of these weekends, four graduate research assistants traveled to the interview sites and interviewed fishermen for a minimum of three hours at each sites. Over these time frames, 537 different fishermen were contacted, of which 517 completed the questionnaire for a survey response rate of 96.3 percent. The resulting data were prepared for data entry by graduate research assistants and entered into the TUCC (Triangle Universities Computing Center) mainframe computer by the data entry personnel at the NCSU Computing Center. All data analyses were completed using the

SAS Statistical Analysis System.

RESULTS

The data analysis was structured to address each of the study objectives. First, however, the personal and behavioral characteristics of the study sample were assessed. Table 3.1 shows the personal characteristics of the sample of fishermen. Of the study sample, 89.0 percent were male. Respondent ages ranged from 10 to 79 years with the average of 39.5 years; 54.7 percent of the respondents were between 20 and 40. The distance traveled between the respondent's home and the interview site ranged from 0 to 3,057 miles with a mean of 213 miles and a median of 158 miles. Years of formal education ranged from 2 to 21 years with a mean of 13.2 and a median of 12. Of the respondents, however, 61.9 percent were either high school graduates or had some college. Overall, only 21.7 percent had college degrees. Income ranged from less than $10,000 to over $110,000; 55.1 percent of the respondents had incomes between $20,000 and $50,000.

Table 3.1
Personal Characteristics of 1988 Survey Sample

Personal Characteristic	Frequency	Percent of Sample
Gender		
male	452	89.0
female	56	11.0
total	508	100.0
Age (years)		
<20	13	2.6
20 to 29	129	25.5
30 to 39	148	29.2
40 to 49	96	19.0
50 to 59	58	11.4
60 to 69	48	9.5
70 or more	14	2.8
total	506	100.0
Distance from Permanent Home Residence to Fishing Site		
<50 miles	87	17.3
50 to 99 miles	62	12.3
100 to 149 miles	71	13.9
150 to 199 miles	66	13.0
200 to 249 miles	52	10.4
250 to 299 miles	45	8.9
300 to 399 miles	48	9.5
400 to 499 miles	30	6.0
500 miles or more	44	8.7
total	505	100.0
Education (last year of school completed)		
less than high school (1 to 11 years)	81	16.4
high school graduate (12 years)	175	35.5
some college (13 to 15 years)	130	26.4
college graduate (16 to 17 years)	73	14.8
advanced college (18 years or more)	34	6.9
total	493	100.0
Household Income		
<$10,000	22	4.8
$10,000 to $19,999	40	8.8
$20,000 to $29,999	92	20.1
$30,000 to $39,999	97	21.2
$40,000 to $49,999	63	13.8
$50,000 to $59,999	50	10.9
$60,000 to $69,999	33	7.2
$70,000 or more	50	13.1
total	457	100.0

Many of the survey respondents had extensive experience as saltwater fishermen (table 3.2). The range in saltwater fishing experience was from 1 to 60 years with a mean of 18.3 years and a median of 16 years. However, extreme variance existed in

the number of days spent fishing in the past year. The range was from one to 365 days with a mean of 51.9 days. Reflecting the highly skewed nature of these data, however, the median number of days spent fishing in the past year was 10 days. In order of frequency, these days were spent fishing at freshwater sites, in salt water from a pier or bridge, in saltwater surf from the beach, in saltwater sounds or bays from a boat or in offshore salt water. As with the frequency of participation data, the data on fishing equipment ownership and fishing expenditures were also skewed. Specifically, the survey respondents reported owning a mean of 7.0 fishing rod and reel combinations and spending a mean of $287.16 on fishing equipment in the year preceding the survey. The median values for these measures were 5 and $100, respectively.

Table 3.2
Fishing Behaviors of 1988 Survey Sample - I

Fishing Behavior Measure	Range	Median	Mean	Standard Deviation
Years of Saltwater Fishing Experience	1 - 60	16	18.3	12.1
Days Spent Fishing in Year Preceding Survey				
freshwater	0 - 340	5	19.1	37.3
saltwater / pier or bridge	0 - 260	3	11.1	23.2
saltwater surf / beach	0 - 304	3	10.6	26.6
saltwater sounds/bays / boat	0 - 300	1	7.4	20.8
offshore saltwater / boat	0 - 100	1	3.7	11.1
Rod and Reel Combinations Owned	0 - 80	5	7.0	6.9
Fishing Equipment Expenditures in Past Year	0 - $20000	$100	$287.16	$1004.20

Most of the respondents also had extensive experience fishing in the area in which they were interviewed. Over 50 percent of the respondents had fished in that area more than 10 times in the five years preceding the survey (table 3.3). There were very few "casual" fishermen in the survey sample. Of the respondents, 66.3 percent had came to the coast specifically to go fishing. Of those who had come to the coast for recreation, only part of which was their fishing experience, 86.7 percent had decided to go fishing before leaving home. Thus, only 22 out of 490 respondents (4.5%) had decided to go fishing on impulse after arriving on the coast.

Table 3.3
Fishing Behaviors of 1988 Survey Sample - II

Fishing Behavior Measure	Frequency	Percent
Fishing Trips to Interview Area in Last 5 Years (within 15 miles of interview site)		
none	40	7.8
1 - 5	138	26.7
6 to 10	61	11.8
more than 10	277	53.7
total	516	100.0
Nature of Current Fishing Trip		
came to the coast specifically to go fishing	325	66.3
visiting for recreation, including fishing	165	33.7
total	490	100.0
Of those visiting for recreation - decided to go fishing		
before leaving home	143	86.7
after arriving on the coast	22	13.3
total	165	100.0
Owns a Fishing Boat	185	36.0
Subscribes to a Fishing Magazine	143	27.9
Saltwater Fishing Focused on Catching One Species	105	20.5
Participant in Saltwater Fishing Tournament	73	14.6
Member of a Fishing Club or Organization	48	9.4
Importance of Fishing to Satisfaction with Life (0 = not at all important to 10 = extremely important scale)		
0 to 2	71	13.9
3 to 4	86	16.9
5 to 6	151	29.7
7 to 8	108	21.2
9 to 10	93	18.3
total	509	100.0

Table 3.3 also presents the results of six general measures of the respondents' involvement in marine recreational fishing. Of the respondents, 36 percent owned a fishing boat, 27.9 percent subscribed to a fishing magazine, 20.5 percent focused their saltwater fishing on catching one particular species, 14.6 percent had participated in a saltwater fishing tournament, and 9.4 percent were members in a fishing club or organization. On a 0 = not at all important to 10 = extremely important scale, the respondents averaged 6.0 in terms of the importance

of fishing to their satisfaction with life.

OBJECTIVE 1: TO DETERMINE THE NATURE, EXTENT, AND TIMING OF MRF INFORMATION-SEEKING BEHAVIORS

Using the seven major types of MRF information identified by the content analysis, the respondents were asked to rate each type of information on two criteria. First, they were asked to indicate how important having accurate and up-to-date information of that type was to their fishing success. Information on where to catch fish and which bait and tackle to use were by far the most important types of information. Information on how to take care of the catch, catch and size regulations, how to cook different types of fish and how to identify the fish you catch were considered least important (table 3.4).

Second, the respondents were asked to rate each type of information in terms of how difficult it is to get accurate and up-to-date information of that type. The pattern of response was essentially similar to that of the importance measure (table 3.4). The most difficult types of information to obtain were where to catch fish, how to catch different types of fish and which bait and tackle to use. The least difficult types of information to obtain were how to cook different types of fish, how to take care of your catch and how to identify the fish you catch.

Table 3.4
Importance and Availability of Selected Types of Saltwater Fishing Information

Type of Information	Mean Score	
	Importance[a]	Performance[b]
where to catch fish	4.09	2.69
which bait and tackle to use	4.01	2.26
how to catch different types of fish	3.69	2.40
how to take care of your catch	3.63	1.98
catch and size regulations	3.62	2.09
how to cook different types of fish	3.51	1.96
how to identify the fish you catch	3.48	2.05

[a]Measured by asking respondents how important having accurate and up-to-date information is to your fishing success. Response scale ranged from 1 = not at all important to 5 = extremely important.

[b]Measured by asking respondents how difficult you feel it is to get accurate and up-to-date information on North Carolina saltwater fishing. Response scale ranged from 1 = not at all difficult to 5 = extremely difficult.

To better understand these results, an importance-performance analysis was conducted of these data. Importance-performance analysis is a graphical procedure frequently used to evaluate marketing and communication efforts. Essentially, it categorizes major types of information, services or product attributes into four categories on the basis of respondent mean ratings of the attribute's importance and the organization's performance in providing that attribute (figure 3.1). The organization is then in a position to focus on maintaining the major successes and rectifying the major failures. Trivial successes and failures are generally areas from which resources are reallocated to better address the major needs.

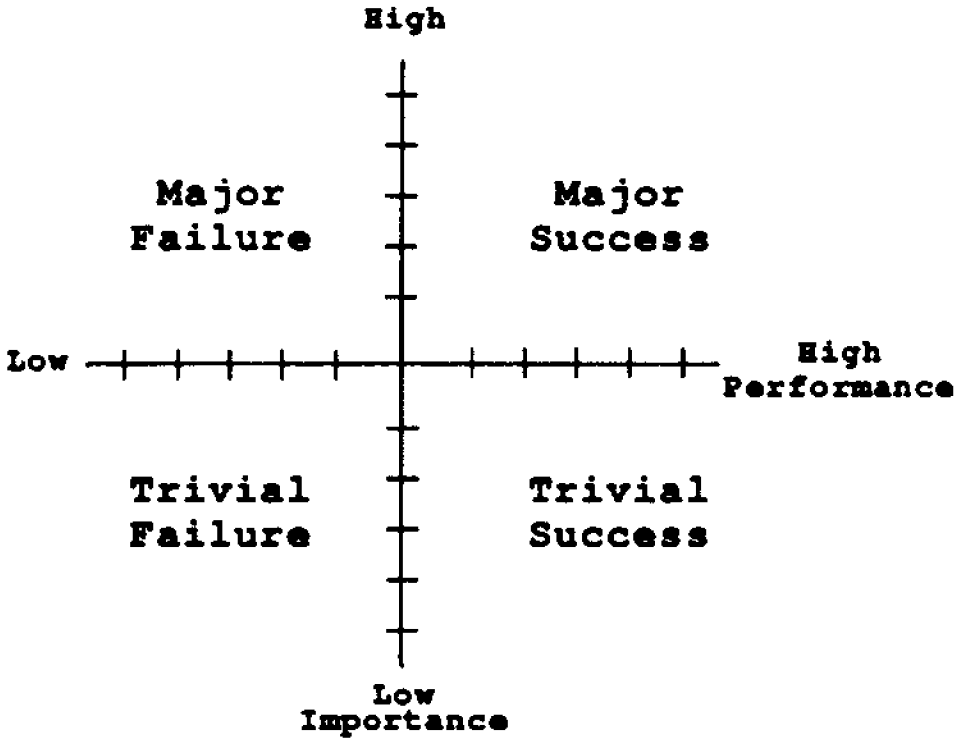

Figure 3.1

Importance Performance Analysis Grid

To accomplish the importance-performance analysis, the difficulty data were recoded so that 1 equaled extremely difficult and 5 equaled not at all difficult. The mean importance and performance scores for each type of information were then calculated. Within the two major issues, importance and performance, the mean of the mean scores was then calculated. These overall mean scores were used to establish the graphical crosshairs for the analyses. For each type of information, the importance and performance means were then subtracted from the overall means and plotted accordingly. Figure 3.2 shows the results. Two types of information were rated as major failures by the respondents -- where to catch fish and which bait and tackle to use. The remaining items all rated as trivial successes. This is not to imply that the only types appropriate to MRF fishermen should focus on where to catch fish and which baits and tackles to use. Obviously, that depends upon the organization's goals and objectives, particularly the regulatory and conservation agencies. Rather, it implies that the success of any communication effort would be enhanced if it included information on locating and catching fish.

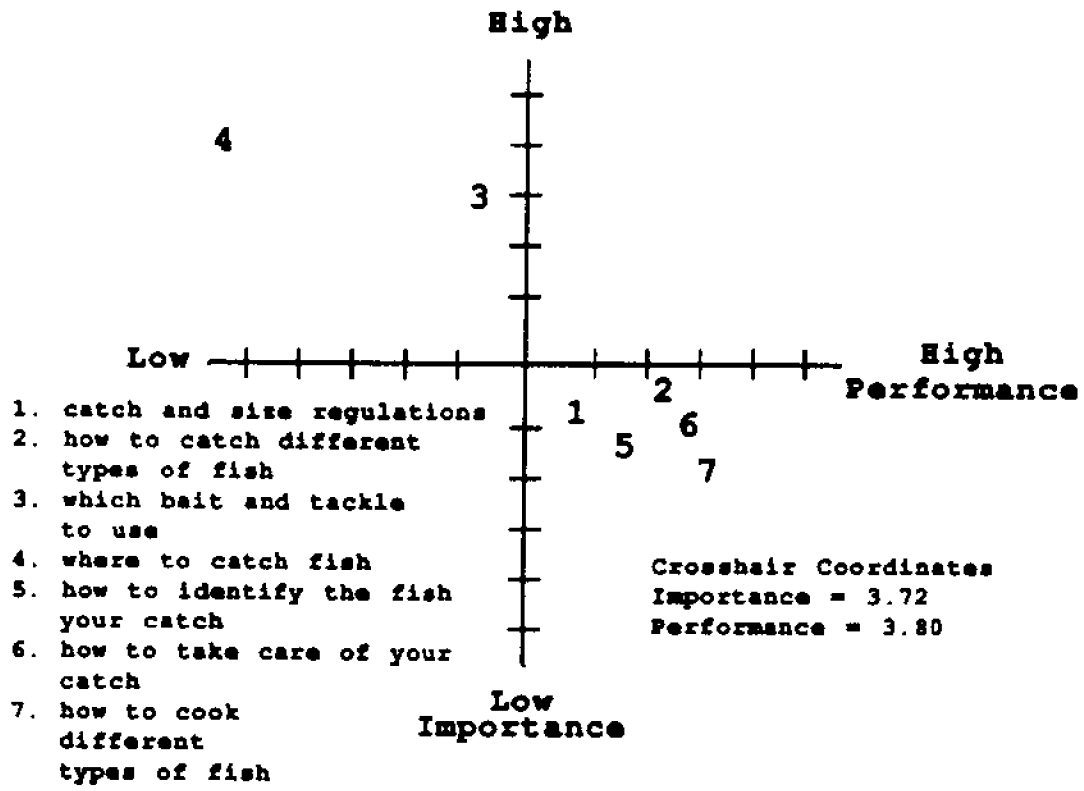

Figure 3.2

Importance Performance Analysis Results

Next, the respondents were asked to identify the sources of information used in planning their current fishing trip. Overall, fishermen are more likely to seek information after arriving on the coast. Of the respondents, 62.1 percent sought information prior to leaving home. For comparison, 74.3 percent sought information after arriving on the coast. The average number of sources used prior to leaving home was 0.9. Although the possible range of responses was from 0 to 10, 44.9 percent of the respondents reported using one source prior to leaving home (table 3.5). The average number of information sources used after arriving on the coast was 1.25, with 43.7 percent of the respondents using only one source. Clearly, the respondents depend upon a very limited set of information sources.

Table 3.5
Number of Information Sources Used by Marine Recreational Fishermen in North Carolina

Number of Information Sources	Frequency	Percent
Used Prior to Leaving Home		
0	196	37.9
1	232	44.9
2	49	9.5
3	26	5.0
4 or more	14	2.7
total	517	100.0
Used After Arriving on the Coast		
0	133	25.7
1	226	43.7
2	80	15.5
3	58	11.2
4 or more	20	3.9
total	517	100.0

OBJECTIVE 2: TO IDENTIFY THE SOURCES OF MRF INFORMATION USED BOTH IN THE COASTAL ZONE AND, FOR TOURISTS, PRIOR TO LEAVING HOME.

The primary source of information used by the survey respondents prior to leaving home was other friends and relatives (table 3.6), followed in order of priority by coastal bait and tackle shop operators, coastal pier operators, other coastal residents, and coastal charter and party boat operators. The least-used sources of information were coastal chambers of commerce, the N.C. Division of Travel and Tourism and the N.C. Division of Marine Fisheries.

Table 3.6
Sources of Information Used by
Marine Recreational Fishermen in North Carolina

Source of Information	Frequency	Percent[a]
Used Prior to Leaving Home		
other friends and relatives	173	53.9
coastal bait and tackle shop operator	67	20.9
coastal pier operator	52	16.2
other coastal residents	44	13.7
coastal charter or party boat operator	24	7.5
coastal marina operator	17	5.3
coastal hotel or motel operator	14	4.4
North Carolina Division of Marine Fisheries	10	3.1
North Carolina Division of Travel and Tourism	8	2.5
coastal chamber of commerce	4	1.2
Used After Arriving on the Coast		
bait and tackle shop operator / employee	200	52.1
pier operator / employee	134	34.9
other local residents	146	38.0
marina operator / employee	49	12.8
other local business employees	48	12.5
chamber of commerce or visitor center	11	2.9
North Carolina Aquarium	4	1.0

[a]Percentages do not add to 100.0 due to people using more than one source of information. Percentages calculated on the basis of the number of people that used one or more sources of information. For sources used prior to leaving home, the basis was 321 individuals. For sources used after arriving at the coast, the basis was 384 individuals.

Essentially, the same pattern existed for sources of information used after arriving at the coast. The most commonly used sources of information were bait and tackle shops operators, pier operators, other local residents, and marina operators. The least frequently used sources at the coast were the North Carolina Aquariums and chambers of commerce and visitors centers.

To further examine the patterns of information seeking, the sources of information were categorized as shown in table 3.7. Clearly, informal sources are the most frequently used information medium for fishermen prior to leaving home. Coastal fishing businesses are used by 37.1 percent of the information seekers. Coastal tourism organizations and state agencies are relatively unused as sources of MRF information for individuals prior to leaving home, being used by 5.3 and 5.0 percent of the information seekers, respectively.

Once at the coast, the primary sources of information are various fishing organizations, which are used by 72.1 percent of the information seekers. For comparison, non-fishing organizations are used by only 3.9 percent of the information seekers. Informal sources are used by 43.0 percent of the information seekers.

Table 3.7
Combined Sources of Information Used by
Marine Recreational Fishermen in North Carolina

Combined Sources of Information	Frequency	Percent[a]
Used Prior to Leaving Home		
Informal Sources coastal residents friends and relatives	190	59.2
Coastal Fishing Businesses marina operator bait and tackle shop operator charter or party boat operator pier operator	119	37.1
Coastal Tourism Organizations chamber of commerce hotel or motel operator	17	5.3
State Agencies North Carolina Division of Marine Fisheries North Carolina Division of Travel and Tourism	16	5.0
Used After Arriving on the Coast		
Fishing Organizations marina operator / employee bait and tackle shop operator / employee pier operator / employee	277	72.1
Informal Sources other local business employees other local residents	165	43.0
Non-fishing Organizations chamber of commerce or visitor center North Carolina Aquarium	15	3.9

[a]Percentages do not add to 100.0 due to people using more than one type of information. Percentages calculated on the basis of the number of people that used one or more types of information. For sources used prior to leaving home, the basis was 321 individuals. For sources used after arriving at the coast, the basis was 384 individuals.

OBJECTIVE 3: TO DETERMINE THE PERCEIVED AND ACTUAL LEVELS OF KNOWLEDGE OF SELECTED MARINE RECREATIONAL FISHING INFORMATION.

In order to assess the respondents' self-perceived knowledge of marine recreational fishing, the survey respondents were asked to rate their knowledge of saltwater fishing on a 0 to 10 scale where 0 = not at all knowledgeable and 10 = extremely knowledgeable. The mean response was 4.99 with a median of 5.0. Of the respondents, 19.4 percent rated their knowledge in the 0 to 2 range (table 3.8). At the other end of the scale, only 6.7 percent rated their knowledge in the 9 to 10 range. A substantial majority of the respondents (59.6%) rated their knowledge in the 3 to 6 range.

Table 3.8
Distribution of Perceived Knowledge Scores

Perceived Knowledge Score	Frequency	Percent
How would you rate your knowledge of saltwater fishing? (response scale ranged from 0 = not at all knowledgeable to 10 = extremely knowledgeable)		
0 to 2	99	19.4
3 to 4	132	25.9
5 to 6	172	33.7
7 to 8	73	14.3
9 to 10	34	6.7
total	510	100.0

As described in the methodology section, a test of MRF knowledge was constructed for the purposes of testing actual knowledge. Essentially, the test can be broken down into four sections: (1) fishing length regulations, (2) baits and tackles, (3) fish identification, and (4) fish location. For fishing length regulations, the respondents were asked the minimal length requirement for keeping channel bass and flounder in North Carolina waters. For channel bass, 17.0 percent of the respondents knew the correct answer of 14 inches (table 3.9). Of the remainder, 41.8 percent did not know the answer and chose not to guess, 19.5 percent felt it was less than 14 inches, and 21.7 percent felt it was greater than 14 inches. For flounder, 10.8 percent knew the correct answer of 13 inches. Many of the respondents answered 11 inches, which was the correct answer up until a few months prior to the survey; 59.6 percent answered less than 13 inches as compared to only 6.0 percent answering greater than 13 inches.

For baits and tackles, the respondents were asked to match seven popular North Carolina saltwater species with the bait that is generally considered best for that fish. Recognizing that there is virtually no general consensus as to the best bait for any given fish, the respondents were encouraged by the surveyor to provide up to two answers. If either answer was that which we considered correct, the response was considered correct. The range of correct responses was from 66.2 percent for spot to 29.6 percent for pompano (table 3.8). For the remaining species, the percentage of correct response was 31.5, 41.0, 46.4, 34.8, and 43.5 percent for flounder, croaker, king mackerel, red drum and bluefish, respectively. Over the seven species, the respondents averaged 41.9 percent correct. Given three pictures, the respondents were also asked to identify a "fish finder" terminal tackle rigging; 48.4 percent of the respondents provided the correct answer.

For fish identification, the respondents were first asked which of three fish

-- 35-pound channel bass, 4-pound flounder or 6-pound pompano -- would be a state record fish in North Carolina. Of the respondents, 33.8 percent correctly answered the 6-pound pompano; 46.6 percent did not know and 19.7 percent answered one of the other two fish. Next, the respondents were given a picture of a Spanish mackerel and asked to identify the species. Of the respondents, 88.6 percent provided the correct answer.

Finally, the respondents were asked to identify the most likely place to catch a sheepshead, red snapper and pompano. The correct response ranged from 70.5 percent for red snapper to 46.0 percent for pompano; 55.0 percent answered correctly for sheepshead.

Table 3.9
Fishing Test Responses

Fishing Test Question	Frequency	Percent[a]
What is the minimum length requirement for keeping the following types of saltwater fish in North Carolina?		
channel bass (red drum, puppy drum)		
no response[d]	216	41.8
less than 14 inches	101	19.5
14 inches*	88	17.0
over 14 inches	112	21.7
total	517	100.0
flounder		
no response[d]	122	23.6
less than 13 inches	308	59.6
13 inches*	56	10.8
over 13 inches	31	6.0
total	517	100.0
Please match the following fish with the bait that is generally considered the best bait for that fish.[b]		
flounder		
cut flounder belly strips	163	31.5
all other baits	354	68.5
total	517	100.0
spot		
bloodworms	342	66.2
all other baits	175	33.8
total	517	100.0
croaker		
shrimp	212	41.0
all other baits	305	59.0
total	517	100.0
king mackerel		
live bait fish	240	46.4
all other baits	277	53.6
total	517	100.0
red drum		
cut bait	180	34.8
all other baits	337	65.2
total	517	100.0
pompano		
sand fleas	153	29.6
all other baits	364	70.4
total	517	100.0

*correct answer

[a]Percentages calculated on basis of study population of 517 respondents. A non-response was considered an incorrect answer.
[b]Respondents were allowed up to two answers, either of which could be correct.
[c]Deviation from 100.0 due to rounding.

Table 3.9 (cont)
Fishing Test Responses

Fishing Test Question	Frequency	Percent[a]
bluefish		
artificial lures	225	43.5
all other baits	292	56.5
total	517	100.0
Which of the following terminal tackles is known as a fish finder rigging?		
A	48	11.0
B*	211	48.4
C	177	40.6
total	436	100.0
Which of the following would be a state record fish in North Carolina?		
35-pound channel bass	75	15.2
4-pound flounder	22	4.5
6-pound pompano*	167	33.8
don't know	230	46.6
total	494	100.1c
What type of fish is shown in this picture?		
Spanish mackerel*	445	88.6
croaker	3	0.6
yellowfin tuna	18	3.6
don't know	36	7.2
total	502	100.0
Where would you be most likely to catch a:		
sheepshead		
offshore bottom reef	53	10.6
bridge pilings*	274	55.0
surf	15	3.0
sounds and inlets	29	5.8
don't know	127	25.5
total	498	99.9c
red snapper		
offshore bottom reef*	354	70.5
bridge pilings	13	2.6
surf	15	3.0
sounds and inlets	26	5.2
don't know	94	18.7
total	502	100.0
pompano		
offshore bottom reef	51	10.2
bridge pilings	42	8.4
surf*	230	46.0
sounds and inlets	50	10.0
don't know	127	25.4
total	500	100.0

*correct answer

[a]Percentages calculated on basis of study population of 517 respondents. A non-response was considered an incorrect answer.
[b]Respondents were allowed up to two answers, either of which could be correct.
[c]Deviation from 100.0 due to rounding.

A composite fishing test score was created by adding the respondent's number of correct answers. With a possible range of 0 to 15, the mean score was 6.73 with a median of 7.0. Of the respondents, 21.3 percent scored in the 0 to 3 range as compared to 7.5 percent in the 13 to 15 range (table 3.10). The majority of respondents (55.7%) scored in the 4 to 9 range. The Pearson Product correlation between the respondents' test scores and self-perceived knowledge scores was .452.

Table 3.10
Distribution of Fishing Test Scores

Fishing Test Score	Frequency	Percent
0 to 3	110	21.3
4 to 6	146	28.2
7 to 9	142	27.5
10 to 12	80	15.5
13 to 15	39	7.5
total	517	100.0
Pearson Correlation between Test and Perceived Knowledge Score		.452
probability		.0001

OBJECTIVE 4: TO EXAMINE THE RELATIONSHIPS BETWEEN KNOWLEDGE OF SELECTED MRF INFORMATION AND INFORMATION-SEEKING BEHAVIOR.

A series of statistical tests was conducted to examine the relationships of perceived and actual levels of MRF knowledge with information-seeking behaviors. Table 3.11 shows the correlations between the measures of knowledge and the number of information sources used for fishing trip planning. Of the four correlations, none are highly significant. Essentially, there is no relationship between MRF knowledge and the number of information sources used for fishing trip planning.

Table 3.11
Pearson Correlations Between Number of Information Sources Used and Perceived Knowledge and Fishing Test Scores

Number of Information Sources Used	Perceived Knowledge	Fishing Test Score
Prior to Leaving Home	.0702	.0501
After Arriving On the Coast	.0432	.0736*

*significant at alpha = .01

Next, t-tests were used to identify differences in perceived and actual fishing knowledge by whether or not the respondent used each major type of MRF information. Of the 14 tests, only one was statistically significant. Contrary to the hypothesis that individuals with lower levels of knowledge would be more likely to be information seekers, individuals who used fishing organizations for information after arriving at the coast tended to have higher levels of actual fishing knowledge than those who did not use fishing organizations. However, while not statistically significant, five of the seven tests for differences in actual knowledge were in the hypothesized direction, including all of the tests pertaining to information-seeking prior to leaving home. Still, the implication of these tests is that there is no relationship between information-seeking behaviors and MRF knowledge.

Table 3.12
Differences in Perceived Knowledge and Fishing Test Scores
by Usage of Different Types of Fishing Information

Type of Information	Perceived Knowledge mean	Perceived Knowledge t-test	Fishing Test Score mean	Fishing Test Score t-test
Used Prior to Leaving Home				
State Agencies		0.9		1.0
yes	5.56		5.88	
no	4.97		6.76	
Coastal Tourism Organizations			1.6	0.7
yes	4.06		6.11	
no	5.02		6.75	
Coastal Fishing Businesses		1.1		0.2
yes	5.22		6.66	
no	4.92		6.75	
Informal Sources		0.6		0.7
yes	4.90		6.58	
no	5.04		6.81	
Used After Arriving on the Coast				
Non-fishing Organizations		0.1		0.4
yes	5.07		7.13	
no	4.99		6.72	
Fishing Organizations		0.2		1.7*
yes	5.01		6.99	
no	4.96		6.43	
Informal Sources		0.3		0.4
yes	5.04		6.65	
no	4.97		6.77	

*significant at alpha = .01

OBJECTIVE 5: TO DETERMINE IF DIFFERENCES EXIST IN INFORMATION-SEEKING BEHAVIOR AND SOURCES OF INFORMATION BETWEEN FISHERMEN CATEGORIZED ON THE BASIS OF FISHING SPECIALIZATION.

Following the procedures developed by Donnelly, Vaske and Graefe (1986), a measure of fishing specialization was next constructed. Five dimensions of fishing specialization were defined: (1) fishing experience, (2) equipment, (3) external involvement, (4) centrality, and (5) site and species specialization. The measure of each dimension was created by combining the scores of one or more of the fishing behavior variables. The particular decision rules are reflected in table 3.13. An overall measure of specialization was then created by adding the dimension scores.

Table 3.14 shows the distribution of the respondents on each dimension and on the overall measure of specialization. For most of the dimension measures, the response was somewhat skewed toward the lower end. For example, on the dimension of

fishing experience, 66.4 percent of the respondents were in the 0 to 1 range as compared to 33.5 percent in the 3 to 4 range. Similarly, on the equipment dimension, 42.0 percent scored 0 as compared to 25.9 percent scoring 2. On the external involvements, 70.1 percent scored 0 as compared to 6.7 percent scoring 2. Consequently, the overall measure of specialization was somewhat skewed to the lower end. Given a possible range of scores from 0 to 12, the mean score was 4.72 and the median was 4.0. While 23.6 percent of the respondents scored in the 0 to 2 range, only 6.4 percent scored 9 or above.

Table 3.13
Creation of Specialization Measures

Specialization Measure			Score
Fishing Experience			
Years of Experience[a]	Fishing Days In Last Yeara	Tournament Involvement	
< 16	< 10	no	0
< 16	< 10	yes	1
< 16	> 11	no	1
> 17	< 10	no	1
< 16	> 11	yes	2
> 17	> 11	no	2
> 17	< 10	yes	2
> 17	> 11	yes	3
Equipment			
Number of Rod Reel Combination[a]	Owns a Fishing Boat		
< 5	no		0
< 5	yes		1
> 6	no		1
> 6	yes		2
External Involvement			
Subscribes to a Fishing Magazine	Member in a Saltwater Fishing Club		
no	no		0
no	yes		1
yes	no		1
yes	yes		1
Centrality			
Importance of Fishing to Satisfaction with Life			
	0 to 3		0
	4 to 6		1
	7 to 9		2
	10 to 12		3
Site and Species Specialization			
Site Specialization[b]	Species Specialization		
no	no		0
no	yes		1
yes	no		1
yes	yes		2

[a]Divided at median value for variable.

[b]Site specialization if individual spent more than 60 percent of fishing days at one type of site.

Table 3.14
Distribution of Respondents by Specialization Measures

Specialization Measure	Frequency	Percent
Fishing Experience		
0	156	31.1
1	177	35.3
2	129	25.7
3	39	7.8
total	501	99.9[a]
Equipment		
0	216	42.0
1	165	32.1
2	133	25.9
total	514	100.0
External Involvements		
0	357	70.1
1	118	23.2
2	34	6.7
total	509	100.0
Centrality		
0	84	16.5
1	224	44.0
2	108	21.2
3	93	18.3
total	509	100.0
Site and Species Specialization		
0	156	32.2
1	259	53.5
2	69	14.3
total	484	100.0
Overall Specialization		
0 to 2	110	23.6
3 to 4	130	27.9
5 to 6	104	22.3
7 to 8	92	19.7
9 to 10	27	5.8
11 to 12	3	0.6
total	466	99.9[a]

[a]deviation from 100.0 due to rounding.

A series of tests was conducted to examine the relationships between the dimensions of fishing specialization and information-seeking behaviors. First, chi square analyses were used to examine the relationships between specialization and usage of each major type of MRF information. As shown in table 3.15, there were few relationships between the dimensions of specialization and usage of the various types of MRF information prior to leaving home. Only two of 20 tests were statistically significant. As external involvement increases, usage of coastal fishing businesses for information prior to leaving home also increases, probably indicating more established relationships with the proprietors of those businesses. The association between centrality to life and usage of coastal tourism

organizations is more nebulous. It appears that those individuals scoring in the middle ranges of centrality (1 - 2) were statistically more likely to use coastal tourism organizations for information than were those individuals on either end of the centrality measure. Overall, however, the conclusion from these tests is that there is essentially no relationship between the dimensions of fishing specialization and the sources of information used for trip-planning prior to leaving home.

Next, Pearson Product correlations were calculated between the dimensions of fishing specialization and the number of information sources used prior to leaving home (table 3.16). The number of information sources increased with increasing fishing experience and with increasing external involvements in fishing. However, there was no relationship between at-home information-seeking and equipment specialization, centrality to life or site and species specialization. It is very likely that through fishing experience and external involvements, the fishermen identify viable information sources that can be contacted prior to leaving home, thus providing a means of determining fishing opportunity.

Table 3.15A
Usage of Different Types of Information Prior to Leaving Home
by Measures of Fishing Specialization

Measure of Organizations Specialization	State			Coastal Tourism Agencies		
	yes	no	X^2	yes	no	X^2
Fishing Experience			1.6			4.5
0	4	152		4	152	
1	8	169		8	169	
2	3	126		2	127	
3	1	38		3	36	
total	16	485		17	484	
Equipment			3.4			0.9
0	8	208		7	209	
1	7	158		7	158	
2	1	132		3	130	
total	16	498		17	497	
External Involvements		1.0			2.4	
0	11	346		11	346	
1	3	115		6	112	
2	2	32		0	34	
total	16	493		17	492	
Centrality to Life			1.4			8.4*
0	3	89		1	91	
1	5	219		9	215	
2	5	103		7	101	
3	3	90		0	93	
total	16	501		17	500	
Site & Species Specialization			1.4			2.3
0	3	153		3	153	
1	9	250		9	250	
2	1	68		4	65	
total	13	471		16	468	

*significant at alpha=.05

Table 3.15B
Usage of Different Types of Information Prior to Leaving Home
by Measures of Fishing Specialization

Measure of Specialization	Coastal Fishing Businesses			Informal Sources		
	yes	no	X^2	yes	no	X^2
Fishing Experience			2.2			3.1
0	32	124		64	92	
1	42	135		57	120	
2	33	96		49	80	
3	12	27		16	23	
total	119	382		186	315	
Equipment			0.6			0.6
0	53	163		83	133	
1	37	128		57	108	
2	28	105		83	50	
total	118	396		190	324	
External Involvements			6.2*			4.3
0	74	283		124	233	
1	31	87		53	65	
2	13	21		11	23	
total	118	391		188	321	
Centrality to Life			2.3			0.6
0	16	76		31	61	
1	56	168		85	139	
2	24	84		39	69	
3	23	70		35	58	
total	119	398		190	327	
Site & Species Specialization			0.5			2.4
0	40	116		62	94	
1	59	200		85	174	
2	16	53		27	42	
total	115	369		174	310	

*significant at alpha=.05

Table 3.16
Pearson Correlation Coefficients for Measures of Fishing Specialization with Total Number of Information Sources Used Prior to Leaving Home

Measure of Fishing Specialization	Number of Information Sources Used Prior to Leaving Home
Fishing Experience	0.112*
Equipment	-0.004
External Involvements	0.162**
Centrality to Life	0.016
Site and Species Specialization	0.073

*significant at alpha = .05
**significant at alpha = .001

Similar tests were conducted to examine the relationships between the dimensions of fishing specialization and usage of information sources after arriving on the coast. Four of the 15 chi square tests were statistically significant (table 3.17). Clearly, there was no association between usage of coastal sources of information and fishing experience, equipment, and site and species specialization. For external involvements, one of the three tests was significant. Those individuals in the middle level of external involvement were more likely to use non-fishing organizations for information after arriving on the coast. All three of the centrality tests were statistically significant. In each case, those individuals scoring either one or two were more likely to use the various types of information than were those scoring either zero or three. It would appear that the probability of using the different information sources increases with increasing centrality to a threshold between centrality measures of two and three and then declines. Without further research, the reasoning for this pattern of scores would be purely speculative.

Table 3.17
Usage of Different Types of Information After Arriving on the Coast by Measures of Fishing Specialization

Measure of Specialization	Non-Fishing Organizations yes	no	X^2	Fishing Organizations yes	no	X^2	Informal Sources yes	no	X^2
Fishing Experience			1.4			1.2			5.5
0	3	153		78					
78	53	103							
1	7	170		98	79		45	132	
2	3	126		71	58		47	82	
3	1	38		20	19		10	29	
total	14	487		267	234		155	346	
Equipment			1.3			1.1			2.4
0	7	209		120	96		61	155	
1	6	159		83	82		58	107	
2	2	131		73	60		45	88	
total	15	499		276	238		164	350	
External Involvements		5.3*			2.1			2.1	
0	8	349		185	172		108	249	
1	7	111		68	50		44	74	
2	0	34		21	13		10	24	
total	15	494		274	235		162	347	
Centrality to Life			6.5*			10.1**			8.4**
0	1	91		42	50		20	72	
1	5	219		131	93		73	151	
2	7	101		64	44		44	64	
3	2	91		40	53		28	65	
total	15	502		277	240		165	352	
Site & Species Specialization			1.5			3.7			0.7
0	5	151		94	62		54	102	
1	5	254		132	127		84	175	
2	3	66		35	34		20	49	
total	13	471		261	223		158	326	

*significant at alpha = .01
**significant at alpha = .05

Table 3.18 shows the correlations between the dimensions of fishing specialization and the number of information sources used after arriving on the coast. Of the five measures of specialization, the only one significantly related to information-seeking after arriving at the coast is external involvements. As external involvements increase, a weak relationship exists with an increasing number of coastal information sources. It is likely that with increasing external involvements, the fisherman develops a network of friends and fishing acquaintances that become valued sources of fishing information.

Table 3.18
Pearson Correlation Coefficients for Measures of Fishing Specialization with Total Number of Information Sources Used After Arriving on the Coast

Measure of Fishing Specialization	Number of Information Sources Used After Arriving on the Coast
Fishing Experience	0.047
Equipment	0.052
External Involvements	0.109*
Centrality to Life	-0.028
Site and Species Specialization	0.055

*significant at alpha = .05

Next, t-tests were used to identify differences in the overall specialization measure, comparing individuals that used each type of information to those that did not use that type of information. For information sources used prior to leaving home, there were no difference in fishing specialization between the respondents categorized on the basis of whether or not they used the various sources of MRF information. Similarly, there were no differences in fishing specialization between respondents categorized on the basis of information source usage after arriving at the coast. Clearly, there is no relationship between overall fishing specialization and usage of the different sources of MRF information.

Table 3.19
Differences in Overall Specialization by Type of Information Source Usage

Types of Information Used	Overall Specialization mean	t-test
Prior to Leaving Home		
State Agencies		0.1
yes	4.54	
no	4.62	
Coastal Tourism Organizations		1.6
yes	2.71	
no	3.13	
Coastal Fishing Businesses		0.7
yes	4.75	
no	4.57	
Informal Sources		0.1
yes	4.62	
no	4.60	
After Arriving on the Coast		
Non-Fishing Organizations		0.3
yes	4.84	
no	4.61	
Fishing Organizations		0.4
yes	4.57	
no	4.67	
Informal Sources		1.1
yes	4.80	
no	4.52	

Table 3.20 shows the correlations between overall fishing specialization and the number of information sources used both before and after arriving at the coast. In both cases, the coefficients are minimally significant. The number of information sources used both before and after arriving on the coast increased with increasing specialization. However, the relationship is so weak that it is of little substantive value.

Table 3.20
Pearson Correlation Coefficients for Overall Specialization with the Total Number of Information Sources Used

Number of Information Sources Used	Overall Specialization
Before Leaving Home	0.10*
After Arriving On the Coast	0.09*

*significant at alpha = .05

CONCLUSIONS

The purpose of the survey described in this chapter was to identify the information-seeking behaviors of marine recreational fishermen in North Carolina and to examine their relationship with measures of fishing knowledge and fishing specialization. Prior to discussing the implications of the survey findings, two important limitations of this survey should be recognized. First, although every effort was made to assure a representative sample of marine recreational fishermen, the lack of a saltwater fishing license or other form of fishermen registration limited the survey to a convenience sample of fishermen. Further, these fishermen were contacted at a limited number of sites. Thus, further research using other contact sites and methodologies is needed to verify or dispute the findings of this study.

Second, as with most research efforts, further research is needed to improve the measurement techniques used in this survey. Although the development of the survey instrument followed the appropriate procedures for instrument development and validation, further effort would be valuable to continue development of the measures of fishing knowledge, particularly the fishing knowledge test, fishing specialization and information-seeking behavior.

The survey reported in this chapter had five major objectives. The first objective was to determine the nature, extent, and timing of MRF information-seeking behaviors. The primary types of information of interest to MRF fishermen is where and how to catch fish. An importance-performance analysis of seven major types of fishing information classified efforts to inform fishermen about where and how to catch fish as major failures. All other information dissemination efforts were classified as trivial successes. This is not to imply that the only types of information distributed should focus on where and how to catch fish. Rather, it implies that incorporating information on how to catch fish will enhance efforts to disseminate other types of information.

Most MRF fishermen seek information both before leaving home and after arriving at the coast. Of the survey respondents, 62.1 percent sought information prior to leaving home and 74.3 percent sought information after arriving at the coast. However, the tendency was to use only one source of information both before and after arriving at the coast. Thus, while MRF fishermen do tend to be information seekers, they use a relatively limited number of information sources.

The second objective was to identify the sources of MRF information used both in the coastal zone and, for tourists, prior to leaving home. Although the primary sources of information for individuals prior to leaving home were other friends and relatives and other coastal residents, the proprietors and employees in the coastal fishing businesses were, by far, the most important formal source of information for marine recreational fishermen. As sources of information prior to leaving home, coastal bait and tackle shop operators, pier operators, marina operators, and charter and party boat operators were used by 20.9, 16.2, 5.3 and 7.5 percent of the information seekers, respectively. Overall, these businesses represent 38.7 percent of all sources used prior to leaving home.

After arriving at the coast, bait and tackle shop, pier, and marina operators and employees were again the most important formal sources of information, being used by 52.1, 34.9 and 12.8 percent of the respondents, respectively. Of the total number of different information sources used, these three major sources of information represented 64.7 percent. Thus, the most effective overall means of distributing information to marine recreational fishermen both before and after arriving at the coast is through the fishing related businesses in the coastal zone.

The third objective of this survey was to measure the perceived and actual levels of knowledge of selected marine recreational fishing information. On a 0 to 10 scale, the average self-perception of MRF knowledge was 4.99. More importantly, on a test of fishing knowledge with a possible range of scores from 0 to 15, the mean score was 6.73 or 44.9 percent. Thus, both scores are essentially in or slightly below the middle range of possible scores. The correlation between the two measures, while being highly statistically significant, was only .452, indicating that substantial variation exists between perceived and actual knowledge of marine recreational fishing by fishermen on the North Carolina coast.

The fourth objective of this survey was to examine the relationships between knowledge of selected MRF information and information-seeking behavior. A series of

statistical tests was conducted to examine the relationships between MRF knowledge and usage of selected sources of MRF information. Overall, the results indicate that both the extent of information-seeking and usage of particular sources of information do not vary by existing MRF knowledge. Thus, existing knowledge does not have any influence on information-seeking behaviors.

The fifth objective of this survey was to determine if differences exist in information-seeking behaviors and sources of information between marine recreational fishermen categorized on the basis of fishing specialization. To accomplish this objective, an index of marine recreational fishermen specialization was constructed on five dimensions: (1) fishing experience, (2) equipment, (3) external involvement, (4) centrality to life, and (5) site and species specialization. Across the five dimensions, the cumulative score could range from 0 to 12. The survey respondents averaged 4.72 with a median of 4.0. Thus, only a small portion of the survey respondents could be considered highly specialized; only 6.4 percent scored nine or above on the overall index.

A series of tests was conducted to examine the relationships between fishermen specialization and information-seeking behavior. As with the measure of knowledge, the results of these tests generally showed very little relationship between specialization and information-seeking, in terms of both usage of the various sources of information and in the total number of sources used. The most significant specialization measure that influenced information seeking was the measure of external involvements. With increasing external involvements, the number of information sources used both prior to leaving home and after arriving at the coast increases. Thus, while it is concluded that overall fishermen specialization does not affect information-seeking behavior, it is important to recognize the importance of external involvements to information seeking. Individuals who actively pursue external involvements in marine recreational fishing, including subscribing to a fishing magazine and/or belonging to a saltwater fishing club, are more likely to seek information both prior to leaving home and after arriving on the coast. In all likelihood, the primary motivation for external involvements is the desire to have more and better MRF information. Thus, one would expect a relationship between such involvement and information-seeking behavior.

The overall conclusion of this chapter can be stated in five observations. First, marine recreational fishermen seek information both before and after arriving at the coast on a fishing trip. Second, the primary type of information sought is

where and how to catch fish. Third, the primary formal information sources used by marine recreational fishermen both before and after arriving at the coast are the operators and employees of the coastal fishing businesses. Fourth, there is no relationship between MRF information-seeking behaviors and either actual or perceived fishing knowledge. Fifth, the only measure of fishing specialization to significantly influence information-seeking behavior is external involvement either in subscribing to a fishing magazine or belonging to a saltwater fishing club. Thus, regardless of the type of information being distributed or the target audience, the most effective distribution channel is probably through the employees and operators of coastal fishing businesses. Additionally, individuals who are strongly oriented to acquiring MRF information are likely to be involved in saltwater fishing clubs and subscribe to fishing magazines. Thus, clubs and magazines are also potentially important information distribution outlets.

CHAPTER 4

DIFFUSION OF FISHING INNOVATIONS BY MARINE RECREATIONAL FISHERMEN IN NORTH CAROLINA

The final phase of this research project involved a second survey of marine recreational fishermen concerning two issues: (1) fishing catch per unit of effort and (2) the awareness and adoption of two marine recreational fishing innovations: the NMFS/Sea Grant Underutilized Species Program and the Satellite Surface Water Temperature Program. The specific objectives of this survey were to:

1. examine the relationships between fishing specialization and both the importance of catching fish to fishing satisfaction and fishing catch per unit of effort.
2. determine the awareness, information-seeking and adoption patterns for a low-involvement fishing innovation -- the Underutilized Species Program.
3. determine the awareness, information-seeking and adoption patterns for a high-involvement fishing innovation -- the Satellite Surface Water Temperature Program.
4. determine if differences exist in awareness, information-seeking and adoption patterns by level of innovation involvement.

METHODOLOGY

Using essentially the same sampling procedures as in 1988, these objectives were accomplished by on-site administration of a self-administered questionnaire to a sample of 400 marine recreational fishermen during the period from Sept. 15, 1989, to Nov. 19, 1989. Specifically, five weekends were randomly selected from the study period. During each of these weekends, teams of graduate students traveled to the coast and contacted fishermen at piers, bridges, marinas, boat landings and along the surf. Overall, 431 fishermen were contacted, of which 400 agreed to participate in the survey and completed the survey questionnaire. The survey response rate was 92.8 percent.

Instrumentation was accomplished through a series of three steps. First, working with the UNC Sea Grant Marine Advisory Service and the Raleigh Saltwater Fishing Club, two relatively recent fishing innovations were identified. The most important criterion for selection of innovations was that they represent opposite ends of a low- to high-involvement continuum.

Four concepts were used to define the level of involvement: (1) the level of consumer learning necessary to adopt the innovation, (2) the costs of adopting the innovation, (3) the level of social imitation that occurs during the adoption process, and (4) the number of people involved in the adoption process. The high-

involvement innovation is essentially high on each of these criterion while the low-involvement innovation is the opposite.

The Satellite Surface Water Temperature Program was selected as the high-involvement innovation. Adoption of this program requires a relatively sophisticated knowledge of marine recreational fishing -- one must be able to interpret the thermographical map of water temperatures to determine the best fishing locations. Further, the cost of adoption is relatively high in that one must either (1) buy the computer equipment and technology for both modem connection to the map sources and printing out the thermographical map or (2) pay for these services from another source. Finally, the fisherman must interact with other individuals in order to adopt this technology. At a minimum, the fisherman must enter into a relationship with the primary source of the satellite data. Because of these expenses and social involvements, it was our opinion that social imitation would be substantially higher in that many fishermen would be likely to wait and observe the success of the "explorers/innovators" before they would incur the expense of adoption.

On the opposite end of the involvement continuum, the Underutilized Species Program involves very little expense, only marginal learning, virtually no social involvement and no social imitation or risk. Specifically, the Underutilized Species Program is an effort to encourage more effective use of less popular species typically caught as a "byproduct" of fishing for the more popular species. It is hoped that this program will shift some of the fishing pressure from the more popular species to those which are classified as "underutilized," thereby creating a more efficient fishing demand-and-supply relationship. Since many of these species are already being caught, the focus of the program is more on the effective care and preparation of the underutilized species. As such, learning requirements are limited to using preparation and cooking techniques that are widely known but generally not used for cooking saltwater fish. Similarly, there is very little expense. Special equipment, tackle and materials are not generally needed to adopt this program. Adoption of the Underutilized Species Program does not require involvement with other people. Finally, it is our opinion that there is very little need for social imitation with the Underutilized Species Program. Because of the relatively low risk of adoption, fishermen are likely to adopt the program without the need for observing others' successes.

The second instrumentation step was to develop a measure of fishing catch per

unit of effort. Since we were using on-site interviews to measure fishing behavior during the fishing trip, a "How many fish did you catch today?/How long have you been fishing?" procedure was inappropriate. Consequently, it was decided to ask fishermen about their last five fishing trips, developing measures both overall of catch per unit of effort and by type of fishing site.

Third, a series of three questionnaire pretests were conducted. First, a draft questionnaire was developed and circulated for comments among colleagues in the College of Forest Resources, UNC Sea Grant Marine Advisory Service personnel, graduate students and selected recreational fishing researchers at other universities and institutions. Second, based on the comments by these individuals, a second draft of the questionnaire was developed. On-site interviews were conducted with a sample of approximately 50 recreational fishermen in the Outer Banks region of North Carolina. These respondents were asked to review the draft questionnaire and point out any questions that they did not clearly understand. Third, based on these comments another draft of the questionnaire was prepared. On-site interviews were conducted with another sample of approximately 50 fishermen in the Outer Banks area of North Carolina. These individuals were asked to complete the questionnaire, again pointing out any problems or questions they did not understand. Finally, the pattern of response from this pretest was used to evaluate each question on the draft instrument. A final questionnaire was prepared, correcting for the identified problems. A copy of the final instrument is included in the appendix.

The survey data were prepared for data entry by graduate research assistants and entered into the NCSU mainframe computer by the data entry personnel at the NCSU Computing Center. All data analyses were completed using the SAS Statistical Analysis System.

RESULTS:

As with the previous chapter, the analyses of the 1989 survey data were structured to address each of the study objectives. First, however, tables 4.1 through 4.3 present the personal and behavioral characteristics of the 1989 study sample. Table 4.1 presents the personal characteristics results. Of the study sample, 93.1 percent were males. Respondent ages ranged from 15 to 80 years, with a mean of 45 years; 64.3 percent of the respondents were between the ages of 30 and 59. The mean number of years of formal education was 14; when examined by level of

education, 29.0 percent were high school graduates and 24.0 percent had some college. The distance traveled from the respondents' home to interview site ranged from 1 to 3,999 miles with a mean of 302.9 miles and a median of 267 miles. Household income ranged from less than $10,000 to over $110,000 per year. The median income was between $40,000 and $49,999.

Table 4.1
Personal Characteristics of 1989 Survey Sample

Personal Characteristic	Frequency	Percent of Sample
Gender		
male	364	93.1
female	27	6.9
total	391	100.0
Age (years)		
<20	14	3.5
20 to 29	54	13.5
30 to 39	82	20.5
40 to 49	117	29.3
50 to 59	58	14.5
60 to 69	54	13.5
70 or more	21	5.3
total		1400100.1[a]
Education (last year of school completed)		
less than high school (1 to 11 years)		53.3
high school graduate (12 years)	116	29.0
some college (13 to 15 years)	96	24.0
college graduate (16 to 17 years)	88	22.0
advanced college (18 years or more)		47.8
total	400	100.1[a]
Distance from Permanent Home Residence to Fishing Site		
<50 miles	32	8.0
50 to 99 miles	36	9.0
100 to 149 miles	26	6.5
150 to 199 miles	48	12.0
200 to 249 miles	24	6.0
250 to 299 miles	49	12.3
300 to 399 miles	90	22.5
400 to 499 miles	51	12.8
500 miles or more	44	11.0
total	400	100.1[a]
Household Income		
<$10,000 92.5		
$10,000 to $19,999	37	10.1
$20,000 to $29,999	57	15.6
$30,000 to $39,999	58	15.8
$40,000 to $49,999	56	15.3
$50,000 to $59,999	44	12.0
$60,000 to $69,999	24	6.6
$70,000 or more	81	22.1
total	366	100.0

[a]deviation from 100.0 due to rounding.

The number of days the respondents had spent fishing in the year preceding the survey ranged from 0 to 257. As is typical of this type of data, these data were highly skewed. The mean total number of fishing days was 49.5 while the median was only 10 (table 4.2). Of these fishing days, 62.2 percent were spent fishing in saltwater environments and 37.8 percent were spent fishing in fresh water. Of the

saltwater fishing days, 38.3 percent were spent fishing in the saltwater surf from a beach, 22.1 percent were spent fishing in sounds/bays from a boat, 21.8 percent were spent fishing from a pier or bridge and 17.9 percent were spent fishing in offshore environments. Years of saltwater fishing experience ranged from 0 to 60 with a mean of 20.4 and a median of 16 years. The average (mean) survey respondent owned eight fishing rod and reel combinations and had spent $354.32 on fishing equipment in the last year. Again reflecting the skewed nature of these data, the median number of rod and reel combinations was 6 and median equipment expenditures was $150.00

Table 4.2
Fishing Behaviors of 1988 Survey Sample - I

Fishing Behavior Measure	Range	Median	Mean	Standard Deviation
Years of Saltwater Fishing Experience	0 - 60	16	20.4	13.6
Days Spent Fishing in Year Preceding Survey				
freshwater	0 - 300	5	18.7	39.6
saltwater from a pier or bridge	0 - 100	2	6.71	15.9
saltwater surf from the beach	0 - 250	5	11.8	22.2
saltwater sounds/bays from a boat	0 - 365	1	6.8	25.0
offshore saltwater from a boat	0 - 365	1	5.5	25.6
Rod and Reel Combinations Owned	0 - 70	6	8.1	7.6
Fishing Equipment Expenditures in Past Year	0 - $9950	$150	$354.32	$1022.58

When examining the categorical fishing behavioral characteristics of the sample (table 4.3), 39.1 percent owned a fishing boat; 34.6 percent subscribed to a fishing magazine; 26.3 percent focused their saltwater fishing effort on catching one species of fish; 18.5 percent had participated in a saltwater fishing tournament; and 13.4 percent were members of a saltwater fishing club or organization. The respondents were also asked to indicate on a 0 to 10 scale how important fishing was to their satisfaction with life. The average score was 5.91; 30.8 percent answered either 5 or 6 and 69.8 percent answered between 3 and 8.

Table 4.3
Fishing Behaviors of 1988 Survey Sample - II

Fishing Behavior Measure	Frequency	Percent
Owns a Fishing Boat	156	39.1
Subscribes to a Fishing Magazine	134	34.6
Saltwater Fishing Focused on Catching One Species	105	26.3
Participant in Saltwater Fishing Tournament	74	18.5
Member of a Fishing Club or Organization	53	13.4
Importance of Fishing to Satisfaction with Life (0 = not at all important to 10 = extremely important scale)		
0 to 2	58	14.5
3 to 4	60	15.0
5 to 6	123	30.8
7 to 8	968	24.0
9 to 10	63	15.8
total	400	100.1[a]

[a]deviation from 100.0 due to rounding.

OBJECTIVE 1: TO EXAMINE THE RELATIONSHIPS BETWEEN FISHING SPECIALIZATION AND BOTH THE IMPORTANCE OF CATCHING FISH TO FISHING SATISFACTION AND FISHING CATCH PER UNIT OF EFFORT

As with the 1988 data, a measure of fishing specialization was constructed to examine the relationships between specialization and both the importance of catching fish to fishing satisfaction and fishing catch per unit of effort. Table 4.4 shows the combinations of variables used to create the specialization score. Essentially, these measures are identical to those used with the 1988 data. The only differences are in the median values of the years of fishing experience and number of rod and reel combinations, which varied slightly over the two surveys. The median fishing days in the past year was the same in the two surveys.

Table 4.5 shows the distribution of the respondents on both the various dimensions of fishing specialization and on the overall specialization score. For all measures, the results are skewed toward the unspecialized or generalist end of the scales. For fishing experience, 34.8 percent of the respondents scored 0 as compared to 6.5 percent scoring 3. Similarly, percentage distributions for the lower and upper ends of the other scales were 42.1 and 25.8, 63.3 and 10.4, 17.8 and 15.8, 25.8 and 17.8 for equipment, external involvements, centrality, and site/species specialization, respectively. Further, reflecting this general pattern, 50.1 percent of the respondents scored between 0 and 4 on the overall specialization scale as compared to only 7.0 percent scoring greater than 8. The mean overall specialization score was 4.6 out of a possible of 12.0.

Table 4.4
Creation of Specialization Measure

Specialization Measure			Score
Fishing Experience			
Years of Experience[a]	Fishing Days In Past Year[a]	Tournament Involvement	
≤ 20	≤ 10	no	0
≤ 20	≤ 10	yes	1
≤ 20	≥ 11	no	1
≥ 21	≤ 10	no	1
≤ 20	≥ 11	yes	2
≥ 21	≥ 11	no	2
≥ 21	≤ 10	yes	2
≥ 21	≥ 11	yes	3
Equipment			
Number of Rod Reel Combination[a]	Owns a Fishing Boat		
≤ 6	no		0
≤ 6	yes		1
≥ 7	no		1
≥ 7	yes		2
External Involvement			
Subscribes to a Fishing Magazine		Member in a Saltwater Fishing Club	
no		no	0
no		yes	1
yes		no	1
yes		yes	2
Centrality			
Importance of Fishing to Satisfaction with Life			
0 to 3			0
4 to 6			1
7 to 9			2
10 to 12			3
Site and Species Specialization			
Site Specialization[b]	Species Specialization		
no	no		0
no	yes		1
yes	no		1
yes	yes		2

[a]Divided at median value for variable.

[b]Site specialization if individual spent more than 60 percent of fishing days at one type of site.

Table 4.5
Distribution of Respondents by Specialization Measures

Specialization Measure	Frequency	Percent
Fishing Experience		
0	139	34.8
1	143	35.8
2	91	22.8
3	26	6.5
total	399	99.9[a]
Equipment		
0	168	42.1
1	128	32.1
2	103	25.8
total	399	100.0
External Involvements		
0	243	63.3
1	101	26.3
2	40	10.4
total	384	100.0
Centrality		
0	71	17.8
1	17	042.5
2	96	24.0
3	63	15.8
total	400	100.1[a]
Site and Species Specialization		
0	100	25.8
1	219	56.4
2	69	17.8
total	388	100.0
Overall Specialization		
0 to 2	84	22.5
3 to 4	103	27.6
5 to 6	94	25.2
7 to 8	66	17.7
9 to 10	22	5.9
11 to 12	4	1.1
total	373	100.0

[a]deviation from 100.0 due to rounding.

The respondents were asked to rate the importance of catching fish to their satisfaction with fishing on a 0 to 10 scale, ranging from not at all important to extremely important. Table 4.6 shows the distribution of the response. Overall the responses are very balanced over the range of the scale. The mean score was 5.9 with a standard deviation of 2.6. Of the respondents, 32.8 percent scored either 5 or 6 and 72.4 percent scored between 3 and 8.

Table 4.6
Importance of Catching Fish to Satisfaction with Fishing

Measure of Importance	Frequency	Percent
0 to 2	58	14.5
3 to 4	77	19.3
5 to 6	131	32.8
7 to 8	81	20.3
9 to 10	52	13.0
total	399	99.9[a]

[a]deviation from 100.0 due to rounding.

As shown in table 4.7, there is a relatively strong correlation between the importance of catching fish to fishing satisfaction and fishing specialization. Specifically, the importance of catching fish increased significantly with all measures of specialization except equipment. Of particular note are the correlations between the importance of catching fish and both the centrality and overall specialization measures.

Table 4.7
Correlations Between
Importance of Catching Fish to Fishing Satisfaction
and Measures of Fishing Specialization

Measure of Specialization	Correlation	Alpha
fishing experience	.133	.0080
equipment	.071	.1570
external involvements	.135	.0079
centrality	.291	.0001
site and species specialization	.133	.0090
overall specialization	.253	.0001

In order to calculate catch per unit of effort (CPU) and to examine CPU over different types of fishing sites, the survey respondents were asked to describe their last five fishing trips in terms of the number of hours spent fishing, the number of fish caught and the primary type of fishing site. Table 4.7 presents these data. As with the previous data on fishing frequency, the data tend to be heavily skewed. Consequently, the median is a more appropriate measure of central tendency. Overall, the survey respondents averaged 38 hours fishing during their previous five trips, catching 25 fish for an average CPU estimate of 0.71 fish.

When examined by fishing site, it is interesting to note that for three of the four sites, piers, sounds, and offshore, the median catch for the last five fishing trips is 0, meaning that at least 50 percent of the respondents had caught no fish during their fishing trips to that type of site. In all cases, catch per unit of effort was less than one fish per hour spent fishing. Specifically, CPU estimates were 0.90 for offshore fishing, 0.83 for pier fishing, 0.78 for sound fishing and 0.50 for surf fishing.

Table 4.8
Fishing Effort, Catch, and Catch Per Unit of Effort Statistics for Five Most Recent Fishing Trips

Standard Measure	Range	Median	Mean	Deviation
Overall				
fishing hours	1 - 600	38	58.7	70.9
catch	0 - 4196	25	79.8	251.5
catch/hour	0 - 59.2	0.71	1.8	4.3
Pier Fishing				
fishing hours	2 - 225	20	37.4	42.9
catch	0 - 710	0	22.6	71.2
catch/hour	0 - 59.2	0.83	2.2	5.4
Surf Fishing				
fishing hours	1 - 490	40	56.7	63.7
catch	0 - 1199	3	33.8	97.1
catch/hour	0 - 59.2	0.50	1.3	4.2
Sound Fishing				
fishing hours	1 - 400	30	48.4	65.8
catch	0 - 2198	0	21.5	135.0
catch/hour	0 - 18.6	0.78	1.8	2.9
Offshore Fishing				
fishing hours	4 - 600	14	35.2	72.6
catch	0 - 4196	0	22.1	217.4
catch/hour	0 - 35	0.9	2.1	4.3

Table 4.8 presents the analysis of catch per unit of effort by the measures of fishing specialization. Essentially, the results show no relationship between fishing specialization and catch per unit of effort. Obviously, the number of hours increases with increasing specialization. Days spent fishing is a component of the fishing experience specialization measure. However, when corrected for the additional time spent fishing, there is no relationship between specialization and catching fish.

Table 4.9
Fishing Catch Per Hour by Specialization Measure: Overall and by Major Fishing Type

Specialization Measure	Overall X	Overall F	Pier X	Pier F	Surf X	Surf F	Sound X	Sound F	Offshore X	Offshore F
Fishing Experience		0.69		1.31		0.24		0.72		0.18
0	1.35		0.87		0.82		0.89		3.50	
1	2.27		3.22		1.42		1.87		1.25	
2	1.78		2.10		1.07		2.00		1.97	
3	1.49		1.43		1.67		2.70		0.96	
Equipment		0.32		1.25		1.06		0.26		2.13
0	1.56		2.42		1.59		1.40		1.42	
1	2.22		2.36		1.08		1.72		3.27	
2	1.59		1.61		1.11		2.51		1.52	
External Involvements		2.52*		1.41		1.23		1.35		0.27
0	2.11		2.45		1.54		2.28		2.43	
1	1.35		1.66		0.95		1.26		1.33	
2	1.07		1.43		0.91		1.35		1.94	
Centrality		1.69		0.80		0.68		1.27		0.42
0	1.05		1.27		0.68		0.71		2.36	
1	2.13		2.55		1.72		2.49		2.01	
2	1.20		1.56		0.83		1.16		1.64	
3	2.46		2.88		1.49		2.05		2.88	
Site and Species Specialization		1.11		1.54		0.56		0.34		0.58
0	2.13		2.16		1.30		1.47		2.68	
1	1.85		1.35		1.09		2.10		1.66	
2	1.13		2.41		1.38		1.40		2.61	
Overall Specialization		0.25		0.77		0.81		0.71		0.91
0 to 2	1.57		1.11		0.66		0.82		4.24	
3 to 5	1.90		2.68		1.73		1.90		1.21	
6 to 8	1.94		2.33		1.25		2.35		2.25	
9to12	.23		1.17		.92		1.53		1.32	

*significant at alpha=.08

OBJECTIVE 2: TO DETERMINE THE AWARENESS, INFORMATION-SEEKING, AND ADOPTION PATTERNS FOR A LOW-INVOLVEMENT FISHING INNOVATION: THE UNDERUTILIZED SPECIES PROGRAM

As the initial step toward examining the diffusion of new fishing innovations, the survey respondents were asked in an open-ended question to list the sources of

information they were most likely to use to find out about new saltwater fishing equipment, techniques and ideas. Overall, 31 different sources were listed. Table 4.9 presents the top 10 sources. These results are essentially similar to those presented in Chapter Three. Specifically, as with the previous assessment of sources of information, friends and relatives, bait and tackle shop operators, and pier operators were the top three sources of information. In contrast to the previous results, however, magazines, television and newspapers were also important sources of information on fishing innovations.

Table 4.10
Sources of Information About
New Saltwater Fishing Equipment, Techniques, and Ideas

Source of Information	Frequency	Percent[a]
Friends and Relatives	115	33.1
Bait and Tackle Shop Operators	74	21.3
Pier Operators	44	12.7
Magazines	16	4.6
Television	16	4.6
Newspapers	10	2.9
Marina Operators	8	2.3
Other Coastal Residents	7	2.0
Fishing Books	5	1.4
NC Division of Marine Fisheries	5	1.4

[a]percentages do not add to 100.0 due to people listing multiple sources of information.

Of the survey respondents, 14.8 percent were aware of the underutilized species program (table 4.10). The primary sources of information by which these individuals first heard about the program was through pier operators and bait and tackle shop operators. Of those individuals aware of the program, 49.1 percent had subsequently changed their fishing behaviors. Thus, of the 386 individuals who responded to this section of the questionnaire, 7.0 percent had adopted the underutilized species program.

Table 4.11
Awareness, Sources of Information, and Adoption of the Underutilized Species Program

Measure	Frequency	Percent
Aware of Program		
yes	57	14.8
no	329	85.2
total	386	100.0
Sources of Information		
pier operators	13	23.2
bait and tackle shop operators	7	12.5
friends and relatives	4	7.1
NC Aquariums	4	7.1
sports shows	3	5.4
all other sources	25	44.6
total	56	99.9[a]
Have Changed Fishing Behaviors in Response to the Program		
yes	27	49.1
no	28	50.9
total	55	100.0

[a]percentages do not add to 100.0 due to rounding.

OBJECTIVE 3: TO DETERMINE THE AWARENESS, INFORMATION-SEEKING, AND ADOPTION PATTERNS FOR A HIGH-INVOLVEMENT FISHING INNOVATION: THE SATELLITE SURFACE WATER TEMPERATURE PROGRAM

Table 4.11 shows the awareness, sources of information and adoption patterns for the Satellite Surface Water Temperature Program. Of the survey respondents, 6.4 percent were aware of the program. The primary sources of information were friends and relatives, coastal fishing businesses and television/magazine programs. Of those aware of the program, 26.1 percent had changed their fishing behaviors to take advantage of this new technology. Thus, of the survey respondents, 1.5 percent had adopted the program.

Table 4.12
Awareness, Sources of Information, and Adoption
of the Satellite Surface Water Temperature Program

Measure	Frequency	Percent
Aware of Program		
yes	25	6.4
no	363	93.6
total	388	100.0
Sources of Information		
friends and relatives	8	33.3
coastal fishing businesses	6	25.0
television and magazines	4	16.7
all other sources	6	25.0
total	24	100.0
Have Changed Fishing Behaviors in Response to the Program		
yes	6	26.1
no	17	73.9
total	23	100.0

OBJECTIVE 4: TO DETERMINE IF DIFFERENCES EXIST IN AWARENESS, INFORMATION-SEEKING AND ADOPTION PATTERNS OF FISHING INNOVATIONS BY LEVEL OF INNOVATION INVOLVEMENT

In order to test for differences in awareness, information-seeking and adoption by level of fishing innovation involvement, a series of chi-square statistics were calculated on the percentage distributions of these measures. Specifically, the chi-square statistic was calculated comparing the awareness percentage distributions of the two innovations. Similar analyses were then calculated of the percentage distribution for information-seeking and adoption by type of innovation. Table 4.12 presents these results. Statistically, the association between type of innovation and fisherman awareness was very weak. Although the respondents were more than twice as likely to be aware of the underutilized species program, statistically the two distributions were relatively similar. However, a substantial association existed between both information-seeking and adoption by type of innovation. The sources of information on the underutilized species program were much more likely to be coastal fishing businesses, whereas the sources of information for the satellite surface water temperature program were much more likely to be friends and relatives. Finally, even when calculated on the basis of the percentage of individuals aware of the two programs, adoption patterns were much greater with the underutilized species program.

Table 4.13
Chi Square Test Results for Comparing Awareness, Sources of Information, and Adoption Rates by Type of Innovation

Measure	Chi Square	Prob.
Awareness	3.72	.06
Sources of Information	11.28	.001
Adoption	21.24	.001

CONCLUSIONS

The purposes of the survey described in this chapter were to examine two issues: (1) fishing catch per unit of effort and (2) awareness, information-seeking and adoption of two marine recreational fishing innovations, the NMFS/Sea Grant Underutilized Species Program and the Satellite Surface Water Temperature Program. Prior to discussing the implications of the survey findings, two important limitations should be recognized. First, as with the 1988 survey, the survey was limited to a non-probability sample of fishermen. Sampling days were randomly selected and appointed to the interview sites, thereby creating a random sample; the individual fisherman's probability of selection is unknown. Consequently, it is difficult to project these results to the population of saltwater fishermen in North Carolina. Further research using other sampling days and sites is needed to verify the findings of this study.

Second, this study was limited to examining the diffusion of two fishing innovations. Considerable care was given to selection of these innovations. However, it is possible that the results would be very different if applied to other innovations. Consequently, further research is also needed to extend the study findings to other innovations and diffusion situations.

The survey reported in this chapter had four major objectives. The first objective was to examine the relationship between fishing specialization and two measures of catching fish: (1) a self-reported measure of the importance of catching fish to fishing satisfaction and (2) actual catch per unit of effort. Fishing specialization was clearly correlated with the self-reported measure of the importance of catching fish to fishing satisfaction. For four of five specialization components and for the overall specialization measure, as fishing specialization increased, the importance of catching fish to fishing satisfaction

also increased. However, there were no relationships between fishing specialization and actual catch per unit of effort (hour), both overall and by type of fishing site. Given that the number of days spent fishing was a component of the fishing specialization measure, an obvious relationship existed between specialization and the number of hours spent fishing. When corrected for this difference in hours, however, fishing success (catch) did not increase with increasing specialization. Thus, the evidence suggests that specialization does not necessarily make the individual a better fisherman. He/she catches more fish simply because he/she spends more time fishing, not because he/she is a better fisherman.

The second objective of the 1989 survey was to determine the awareness, information-seeking, and adoption patterns for the Underutilized Species Program. Of the survey respondents, 14.8 percent were aware of the Underutilized Species Program; the primary sources of information about the program were through coastal fishing businesses, especially piers and fishing bait and tackle shops. Of the individuals aware of the program, 49.1 percent had subsequently changed their fishing behaviors. Thus, of the survey sample, 7.0 percent had adopted the program.

The third objective was to determine the awareness, information-seeking, and adoption patterns for the Satellite Surface Water Temperature Program. Of the respondents, 6.4 percent were aware of the program. The primary sources of information were friends and relatives, coastal fishing businesses and television/magazine programs. Of those aware of the program, 26.1 percent had changed their fishing behaviors. Thus, of the survey respondents, 1.5 percent had adopted this program.

The fourth objective was to determine if differences existed in the awareness, information-seeking and adoption patterns of the two fishing innovations. Although the survey respondents were more than twice as likely to be aware of the Underutilized Species Program, the chi-square statistic examining awareness by type of innovation was only weakly significant. However, the chi-square statistics for both information-seeking behaviors and adoption were highly significant. In keeping with the concepts proposed by Murray (1991), adoption of the higher risk (higher involvement) innovation is more likely to depend on personal sources of information. Essentially, Murray postulates that consumers are more likely to depend on "credible" sources of information when considering a high-involvement innovation. His research found that service consumers generally perceive personal sources of information, particularly friends and relatives and personal experience, to be much

more credible than either mass media or salespersons. As expected, adoption rates were substantially higher with the low-involvement innovation. The cost and learning requirements of the high-involvement innovation greatly limit or slow its adoption cycle.

CHAPTER 5

STRUCTURAL GUIDELINES FOR COMMUNICATING WITH MARINE RECREATIONAL FISHERMEN

Marine recreational fishermen are an important component of marine fisheries management. The pressures to improve communications with this sector of fishermen have grown dramatically over the past decade and will continue to grow in the future. Given the lack of a marine recreational fishing license in many areas, fisheries managers are often dependent upon a relatively uncoordinated, informal communications system for dissemination of information to recreational fishermen. With the goal of improving the efficiency of this informal communication system, this project was an assessment and evaluation of the marine recreational fishing information dissemination system in North Carolina. In previous chapters of this report, the research conducted to examine the current information dissemination system and the information-seeking behaviors of marine recreational fishermen has been reported. In addition to the conclusions discussed in each research chapter, the purpose of this chapter is to recommend specific courses of action that fisheries managers may use to achieve better communications with marine recreational fishermen. All of these recommendations focus on the structural aspects of the MRF information dissemination system.

STRUCTURAL ASPECTS OF THE MRF INFORMATION DISSEMINATION SYSTEM

Perhaps the best approach to describing the structural aspects of the marine recreational fishing information dissemination system is to examine the system within the context of marketing. According to the American Marketing Association, marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, wants, and services to create exchanges that satisfy individual and organizational objectives (Pride & Ferrell, 1987). The key to this definition is the concept of exchange. The parties to the exchange process essentially agree to exchange units of value, which can broadly be defined to include experiences, behaviors, money, and any other of a variety of different items, to accomplish their individual goals and objectives. As described by Crompton and Lamb (1986), this exchange process does not necessarily involve money. In the context of this project, marine recreational fisheries managers commit to providing a quality fishing experience in exchange for fishermen adopting appropriate fishing behaviors by adhering to the rules and regulations necessary for

sustaining that quality experience over the long term.

A marketing orientation implies that the fisheries manager, first, determines what the marine recreational fishermen wants when participating in a fishing experience; second, develops and offers fishing experiences geared to those specific wants but yet meeting the biological requirements of a sustainable fisheries resource; and third, promotes that fishing experience and the appropriate sustaining behaviors to the fisherman. Given this marketing orientation, the results of this research have seven structural implications for more effectively communicating with marine recreational fishermen.

1. Target Audiences

Much of the literature in communications and marketing emphasizes the importance of carefully defining the target audience and developing the communications strategy and materials accordingly. In this research, the effectiveness of using both fishing specialization and current knowledge of fishing were assessed as potential means of defining target audiences. In both cases, there was only limited evidence of relationships with information-seeking behaviors.

Existing knowledge of marine recreational fishing was measured both by a self-perceived rating scale and by an objective test. Both measures were essentially unrelated to information-seeking behavior, measured either by the number of information sources used or by the type of information sources used. Thus, the evidence is relatively conclusive that information-seeking is unrelated to fishing knowledge.

Similarly, several measures of fishing specialization were developed and tested for relationships with both the number and types of information sources used by the survey respondents. Specifically, the specialization measures included measures of fishing experience, equipment, external involvements, centrality or importance to the individual's satisfaction with life, site/species specialization and a cumulative overall measure. External involvements included both memberships in saltwater fishing clubs and subscriptions to fishing magazines. Of these measures, the only items to relate to information-seeking behavior were external involvements and centrality to life. As external involvements increased, the probability of using coastal fishing businesses as a source of information prior to leaving home also increased. Further, as external involvements increased, the number of information sources used prior to leaving home also increased. Thus,

external involvements tends to influence both the types and number of information sources used prior to leaving home.

External involvements was also very weakly related to the number of information sources used after arriving at the coast. However, external involvements were unrelated to the use of the various specific types of information. Rather, centrality to life seemed to be the only factor influencing selection of information sources after arriving at the coast. For all three major types of information -- non-fishing organizations, fishing organizations and informal sources -- the probability of usage increased with increasing centrality to life, but then actually declined at the very highest levels of centrality.

The primary conclusion of these analyses is that for sources of information used both prior to leaving home and after arriving at the coast, the evidence is not sufficient to justify developing alternative communications strategies for different target markets identified on the basis of existing knowledge and fishing specialization. An undifferentiated communications strategy is probably equally efficient and certainly much less expensive.

2. Catch Per Unit of Effort

Saltwater fisheries management is increasingly concerned with overharvesting of selected species. Consequently, effective communications with those groups that contain better, more effective fishermen is a priority need. In this study, catch per unit of effort (hour of fishing) was examined as related to increasing fishing specialization. While specialists did catch more fish, it was primarily the result of the amount of effort, not their effectiveness as fishermen. There was no relationship between fishing specialization and catch per unit of effort. However, a relatively strong relationship exists between fishing specialization and the fisherman's self-rating of the importance of catching fish to fishing satisfaction. Thus, an appropriate communications need is to focus the specialists on another element of the fishing experience. For example, it may be appropriate to focus the specialized fishermen not on catching fish, but rather on the challenge of fishing with particular equipment, (i.e.) bluefish on a lightweight fly rod.

3. Primary Sources of Information

The primary formal sources of information used by marine recreational

fishermen in North Carolina both before leaving home and after arriving at the coast are the various types of coastal fishing businesses, particularly bait and tackle shops and piers. As is always the case, informal sources such as friends and relatives were very important. However, it is very difficult to develop a communications strategy attempting to influence such informal information sources. Consequently, it is our conclusion that for most types of fishing information, the appropriate media for dissemination is through the coastal fishing businesses. Secondary distribution systems include saltwater fishing organizations, fishing magazines, and newspaper sports and travel writers. More effective travel and sports writer media development programs could be very successful, particularly for newspapers and television.

4. Primary Information Needs/Wants

Both the importance to fishermen and difficulty of obtaining various types of saltwater fishing information were examined. On the basis of an importance-performance analysis, the survey results clearly show that fishermen are primarily interested in information on where and how to catch fish. Specifically, the importance-performance analysis identified two major failures in the current information dissemination system: (1) where to catch fish and (2) which bait and tackle to use. All of the remaining types of information rated as trivial successes. Although it is obviously important to distribute a variety of different types of information, the conclusion of this study is that the effectiveness of any information dissemination effort will be directly related to the extent to which fishermen perceive that it will enhance their ability to catch fish. Thus, for information other than where and how to catch fish, it is important to couch or position the information within the broader context of improving fishing ability.

5. Fishing Brochure Evaluation Criterion

It was stated earlier that developing communications for fishermen would not necessarily benefit from a differentiated communications strategy wherein different communications strategies and materials would be used for different types of fishermen. But it is important to focus the communications on fishermen and their respective information needs and wants. The comparative panel evaluation of the selected fishing brochures clearly showed that fishermen used different criterion for evaluating the brochures than did the communications students. Thus, it is

essential that fishermen be used as the pretest audience for any saltwater fishing communications development process. The primary criteria that fishermen use to evaluate fishing brochures are (1) that it be informative and (2) attractive, and that it list both the (3) fishing resources, and (4) available services at the promoted fishing business or facility.

6. Timing of Information Search

The survey respondents engaged in information-search behaviors both before leaving home and after arriving at the coast. It is reasonable to conclude that information-search prior to leaving home would be most likely to influence whether or not the individual went fishing and/or the particular region of the coast visited. Information search after arriving at the coast probably focuses on current, specialized information on where to fish and the particular baits and tackles that seem to be working best. From a fishing business development perspective, it would benefit coastal fishing businesses to engage in cooperative communications or marketing strategies with the local tourism development authorities and/or chambers of commerce. The cost of effectively communicating with fishermen before they leave home is almost prohibitive for most coastal businesses. Thus, a cooperative communications strategy may be a more cost-efficient means of influencing people both to come to the business's particular area of the coast and to purchase fishing supplies and/or experiences from the particular business. Although most of the survey respondents were highly experienced in fishing the interview area, 8 percent had never fished in the area before. Further, 33.7 percent of the survey respondents are visiting the coast for recreation, only part of which is fishing. Cooperative relationships with the other complimentary recreation providers may be a very successful communications and marketing strategy.

7. Diffusion of Innovations

As expected, awareness, information-seeking, and adoption patterns vary by the level of involvement of fishing innovations. High-involvement innovations rely much more heavily on word-of-mouth information systems and are adopted much slower. Opinion leaders, specialized fishing magazines, and newspaper sports articles are the most efficient formal information dissemination systems. Demonstration projects with opinion leaders would probably lead to the most rapid adoption cycle. Still, however, it would be unreasonable to expect a rapid, exponential diffusion process.

For low-involvement innovations, coastal fishing businesses are the primary source of information, and adoption rates tend to be much more rapid than that of the high-involvement innovation. Appropriate communications strategies are mass media development targeting coastal fishing businesses. Attractive posters and brochures distributed to such information outlets would probably be most effective as a diffusion strategy.

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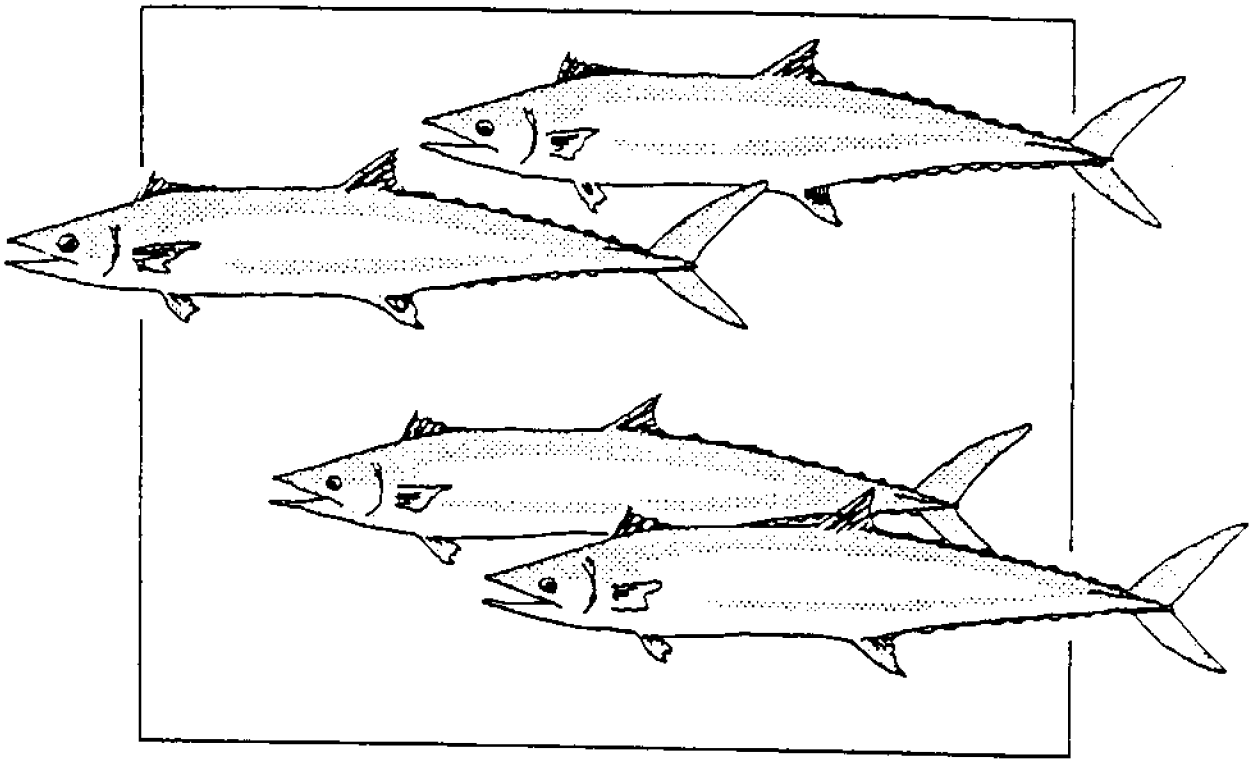
APPENDIX

DATA COLLECTION INSTRUMENTS

1988 SALTWATER ANGLER SURVEY



Department of Recreation Resources Administration
North Carolina State University
Raleigh, NC 27695-8004
(919) 737-3687

Dear Angler:

Thank you for participating in **this study** to improve the distribution of information on saltwater recreational fishing in North Carolina. Please answer **each question** in the survey as carefully as possible. It should only take about **10 to 15 minutes** of your time. If you have any questions, please feel free to ask them.

Sincerely,

Richard R. Perdue

Richard R. Perdue
Project Director

SECTION 1: FISHING ACTIVITY AND EXPERIENCE

1. In the last five years, how many times have you gone fishing **in this area of the coast?** (within 15 miles of this site)?
   - O never
   - O 1 to 5 times
   - O 6 to 10 times
   - O more than 10 times

2. How many years have you been fishing in saltwater?
   _____ years

3. **Since this time last year**, how many days did you go fishing in: (if none, please enter 0)
   - _____ freshwater
   - _____ saltwater from a pier or bridge
   - _____ saltwater surf from the beach
   - _____ saltwater sounds or bays from a boat
   - _____ offshore saltwater from a boat

4. Which of the following best describes you today?
   - O I came to the coast **specifically** to go fishing
   - O I'm visiting the coast for recreation, part of which is today's fishing trip
     - → When did you decide to go fishing?
       - O before leaving home
       - O after arriving on the coast

5. Have you ever participated in a saltwater fishing tournament?
   - O yes
   - O no **IF YES**, how many saltwater tournaments did you fish in **last year**? _____

6. Do you put most of your saltwater fishing effort into catching one particular kind of fish?
   - O yes
   - O no **IF YES** - What kind? _____

7. How would you **rate your knowledge of saltwater fishing?**
(put an **X** on the line at the point that represents you)

not at all knowledgeable 0 2 4 6 8 10 extremely knowledgeable

8. How many rod and reel combinations do you own? _____

9. In the **last year**, approximately how much have you spent on fishing equipment (including reels, rods a tackle)? $_____

10. Do you own a fishing boat?
- O yes
- O no **IF YES**, please list the length of **each** boat. _____

11. Do you subscribe to any fishing magazines?
- O yes
- O no **IF YES**, which ones _____

12. Are you a member of any fishing clubs or organizations?
- O yes
- O no **IF YES**, which ones? _____

13. In **general**, how important is fishing to your **satisfaction with life?**
(put an **X** on the line at the point that represents you)

not at all important (I could take it or leave it) 0 2 4 6 8 10 extremely important (my life revolves around fishing)

15. Are you aware of the artificial reefs (sunken barges, bridge rubble, railroad cars, etc) which have been built in North Carolina to improve saltwater recreational fishing ?
- O yes
- O no **IF YES**, have you ever gone fishing on an artificial reef site in North Carolina?
  - O yes
  - O no

SECTION 2: SALTWATER FISHING INFORMATION

The following two sets of questions may appear similar. However, there are very important differences. **Please answer each of the following questions as carefully and completely as possible.**

1A. **PRIOR TO LEAVING HOME ON THIS TRIP**, did you request fishing information from (check **each** source of information used **prior** to leaving home)

- O the North Carolina Division of Marine Fisheries
- O the North Carolina Division of Travel and Tourism
- O a coastal chamber of commerce
- O a coastal marina operator
- O a coastal bait and tackle shop operator
- O a coastal charter or party boat operator
- O a coastal pier operator
- O a coastal hotel or motel operator
- O other friends or relatives
- O other _____
  (please specify)

1B. **WHILE ON THE COAST ON THIS FISHING TRIP**, did you get fishing information from a: (check **each** source of information used **after arriving** on the coast)

- O chamber of commerce or visitor center
- O marina operator/employee
- O bait and tackle shop operator/employee
- O North Carolina Aquarium
- O pier operator/employee
- O other local business employees (service station, restaurant, etc)
- O other local residents
- O other _____
  (please specify)

2A. For each of the following types of fishing information, please circle the number that indicates **how important** having accurate and up-to-date information is to your fishing success.

IMPORTANCE TO YOUR FISHING SUCCESS

INFORMATION ON	not at all important	slightly important	moderately important	very important	extremely important
catch and size regulations	1	2	3	4	5
how to catch different types of fish	1	2	3	4	5
which bait and tackle to use	1	2	3	4	5
where to catch fish	1	2	3	4	5
how to identify the fish you catch	1	2	3	4	5
how to take care of your catch	1	2	3	4	5
how to cook different types of fish	1	2	3	4	5

2B. Now, for each type of fishing information, please circle the number that indicates **how difficult** you feel it is to get accurate and up-to-date information on **North Carolina** saltwater fishing.

DIFFICULTY OF GETTING GOOD INFORMATION

INFORMATION ON	not at all difficult	slightly difficult	moderately difficult	very difficult	extremely difficult
catch and size regulations	1	2	3	4	5
how to catch different types of fish	1	2	3	4	5
which bait and tackle to use	1	2	3	4	5
where to catch fish	1	2	3	4	5
how to identify the fish you catch	1	2	3	4	5
how to take care of your catch	1	2	3	4	5
how to cook different types of fish	1	2	3	4	5

SECTION 3: FISHING TEST

The following questions are designed to provide a general measure of **your knowledge** of marine recreational fishing. Please answer each question as completely and accurately as possible, without looking up the answers or asking another person for help. The results of this test will help us identify important topics for future fishing education programs.

1. What is the minimum length requirement (in inches) for keeping the following types of saltwater fish in North Carolina?

   _____ channel bass (red drum, puppy drum)

   _____ flounder

2. Please match the following fish with the bait that is **generally considered** the best bait for that fish. (write the letter represting the bait on the line - a bait can be used for more than one fish)

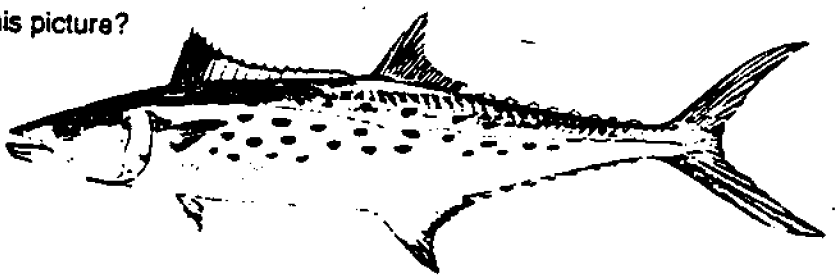
_____	flounder	a.	bloodworms
_____	spot	b.	sand fleas
_____	croaker	c.	cut bait (e.g., mullet heads)
_____	king mackeral	d.	artificial lures
_____	red drum	e.	shrimp
_____	pompano	f.	cut flounder belly strips
_____	bluefish	g.	live bait fish

3. Which of the following would be a state record fish in North Carolina?

   O 35 pound channel bass
   O 4 pound flounder
   O 6 pound pompano
   O don't know

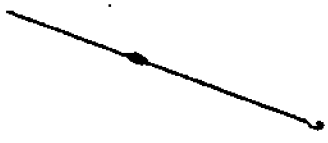
4. What type of fish is shown in this picture?

   O spanish mackeral
   O croaker
   O yellowfin tuna
   O don't know



5. Which of the following terminal tackles is known as a fish finder rigging?

A



B

C

6. Where would you be **most likely** to catch a sheepshead?
   - O offshore bottom reef
   - O bridge pilings
   - O surf
   - O sounds and inlets
   - O don't know

7. Where would you be **most likely** to catch a red snapper?
   - O offshore bottom reef
   - O bridge pilings
   - O surf
   - O sounds and inlets
   - O don't know

8. Where would you be **most likely** to catch a pompano?
   - O offshore bottom reef
   - O bridge pilings
   - O surf
   - O sounds and inlets
   - O don't know

SECTION 4: NORTH CAROLINA SALTWATER RECREATIONAL FISHERMEN

The following questions will help us to know more about saltwater recreational fishermen in North Carolina. The information you provide will be kept **strictly confidential** and you will not be identified with your answers.

1. What is your age? _____

2. Are you
   - O male
   - O female

3. What is the zip code of your permanent home residence? _____

4. How far is it from your permanent home residence to where you are fishing today? _____ miles

5. What was the last year of school you completed?
(circle only one number)

Grade School								High School				College				Graduate School				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+

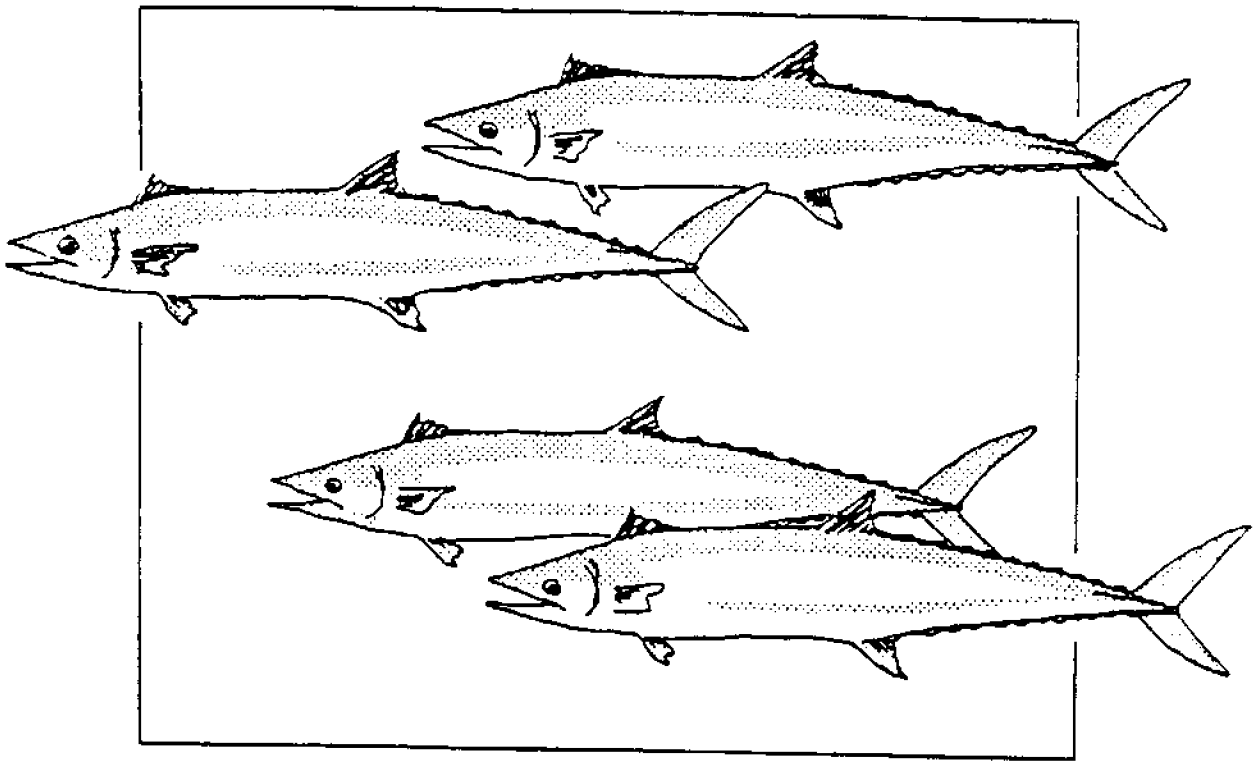
6. What is your approximate annual HOUSEHOLD income before taxes?
(check only one box)

- O under $10,000
- O $10,000 to $19,999
- O $20,000 to $29,999
- O $30,000 to $39,999
- O $40,000 to $49,999
- O $50,000 to $59,999
- O $60,000 to $69,999
- O $70,000 to $79,999
- O $80,000 to $89,999
- O $90,000 to $99,999
- O $100,000 to $109,999
- O $110,000 or more

IS THERE ANYTHING ELSE YOU WOULD LIKE TO SHARE WITH US?

THANKS
YOUR TIME AND EFFORT ARE SINCERELY APPRECIATED.

1989 SALTWATER ANGLER SURVEY



Office of Park and Tourism Research
Department of Recreation Resources Administration
North Carolina State University
Raleigh, NC 27695-8004
(919) 737-3687

Dear Angler:

Thank you for participating in this study to improve the distribution of information on saltwater recreational fishing in North Carolina. Please answer **each question** in the survey as carefully as possible. It should only take 10 to 15 minutes of your time. If you have any questions, please feel free to ask them.

Sincerely,

Richard R. Perdue

Richard R. Perdue
Project Director

SECTION 1: FISHING ACTIVITY AND EXPERIENCE

1. How many years have you fished in saltwater? _____ years

2. Since this time last year, how many days did you go fishing in:
(if none, please enter o)

_____ freshwater
_____ saltwater from a pier or bridge
_____ saltwater surf from the beach
_____ saltwater sounds or bays from a boat
_____ offshore saltwater from a boat

3. Have you ever participated in a saltwater fishing tournament?

O yes
O no **IF YES**, How many saltwater tournaments did you fish in last year? _____

4. Do you put most of your saltwater fishing effort into catching one particular kind of fish?

O yes
O no **IF YES**, What kind? _____

5. Are you a member of any fishing clubs or organizations?

O yes
O no **IF YES**, Which ones? _____

6. How may rod and reel combinations do you own? _____

7. How would you **rate your knowledge** of saltwater fishing?
(put an **X** on the line at the point that represents you)

not at all knowledgeable — 0 2 4 6 8 10 — extremely knowledgeable

8. In the last year, approximately how much have you spent on fishing equipment (including reels, rods, and tackle)?

$_____

9. Do you own a fishing boat?

O yes
O no **IF YES**, please list the length of each boat. _____

10. Do you subscribe to any fishing magazines?

O yes

O no IF YES, which ones? _____

11. In general, how important is **fishing to your satisfaction with life?** (put an **X** on the line at the point that represents you)

not at all important (I could take it or leave it) 0 2 4 6 8 10 extremely important (my life revolves around fishing)

12. In general, how important is **catching fish to your satisfaction with fishing?** (put an **X** on the line at the point that represents you)

not at all important (I don't care if I catch anything) 0 2 4 6 8 10 extremely important (The trip is a total waste if I don't catch a lot of fish)

13. For your most recent saltwater fishing trips, please record the (**A**) month, (**B**) number of hours spent fishing, (**C**) number of fish caught, and (**D**) the type of fishing you were doing.

	A. Month	B. Number of Hours Spent Fishing	C. Number of Fish Caught	D. Type of SaltwaterFishing (check as many as apply)			
				Pier or Bridge	Surf from Beach	Sounds or Bays	Offshore
(1).	_____	_____	_____	O	O	O	O
(2).	_____	_____	_____	O	O	O	O
(3).	_____	_____	_____	O	O	O	O
(4).	_____	_____	_____	O	O	O	O
(5).	_____	_____	_____	O	O	O	O

SECTION 2: FISHING INNOVATIONS AND SOURCES OF INFORMATION

We are particularly interested in knowing how people find out about the new fishing equipment, techniques, and ideas. Please answer the following questions as completely as possible.

1. Please list the **sources of information** that you use to find out about new saltwater fishing equipment, techniques, and ideas.

2. Are you aware of the **Under-Utilized Species Program** being used in North Carolina to encourage people to keep and use less popular types of fish?

O yes

O no

2a. Where did you first hear about the under-utilized species program? (please answer as specifically as possible)

2b. Have you changed your fishing behavior as a result of the under-utilized species program?

O yes

O no **IF YES**, In what ways?

3. Are you aware of the **Satellite Surface Water Temperature Program** being used in North Carolina to identify the most likely locations of sport fish both along the North Carolina shore and offshore?

O yes

O no

3a. Where did you first hear about the Satellite Surface Water Temperature Program? (please answer as specifically as possible)

2b. Have you changed your fishing behavior as a result of the Satellite Surface Water Temperature Program?

O yes

O no **IF YES**, In what ways?

SECTION 3: NORTH CAROLINA SALTWATER RECREATIONAL FISHERMEN

The following questions will help us to know more about saltwater recreational fishermen in North Carolina. The information you provide will be kept **strictly confidential**. You will not be identified with your answers in any report or presentation of this information.

1. What is your age? _____

2. Are you
   - O male
   - O female

3. What is the zip code of your permanent home residence? _____

4. How far is it from your permanent home residence to where you are fishing today? _____

5. What was the last year of school you completed?
(circle only one number)

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O $30,000 to $39,999	O $70,000 to $79,999	O $110,000 or more

IS THERE ANYTHING ELSE YOU WOULD LIKE TO SHARE WITH US?

THANKS
YOUR TIME AND EFFORT ARE SINCERELY APPRECIATED