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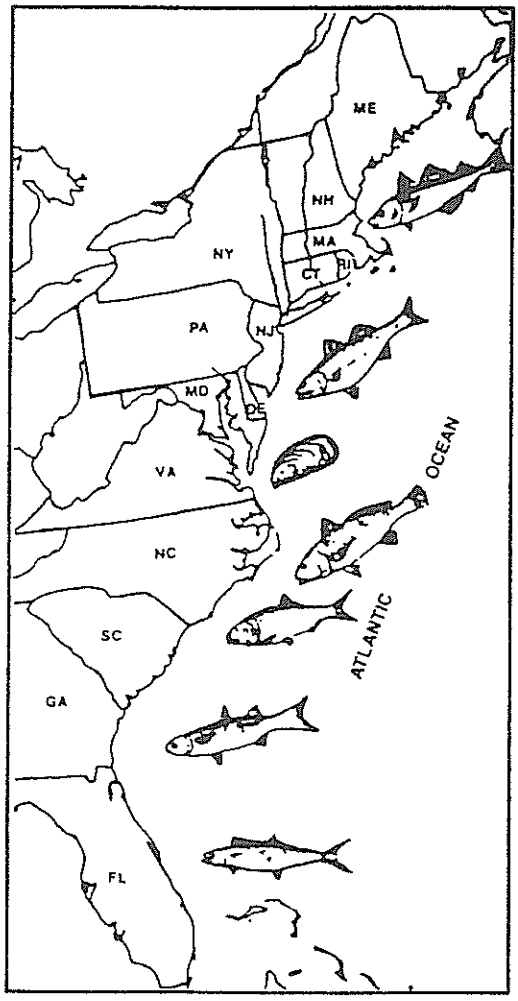

A HANDBOOK FOR RECREATIONAL FISHERIES STATISTICS PROGRAMS OF THE ATLANTIC COAST

June 1989

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A HANDBOOK FOR RECREATIONAL FISHERIES STATISTICS PROGRAMS OF THE ATLANTIC COAST

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"A Handbook for Recreational Fisheries Statistics Programs of the Atlantic Coast" was developed by the Atlantic States Marine Fisheries Commission (ASMFC) Marine Recreational Fisheries (MRF) Committee in cooperation with the Mid-Atlantic Fishery Management Council, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. Information on individual agency programs was compiled in conjunction with the MRF Committee and the individuals noted in the agency overviews. The cooperation of those individuals and the above agencies in completing this project is most appreciated.

PREFACE

This handbook is intended principally for practitioners in the area of recreational fisheries statistics programs who have a minimal background in statistical theory. The purpose is to provide an introduction to the issues in marine recreational fisheries catch and effort surveys along the Atlantic coast. Since this area of specialization has been accessible principally through technical reports of government agencies, this handbook is an attempt to synthesize information on existing state and federal fisheries surveys for the use of the general reader. No special quantitative skills are necessary but some understanding of statistical methods and analyses would be helpful in comprehending the techniques of recreational catch and effort estimation. While other aspects of recreational fisheries statistics such as socio-economic surveys and shellfish studies are referred to in the handbook, the main emphasis is on finfish catch and effort. The document also includes recommendations for future Atlantic coast survey efforts and a bibliography of reference material for readers who are interested in pursuing particular topics in greater detail.

Although this handbook explains the basic elements of survey design, data collection, and statistical analyses used in fishery management, it should be considered a complement rather than a substitute for the comprehensive statistical treatments found in the complete federal and state recreational fisheries reports.

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EXECUTIVE SUMMARY

"A Handbook for Recreational Fisheries Statistics Programs of the Atlantic Coast" summarizes recreational fisheries statistics programs and provides recommendations for collecting improved catch and effort information along the east coast of the United States. The document is divided into three sections including an assessment of marine recreational fisheries trends, highlights of current uses of recreational statistics in fishery management, and a review of state and federal marine recreational fisheries statistics programs. Recommendations are made in each area.

Marine Recreational Fisheries Trends

Most marine fish species are shared stocks, harvested by both commercial and recreational fishermen. The recreational portion of the harvest is substantial. In 1987 approximately 385 million fish, weighing approximately 632 million were caught by an estimated 17 million anglers. The Atlantic coast recreational fisheries contribute significantly to these U.S. sport fishing totals (58 percent of total U.S marine recreational catch). Both the unique nature of marine fisheries and the need for precise and accurate data require that the public sector shoulder a major part of the responsibility for gathering information on marine sport fisheries. State and federal government agencies are involved in compiling recreational statistics for their specific needs. Because of this multiple level of involvement, conflicts can arise over the proper objectives for recreational data collection. Unfortunately, there is no simple formula that provides an infallible guide to survey program planning.

RECOMMENDATION 1: Efforts to collect recreational statistics need to be based on a clear understanding of management goals and objectives. Because of the diversity of management agencies (states, commission, councils) involved with recreational fisheries, each agency's statistics goal should be well defined, and if possible, a consensus on common recreational fisheries statistics needs should be established.

RECOMMENDATION 2: Within the bounds of existing long term recreational data collection systems, special surveys or program supplements may need to be considered for important species or complexes of species that have a high management priority.

Using Recreational Fisheries Statistics in Fishery Management

Effective statistics programs supply information that is useful for fishery management. Data on recreational fisheries is most often collected through angler surveys. Most fisheries surveys collect two kinds of data: 1) basic descriptive data about the fishermen such as age, education, income, family size,

and other socio-economic characteristics and, 2) measures of the fishermen's catch and effort. The basic descriptive type of data is usually relatively straightforward and easy to obtain using either a mail, telephone, or personal interview survey. he second type of data is more difficult because it may require the survey respondent to recall past events or provide information that is not easily verified. Unfortunately, this catch and effort information is the basic information needed for fishery management plans.

To address catch and effort needs, a survey must be based on scientific sampling so that the costs are minimized and the results representative of actual fishing activity. For survey results to be useful for management purposes they must be both accurate and precise. Procedures for collecting accurate data and target levels of precision must be established so that appropriate survey designs, sampling procedures, and data analyses can be developed for particular marine recreational fishery surveys.

Stock assessment models that can provide more precise information on fish population sizes and trends usually depend on a time series of data (consecutive years of consistent data collection). Thus, the lack of adequate data has limited the development of good stock assessment information. Without this stock assessment information, more sophisticated management options (quotas, etc.) cannot be adequately evaluated.

RECOMMENDATION 3: Based on the species being considered for management, fishery managers need to establish adequate target levels of precision and develop study procedures that accurately measure (minimize bias) catch and effort.

RECOMMENDATION 4: A mechanism should be established to develop standards on appropriate survey design, data collection, and data analysis techniques that deal with the unique problems of assessing marine recreational fisheries.

Federal and State Recreational Fisheries Statistics Programs

While many marine recreational fisheries surveys have been conducted over the years, consistent long-term data collection remains a problem. Other than surveys conducted by the National Marine Fisheries Service and U.S. Fish and Wildlife Service, most Atlantic surveys have been conducted at irregular intervals using different methodologies. While these efforts are useful for "snapshots" of the existing fisheries, such data cannot be readily used to predict fish population trends.

Based on a review of state and federal recreational fishing surveys of the Atlantic coast, it is possible to summarize key issues for ongoing surveys and develop recommendations on future

efforts. These recommendations will be for both individual federal and state survey programs, and as state/federal cooperative efforts.

Federal Statistics Programs

Even though there have been a number of national surveys on particular fisheries issues, there are only two federal surveys that have been consistently conducted over time. These are the recreational fisheries survey programs of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

National Marine Fisheries Service

Given the lack of continuous and systematic collection of marine recreational fishery data and the impetus provided by the Magnuson Fishery Conservation and Management Act (MFCMA), NMFS began a new comprehensive Marine Recreational Fishery Statistics Survey (MRFSS) in 1979. Nine years later, the MRFSS has become the basic framework for Atlantic coast recreational fishery data collection. The MRFSS is only one of several NMFS efforts to obtain data on recreational fisheries. Specialized surveys on particular species or to obtain socio-economic data are also conducted by NMFS, but the key to catch and effort data collection remains the MRFSS.

RECOMMENDATION 5: ASMFC and its member state agencies recommend a MRFSS budget of $3.2 million in FY 1990 for surveying the three coasts of the United States. Given the increasing need for more detailed and timely statistical data and the continued level funding of the MRFSS, the ASMFC and its state agencies must continue to pursue this issue with Congress as part of the annual NMFS budget review.

RECOMMENDATION 6: The ASMFC and its member states should participate during the review of the MRFSS RFP and the NMFS special study on recreational fisheries data collection with an objective of providing improved information for state, regional, and coastwide management.

RECOMMENDATION 7: The Atlantic coast states should actively participate in the MRFSS efforts within their state borders to improve the quality of survey data collection. As a start for this process, state personnel need to:

a. Attend training sessions for survey interviewers.

b. Oversee the sampling process.

c. Regularly respond to NMFS requests for updating local fishing site lists.

U.S. Fish and Wildlife Service

Conducted by the U.S. Fish and Wildlife Service (USFWS), the 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation was designed to gather information about American participation in fishing, hunting, and other forms of wildlife-associated recreation. The National Survey has been conducted ever five years since 1955 and represents one of the oldest and most comprehensive continuing recreation surveys. The purpose of the survey is to gather information on the numbers of fishermen and hunters in the United States, as well as how often they participate and how much they spend on these activities.

In 1989, the USFWS will complete planning for the 1990 National Survey which is not only important to the Atlantic in terms of its fisheries information, but also as a means of setting Wallop-Breaux funding allocations to individual states. Although the USFWS will accept comments on the national survey from any state agency, formal decisions on the survey are usually made in conjunction with the International Association of Fish and Wildlife Agencies (IAFWA). In 1988, the USFWS polled the IAFWA member states as to their preferences among six options for a 1990 survey. Of the 10 Atlantic states responding, a state-level, in-person survey similar to the 1985 Survey (Option 1) was favored by 5 states and a state-level telephone survey with less detail (Option 2) was favored by 4 states. The survey costs are approximately $8.8 million (Option 1) and $6.0 million (Option 2), with both surveys resulting in national and state level reports.

RECOMMENDATION 8: The Atlantic states should continue to support either Option 1 or 2 as the appropriate priorities for conducting the 1990 National Survey.

RECOMMENDATION 9: It is recommended that the Atlantic states participate in final design and implementation of the 1990 survey through the Marine and Estuarine Committee of the IAFWA.

State And State/Federal Recreational Fisheries Statistics Programs

The review of state statistics programs along the Atlantic coast reveals a wide variety of data collection activities. These activities range from independent state programs utilizing aerial surveys, to cooperative state programs for special areas or species, to state/federal cooperative efforts with the NMFS through the MRFSS.

State Statistics Programs

While state sponsored statistics efforts have improved the recreational fisheries data base, there is still a great need for accurate and reliable information for use in management on the state level. Consistent long-term data collection remains a problem. For the most part, the individual Atlantic states conduct surveys at irregular intervals using different methodologies. While these efforts are useful for "snapshots" of the existing fisheries, such data cannot be readily used to predict fish population trends.

RECOMMENDATION 10: Most states should be encouraged to increase funding and personnel dedicated to recreational fisheries statistics programs.

RECOMMENDATION 11: Special surveys should be designed for localized fisheries, and/or for unique state fishery issues.

RECOMMENDATION 12: Compatible or cooperative survey efforts should be encouraged for fisheries under shared state jurisdictions.

RECOMMENDATION 13: States initiating long term recreational data collection programs should strive for maximum compatibility with the existing Marine Recreational Fisheries Statistics Survey (MRFSS) framework.

Beyond the importance of compatibility in data collection, this last recommendation highlights the importance of State/Federal MRFSS cooperative efforts in Atlantic coast recreational fisheries statistics programs. Because of the importance of these cooperative efforts, it is necessary to address the issue of MRFSS cooperative efforts separately.

State/Federal Cooperative Efforts in the MRFSS

The advent of the MRFSS in 1979 enabled every Atlantic state to obtain recreational fishery statistics on an annual basis. The baseline MRFSS is conducted by NMFS and its contractors regardless of the willingness or ability of individual state statistics programs to participate in the MRFSS program. Thus, every Atlantic state had some form of 1988 recreational fishery survey, ranging from the baseline MRFSS only to extensive cooperative State/Federal efforts in the MRFSS. Nine states are actively involved in adding on to the 1988 MRFSS - Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Jersey, North Carolina, Rhode Island, and South Carolina. Many obstacles still prevent the establishment of a coordinated State/Federal marine recreational fishery statistics program. Future recommendations for addressing these obstacles are as follows:

RECOMMENDATION 14: For migratory fish that support multi-state ocean fisheries, individual states should consider entering into cooperative efforts with NMFS to strengthen the existing MRFSS database for intrastate management purposes. Such efforts may include:

a. States providing funds for increasing sample sizes or modifying the survey instrument to gain additional information from the telephone and/or intercept portion of the MRFSS.

b. States collecting data for the intercept portion of the MRFSS

RECOMMENDATION 15: The Atlantic states should work with NMFS to find solutions to the existing state and federal administrative obstacles hindering present cooperative efforts and incorporate those solutions in the new MRFSS RFP.

RECOMMENDATION 16: ASMFC should consider a role as coastwide or regional coordinator for future cooperative efforts by submitting a proposal for conducting the intercept portion of the MRFSS.

TRENDS IN MARINE RECREATIONAL FISHERIES

Sport fishing is by far the most popular outdoor activity that depends on a renewable natural resource (Gallup Poll 1985). Nationwide participation statistics indicate a substantial increase in the popularity of marine recreational angling since 1955 when the U.S. Fish and Wildlife Service (FWS) first began to gather this information. Approximately 14 million Americans aged 16 and older went saltwater fishing in 1985. These anglers comprised 30 percent of the total number of U.S. sport fishermen and accounted for $7.2 billion in fishing-related expenditures.

Although the very rapid rate of growth of marine sport fishing participation slowed significantly from 1970 to 1980, there were nearly three-times as many marine anglers in 1985 as there were in 1955. In addition to changing the nature of marine fisheries, this growth in saltwater sport fishing presents a challenge to marine fisheries managers who must factor the growing impact of anglers into strategies for conserving and managing fishery resources. The measurement of angler catch and effort along the Atlantic Coast is the subject of this report.

Project Goal and Objectives

In 1987, the Atlantic States Marine Fisheries Commission (ASMFC) and its member states formed an interstate Marine Recreational Fisheries Committee (MRF Committee) to address priority issues in recreational fishery research, development, and management. After publishing an overview of existing Atlantic recreational fisheries programs and activities (Halgren et. al 1988), the MRF Committee surveyed its recreational fishery program coordinators to determine their priority goals. The improvement of recreational fishery statistics, particularly catch and effort data, was their top priority. As a result, the Committee initiated a project with the following goal and objectives.

Goal: Improve Recreational Fisheries Catch and Effort Statistics for Use in Fishery Management

Objective 1: Identify present Atlantic fishery trends

Objective 2: Examine current uses and needs for statistics in fishery management

Objective 3: Review existing statistics programs

Objective 4: Make recommendations for future efforts in the development of Atlantic recreational catch and effort statistics

This report summarizes the results of that project. It includes basic information on recreational fisheries trends and management, provides an overview of existing east coast marine recreational fisheries statistics programs, and makes

recommendations for improved catch and effort data collection and analyses in the future.

Atlantic Sport Fishing Trends

Most marine fish species are shared stocks, harvested by both commercial and recreational fishermen. The recreational portion of the harvest is substantial. Estimates from the National Marine Fisheries Service (NMFS) place the 1987 marine recreational finfish catch at 385 million fish, which weighed approximately 632 million pounds and were caught on an estimated 76 million fishing trips.

Atlantic Coast recreational fisheries comprise a significant portion of the U.S. marine sport fishing totals. In 1987, 58 percent of all fish caught nationwide came from the Atlantic Coast. Most (80 percent) of the catch along the Atlantic Coast came from state waters either in interior areas such as bays and sounds or the ocean within 3 miles of shore.

Trends in Atlantic Fisheries Management

Marine fisheries management along the Atlantic, prior to the implementation of the Magnuson Fisheries Conservation and Management Act of 1976 (MFCMA), was based primarily on very limited biological information. Before MFCMA, management agencies imposed size limits, closed fishing areas, and established seasons to prevent overharvest and enhance yield. Research programs were conducted on life history aspects of the stock and commercial fisheries were sometimes surveyed. This information was then used to establish management measures for each species. Unfortunately, after such measures were instituted, stocks were not monitored sufficiently to determine if management efforts were effective, or if other factors such as environmental alterations, increased fishing effort, or gear refinements had altered the earlier projections.

After the MFCMA of 1976, management became an active, dynamic process which involved both the fish and the fishermen. Management procedures required detailed and timely fisheries data on catch, effort, fishing area, and size frequencies of recent catches as well as socioeconomic data on participants.

While some commercial fisheries statistics were available for management, information on recreational catches was much more difficult to obtain, and had not been routinely collected. Prior to 1979, when the National Marine Fisheries Service (NMFS) established the Marine Recreational Fishery Statistics Survey (MRFSS), there was no consistent approach to collecting data on marine recreational fisheries along the coast. The MRFSS was established to meet the goals of the MFCMA which required management of both the commercial and recreational components of fisheries within the 3-200 mile Exclusive Economic Zone (EEZ). Previously, a few national surveys (Clark 1962, Deuel and Clark 1968, Deuel 1973) as well as a variety of state surveys, had been

conducted. Many of the state surveys were intended to be qualitative in nature and lacked proper statistical techniques to allow quantitative estimates of angler catch and effort.

Management Entities, Jurisdictions, and Plans

In expanding the nation's marine management authority from 3 to 200 miles offshore, the MFCMA created new management jurisdictions and mandated the establishment of new fishery management plans. Resources in the Exclusive Economic Zone (EEZ or 3-200 mile zone offshore) were to be managed by eight regional management councils. On the Atlantic Coast, three councils were established to manage the offshore fisheries in three sub regions: New England (ME, NH, RI, MA, CT), Mid Atlantic (NY, NJ, DE, MD, VA), and South Atlantic (NC, SC, GA, FL). The councils are comprised of both public fishery officials (federal and state) and private citizens, including representatives from both the commercial and recreational fishing industries. Several fishery management plans that involve recreational species have been developed or are in preparation (Table 1).

Table 1. Council Management Plans (FMPs) that Involve Recreational Fisheries

Council	FMP	Status of Plan
New England	Northeast Multi-species	FMP and Amendment 1, 2 implemented, Amendment 3 in review
Mid-Atlantic	Atlantic Mackerel, Squid, and Butterfish	FMP and Amendment 1, 2 implemented
	Summer Flounder	FMP implemented
	Bluefish	FMP in preparation
	Black Sea Bass	FMP in preparation
	Scup	FMP in preparation
South Atlantic	Coastal Migratory Pelagics (Spanish and King Mackerel)	FMP and Amendment 1, 2 implemented, Amendment 3 in review
	Red Drum	FMP in preparation
	Snapper-Grouper	FMP and Amendment 1 implemented
	Billfish	FMP implemented

From the coastline to three miles offshore, individual state governments manage fisheries. To address common state concerns in state waters, the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fisheries Management Program (ISFMP) was initiated in 1980 through a cooperative agreement with the National Marine Fisheries Service. The ISFMP promotes cooperative management of marine, estuarine and anadromous fisheries in state waters of the United States East Coast. The ISFMP Board, comprised of fisheries administrators from each of the member states and representatives from both the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, oversee this program. The Policy Board meets bi-annually to monitor the direction of the program and to review and approve management plans. A number of these plans involve important recreational fisheries (Table 2).

Table 2. ASMFC Fisheries Management Plans Involving Recreational Fisheries

Plan	Date Approved
Striped Bass	1981, Major revisions in preparation
Summer Flounder	1982
Weakfish	1985
Shad and River Herring	1985, FMP supplement approved in 1989
Red Drum	1984
Spotted Seatrout	1984
Spot	1987
Atlantic Croaker	1987
Bluefish	In preparation
Spanish Mackerel	In preparation
Winter Flounder	In preparation

A review of state, council, and commission plans indicates the major problem facing this multi-jurisdictional arrangement has been the migratory nature of most marine finfish. Because migratory fish travel across jurisdictional boundaries, effective management of these species requires state, commission, and council management processes. When a species ranges into several jurisdictional areas, there may be a number of management plans, sometimes put together in a coordinated fashion, and other times

resulting in conflicting management strategies. The most recent approach to solving these jurisdictional problems is the development of joint Council/Commission management plans such as the one for bluefish.

Important Atlantic Recreational Fisheries

Given the migratory nature of most marine finfish, it is not surprising that the most important recreational fisheries depend on migratory species. Based on catch records from past MRFSS surveys, several migratory species have been predominant in the Atlantic sport fisheries including bluefish, summer flounder, winter flounder, striped bass, and weakfish (Table 3).

Table 3. Estimated weight[a] (millions of pounds) and percent of total recreational catch of several species caught by marine recreational anglers, US Atlantic Coast, 1983-1987.

	1983		1984		1985		1986		1987	
	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%
Striped Bass	5.1	1	4.8	1	5.0	1	15.1	4	16.3	4
Black Sea Bass	10.1	2	11.4	3	9.2	2	20.0	5	5.5	2
Groupers	1.8	T	1.9	1	3.0	1	9.6	2	4.9	1
Sea Bass	0.4	T	0.6	T	0.3	T	0.4	T	0.2	T
Bluefish	144.2	29	88.4	24	100.3	25	122.5	30	101.3	27
Scup	8.6	2	4.0	1	9.2	2	16.2	4	8.7	2
Spotted Sea Trout	2.0	T	1.5	T	2.6	1	3.4	1	3.4	1
Weakfish	13.3	3	7.3	2	7.2	2	14.6	4	9.7	3
Spot	8.0	2	4.1	1	8.8	2	5.8	1	6.8	2
Atlantic Croaker	3.3	1	6.8	2	4.6	1	7.5	2	8.0	2
Red Drum	1.3	T	2.4	1	2.3	1	2.8	1	3.0	1
Atlantic Mackerel	7.6	2	5.7	2	7.2	2	9.2	2	12.7	3
King Mackerel	10.8	2	11.5	3	11.9	3	6.1	2	5.2	1
Spanish Mackerel	0.3	T	1.7	1	1.2	T	1.7	T	2.0	1
Summer Flounder	54.5	11	47.9	13	20.6	5	35.5	9	36.1	10
Winter Flounder	17.4	4	21.8	6	28.8	7	10.4	3	16.3	4
All Fish	494.5	100	365.8	100	397.4	100	414.9	100	374.2	100

T=less than 0.5%

[a]Calculated from the number of MRFSS type A+B1+B2 fish multiplied by the mean weight of type A fish.

Some data are already being collected in a variety of surveys on all of the species listed above. Although this data is useful in providing recreational fisheries information, a common theme in fishery management plans is the lack of adequate recreational statistics to develop more sophisticated and

efficient management strategies.

Summary and Recommendations

Both the importance of marine fisheries and the need for precise and accurate data require that the public sector shoulder a major part of the responsibility for gathering information on marine sport fisheries. State and federal government agencies are involved in compiling recreational statistics for their specific needs. Because of these multiple levels of involvement, conflicts can arise over inconsistent objectives for recreational data collection. Unfortunately, there is no simple formula that provides an infallible guide to survey program planning. However, regardless of the type of fishery information required, a successful statistics effort starts with clear goals and objectives.

RECOMMENDATION 1: Efforts to collect recreational statistics need to be based on a clear understanding of management goals and objectives. Because of the diversity of management agencies (states, commission, councils) involved with recreational fisheries, each agency's statistics goal should be well defined, and if possible, a consensus on common recreational fisheries statistics needs should be established.

Because different management agencies deal with varying recreational fish and fisheries, it may be helpful to identify important species on both a coastwide and regional basis (e.g. by council jurisdiction). Information from the present council and commission plans that involve recreational species, and trends in coastwide catch statistics in the MRFSS Survey can be used as a starting point for determining important recreational species and fisheries along the Atlantic.

RECOMMENDATION 2: Within the bounds of existing long term recreational data collection systems, special surveys or program supplements may need to be considered for important species or complexes of species that have a high management priority.

USING RECREATIONAL FISHERIES STATISTICS IN FISHERY MANAGEMENT

As discussed previously, several factors complicate the collection of recreational fisheries data. The behavior of a wide variety of migratory sport fish species, the different management entities and their responsibilities, the common property nature of coastal fishery resources, and the large and diffuse nature of recreational fishing activity complicate the planning and implementation of an effective statistics program.

Given the above difficulties, the importance of designing appropriate recreational fisheries statistics studies cannot be overemphasized. The validity of study conclusions are directly linked to technical aspects of study design such as survey procedures, sampling strategies, and data analysis and assessment. The following section is an introduction to basic principles involved in study design. It applies to the use of catch and effort statistics in making conclusions about Atlantic Coast fish populations and recreational fisheries. More detailed discussions of study design and statistics principles can be found in a variety of sources (Weber 1973, Armour et al. 1983, Zar 1984).

Recreational Fisheries Surveys

Surveys play a particularly important role in studies of marine recreational fisheries. Because it is not feasible to obtain all possible data on catch and effort, a small fraction or sample is collected through angler surveys. Surveys provide an indirect method to make estimates of participation, catch, and effort. The type of survey that is used to obtain fisheries data depends on the information required by fishery managers and the kind of statistical analyses necessary to provide this information. Most fisheries surveys collect two kinds of data: 1) basic descriptive data about the fishermen such as age, education, income, family size, and other socio-economic characteristics; and, 2) measures of angler catch and effort. The basic demographic type of data are relatively straightforward and easy to obtain using either a mail, telephone, or personal interview survey. The second type of data are more difficult to collect because it may require the survey respondent to recall past events or provide information that cannot be directly verified (Milon and Johns 1982).

There are a number of basic types of survey methods employed in collecting recreational fisheries data. Mail questionnaires are usually the least expensive survey method. Although it is relatively easy to determine who will receive the questionnaire, the actual sample size will depend on the response rate. Descriptive data is easy to obtain by mail questionnaires if the purpose of the survey is clearly explained. Catch and effort data obtained by mail can be biased because the questions may require recall of events that occurred several months ago or detail issues that the respondent may not clearly understand. Remedies for these problems are to limit respondent recall to a relatively short period of time (less than 6 months) and provide

as much explanation as possible about the purpose of the survey without making the questionnaire unduly long.

Telephone interviews are also relatively inexpensive but, as with the mail questionnaire, require identification of marine recreational fishermen before the survey is implemented. In addition, the sources of angler telephone numbers (phone books, association listings, etc.) must be appropriate for the particular survey. Descriptive data is easy to obtain by telephone and more attention can be given to explaining the purpose of the survey and the intent of specific questions. However, like mail questionnaires, if heavy reliance is based on recall of previous fishing experiences, the responses may not be accurate (Milon and Johns 1982).

The most common type of survey used in obtaining fishery information is the personal on-site interview. This technique has the advantage of assuring contact with marine anglers and minimizing biases associated with a lengthy recall. In addition, the interviewer can provide in-depth explanations for the study and more detailed or involved questions are more easily handled than with the mail or telephone surveys. The personal interview also is more appropriate for verifying angler catch and obtaining biological data on particular fish species. However, the survey depends on participation and the ability to contact on-site users. It is best to schedule the interview process over a reasonable period of time so that holiday and weather influences can be controlled. If possible, interviews can be conducted at major access points so that a representative distribution of users is obtained.

The most serious problem with personal interviews is the cost. As with most types of coastal recreation that are dispersed over wide areas, the expense of training and keeping the interviewers in the field can be high. A preliminary assessment of the importance of the study, the needs for accuracy and precision, and the available resources should be made before any type of survey technique is selected.

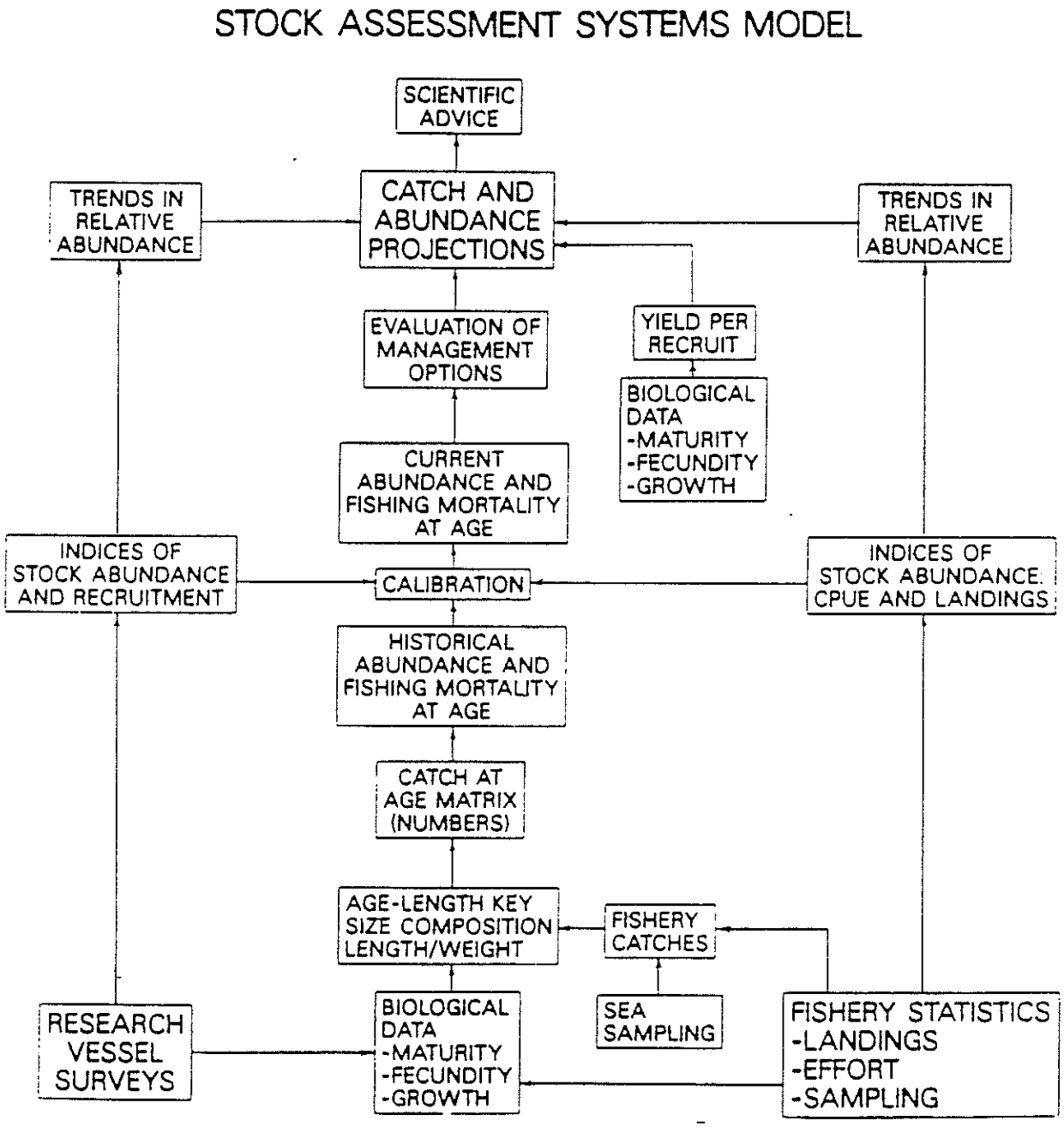
Use of Recreational Statistics in Management Plans and Stock Assessments

The development of an effective management plan requires an accurate assessment of the status of the fishery. The collection of accurate fisheries statistics not only ensures better stock assessments, but are also useful to monitor the harvest, evaluate the impact of various regulations on anglers, and modify management strategies.

Assessments allow scientists to determine the status of a fisheries resource, specifically the size of the resource as well as the amount of fish harvested each year. Monitoring the important parameters of a fish population - growth, recruitment, and mortality - allow scientists to determine a catch level that will ensure a sustainable harvest from year to year. A stock

assessment can allow for the development of a simple indicator such as Catch Per-Unit of Effort (CPUE) or more sophisticated fisheries models such as yield-per-recruit or surplus production (Figure 1).

Figure 1. Use of Recreational Catch and Effort Statistics in the Stock Assessment Process (from USDC 1988)



The use of surplus production models result in an estimate of Maximum Sustainable Yield (MSY) which is an estimate of the largest amount of fish (usually by weight) that can be annually harvested from a given stock or population under current environmental conditions. To establish MSY, scientists require data on catch and effort collected in a consistent manner over an extended period of time. This allows scientists to calculate an average yield that takes periods of exceptionally high and low population sizes into account. MSYs are usually presented as a range of values (e.g. 5,000 to 10,000 tons) around a point estimate (7,000 tons).

The calculations used to determine MSY depend on the quantity and quality of the data available. For long-standing fisheries with abundant information (such as Atlantic cod), a variety of methodologies exist to compute MSY. Conversely, for other fisheries with less data (such as Spot) calculating an MSY may be no more meaningful than using the average recorded catch as a basis for management actions. In all cases, an accurate assessment of the actual state of fish stocks is critical to management.

A bluefish stock assessment conducted by ASMFC and the NEFC is a good example of the use of recreational statistics in an assessment of a stock. The use of recreational statistics for assessment purposes is particularly applicable to bluefish for two reasons. First, approximately 90% of the bluefish caught along the coast are caught by recreational anglers. Second, bluefish, one of the top three species harvested by Atlantic Coast anglers, are well represented in the MRFSS statistics.

In the bluefish assessment, length frequency data from the MRFSS (type A fish) were expanded to the entire catch and the resulting catch at length data aged using an age-length key. This key was derived from a number of data sets obtained from several coastal states. The catch-at-age matrix was then used to derive mortality rates and growth parameters, and as input into a Virtual Population Analysis (VPA). Stock abundance estimates from the VPA were then used with recruitment data to derive a stock recruitment relationship and determine the fishing rates that maximize bluefish yield.

Of course, the principle assumption implicit to the above analyses was that the catch-at-age matrix from the fishery represented the age structure of the stock. Not considering the bias inherent in a composite age-length key, it's probable that the length frequency data were biased for two reasons. First, an estimated 1 in every 5000 fish caught by recreational fishermen were measured each year in the recreational survey. For example, in 1987, slightly over 6170 bluefish were measured in MRFSS interviews, whereas an estimated 33.8 million were caught by anglers. This small sample size may not offer the accuracy or proper proper precision necessary to adequately represent the catch. In addition, fishermen tend to differentially seek

certain size classes of fish. Thus the assumption that the catch represents the age distribution of the population may not be accurate and would bias results. For example, if fishermen seek larger fish, then the use of the estimated catch proportion at age would produce an artificially low estimate of total mortality.

In addition to length frequency data, MRFSS data were used in the bluefish assessment to develop a CPUE index of abundance. The number of fishing trips where at least one bluefish was caught was expanded annually by subregion, area, and mode and used as an index of directed fishing effort. Also, MRFSS data were used to develop a juvenile index from the shore fishery to substantiate the NEFC fall survey index as a valid indicator of recruitment. Finally, mean weights at age from the MRFSS survey were used as input into a Thompson & Bell yield model to estimate values of F0.1 and Fmax, important biological reference points, for Atlantic Coast bluefish. In all cases, the NMFS survey data were assumed to be both precise and accurate enough to supply the needed parameters of relative abundance, juvenile recruitment, and fishing mortality rates.

Accuracy and Precision

As can be seen from the bluefish example, the accuracy and precision of the catch and effort statistics determine the validity of the information derived from stock assessments. Accuracy can be defined as "freedom from error" and is a measure of how much an estimate deviates from the real value of the parameter. If sampling or statistical methodology introduce significant bias, then estimates of important parameters will be inaccurate. For example, bias in estimates of catch and effort from recreational surveys will exist if sample sites are not randomly selected or systematic errors occur during counts and measurements in the field.

Although an estimate is inaccurate it still may be precise. Precision refers to repeatability, i.e., if a series of estimates are made from the same population, precision is the closeness of the estimates to each other. A measure of precision, or variability, such as standard deviation, indicates the degree of dispersion associated with a set of observations. Obviously, a fisheries investigator must carefully design a sampling program to minimize bias and increase the precision of the estimates.

In addition, the design of a sampling program is not complete without the identification of appropriate techniques for analyzing the data and computing catch and effort estimates. For example, in most surveys, including the MRFSS, the catch frequency distribution per angler per trip is assumed to be normal and the arithmetic mean the best method for representing the average catch per trip. However, a study conducted to evaluate past recreational surveys in Connecticut indicates that this may not be the best approach (V. Crecco pers. comm.).

Although the arithmetic mean is easy to compute, has desirable statistical properties, and is always an unbiased estimator of the population mean, it is only the average (i.e. 50th percentile) when the catch frequency distribution approximates a normal distribution. Crecco determined that the recreational catch/trip data for Connecticut was not normally distributed but rather approximated a negative exponential distribution where the arithmetic mean was between the 70th and 80th percentile. This exponential distribution resulted from the fact that approximately half of the anglers surveyed each year did not catch any fish on their fishing trips, i.e., most of the catches were zeros. As a result, it's probable that catch estimates were overestimated and the standard error about the mean catch per trip biased. If these findings are similar for the MRFSS coastwide data, then the widely held belief that an increase in sample size improves the precision of the catch estimate may not be true. This has widespread implications, since state administrators and fishery managers are under the impression that the precision of the catch estimates from the MRFSS will be improved by increasing the number of anglers surveyed in each state. It is important that a thorough review of MRFSS methodology be undertaken to determine if alternatives, such as the median or geometric mean, are better estimates of the average catch per trip. Ideally, any new methodology would be used with historical data to maintain the time series of catch and effort information as well as provide a basis for improved catch and effort estimates in ongoing and future recreational surveys.

Accuracy in Surveys: The Case of Summer Flounder

Probably the most important component of any survey program is the field interview, and particularly the selection and training of the field interviewers. Interviewers must be trained to correctly identify species, take random samples, and accurately measure and record biological data (e.g. length) of the fish. Minor errors in the field or in data entry can have a profound effect on the final catch estimates because of the way that intercept data is expanded to total catch estimates.

For example, a recent analysis of summer flounder data indicated that published catch estimates and mean weight of fish (MRFSS type A) derived from interview data would result in a catch estimate of 67.2 million pounds of summer flounder in 1980 (Terceiro pers. comm). This estimate was the highest in the time series from 1979 to 1987. Analysis indicated that this 1980 value was due to two factors: a large number of summer flounder caught by anglers in the Mid-Atlantic using private or rental boats, and a mean weight of 2.654 lb./fish for fish taken by these fishermen. This mean weight was by far the highest value in the time series at nearly double the next highest value of 1.54 lbs/fish. Examination of the data indicated that sample weights were largely influenced by a single, probably erroneous record which when removed reduced the mean weight per fish to 1.41 lbs.

The elimination of this single value reduced the total catch in 1980 to almost half, from 67.2 million pounds to 39.9 million pounds.

Precision in Surveys: The Case of King Mackerel

Recreational catch statistics have been used to trigger quota management. Since management in this case can result in closure of the fishery, it is important to provide precise and accurate estimates of the catch. To improve the precision of catch estimates for king mackerel, NMFS instituted changes in the intercept sampling portion of the MRFSS in 1986. The primary objectives were to minimize duplication of effort and to increase sampling in the boat modes. The results were that the number of intercepts collected in 1986 were 1.5 times the mean number of intercepts in 1979-85 for the South Atlantic and Gulf subregions. Statistical sampling theory predicted a 13 percent reduction in coefficient of variation (CV) due to this increase in sampling size, but since MRFSS sampling changes increased the likelihood of contacting king mackerel fishermen, the percentage reduction in CV was even greater than 13 percent. Data presented at the joint meeting of the South Atlantic and Gulf of Mexico Fishery Management Councils showed that the actual reduction in CV of the South Atlantic and Gulf subregions in 1986 of 35 percent was even greater than predicted (Holiday 1986). Thus, analyses of catch estimates before and after increasing sample size indicated dramatic improvements in precision.

Use of Recreational Statistics by Atlantic Councils and Commission

The Atlantic States Marine Fisheries Commission, as well as the three Atlantic Councils, include recreational statistics in their management plans. In many cases, these statistics are limited to descriptive tables which provide general information on the recreational fishery. Due to the constraints of the recreational data or other information limitations (biological, social, economic, etc.,) the use of recreational statistics in stock assessments and the development of management strategies is limited.

Although the ASMFC has recreational statistics in a variety of its management plans (summer flounder, weakfish, shad and river herrings, red drum, spotted seatrout, spot, and croaker), only the bluefish plan contains adequate recreational data for direct incorporation into a management regime. In addition to bluefish, the Commission is involved in a major revision of its striped bass plan with a management strategy based on a stepwise rebuilding of the stocks with appropriate catch allocations between recreational and commercial fisheries. To monitor the effect of various management strategies on the recreational fishery, the Commission is considering a special sport fish survey to accurately assess this unique fishery. An initial target for precision of the catch estimates would be a Coefficient of Variation (CV) of approximately 20 percent.

Presently, the three Atlantic Coast Fishery Management Councils do not administer statistics programs. However, all use recreational statistics in fishery management plan development and monitoring programs. Specifically, the Councils use the NMFS MRFSS data and information from other surveys to: 1) determine the amount of fish caught by anglers each year; 2) as input into fishery assessments; and, 3) in analyses of the probable impacts of various management alternatives. In general, if a recreational fishery exists for a particular species, then an FMP for that species will contain detailed tables of recreational catch and landings by subregion, fishing zone (state or EEZ), and mode (e.g. boat fishermen).

Although the New England region has been traditionally characterized by its commercial fisheries, recreational fisheries exist for many of the species covered under the New England Multispecies Fishery Management Plan. MRFSS statistics were used in the plan to describe the various components of the recreational fishery and also in economic and resource impact analysis. Specifically, information from angler surveys was used to determine the effect of alternative minimum size regulations on angler trips and catch of cod, haddock, and pollock.

The Mid-Atlantic Fishery Management Council (MAFMC) uses MRFSS data extensively in all plans that concern recreationally important species. In the Atlantic mackerel plan, MRFSS data is used to determine the recreational catch for the upcoming year from a predictive equation developed from the relationship between recreational catch of mackerel and spawning stock size. The projected recreational catch is then used in an allocation formula to determine allowable catch levels.

In the Summer Flounder FMP, the MAFMC used MRFSS data to determine the number of fishing trips affected by the imposition of a 13 inch minimum size limit. The number of fishing trips directed towards summer flounder was calculated by taking the product of the regional number of trips tabulated by the MRFSS for a particular year and the regional percent of the directed summer flounder trips as identified by angler interviews. MRFSS data was also used to derive a catch-per-unit-effort for the recreational fishery as an index of summer flounder abundance (Terceiro pers. comm.). This index may eventually be used to tune a Virtual Population Analysis which in turn will be used to estimate fishing mortality and decide if an adjustment to the minimum size limit is necessary.

MRFSS data also has been used extensively in the Bluefish FMP which is being jointly developed by the MAFMC and ASMFC. Aside from the previously described stock assessment purposes, MRFSS data has been used in this plan to determine the impact of various alternative possession limits proposed for the bluefish fishery. In addition, a primary management measure in the plan limits the commercial fishery to 20% of the total coastwide bluefish catch, recreational catch and commercial landings

combined. The plan proposes that controls on the commercial fishery be implemented when commercial landings equal or exceed the 20% catch limit. The MRFSS will supply the recreational catch statistics that will allow the Council to project the catch for the upcoming year and determine if management measures need to be implemented.

The South Atlantic Fishery Management Council uses recreational statistics in a number of their plans most notably for spanish and king mackerel in the Coastal Migratory Pelagic Resources Plan. Both king and spanish mackerel stocks in the Atlantic migratory group are depleted and have been subjected to intense and rapidly increasing fishing effort in recent years. In order to rebuild the stocks, annual catch quotas are allocated to both the commercial and recreational fisheries. When the quotas are filled, the fisheries are closed until the following fishing year, at which time new quotas are set. In order to monitor the filling of the recreational quota, the NMFS MRFSS Survey data is used to tabulate the ongoing catch and make projections about when the quota will be reached. Thus, the recreational statistics are used in a timely fashion to trigger appropriate management actions (i.e. closure of the fishery).

The SAFMC also used catch statistics from a Mid-Atlantic survey conducted by the state of New Jersey, as well as a coastwide survey conducted by the Southeast Fisheries Center in 1977 and 1978, in the Billfish FMP. Recreational statistics collected by New Jersey for the offshore pelagic big game fishery in the Mid-Atlantic subregion supplied economic information that was used to partly justify a no-sale provision for white marlin, blue marlin, and sailfish in this FMP. The primary purpose of the survey conducted by the SEFC was to estimate the total number of billfish caught by recreational fishermen in the western North Atlantic.

Summary and Recommendations

Beyond questions about priority sport fish species and the different management entities and their needs, statistics program managers are faced with the basic problem of estimating sport fishing activity. Because there is no direct means of measuring this activity, surveys play a particularly important role in studies of marine recreational fisheries.

The type of survey that is used to obtain fisheries data depends on the type of problem being considered and the method of estimation employed. Most fisheries surveys collect two kinds of data: 1) basic descriptive data about the recreationists such as age, education, income, family size, and other socio-economic characteristics and, 2) measures of the fishermen's catch and effort. The basic descriptive type of data is usually relatively straightforward and easy to obtain using either a mail, telephone, or personal interview survey. The second type of data is more difficult because it may require the survey respondent to recall past events or provide information that is not easily

verified. Unfortunately, this catch and effort information is the basic information needed for fishery management plans.

To address catch and effort needs, a survey must be based on scientific sampling so that the costs are minimized and the results representative of actual fishing activity. For survey results to be useful for management purposes they must be both accurate and precise. Procedures for collecting accurate data and target levels of precision must be established so that appropriate survey designs, sampling procedures, and data analyses can be developed for particular marine recreational fishery surveys.

While many marine recreational fisheries surveys have been conducted over the years, consistent long-term data collection remains a problem. Other than surveys conducted by the National Marine Fisheries Service and U.S. Fish and Wildlife Service, most Atlantic surveys have been conducted at irregular intervals using different methodologies. While these efforts are useful for "snapshots" of the existing fisheries, such data cannot be readily used to predict fish population trends. Stock assessment models that provide more precise information on fish population sizes and trends usually depend on a time series of data (consecutive years of consistent data collection). Thus, the lack of adequate data has limited the development of accurate stock assessments. Without stock assessments, more sophisticated management options (quotas, etc.) cannot be adequately evaluated.

RECOMMENDATION 3: Based on the species being considered for management, fishery managers need to establish adequate target levels of precision and develop study procedures that accurately measure (minimize bias) catch and effort.

RECOMMENDATION 4: A mechanism should be established to develop a consensus on appropriate survey design, data collection, and data analysis techniques that deal with the unique problems of assessing marine recreational fisheries.

PROFILES OF RECREATIONAL FISHERIES STATISTICS PROGRAMS

The following profiles of Atlantic Coast recreational fisheries statistics programs include brief summaries of past and present federal and state efforts. The information was provided by federal and state fisheries personnel involved with various aspects of recreational catch and effort data collection and analysis. Summary tables for each state provide information on relevant management agencies, available personnel, latest statistics publications, and program budget information. The accompanying narratives explain the basics of various surveys and contain comments and recommendations for future efforts.

Federal Recreational Fisheries Statistics Programs

Because of the importance of federal efforts in Atlantic Coast fishery management and the preponderance of federal/state cooperative statistics efforts, the federal programs are presented first and generally include more detail than the individual state profiles. Even though there have been a number of national surveys on particular fisheries issues, there are only two federal surveys that have been consistently conducted over time. These are the recreational fisheries survey programs of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service

by

Chris Dlugokenski

The 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation was designed to gather information about American participation in fishing, hunting, and other forms of wildlife-associated recreation. The National Survey has been conducted every five years since 1955 and represents one of the oldest and most comprehensive continuing recreation surveys. The purpose of the survey is to gather information on the numbers of fishermen and hunters in our country, as well as how often they participate and how much they spend on these activities. The 1985 survey was the first to gather state-level information about those who observe, photograph, or feed wildlife. Differences and similarities between the 1985 survey and previous surveys are discussed in the preliminary 1985 report.

1985 Survey Procedures

The planning process for the 1985 survey began in 1983 when the International Association of Fish and Wildlife Agencies (IAFWA) passed a resolution asking the U.S. Fish and Wildlife Service to conduct a national survey of wildlife-associated recreation in 1985. As with previous national surveys, funding for the survey came from the administrative portion of Federal Aid funds produced by excise taxes on fishing and hunting equipment under the Dingell-Johnson, Pittman-Robertson, and Wallop-Breaux Federal Aid for Fish and Wildlife Restoration Acts.

In early 1984, the IAFWA was asked to help ensure that fish and game agencies of the 50 states had an opportunity to participate in all phases of planning and design of the survey. Four regional technical committees were set up under the auspices of the IAFWA. Made up of representatives of state fish and game agencies, the committees served as a point of contact for the survey between the states and the Fish and Wildlife Service. They provided initial suggestions and comments about what information the survey should produce and how it should be conducted. The technical committee reviewed alternatives for survey design, draft questionnaires and finally, preliminary tabulations of survey results. Review of draft materials were also solicited from state fish and game directors and a cross-section of sportsmen's and conservation organizations.

The 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation produced both this national report and individual state reports. The survey was conducted by the U.S. Bureau of the Census in two phases. In the first phase, a sample of almost 111,000 households nationwide was screened, mostly by telephone, to determine who in the household had fished, hunted, or engaged in nonconsumptive wildlife-associated activity in 1985. The screening was done from January-March of 1986. Information about household members (16 years old and older) was obtained from an adult member of each household. A 93 percent

response rate was achieved for the screening.

The second phase of the survey consisted of detailed in-person interviews conducted in the spring of 1986 with subsamples of fishermen, hunters, and nonconsumptive participants who were identified in the screening phase. Participants in this detailed phase were limited to those at least 16 years old because of the length and complexity of the questionnaires. Sample sizes were designed to provide statistically reliable results at the state level for fishing, hunting and nonconsumptive activities. A total of 33,973 fishermen and hunters and 30,177 nonconsumptive users were in the detailed sample. Altogether, fishermen and hunters completed 28,011 interviews and there were 26,671 completed interviews with nonconsumptive participants.

Plans for 1990 Survey

Since a national survey requires significant planning and coordination by the Service and the contractor who does the sampling and field work, options for 1990 are being presented in 1988 for the information of the International Association of Fish and Wildlife Agencies.

The Fish and Wildlife Service has designed recent surveys in consultation with the states, other interested parties, and the Bureau of the Census. In addition, the Service has guided the Bureau of the Census sampling, field work, and tabulation of results.

Listed below are four alternative surveys that can be done under the direction of the Service, and two options for "no survey" in 1990.

Cost estimates reflect Bureau of the Census costs plus Fish and Wildlife Service administrative costs. Private survey firms may face cost structures that are different from the Bureau of the Census, but existing regulations discouraged the Service from asking for such estimates. It is expected that Option 1 can be done only by the Bureau of the Census because others lack the large labor force that is required in each state for this option.

Option 1: A state-level, in-person survey similar to the 1980 and 1985 Surveys.

National and State reports.

Approximate cost -- $8.8 million.

Option 2: A state-level telephone survey to determine participation, days of participation, and expenditures, but with less detail within categories than Option 1.

National and state reports.

Approximate cost -- $6.0 million.

Option 3: A national in-person survey to determine the national number of participants, days of participation, and expenditures, with additional telephone interviews in coastal states to determine the number of freshwater and saltwater anglers in the coastal states.

National report.

Approximate cost -- $4.8 million.

Option 4: A telephone survey of the population in coastal states to determine the number of freshwater and saltwater angler in coastal states, with additional sample cases in non-coastal nonconsumptive participants, but not their days of participation or expenditures.

National report.

Approximate cost -- $2.7 million.

Option 5: No survey.

Option 6: Move the National Survey to a ten-year cycle, by doing the next survey in 1995, rather than 1990.

Discussion of Options and Responses of Atlantic States

Survey Options 1-4 were developed in consultation with the U.S. Bureau of the Census. They are presented because details about them are known, rather than to preclude other surveys by the Bureau of the Census or private survey firms. These options reflect state views, as understood by the Service from the states' comments on the March 18, 1983, draft options paper for the 1985 Survey and the comments that were received during the development and execution of that survey.

Any 1990 Survey must meet the criteria for approval by the Office of Management and Budget (OMB). Options 1-4 would use a one-year recall period. The OMB may be expected to review the findings of a current Federal Aid special project to study the effects of several different recall periods on the accuracy of National Survey estimates. That study is under way, but its field work will not be completed until early 1989. Options 1-4 can be done at the stated costs only if a one-year recall period may be used.

Options 1 and 2 would provide continuity of national and state trends from earlier surveys. Each would provide state-level estimates of participants, days of participation, and expenditures. The principal differences are in their costs and interview methods (i.e., in-person versus telephone). Since telephone interviews must be brief, Option 2 will provide less detail within the overall measures of days of participation and expenditures.

Options 3 and 4 are similar in that each would measure the ratios of resident saltwater and freshwater coastal anglers for distribution of Dingell-Johnson funds within coastal states, per the Wallop-Breaux Amendment. Option 3 would provide the ratios of resident freshwater/saltwater anglers in the coastal states. In addition, Option 3 would maintain national trends by providing national estimates for participation, days of participation, and expenditures similar to those in previous surveys. Option 4 would provide estimates for the national number of participants, but would not provide estimates of days of participation or expenditures.

Prompt reporting of survey results depend upon many factors and events. Most fundamental are whether or not the sample is drawn from Bureau of the Census files, the size and complexity of the survey questionnaires, and the date when the Service gains access to the survey's data. Based on these considerations, the time lapse from the end of data collection until published reports are available is least for Option 4, followed (in order) by Option 2, Option 3, and Option 1.

If a 1990 survey is requested, it would be beneficial to have recommendations for the contractor (Bureau of the Census, or private survey firm), the level of reporting (national or state), groups of participants to include (anglers, hunters, nonconsumptive participants), and key measures desired (participation, days of participation, expenditures, coastal state freshwater/saltwater ratios).

The responses from the Atlantic states through the IAFWA on the four options are summarized below (Table 4).

Table 4. State Preference for Design of National Survey of Fishing, Hunting and Wildlife Associated Recreation

STATE	Options 1	2	3	Comments
Connecticut			X	Don't use state data, have own surveys to get this information
Delaware				
Florida		X		Continuity of data, state data are important, five year cycle
Georgia		X		Cost savings with option 2, detial of option 1 not essential
Maine				
Maryland				
Massachusetts	X			
New Hampshire				
New Jersey	X			State data essential
New York	X			Trends and State data important
North Carolina	X			Keep five year interval, State data valuable
Pennsylvania (Fish)		X		Cost savings with option 2 are significant
Rhode Island				
South Carolina		X		State data, trends, timeliness and cost are important factors
Virginia	X			More timely reporting of results is very important

Since none of the Atlantic States supported the elimination of a 1990 survey (Options 5 and 6), nor a greatly reduced survey (Option 4), these options were not included in the previous table. The results show a narrow preference for maintaining the survey as it was conducted in 1985. Other states surveyed across the country agreed with this choice. The final decision on the basic design of the 1990 survey will be made in the coming year.

National Marine Fisheries Service

by

Mark Holliday and Ron Essig

While data on commercial fisheries have been collected by the National Marine Fisheries Service (NMFS) for many years, detailed statistical information on marine recreational fishing is also required to support a variety of fishery management purposes including the objectives of the Magnuson Fishery Conservation and Management Act (MFCMA). Given the lack of continuous and systematic collection of marine recreational fishery data and the impetus provided by the MFCMA, NMFS began a new comprehensive Marine Recreational Fishery Statistics Survey (MRFSS) in 1979. Nine years later, the MRFSS has become the basic framework for Atlantic Coast recreational fishery data collection. The Atlantic and other coastal surveys have been conducted in the following areas and years:

Atlantic and Gulf, 1979 through 1988
Pacific, Mid-1979 through 1988
Western Pacific, 1979 through 1981
Caribbean, 1979, 1981

These surveys use an intercept survey of fishermen in the field and an independent telephone survey of households. Each component survey provides certain information that is combined to produce estimates of recreational catch, fishing effort and participation. Estimates are generated by subregion or state, species, and mode and area of fishing. In addition, information on catch rates and fish lengths and weights is obtained.

The MRFSS is only one of several NMFS efforts to obtain data on recreational fisheries. Specialized surveys on particular species or to obtain socio-economic data are also conducted by NMFS.

Historical Review

The MRFSS program has experience in collecting recreational data since 1955. Nationwide saltwater angling surveys were conducted every 5 years from 1960-1970. These surveys were adjuncts to the Department of Interior's nationwide survey of fishing and hunting. A subsample of respondents were screened for saltwater fishing activity, and administered a personal interview questionnaire regarding their catch, effort and participation for the preceding one year period. (See Clark, 1962; Deuel and Clark, 1968; Deuel, 1973).

Analyses of these surveys concluded several methodological weaknesses existed, including response-bias errors and sampling errors. Response-bias errors resulted from an interviewee's failure to provide accurate accounts of fishing activity, such as prestige bias in number and size of fish caught, and memory bias errors associated with a one year recall period. Digit bias and reliance on angler fish identification also contributed to biased

results. Since the number of anglers interviewed was based on the sample size and design of the National Survey of Fishing and Hunting, a different design of the same size could have minimized sampling errors due to sample size and selection.

Alternative approaches to collecting better data were soon investigated under contract. In 1971, Audits and Surveys, Inc. developed methods of reducing response biases associated with household surveys. Abramson (1973) compared the resulting household survey estimates with compulsory logbook catch data reported to the California Department of Fish and Game. In addition, survey estimates of average size of fish in the catch were compared to estimates from a fishing site sampling program conducted by the NMFS Tiburon Lab. He concluded the household survey as designed decreased response biases appreciably, but that species identification and angler ability to estimate weights or lengths would still be a problem.

Further research on methods was conducted by Chilton Research Services in 1973 and 1974. A combination mail and telephone survey of households was used to estimate catch, effort and participation (see USDOC, 1975; USDOC, 1977). Unacceptable low response rates to the mail questionnaire were compounded by the high cost of telephone follow-ups of non-respondents. However, the research did identify design criteria for future surveys with regard to recall period, response rates, stratification, respondent fatigue and seasonal variations in fishing activity.

In 1977 Human Sciences Research, Inc., (HSR) under contract to the National Marine Fisheries Service, conducted an intensive analysis of methods for collecting marine recreational fishing information. This study involved the testing of a variety of survey approaches and data collection methods to obtain information required by NMFS. The project included the collection and review of relevant literature and a pretest of survey approaches and data collection methods.

Based on the review of relevant literature (Brown 1977), HSR, Inc designed pretests of several survey approaches or collection methods (Brown, et. al 1977; Chandler 1977; Hiett and Ghosh 1977; and Worrall and Metze, 1977). The two most critical issues identified by HSR (Hiett and Ghosh, 1977) were, 1) the ability of fishermen to identify their catch and estimate weight and length, and 2) the ability to recall catch and effort over time. From a sample of 1086 fishermen interviewed over a two-week period along the Southern California coast HRS found:

1) Fishermen were able to routinely identify only one species. Only 33 percent of all other species were correctly identified.

2) Fishermen tended to overestimate the weight of smaller and medium sized fish, and under-estimate the larger fish.

3) A full telephone interview has a much higher response rate than a mail questionnaire,

4) During on-site intercept interviews a large proportion of anglers would agree to provide information on age, county of residence, telephone subscribership, fishing avidity and fishing effort and were willing to have their catch identified, weighted and measured, and

5) Creel census methods are inadequate for determining total number of fishermen, fishing trips or catch.

The HRS studies and recommendations (Hiett and Ghosh, 1977) are the basis for the current MRFSS methodologies consisting of two complementary surveys: a telephone survey of households and an intercept survey of fishermen at fishing sites. Different types of data are collected by each method (Table 5). Data from the two independent sources are combined to produce total effort, participation and catch estimates.

Table 5. Type of Data Collected by Survey Method in the MRFSS Survey

Categories of Data Collected in	
Intercept Survey	Household Telephone Survey
o Fishing mode	o Presence of marine recreational fishermen in the household
o Finfish catch, weight and length by species	o Number of fishermen per household
o County/State of residence	o Number of finfishing trips in 2-month period
o Avidity level	o Location of each trip
o Area of fishing	o Mode of each trip

A panel of outside statistical experts was convened by NMFS and met in Washington, DC to advise the NMFS on the findings of the HSR study. This provided an independent review of the final recommended approach. The chosen method was independently tested for a year by Rhode Island Sea Grant in 1978 (URI, 1981), and fully pilot tested throughout the entire Atlantic and Gulf in November/December 1978 (HSR, 1978).

Throughout this period, a simultaneous effort was conducted under contract (Moshman, 1973; HSR, 1979) and in-house on what recreational data to collect, including information on frequency,

precision, data elements and intended usage. The Moshman study polled NMFS Headquarters and management staff, NMFS Fisheries Centers and labs, State government personnel, non-government marine biologists, association personnel and members of the Interstate Commissions. About a third of the respondents desired annual data while another third desired monthly data. Five years later the HSR study sponsored a two day workshop on social and economic data needs for fishery management in 1978, and prepared a report on economic and sociological data needed to prepare fishery management plans. The MRFSS was designed to meet the needs identified by these and other studies, providing information for stock assessment biologists, fishery managers and resource economists.

MRFSS Staff Statistical Review

The MRFSS methods and results have been continually evaluated by the program staff of three statisticians, as well as the contractor's statistical consultant. These reviews have focused on specific issues such as appropriate calculation of variances, optimization of telephone and intercept sample size and allocation, treatment of outliers and missing data, collection of specialized data on recreational economics and localized or unique fisheries, estimating invertebrate catches, and continuing research on recall.

Recall Studies

Three major recall studies have been conducted in association with the MRFSS. The original MRFSS recall study conducted in 1977 compared results of 15, 30 and 60 day recall periods. Fishermen could report fishing dates for which they could not recall the details of the trip. Accuracy fell off as recall period increased, the greatest loss occurring after 60 days. The second recall study (HSR, 1980) investigated the effect of avidity on recall ability, suggesting the percentage loss in recalled trips was higher for highly avid fishermen, even during the 30-60 day recall period. The last recall study (MFI, 1982) re-evaluated the avidity issue by correcting for past shortcomings in the recall experiment design. The conclusion reached was that the 30-60 day recall period introduced an underestimate of trips of approximately 10 percent per wave, and that trip losses were highest for the low avidity group.

Data Processing Review

A complete evaluation of the MRFSS estimation procedure was undertaken in 1981 when a contract was let to Market Facts to evaluate the present data processing methods. Sampling procedures and data processing algorithms were checked in great detail, and a significant computer coding error was discovered which required the re-estimation of the 1979 Atlantic and Gulf data.

Research Council Program Review

In 1982, the NMFS Research Council conducted a program evaluation of the MRFSS. Utilizing Center scientists, the review focused on the statistical design aspects of the MRFSS and concluded the methodological approach taken was appropriate for the objectives sought.

Statistical Consultations

From 1978-1980, Dr. Dhirendra Ghosh (Fellow of the Royal Statistical Society, and member of the Washington Statistical Society Board of Directors) was the senior statistical consultant contracted for the project. Since 1981, Dr. Seymour Sudman, an internationally recognized expert on survey methods at the University of Chicago, has advised the MRFSS on all its statistical issues.

In addition, in 1978, 1980, 1983 and 1986 during the contract procurement process, statisticians from the firms bidding on the contract evaluated the survey design. These statisticians, many of whom worked in senior positions at the Bureau of the Census, included Drs. Morris Hansen, Benjamin Tepping, Edward Bryant, Mr. Joseph Waksberg and Mr. Harold Nisselson. These evaluations of the methodology confirmed the appropriateness of the survey design.

Throughout 1982-1985, the NMFS and the Department of Interior's Fish and Wildlife Survey of Fishing and Hunting staff met on a regular basis to evaluate the methodologies of their survey and the MRFSS, including an exhaustive review of the data collection and data processing procedures to produce estimates of catch and participation. No inconsistencies were identified in the MRFSS methodology.

Telephone Survey Methods

The telephone survey portion of the study is carried out in a 2-week period of interviewing conducted near the end of each 2-month period of fishing activity. Each period of interviewing covers only fishing activity in the previous 2 months. That prescribed telephone interview quota for each wave varies with the amount of seasonal fishing activity expected.

Telephone sample effort is directed at households located in counties within 25 miles of the coast or major bays or estuaries. Entire counties are included in the telephone sampling, even if they fall only partially within the coastal mileage zone.

Prior to 1987, a random digit dialing method was used in the telephone household survey. For each county in the sampling frame, identification of assigned telephone exchanges was obtained from AT&T. Random samples of numbers were generated from these exchanges. The area code, exchange and first set of computer generated two digit numbers became the stem. A second

set of randomly generated two digit numbers completed the "seed" numbers. These new seed numbers were dialed to determine if they were working residential numbers. If they were, a cluster of fifteen consecutive telephone numbers was placed in the sample. Interviewers attempted to complete up to five interviews with households among the fifteen telephone numbers in each block. Starting in 1987, lists of random numbers are purchased by the contractor (i.e. the two-step clustered procedure is no longer used).

Intercept Survey Methods

The intercept portion of the survey, consists of on-site interviews which gather catch and demographic data from marine recreational fishermen in three modes: Shore (beach/bank, piers, jetties, and bridges), charter boat, and private/rental boat. Sampling is conducted continuously in six 2-month sampling periods from January through December with the exception of the Atlantic Coast north of Georgia, where January and February have not been routinely sampled because of minimal estimates (10% of annual catch) for this area in the 1979 and 1980 surveys.

The allocation of the charterboat interviews by wave is based on a comprehensive site list which includes expected fishing pressure re-estimates by site by wave. The site list is dynamic and updated continuously based on information provided by interviewers. Sites are randomly selected, in proportion to fishing pressure, to meet the mode allocations. The sampling schedule includes 75 percent of effort on weekends and holidays, and 25 percent on weekdays.

Interviewers are assigned to randomly selected sites where fishermen are interviewed at the completion of their fishing trip. At heavy sites, samples are taken of every nth fisherman at the completion of the angler's trip. The total number of fishermen present upon arrival at the site divided by the maximum number of interviews (20) possible for that assignment in that mode determines n. Alternate sites may have to be sampled if there is low fishing activity at low use sites. Up to two alternate sites in the same mode and county may be sampled on the assigned day.

The interview consists of an introduction to the survey and information on the Privacy Act of 1974, an oral interview concerning the fishing trip just completed (e.g., how long the person had fished, what gear was used), followed y an examination of the respondent's catch. Length and weight data for a random sample of each species in the respondent's catch are collected. The intercept survey is the part of the MRFSS most often expanded or modified by the Atlantic states in their cooperative efforts with NMFS. These State/Federal cooperative efforts are discussed in the individual profiles of state statistics programs.

Federal MRFSS Enhancements

The NMFS Washington office, which conducts and oversees the MRFSS, has been involved with a number of cooperative efforts with other federal agencies and the NMFS regional offices.

NMFS/EPA Economic Study

In cooperation with the EPA, a contract was awarded to collect economic data through a telephone survey piggy-backed to the intercept survey in the Mid-Atlantic and South Atlantic subregions. Data collection started in November 1987 and continued through until October 1988. One of the principal objectives of this effort was to correlate changes in the value of marine recreational fishing with changes in water quality.

NMFS Southeast Region Studies

NMFS continues to work on a South Regional Office enhancement to the MRFSS for coastal pelagics quota monitoring. The existing national MRFSS contract is modified for optimal allocation of additional intercept and telephone household samples. For calendar year 1988, the NMFS Southeast Regional Office is enhanced by the MRFSS using $280,000 of funds obtained under the 1987 MARFIN Program (Marine Fisheries Initiative). Counting on-going state enhancements (NC, SC, and GA), this enhancement will allow NMFS to obtain three to four times the historic sampling effort in all areas of the region (except Florida and Texas) and to conduct telephone surveys on a monthly rather than bimonthly basis. Along with some additional sampling for the mackerel fisheries, these enhancements will allow for more precise and timely catch and effort estimates. The monthly estimates will be provided starting in July 1988 to monitor 1988-89 fishing year quotas. The intercept sample size will approximately double, while the telephone household sample size will approximately triple. Notably, this pilot study should provide sufficient documentation of the survey's capabilities to encourage greater state participation in future years.

NMFS Northeast Fisheries Center Pelagics Survey

Since 1984, the Fishery Statistics and Economics Branch of the Northeast Fisheries Center (NEFC) has conducted a survey in cooperation with several states and VIMS to estimate catch and effort and to collect biologic data relative to the rod and reel fishery for large pelagic species (principally tunas, billfishes and sharks) off the northeast coast. The survey partly is an outgrowth of a cooperative effort in 1983 between the states of New York, New Jersey, Delaware, Maryland and Virginia funded by the NMFS Northeast Region under the Saltonstall-Kennedy Program (Project NA-83-FA-D-00001) to estimate catch, effort, participation and economic value of the recreational fishery for large pelagics in the Middle-Atlantic area. Funding for the NEFC survey has been partially provided by the Southeast Fisheries Center, which has the primary responsibility within NMFS for

assessments of large pelagics of the Atlantic Ocean. Data for 1986 through 1988 are maintained at both NEFC and SEFC.

The NEFC survey consists of a random telephone survey of captains of vessels known to participate in the rod and reel fishery for large pelagics and an intercept survey conducted at tournaments, marinas, and fish dealerships where large pelagic species commonly are landed. The vessel (or captain) lists compiled by the state and NMFS serve the sampling universe. No effort is made to classify the fishing trip and catch as recreational or commercial, however, the rod and reel catch and effort generally are considered as recreational in nature, regardless of whether the catch is sold.

Over the period 1984-1986, the survey was conducted in the area from New York through Virginia. Since there is a substantial and developing fishery for large pelagics off Southern New England, the survey was expanded in 1987 to include Massachusetts and Rhode Island.

Since the Marine Recreational Fisheries Statistics Survey (MRFSS) is not designed to sample fisheries of the "rare event" type, the NEFC survey has been the primary source of regional information regarding the pelagics fishery off the Northeast coast. A main problem has been a lack of adequate, stable funding to support an appropriate level of sampling. Consequently, the data is of limited use in the development of expanded estimates. Funding for the survey was greatly reduced in 1988 and as of November, 1988, no funds were available to continue the program in 1989. In addition, there is a problem of reliability of the estimates of fleet size based on the vessel (captain) lists. A licensing or permit program, which would serve to identify the participants in the fishery, would be of considerable benefit to this type of survey.

State Recreational Fisheries Statistics Programs

The following review of state recreational fisheries statistics programs along the Atlantic Coast shows a wide variety of data collection activities. These activities range from independent state programs utilizing aerial surveys, to cooperative state programs for special areas or species, to state/federal cooperative efforts with the NMFS through the MRFSS. Although some information on past survey efforts is included, the major focus is on present and ongoing statistics activities. Because personnel and funding data are constantly changing, only general estimates are given in order to provide comparative information. The implications of funding and personnel aspects on a coastwide basis are included in the Summary and Recommendations at the end of this section.

Connecticut

by
Eric Smith

In 1988, Connecticut participated in the NMFS MRFSS survey in the collection of data from March through December, and at present is conducting its own "in-house" evaluation of past efforts to collect catch and effort data which will include recommendations for future efforts (Table 6).

Table 6. Connecticut Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

Department of Environmental Protection
Division of Conservation and Preservation
Bureau of Fisheries
Marine Fisheries Program

Total Fisheries Mgt:	19
Administrators:	1
Biologists:	10
Field Technicians:	5
ADP/Statisticians:	1
Clerks/Secretaries:	2
Total Statistics Program:	2
Full:	2
Part:	NONE

MOST RECENT PUBLICATION:

A Study of Marine Recreational Fisheries in Connecticut. Federal Aid in Sport Fish Restoration F54R7 Annual Performance Report, March 1, 1987 - February 29, 1988.

The type of data collected for this publication included: numbers landed, fishing effort, biological data, and pounds landed.

1988 STATISTICS PROGRAM STATUS:

NMFS/State Cooperative Effort. Connecticut funds creel census portion of MRFSS. Because federal funds are already allocated for creel census, these funds are allocated for additional telephone samples.

1988 TOTAL STATISTICS PROGRAM BUDGET: $150,000-175,000
Federal: $50,000 **State:** $100,00-125,000

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: $75,000
Federal: $50,000 **State:** $25,000

Since 1979, Connecticut has conducted a number of different recreational fishing surveys. The focus has been on obtaining total catch and effort for the state sport fisheries. During the period 1979-1981, the Marine Fisheries Program of the Connecticut Department of Environmental Protection, Bureau of Fisheries (DEP) collected marine recreational fisheries data in cooperation with the NMFS and their contractors Human Sciences Research Inc. (1979 and 1980); and Market Facts Inc. (1981). The survey consisted of a creel census to obtain statistics, and data expansion by means of a telephone survey. Through early 1984, results were unavailable for the 1979-1982 period and preliminary reports suggested that the data were too general to describe variations in the fisheries within the State of Connecticut.

In an attempt to be more responsive to management needs within the bounds of Long Island Sound, DEP began collecting marine recreational fisheries data independently in 1982. This project is referred to as the "Marine Angler Survey" and is summarized in "A Study of Marine Recreational Fisheries in Connecticut" (Federal Aid in Sport Fish Restoration F54 Final Report. March 1, 1981 - February 28, 1984). In this effort, total catch and angler effort statistics were obtained from a marine creel census and expanded directly via observations from an airplane. The party and charter vessel fleet was not sampled since catch reports were required from operators in this fishery. The result is a continuous series of creel census data from 1979, with changing methods of expanding the data. Methods of data expansion were consistent between 1982 to 1986. The published report summarizes marine recreational fisheries data collected during 1981, 1982, and 1983 fishing seasons with particular emphasis on the aerial flight method of data expansion instituted in 1982.

Between 1981 and 1983, creel census interviews contacted between 1,300 and 4,000 anglers annually. Angler catch information obtained from these interviews was expanded using direct estimates derived from aerial observation flights. Aerial flight data collected during 1982 and 1983 were assessed by comparing aerial values to ground counts at similar sites. The flights proved to be well correlated to ground counts at the same sites. An attempt was made to develop an ability to predict numbers of trips from data of previous years and minimal current sampling. However, when parameters generated from 1983 observations were used to estimate angler numbers in 1982, they failed to predict well enough to be useful.

Aerial observations were used to obtain estimates of angler effort in trips, stratified by month, time of week (weekday vs. weekend day), mode (boat- and shore-based fisheries) and county. Creel census data were used to calculate targeted catch per unit effort by species for each of the same strata. These results were then multiplied by the angler effort expended to catch that species to obtain estimates of total catch.

A revised statistical effort began in 1984. A five-year

study of Long Island Sound recreational fisheries was to provide recreational fishery-specific information and to monitor the relative abundance and distribution of species important to Connecticut's marine sport fishery. The objectives included:

A) Gather information on fishing habits, catch composition, catch disposition, and trip cost.

B) Produce monthly and annual estimates of total angler catch and effort.

C) Determine the relationship between angler counts obtained by aerial observation and by ground-based observation at key fishing sites.

The 1987 sampling season was a transition period for the Marine Angler Survey when Connecticut decided to participate with the National Marine Fisheries Service's (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) in the collection of marine recreational fisheries data. The decision was based on the probability that previous methods (aerial surveys) employed by Connecticut's Marine Angler Survey underestimated total effort, and therefore, total catch. The interim report on the five year effort "A Study of Marine Recreational Fisheries in Connecticut" (Federal Aid in Sport Fish Restoration F54R7 Annual Performance Report, March 1, 1987 - February 29, 1988) consists of two sections: 1) results derived from the use (through June 1987) of Connecticut's methods in the "Marine Angler Survey; and, 2) results derived (after July 1, 1987) from using the NMFS survey (MRFSS) methods. The estimated total expenditure for Connecticut's recreational fisheries statistics project was $75,574 for the period of March 1, 1987 through Feb 29, 1988. This figure includes an estimated $48,639 of Federal expenditures.

An evaluation on the 1988 MRFSS/Connecticut cooperative effort will be available in 1989.

Delaware
by
Richard Seagraves

The Delaware recreational fisheries statistics program (Table 7) consists of creel census at dockside coupled with aerial counts (via small aircraft) of fishing pressure from 1982-1987 (conducted exclusively by Delaware personnel).

Table 7. Delaware Recreational Fisheries Statistics Program

STATISTICS/MANAGEMENT AGENCY:

Department of Natural Resources and Environmental Control

Division of Fish and Wildlife

Total Fisheries Mgt:	11
Administrators:	1
Biologists:	5
Field Technicians:	3
ADP/Statisticians:	1
Clerks/Secretaries:	1
Total Statistics Program:	1
Full:	0
Part:	1

MOST RECENT PUBLICATION:

1987 Survey of Marine Recreational Fishing in Delaware. (Project No. F-33-R-7. Job No: I-3 Continuing Survey of sport fishing in Delaware Bay and elsewhere in Delaware April 1, 1987-April 15, 1988)

The type of data collected for this publication included: numbers landed, fishing effort, biological data and pounds landed.

1988 STATISTICS PROGRAM STATUS:

NMFS/State Cooperative Effort & Independent State Survey. Delaware funds interviews & dockside intercept interviews for NMFS and conducts independent dockside creel census & aerial counts in cooperation with New Jersey.

1988 TOTAL STATISTICS PROGRAM BUDGET: $70,000
Federal: $48,750 **State:** $21,250

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: $65,000
Federal: $48,750 **State:** $16,250

This program has included a cooperative effort with the New Jersey Division of Fish, Game and Shellfish throughout the period. New Jersey personnel gathered creel census data on the New Jersey side of Delaware Bay while Delaware made estimates of fishing pressure on their side of the Bay. As a result, Delaware statistics personnel are able to make estimates of catch and effort for the entire Delaware Bay as well as for the rest of the tidal waters under the jurisdiction of State of Delaware. The coastal portion of the tidal water estimates are made in conjunction with NMFS through the MRFSS effort.

During 1987, Delaware combined its creel survey with the NMFS MRFSS. The end result of this effort was that the Delaware Division of Fish and Wildlife discontinued dockside creel sampling and the resultant funds were diverted to the NMFS sub-contractor to increase the number of intercepts at dockside to three times the base fund level. The state also provided additional funding to NMFS to increase the number of phone interviews in that portion of their survey. Funding for these activities came from the Dingell-Johnson/Wallop-Breaux study which funded data collection activities in the past. Delaware personnel have continued to conduct aerial counts of fishing pressure for all state waters during 1988 as they had in the past. The only changes in this part of the old survey were an increase in the total number of flights (counts) and additional replicate counts from a second aircraft in order to measure the accuracy and increase the precision of this method of determining fishing effort.

The strong points of Delaware's aerial count method of estimating fishing pressure are:

1) Data are observed as opposed to the reliance on fishermen recall as in the NMFS phone survey;

2) Areas of high fishing pressure (and consequently importance) can be determined with a relatively high degree of resolution;

3) Given previous surveys during 1955, 1960-61, 1968, 1971-73, 1976, 1978 as well as 1982-88, the relative changes in fishing pressure levels and patterns over four decades can be compared.

4) The cost of obtaining these data is relatively low (approximately $9,000 for 52 counts in 1988).

The weakness of the aerial survey include:

1) No coverage or estimates of night fishing are possible;

2) Counting errors;

3) Difficulty in counting fishermen under adverse weather conditions such as haze or fog;

4) The method is not applicable to extremely large coastal areas;

5) No coverage or estimates made for the EEZ.

In summary, during 1988 Delaware will rely completely on the NMFS survey to obtain fishermen intercept data while continuing to conduct aerial counts of fishing pressure in Delaware waters (and the New Jersey portion of Delaware Bay). Statistics personnel look forward to comparing state estimates of participation for Delaware with those from the NMFS phone survey. The amount of agreement (or disagreement) between the estimates of participation will determine whether Delaware continues to fund the NMFS survey (at increased levels) or continue their aerial counts. At present, the state plans to continue to support the NMFS survey through increased funding in the future.

For more details on the Delaware program, the "1987 Survey of Marine Recreational Fishing in Delaware" (Project No. F-33-R-7. Job No: I-3 Continuing Survey of sport fishing in Delaware Bay and elsewhere in Delaware April 1, 1987-April 15, 1988), provides a detailed assessment of the condition of the marine recreational fishery in Delaware by determining: 1) total participation by mode of fishing (i.e., private boat, head boat and charter boat, and shore-based fishing) for all Delaware marine waters and all of Delaware Bay, 2) catch rate by species through dockside sampling and 3) the total harvest of finfish by marine recreational anglers in Delaware marine waters. This report summarizes the findings for the fifth year (1987) of the continuing project.

Florida

by

Virginia Vail

Florida is in the process of expanding its efforts to collect statistical data pertinent to the management of the recreational fishery (Table 8). The receipt of Federal Aid in Sport Fish Restoration (D-J/Wallop-Breaux) funds, beginning in 1986, has make it possible to begin new data collection projects. These data will be used by the Florida Marine Fisheries Commission in developing fisheries management plans and formulating fisheries regulations.

Table 8. Florida Statistics Program

STATISTICS/MANAGEMENT AGENCY:

Florida Department of Natural Resources (DNR)
Division of Marine Resources
Division of Law Enforcement
Florida Marine Fisheries Commission

Florida DNR Total Fisheries Mgt:	406 1/2 FT, 27 1/2 OPS
Administrators:	16 FT
Biologists:	22 FT
Program Support Staff:	65 1/2 FT
Legal:	1 FT
Economist:	1 FT
Management Consultant:	1 FT
Law Enforcement Officers:	300 FT
Total Statistics "Program":	20 FT, 11 1/2 OPS

MOST RECENT PUBLICATION:

Progress Report, Florida Marine Recreational Fishery Statistical Data Collection. (Project F-43. Segment 3: April 1, 1988 to March 30, 1989.)

Progress Report, Investigations Into Nearshore and Estuarine Gamefish Abundance, Ecology and Life History in Florida. (Project F59. Segment 1: April 1, 1988 to March 30, 1989).

1988 STATISTICS PROGRAM STATUS:

Continuing cooperative NMFS/State effort. Florida supports and uses NMFS fishery dependent recreational fishery data and has designed and conducts the fishery dependent commercial survey for NMFS.

1988 TOTAL STATISTICS PROGRAM BUDGET: $1,584,000
Federal: $1,134,000 **State:** $178,230

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: Unknown
Federal: **State:**

At this time the primary recreational fisheries survey in Florida is the MRFSS, conducted annually by NMFS since 1979. The survey collects fishery dependent data from approximately 9000 recreational fisherman intercepts and a similar number of telephone interviews per year. Access points for the fisherman intercept creel survey are randomly chosen from a list of sites developed in 1978. This survey provides reasonably accurate estimates on numbers of fishermen and the catch species for both the Gulf and Atlantic Coasts. However, the sampling design and level of sampling currently prohibit reliable estimates of fishermen and catch rates for smaller subregions and individual bay systems. Also sufficient data on rare events, such as snook, bonefish or tarpon catches are not collectible via current procedures.

Implementation of a long-term recreational fisheries statistical data collection project began in 1986. The original 5 year planning budget, projected to be $2.4 million, would support data collection efforts on both coasts. The dual emphasis of this project is focused on 1) the fishery independent assessment of the juvenile finfish population to build a data base for future assessments of reproductive success and early survival rates, and 2) identification of fishing access sites and assessing fishing success at each site. In 1988 DNR implemented a 5-year, $886,300 project to assess the status of Florida tarpon, bonefish and snook populations using both fishery dependent and independent data collection techniques.

As a result of the state's expanding efforts to gather statistical data on the recreational fishery and continued cooperation with NMFS activities, it is anticipated that management of the recreational fisheries will benefit from:

1) the ability to evaluate the effects of management measures on recreational fisheries and predict future recreational finfish stock levels by monitoring of the catch and effort and seasonal relative abundance and recrutiment of juveniles in the major estuarine systems.

2) stock assessment and catch data for important Florida gamefish (tarpon, bonefish, snook).

3) catch, effort and area information on Florida's recreational fisheries is equivalent to that now being collected on the commercial fishery thereby providing management with data from all fishery components.

4) evaluation of marine recreational fishing sites and establishment of a common repository for the site information. Information gained here could be directly applied to the MRFSS, providing updated details on sites to be considered for

fisherman intercept creel surveys. State, county and local governments would also be able to use this information in planning for operation, maintenance and expansion of their respective facilities. Published in brochure format, the information would advise the general public (residents and tourists) on fishing opportunities.

5) enhancement of the NMFS survey by increasing the number of sampling sites, updating weighting factors assigned to access sites (i.e., beach, pier, charterboat, etc.), selecting interview access points from an updated list and improving the precision of catch estimates for species of special importance to Florida recreational fishermen. This would allow estimates of fishing pressure and catch effort for smaller geographic areas.

Thus, the basic approach to recreational fisheries management in Florida involves coordination and cooperation with NMFS while implementing projects designed to provide the additional information necessary for successful management. For example, fishery dependent data allows for a reasonably rapid evaluation of the effects of management actions while fishery independent data allows evaluation of non-fishing related impacts on a species and provides a basis for predicting future stock levels. Knowledge of both data sets is essential to wise management decisions.

Georgia

by

John M. Pafford

Georgia is presently analyzing a three-year marine recreational survey to include data collected from 1985 through 1987 (Table 9). Much of this information is derived from participation on the NMFS Marine Recreational Fisheries Statistics Survey.

Table 9. Georgia Recreational Fisheries Statistics Program

STATISTICS/MANAGEMENT AGENCY:
Georgia Department of Natural Resources
Coastal Resources Division
Marine Recreational Fisheries

Total Fisheries Mgt:	30
Administrators:	8
Biologists:	12
Field Technicians:	9
ADP/Statisticians:	4
Clerks/Secretaries:	4
Total Statistics Program:	7
Full:	3
Part:	4

MOST RECENT PUBLICATION:
Georgia Marine Recreational Fisheries Survey for 1985. (Georgia DNR, Coastal Resources Division, 1986; DJ Project F-31)

The type of data collected for this publication included: pounds landed, numbers landed, fishing effort and biological data.

1988 STATISTICS PROGRAM STATUS:
Cooperative NMFS/State Effort. Georgia provides additional phone & intercept interviews for NMFS

1988 TOTAL STATISTICS PROGRAM BUDGET: $185,000
Federal: $112,000 **State:** $73,000

1988 RECREATIONAL FISHERIES STATISTICS BUDGET:$40,000
Federal:$30,000 **State:**$10,000

Georgia investigated various alternatives for collecting marine recreational fisheries data and decided to participate in a joint survey effort beginning in 1985. The present NMFS survey design did not provide adequate data for management decisions at the state level. Basically, Georgia involvement included

increasing both the number of telephone and intercept interviews.

The greatest strength to the NMFS survey in respect to Georgia's involvement would be the efficiency of man hours and cost savings especially when considering limited project budgets. However, Georgia personnel identified one weakness to the survey design, and such a weakness may be too costly in man hours to sufficiently correct. The NMFS survey design directs interviewers to collect 20 "good" interviews in the assigned mode of fishing, and then collect additional interviews in other modes if conditions exist. The problem with this methodology is if the assigned site for a specified mode has significantly more than 20 fishermen, there is a greater chance that the less skilled fishermen will complete their trip earlier than the more skilled fishermen who may be catching more fish and may fish longer. Therefore, the intercept data may be biased to a lower CPUE.

Typically, in the past, when the assigned number of interviews are collected for each mode during each month, interviewing activities would stop for that mode and start again the first of the following month. It should be noted the number of interviews for each mode is divided equally between each month of the two-month sampling wave. Basically, to correct the catch bias by only conducting 20 interviews per mode each day, every assignment for each month is completed regardless of the number of monthly interviews conducted, and attempts are made to interview all fishermen at an assigned site. Of course the problem this methodology produces is increased survey costs. Georgia has set up a contract with Market Facts, Inc. (survey contractor to NMFS) to process additional interviews. Georgia generally collects 2,000-4,000 intercept per 100 miles of coast, which provides adequate data for management decisions. Also, with Georgia collecting intercept data, management personnel have immediate, first-hand access to data. It generally takes NMFS at least four months to provide data back to individual states when the NMFS contractor collects the intercept data.

Maine

by

Lewis Flagg

Maine does not have any of its own statewide surveys to gather recreational catch statistics (Table 10), although the Atlantic Sea-Run Salmon Commission collects catch data on Atlantic salmon harvested from coastal and inland waters. At present, the state depends solely on information provided by the NMFS MRFSS.

Table 10. Maine Recreational Fisheries Statistics Program

STATISTICS/MANAGEMENT AGENCY:
Department of Marine Resources
Anadromous Fish Division

Total Fisheries Mgt (Biological):	72	
Administrators:	4	
Marine Scientists:	31	
Field Technicians (full time):	8	
Field Technicians (part time):	4	
ADP/Statisticians:	6	
Licensing:	2	
Clerks/Secretaries (Biol. support):	9	
Total Statistics Program:	8	(Incl. 2 in Licensing)
Full:	5	
Part:	3	

MOST RECENT PUBLICATION:
The Anadromous Smelt Fishery of Maine, 1980. Maine Department of Marine Resources.

The type of data collected for this publication is unknown.

1988 STATISTICS PROGRAM STATUS:

MRFSS only; No State program effort

1988 TOTAL STATISTICS PROGRAM BUDGET:250,000
Federal: Not available **State:**Not available

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: Not available

Federal: **State:**

Maine has done some species specific recreational survey work, particularly on rainbow smelt. From 1974-82, Maine

collected catch and effort statistics from the Kennebec River winter fishery which comprises about 60-70% of the total Maine winter hook and line fishery for rainbow smelt. A stratified random sampling design based on fishing pressure, time off day, time of week, and tidal cycle was carried out for the 1979-80 winter fishery. A detailed description of the methods used can be found in the Annual Progress Report for AFS-19-1, American Shad Restoration and Rainbow Smelt Population Dynamics, June 1, 1974 to June 30, 1975. Maine has just begun the smelt survey again this winter and will be continuing it for the next several years. Fishery officials hoped to start a coastwide marine recreational fishing survey or expand the MRFSS survey over the next two years, but their Part II budget, which would have provided funding for this initiative, was eliminated.

The numbers of smelt camps in the study area decreased from 740 in 1979 to 651 in 1980 even with the addition of an additional sampling site in 1980. This decrease is probably the result of poor ice conditions experienced in the winter of 1980 and also the extremely low fishing success.

Maryland

by

Chris Bonzek and Howard King

In the last two years, Maryland has been involved in a cooperative state/federal survey with NMFS by supplementing the MRFSS (Table 11).

Table 11. Maryland Recreational Fisheries Statistics Program

STATISTICS/MANAGEMENT AGENCY:

Maryland Department of Natural Resources
Tidewater Administration
Fisheries Division

Total Fisheries Mgt:	100
Administrators:	10
Biologists:	50
Field Technicians:	22
ADP/Statisticians:	3
Clerk/Secretaries:	15
Total Statistics Program:	11
Full:	11
Part:	NONE

MOST RECENT PUBLICATION:

1985 Maryland Recreational Fishing Study by Anthony J. Fedler and Mark P. Jacobsen. July 1988. (A 1989 publication by Fedler and Grove examines the effects of a Chesapeake Bay License and the Striped Bass moratorium)

The type of data collected for the 1985 publication included: pounds landed, numbers landed, fishing effort and biological data.

1988 STATISTICS PROGRAM STATUS:

Cooperative NMFS/State Effort. Maryland provides additional data assessment and analysis.

1988 TOTAL STATISTICS PROGRAM BUDGET: $300,000
Federal: $130,000 **State:** $170,000

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: Integrated with Commercial Statistics budget.
Federal: **State:**

For years Maryland has collected detailed information from its commercial fishing industry including species caught, location, pounds, and effort. However, similar information had not been collected on a regular basis for sport fishing until 1979 with the advent of the NMFS MRFSS.

Prior to 1979, (Williams, et al. 1982) a survey of sport fishing for all of Maryland's portion of the Chesapeake Bay (from Crisfield to Susquehana River) had never been conducted. Most earlier studies (listed by Mansueti and Joseph 1962) were in localized areas such as Patuxent River. The first two studies to address a large portion of Maryland's Chesapeake Bay (Elser 1965; Speir et al. 1977) covered a zone from Pooles Island to Plum Point. Results from these studies were used in designing surveys for 1979 and i980. Two basic objectives of these 1979 and 1980 studies were: (1) to determine the sport harvest pressure on Chesapeake Bay finfish species and (2) to evaluate economic inputs generated by sport fishing. The 1979 and 1980 studies were cooperative project between Tidewater Administration of the Maryland Department of Natural Resources, University of Maryland Department of Agricultural and Resource Economics, and NMFS. The survey reports addressed the overall Maryland sport harvest for different species, total participation, sizes of fish caught, residency-use of sites, fishing success, economic impacts, and other activities.

In 1985, Maryland began a study (Fedler and Jacobsen 1988) of a number of issues that involved use of the NMFS MRFSS. Questions concerning the Striped Bass Moratorium, Chesapeake Bay Sport Fishing License, and Catch-A-Fortune Tournament were added to the telephone portion of the MRFSS. In designing the study, reports from the MRFSS between 1979 and 1986 showed that participants ranged from a low of about 600,000 in 1985 to a high of 1,273,000 in 1982. Trip and catch estimates were also lowest for 1985 but highest in 1982 and 1986. Of particular note and importance to the Maryland study are the low estimates for 1985. The 30 percent reduction in participants from 1984 and the 92 percent increase in participants in 1986 suggests that there may have been some calculation errors in the 1985 estimates. This is further underscored by a 86 percent reduction in trips and 93 percent reduction in catch from 1984 to 1985 and a 119 percent increase in trips and 183 percent increase in catch from 1985 and 1986. This great variation in estimates further raised the need for examining the 1985 NMFS data in greater detail.

Data tapes for the 1985 MRFSS were provided by the National Marine Fisheries Service's Fisheries Statistics Program and analyzed using University of Maryland computer facilities. During the analysis, it was discovered that the 1985 NMFS report failed to include wave 4 (July/August) trips for the Private/Rental Boat mode and thus underestimated total trips by about one million for the year. This error was corrected in the 1988 Maryland report by Fedler and Jacobsen that looked at the 1985 Maryland fishery.

Massachusetts

by
Drew Kolek

Massachusetts has been involved in state/NMFS cooperative efforts for 1987 and 1988, thru the MRFSS (Table 12).

Table 12. Massachusetts Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

Division of Marine Fisheries

Total Fisheries Mgt:	75
Administrators:	6
Biologists:	29
Field Technicians:	17
ADP/Statisticians:	2
Clerks/Secretaries:	11
Total Statistics Program:	4
Full:	4
Part:	NONE

MOST RECENT PUBLICATION: No recreational statistics published recently.

1988 STATISTICS PROGRAM STATUS:

Cooperative NMFS/State Effort. Massachusetts funds additional interviewers for intercepts.

1988 TOTAL STATISTICS PROGRAM BUDGET: Unavailable

1988 RECREATIONAL FISHERIES STATISTICS BUDGET:$180,000
Federal:$135,000 **State:**$45,000

Massachusetts provided extra funds for the NMFS survey (MRFSS) in 1987. There was a three-fold increase in intercepts during waves 2-6. The vendor (KCA) working for NMFS had a problem hiring interviewers during 1987 but that was overcome for 1988. Massachusetts fisheries personnel have not yet analyzed the 1987 data so they could not comment on their evaluation of their cooperative survey.

The 1988 statistics budget of $180,000 is divided as follows: $100,000 to expand the MRFSS sample and add an economic questionnaire; $20,000 to the University of Massachusetts to prepare the economic questionnaire for the MRFSS add-on and to analyze the data collected; and, $60,000 for a striped bass market survey.

New Hampshire
by
Robert S. Fawcett

To estimate the marine recreational fishery catch, fishing effort, and catch per unit effort in their state, New Hampshire fishery personnel have an ongoing independent statistical survey (Table 13).

Table 13. New Hampshire Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

State of New Hampshire
Fish and Game Department

Total Fisheries Mgmt.:	6
Administrators:	1
Biologists:	3
Field Technicians:	1
ADP/Statisticians:	None
Clerks/Secretaries:	1
Total Statistics Program:	4
Full:	4
Part:	None

MOST RECENT PUBLICATION:

1988 Creel Survey of Marine Recreational Fishing in New Hampshire, prepared by Robert S. Fawcett. Job No. V, Annual Progress Report Federal Aid in Sport Fish Restoration. Project No. F-50-R Study I Job V.

The type of data collected for this publication included: numbers landed, size categories, fishing effort and biological data.

1988 STATISTICS PROGRAM STATUS:

Independent state survey. New Hampshire conducts an creel survey, independent of existing federal MRFSS survey by NMFS.

1988 TOTAL STATISTICS PROGRAM BUDGET: $40,000
Federal: Unavailable **State:** Unavailable

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: Unavailable
Federal: **State:**

A creel survey of the marine recreational fishery in New Hampshire was conducted during July and August 1984; June through October in 1986; January through March, and April through October in 1987 and 1988, respectively. The time covered was from noon to 6 p.m. in two-hour survey periods for open water and from 8 a.m. to midnight for the ice fishery. Private boats and party or charter boats were surveyed with a 10 percent coverage of possible sampling periods. Bridge, pier or jetty fishing entailed a 3.33 percent coverage of possible sampling periods. Information obtained included percent distribution of species caught, sample lengths (T.L.) and estimates of angler hours, angler trips, fish per angler hour, and total catch by fishing type, month, and season.

Past New Hampshire recreational surveys have been designed for a variety of purposes. The University of New Hampshire Resources Development Center has evaluated the economic impact of the marine recreational fishery of New Hampshire and southern Maine (Sullivan, 1966). The New Hampshire Fish and Game Department's 1978 marine recreational fishery survey under Federal Aid Project AFS-5 provided the first estimate of total catch by the transient and resident boaters and party boat fishery in New Hampshire for all species. During the following year, a study of the impact of the marine recreational fishery on the finfish resources of New Hampshire coastal waters was conducted from June 1, 1979, through September 30, 1982 (Federal Aid Research Project F-36-R). The four years of creel survey provided baseline data for the catch; fishing effort; catch per unit effort; percent distribution of the catch by species and area; plus length frequencies by species.

New Hampshire has participated in the NMFS Marine Recreational Fisheries Statistics Survey in the past. Although they are not currently do so, state fisheries personnel have contemplated making a three-fold increase in NMFS intercept surveys to improve the local precision. In the past, Massachusetts has found problems in handling the local winter ice fishery in its statewide estimates. Particularly, there are difficulties in clearly designating "winter only" sites for ice fishing. In addition, some of these sites are so sporadically used that it is hard to collect a sufficient number of interviews.

In comparing the state survey to previous state/NMFS surveys, New Hampshire fishery biologists feel that the precision of individual interviews is better on their state survey than the predicted precision of the NMFS survey. On the minus side, New Hampshire's survey probably underestimates the total catch because it does not reach a sample of all participants as does the NMFS survey through random digit dialing. Massachusetts personnel hope that some uniformity between the two survey techniques can be developed for possible future NMFS/State cooperative efforts.

New Jersey

by

Bruce Halgren

New Jersey recreational fisheries data is collected through legislative authority for specific areas or fisheries. In the past, New Jersey has been involved in cooperative efforts with both the state of Delaware and with NMFS (Table 14).

Table 14. New Jersey Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

New Jersey Department of Environmental Protection
Division of Fish, Game and Wildlife
Marine Fisheries Administration
Bureau of Marine Fisheries

Total Fisheries Mgt:	40
Administrators:	3
Biologists:	14
Field Technicians:	13
ADP/Statisticians:	3
Clerks/Secretaries:	7
Total Statistics Program:	12
Full:	2
Part:	10

MOST RECENT PUBLICATION:

1988 Fishing Survey of the Summer Flounder sportfishery in Great Bay, New Jersey, by Tom Baum and Diane Harvell. (Project F-15-R-29, Dingell-Johnson). There are at least 8 other recent publications available (see reference list in appendix)

The type of data collected for the flounder publication included: pounds landed, numbers landed, fishing effort and biological data.

1988 STATISTICS PROGRAM STATUS:

Independent State Survey (no cooperative NMFS MRFSS survey). New Jersey conducts independent dockside creel census and aerial counts in cooperation with Delaware.

1988 TOTAL STATISTICS PROGRAM BUDGET: Unavailable
Federal: **State:**

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: Unavailable
Federal: **State:**

Three creel surveys have been conducted by the New Jersey Bureau of Marine Fisheries in the Delaware Bay. New Jersey began the Delaware Bay survey in 1980 and was joined by the state of Delaware in 1981. Since 1982, New Jersey has been sending its creel data to Delaware and they have been preparing the report. Full details of this effort is available in the Delaware program profile in this report.

Cooperative efforts with NMFS ended after 1983. Previously, the N.J. Bureau conducted field interviews in 1980, 1981, 1982, and 1983. The cooperative program was terminated due to manpower and budget constraints. While State personnel felt there were problems with the survey in the early years, they agreed that NMFS seems to have worked out most of them. The state continues to be interested in being involved in the data collection, but doesn't have enough people, especially since NMFS wants 75 percent of the work on weekends.

State statistics personnel met with representatives of NMFS and KCA in 1988 to discuss the sampling program in New Jersey. They have also attended some of KCA's interviewer training sessions in New Jersey and asked the interviewers to call them if they have any problems. New Jersey will probably continue to work with NMFS and KCA in this manner, rather than hiring its own interviewers.

Future problems that need to be addressed with any creel survey are interviewing and determining the overall number of "specialized" fisheries such as striped bass beach and jetty fishing. This bass fishery is spread out with small numbers of anglers in many different locations and fishing at a variety of times including night and at dawn. Another fishery in this is black drum angling in Delaware Bay.

Although 1988 statistics program budget information was unavailable for this report, the 1989 recreational fisheries statistics plan is budgeted for $201,200 ($150,900 - Federal, $50,300 - State).

New York

by

Chester Zawacki

At present, the New York State Department of Environmental Conservation, Division of Marine Resources (DMR) depends mainly on the NMFS national survey for its recreational fishery statistics program (Table 15).

Table 15. New York Recreational Fisheries Statistics Program

STATISTICS/MANAGEMENT AGENCY:

New York State Department of Environmental Conservation
Finfish and Crustaceans

Total Fisheries Mgt:	22
Administrators:	3
Biologists:	10
Field Technicians:	6
ADP/Statisticians:	1
Clerks/Secretaries:	2
Total Statistics Program:	NA
Full:	NA
Part:	NA

MOST RECENT PUBLICATION:

None formally published. State Open Boat Surveys as of present date are unpublished.

1988 STATISTICS PROGRAM STATUS:

NMFS MRFSS only

1988 TOTAL STATISTICS PROGRAM BUDGET: Unavailable
Federal: **State:**

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: $88,000
Federal: $88,000 **State:** 0

In the past, DMR has attempted to participate in an expansion of the existing NMFS Marine Recreational Fisheries Statistics Survey. In 1986 the DMR provided funding to Market Facts, Inc. (MRFSS vendor) for the purpose of increasing the precision of the estimates of the NMFS data. For $65,000, New York's number of field intercepts were to be multiplied by 3, although telephone interviews were not increased. The work was accomplished, although some of the costs were rebated to New York

because the contract was not completely fulfilled. In 1987, and 1988, New York did not augment the NMFS survey. Reasons include New York's inability to successfully let a contract through a myriad of bureaucratic delays. New York's fiscal management officials questioned the acceptability of a sole source contract. Fisheries personnel are stymied by our inability to contract effectively, a problem which is exacerbated in 1988 by a state budget shortfall requiring justification of all major purchases.

Other problems in New York included the occasional inability of the subcontractor to Market Facts, Inc. (KCA) to hire or maintain employment of field personnel. This apparently caused late changes in the conditions of payment in relation to undersampling (failure to meet contracted number of intercepts). New York's purchasing and payment requirements are often inflexible and difficult to adjust to real world problems.

DMR continues to be very interested in increasing the precision of the recreational survey particularly of the catch estimates. Fisheries personnel are willing and prepared to use Wallop-Breaux funding to this end and would favor a system whereby New York DMR would contract or otherwise fund such work through ASMFC.

New York does conduct a limited survey of recreational fishermen on head/party boats fishing for summer and winter flounder. Sampling conducted in 1985 was limited to vessels fishing for summer flounder in Great South Bay, New York. The survey has been expanded since 1986 to include winter flounder and to other major Long Island ports. Data recorded on each trip includes the number of fishermen, total fishing time, and total catch. Measurements of total length and age samples are also taken from a sample of the catch. The open boat sampling may be expanded to vessels fishing on wrecks and artificial reefs in 1989.

North Carolina

by

Mike Street

North Carolina has been a participant in the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS) since 1979. The state has increased MRFSS sample sizes and modified survey procedures when it began conducting the intercepts in 1987 (Table 16).

Table 16. North Carolina Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

North Carolina
Department of Natural Resources and Community Development
Division of Marine Fisheries

Total Fisheries Mgt:	60
Administrators:	2
Biologists:	19
Field Technicians:	22
ADP/Statisticians:	9
Clerks/Secretaries:	6
Total Statistics Program:	21
Full:	14
Part:	7

MOST RECENT PUBLICATION:

A Marine Recreational Fishery Statistics Survey for North Carolina. Federal Aid in Sport Fish Restoration Act. Annual Progress Report, August 1988, Project No. F-31-1.

The type of data collected for this publication included: pounds landed, numbers landed, fishing effort and biological data.

1988 STATISTICS PROGRAM STATUS:

NMFS/State Cooperative Effort. North Carolina modifies NMFS questionnaire and procedures slightly to obtain additional data.

1988 TOTAL STATISTICS PROGRAM BUDGET: $325,000
Federal: $229,300 **State:** $95,700

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: $182,000
Federal: $136,500 **State:** $45,500

Specific MRFSS changes were:

1. The NMFS MRFSS questionnaire was modified to include specific North Carolina waterbody codes. No changes were made to the telephone questions. Therefore, North Carolina gets only relative CPUE data for these waters.

2. Several species will have more than the normal limit of ten lengths/weights recorded.

3. The boundaries for the telephone survey were increased to account for at least 50 percent of resident N.C. fishermen.

In 1987 and 1988, the target number of completed intercepts was 8,000. North Carolina has published an annual 1987 report for the survey. The results of this report (Mumford, Bland, and West 1988) provide further details on the cooperative effort.

In past North Carolina statistics efforts, a limited amount of research was collected on marine recreational fishing prior to the MFMCA. The studies that were conducted spanned limited time periods and, like the Fish and Wildlife surveys, did not provide detailed information on catch, one of the primary data gaps regarding marine recreational fishing. Two of the few studies completed on marine sport fishing in North Carolina were published in 1965 and 1968 by the North Carolina Department of Conservation and Development, Division of Commercial and Sport Fisheries.

Since the establishment of the FCMA in 1976, more emphasis has been placed on examining marine recreational fishermen in the states since the MFCMA was established. But like the earlier studies, most research efforts in North Carolina spanned limited time periods, and narrowly focused on certain aspects of marine recreational fishing. In 1985, Johnson and Griffith of East Carolina University (Greenville, NC) published a report for UNC Sea Grant on species preferences of marine recreational fishermen. These researchers set out to determine the reasons fishermen keep some species and throw back others.

UNC Sea Grant also published a socioeconomic analysis of recreational fishing in the sounds of North Carolina. Interviewers spoke with 957 sport fishermen in 1981 and 1982 during their fishing trips on the Albemarle, Croatan, Roanoke, and Pamlico sounds, and on the Neuse and Pamlico rivers (Johnson et al. 1986). Another North Carolina report in 1986 focused on economic information about marine manufacturers and marinas. Its purpose was to provide economic and descriptive information on firms within these industries and to provide estimates of direct economic impacts of marine recreational fishing. Data were collected using a mail-out/telephone interview technique developed by the authors (Johnson and Perdue 1986).

Beyond these specific past studies, the ongoing North Carolina program is based on continued survey coordination between the state and NMFS. Several meetings were held with NMFS (Beaufort Laboratory) staff to discuss sampling of the recreational head boat fishery. This segment of the recreational fishery is not sampled by the MRFSS in order to avoid duplicating the southeastern headboat census conducted by the Beaufort laboratory staff. Utilizing different methodologies, duplicate sampling would have produced two different estimates of the catch. In these meetings, it was noted that NMFS needed to include the inshore headboats in their program. Data from the headboat survey would be made available to DMF, but only on an annual basis after all data had been edited. No arrangements could be made to provide headboat data on any specific time schedule.

Rhode Island
by
Chris Ordzie

At present, Rhode Island doubles the current federal MRFSS allocation with no modification to the sampling program (Table 17). The state did not specify if this doubling was for the intercept, telephone, or both portions of the MRFSS instrument.

Table 17. Rhode Island Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

Department of Environmental Management
Division of Fish and Wildlife

Total Fisheries Mgt:	19
Administrators:	2
Biologists:	10
Field Technicians:	NONE
ADP/Statisticians:	3
Clerks/Secretaries:	1
Total Statistics Program:	2
Full:	2
Part:	NONE

MOST RECENT PUBLICATION:

Unavailable

1988 STATISTICS PROGRAM STATUS:

Cooperative NMFS/State Effort. Rhode Island doubles funds for NMFS.

1988 TOTAL STATISTICS PROGRAM BUDGET: $83,000
Federal: $75,000 **State:** $8,000

1988 RECREATIONAL FISHERIES STATISTICS BUDGET: Unavailable

Federal: **State:**

Rhode Island officials supplied no information concerning past recreational data collection procedures, either conducted by the State or NMFS. They will be evaluating their State/NMFS cooperative efforts for 1987 and 1988 in the future.

South Carolina
by
Charles Moore

At the present time, South Carolina is participating in the MRFSS through a cooperative state/federal effort and will continue with this approach at least through June 1989 (Table 18).

Table 18. South Carolina Recreational Fisheries Statistics Program

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STATISTICS/MANAGEMENT AGENCY:

South Carolina Wildlife & Marine Resources Department
Recreational Fisheries Program

Employment information unavailable.

MOST RECENT PUBLICATION:
South Carolina Marine Recreational Fishery Survey - 1987, prepared by R.A. Low and C.M. Waltz. Technical Report Number 68, 1988 58 pp.

1988 STATISTICS PROGRAM STATUS:

Cooperative NMFS/State Effort. South Carolina provides a supplemental survey.

1988 TOTAL STATISTICS PROGRAM BUDGET: Unavailable
Federal: **State:**

1988 RECREATIONAL FISHERIES STATISTICS BUDGET:$125,333
Federal: $94,000 **State:** $31,333

Data collected during 1987 has been summarized in the South Carolina Technical Report No. 68. Prior to the state's participation in the MRFSS, South Carolina conducted a variety of short-term surveys which were limited in scope and dealt with only one or two specific aspects of the recreational fishery. Two typical surveys have been summarized and published in a State Fishery Technical Report (Low et al 1986).

South Carolina has fairly good success with the MRFSS at obtaining state level data. Unfortunately, most of the recent management problems have been on a more local level and the MRFSS data has not been sensitive enough to detect differences in fishing success at these lower levels. Basic criticisms of the survey include the charterboat allocations in S.C., the cost of surveys, and some of the methodologies used by NMFS in the trip estimates. In order to meet the large charterboat quotas in

Waves 2 and 3 of the MRFSS survey, South Carolina had to rely on the charterboat schedules from a few primary marinas. This violated the random site selection design of the survey. This also affected the sampling of the pier/ramp mode, in that collection of data was at boat ramps adjacent to the primary marinas, while interviewers were waiting for charterboats. In an attempt to alleviate this problem, South Carolina has proposed a 175 interview per wave cap on the charterboat mode for the state's participation in the 1988-89 MRFSS effort.

The cost of the cooperative South Carolina/NMFS survey also has been a concern. In an attempt to maximize creel clerk time in the field, a supplemental survey form has been used to collect additional information on fishing, crabbing, shrimping and shellfishing. This has worked out well, especially in colder months, when fishing slows down and shellfishing begins. This supplemental survey enabled South carolina to direct some efforts into areas of local concern.

Another issue of concern is the procedure for estimating coastal vs. non-coastal vs. non-resident trips. Presently all estimates are based on the mean number of trips of coastal residents observed in the telephone survey. This value is then expanded based on the coastal county populations and is then used with data from the intercept survey (i.e. ratio of coastal to non-coastal to non-resident interviewed). This procedure assumes that the average number of fishing trips of coastal residents is the same for non-coastal and non-resident anglers, which is not the case in South Carolina.

During the upcoming year, South Carolina will be trying to develop its own computer programs and data processing procedures so as not to rely totally on NMFS software programs, which have been found to be in error more than once. This will give the state full control of the raw data and allow analysis of data in ways other than the standard NMFS tables. Other modifications that have been discussed have been the possible addition of a drop box survey at coastal oceanic piers. The information collected in the South Carolina shore mode mainly comes from public and commercial piers. The addition of one or two big catches in this mode can drastically alter expanded values. Since the fishing success on our piers is very sporadic, the presence or absence of a creel clerk (say during a good run of spot) can make a big difference. Having a voluntary drop box on each pier may help overcome this problem at very little additional cost.

Virginia

by

Lyle Varnell and Jon Lucy

In 1984, Virginia Marine Resources Commission (VMRC), felt the accuracy of its recreational fishing data needed improvement. As a result, the state entered into a cooperative agreement with NMFS using the MRFSS in 1985 and 1986 (Table 19).

Table 19. Virginia Recreational Fisheries Statistics Program

STATISTICS/MANAGEMENT AGENCY:

Virginia Marine Resources Commission
Fisheries Management Divisions
Plans and Statistics Department

Total Fisheries Mgt:	37
Administrators:	5
Biologists:	6
Field Technicians:	17
ADP/Statisticians:	1
Clerks/Secretaries:	8
Total Statistics Program:	4
Full:	4
Part:	0

MOST RECENT PUBLICATION:

Marine Recreational Fishing in Virginia, 1985. (VMRC Technical Report No. 87-01 in cooperation with the National Marine Fisheries Service). A number of 1988 publications on specific species and modes of fishing are available.

1988 STATISTICS PROGRAM STATUS:

MRFSS is conducted by NMFS only. State funds independent surveys on specific species and issues.

1988 TOTAL STATISTICS PROGRAM BUDGET:$287,933
Federal:$215,700 **State:**$72,233

1988 RECREATIONAL FISHERIES STATISTICS BUDGET:$91,000
Federal:$68,000 **State:**$23,000

Through the cooperative agreement, VMRC funded increased MRFSS sampling efforts and other activities. In 1985, this funding was sufficient to increase the number of intercept interviews conducted in Virginia by 200 percent (2,772

interviews). Statistically, this increase in sampling size resulted in approximately a 30 percent decrease in existing standard errors of estimates in the MRFSS.

In order to further improve estimate quality, VMRC conducted an extensive interview site update in 1985. Survey sites chosen by NMFS were thoroughly reviewed by VMRC staff and site listings were updated accordingly by a grant funded (88-309) part-time employee. This was done by visiting each listed site and determining activity level by wave and mode. In addition, VMRC field personnel and Marine Patrol Officers cooperated by observing and documenting activity at known sites within their respective areas. These activities resulted in over 50 sites being eliminated from the original list and 117 new sites being added. Activity levels and/or site information were also modified for approximately 250 sites.

Subsequent to the site listing update, VMRC contracted to receive detailed Virginia-specific data for 1985 and 1986. Federal grant funds (88-309) were used to enhance on-site intercept interviews by 200 percent and, in 1986 only, enhance telephone interviews by 100 percent. A total of 2,772 intercept interviews were contracted for in 1985 at a cost of $37,990, and 5,086 intercept interviews and 5,699 telephone interviews were contracted for in 1986 at a cost of $61, 790.

A major emphasis for the expansion of the MRFSS by Virginia was to collect additional information on striped bass. Estimated striped bass landings for 1985 and 1986 were 4,000 fish and 12,000 fish, respectively. In each year, only two striped bass were actually measured by intercept interviewers. Spot, on the other hand, were measured 2,933 times in 1985 and 4,192 times in 1986.

Given the detail needed to accurately assess the recreational fisheries impact on a single species and the level of success from our past surveys at enhanced funding levels, it seems unfeasible that striped bass, or any one species could be accurately measured through the MRFSS as it is currently. For this to be done, study effort would need to be strongly directed at a particular species. However, this would essentially destroy the presumed intent of the current MRFSS -- to assess the total state recreational harvest of all species. Monies which would go to fund further enhancement of the MRFSS could best be used in a separate or cooperative effort in determining accurate single species recreational harvest figures.

Beyond the efforts of the state with NMFS, VMRC has been involved in a variety of cooperative efforts with Virginia Sea Grant Colleges. Beginning in 1983, the Virginia Institute of Marine Science of the College of William and Mary has collected catch and effort data from boat owners/captains fishing out of Virginia ports for marlin and tuna. Beginning as part of a regional mid-Atlantic study of the pelagic fishery, the VIMS effort continued in 1984, focusing primarily on fishing activity

at Rudee Inlet, Virginia Beach but also, through log books, including fishermen utilizing other ports. In 1985 the NMFS Port Sampling Program for Large Pelagics requested assistance from VIMS in coordinating port sampling and telephone interviewing efforts targeting boat-owning fisherman participating in Virginia's pelagic fishery. This effort continued during 1986 and was supplemented with funding from the Virginia Marine Resources Commission through Wallop-Breaux funds during 1987 and 1988.

The 1987-88 pelagic fishery survey was expanded to include collection of data on how fishermen were handling and utilizing their tuna catches. Data were also taken on internal tissue temperatures of bluefin tuna at the time of landing and subsequent meat spoilage rates as affected by various killing and storage/icing procedures practiced aboard vessels in the Virginia fleet. During 1988. catch and effort data collection efforts were largely funded by Wallop-Breaux funds since NMFS port sampler funds were not available for Virginia sampling that year. The local (Hampton) NMFS port sampler for commercial fishery landings, however, was made available to the pelagic fishery study during weekday afternoons, thereby enhancing dockside interviews of primarily charter captains at Rudee Inlet, Virginia Beach.

Sampling effort in 1983 resulted in thirty boat owners/captains contacted weekly, biweekly or monthly, depending upon the time of the pelagic fishery season in which sampling occurred. Weekly sampling was the practice for the months of June through August with less frequent sampling occurring in May, September and October. A total of 431 marlin/tuna fishing trips were included in the 1983 sampling effort. During 1984 catch log forms were obtained for 337 marlin/tuna trips from Virginia ports. Telephone (approximately 40 captains/owners contacted weekly) and dockside interviews during 1985-1987 obtained data on 302/1,136, 211/892, 308/706 (telephone/dockside) fishing trips, respectively. With the loss of NMFS port sampling funds in 1988, only 244/376 trip interviews were obtained.

Summary and Recommendations

Based on the previous review of state and federal recreational fishing surveys of the Atlantic Coast, it is possible to summarize key issues for ongoing surveys and develop recommendations on future efforts. These recommendations will be for both individual federal and state survey programs, and as state/federal cooperative efforts.

Federal Survey Issues and Recommendations

Even though there have been a number of national surveys on particular fisheries issues, there are only two federal surveys that have been consistently conducted over time. These are the recreational fisheries survey programs of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

National Marine Fisheries Service

Given the lack of continuous and systematic collection of marine recreational fishery data and the impetus provided by the Magnuson Fishery Conservation and Management Act (MFCMA), NMFS began a new comprehensive Marine Recreational Fishery Statistics Survey (MRFSS) in 1979. Nine years later, the MRFSS has become the basic framework for Atlantic Coast recreational fishery data collection. The MRFSS is only one of several NMFS efforts to obtain data on recreational fisheries. Specialized surveys on particular species or to obtain socio-economic data are also conducted by NMFS, but the key to catch and effort data collection remains the MRFSS. The contracts for conducting the MRFSS are subject to competitive bid and NMFS issues a Request for Proposals (RFP) on a regular basis. The most recent RFP involved a three year contract award initiated in 1987. The intercept data collection contractor was Market Facts, Inc., who subcontracted with KCA Research, Inc. CIC Research, Inc. was the contractor for telephone household data collection and data processing. These vendors continued work in 1988, the first option year of the award. Although the competitive bidding keeps survey costs down, the total MRFSS budget has remained at a level funding of 1.8 million dollars since its inception in 1979. Taking into account inflation over the last 10 years, NMFS is attempting to conduct the same survey in 1989 with a budget that has eroded dramatically. Coupled with the increasing data needs of marine fishery management, this amount of funding is inadequate.

NMFS is now preparing an RFP to conduct the data collection activities for the MRFSS into the 1990's. Once a final RFP is formulated, NMFS will accept bids on both the intercept portion (on-site interviews) and telephone portion of the survey. In addition, NMFS will begin a special study to evaluate the strengths and weaknesses of its present marine recreational fisheries data collection activities, and to recommend options for improvement. Both the RFP for the MRFSS and the special study on NMFS recreational fisheries data collection will be open

to public comment and review. As these activities unfold, a number of recommendations should be considered.

RECOMMENDATION 5: ASMFC and its member state agencies recommend a MRFSS budget of $3.2 million in FY 1990 for the three coasts of the United States. Given the increasing need for more detailed and timely statistical data and the continued level funding of the MRFSS, , ASMFC and its state agencies must continue to pursue this issue with Congress as part of its annual NMFS budget review

RECOMMENDATION 6: The ASMFC and its member states should participate during the review of the MRFSS RFP and the NMFS special study on recreational fisheries data collection with an objective of providing improved information for state, regional, and coastwide management.

RECOMMENDATION 7: The Atlantic Coast states should actively participate in the MRFSS efforts within their state borders to improve the quality of survey data collection. As a start for this process, state personnel need to:

a. Attend training sessions for survey interviewers.

b. Oversee the sampling process.

c. Regularly respond to NMFS requests for updating local fishing site lists.

U.S. Fish and Wildlife Service

The 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, conducted by the U.S. Fish and Wildlife Service (USFWS), was designed to gather information about American participation in fishing, hunting, and other forms of wildlife-associated recreation. The National Survey has been conducted every five years since 1955 and represents one of the oldest and most comprehensive continuous recreation surveys. The purpose of the survey is to gather information on the numbers of fishermen and hunters in the United States, as well as the level of participation and expenditure on these activities.

In 1989, the USFWS will complete planning for the 1990 National Survey. This survey is not only important to the Atlantic states for the fisheries information it will provide, but also becauseit will supply the information to make Wallop-Breaux funding allocations to individual states. Although the USFWS will accept comments on the national survey from any state agency, formal decisions on the survey are usually made in conjunction with the International Association of Fish and Wildlife Agencies (IAFWA). In 1988, the USFWS polled the IAFWA member states as to their preferences among six options for a 1990 survey. Of the 10 Atlantic states responding, a state-level, in-person survey similar to the 1985 Survey (Option 1) was favored by 5 states and a state-level telephone survey with less

detail (Option 2) was favored by 4 states. The survey costs are approximately $8.8 million (Option 1) and $6.0 million (Option 2), with both surveys resulting in national and state level reports.

RECOMMENDATION 8: The Atlantic states should support either Option 1 or 2 as the appropriate priority for conducting the 1990 National Survey.

RECOMMENDATION 9: It is recommended that the Atlantic states participate in final design and implementation of the 1990 survey through the Marine and Estuarine Committee of the IAFWA.

State Recreational Fisheries Statistics Programs

The review of state statistics programs along the Atlantic Coast shows a wide variety of data collection activities. These activities range from independent state programs utilizing aerial surveys, to cooperative state programs for special areas or species, to state/federal cooperative efforts with the NMFS through the MRFSS. Since 1980, almost every Atlantic state (13 of the 14 surveyed) reported the development of some type of survey beyond the basic MRFSS conducted by NMFS (Table 20).

Table 20. Surveys Conducted Independently of NMFS/MRFSS Cooperative Effort

	Independent Surveys	
	Type	Years
CT	Creel survey and aerial counts	1982-6/87
DE	Dockside creel census aerial counts	1982-present
FL	Creel survey	1986-present
GA	Dockside creel census for priority species caught in boatmode	1988
MD	Creel surveys and surveys on licensing, striped bass moritorium, blue crabs	1980, 1985, 1988
MA	No independent surveys reported	
ME	Surveys of smelt fishery, Atlantic Salmon	1980
NH	Creel survey for all finfish	1984-present
NJ	Dockside, mail & telephone surveys on specific species & modes of fishing	1980-present
NY	Head boat survey targeting summer and winter flounder	1986-present
NC	Angler attitude, socio-economic surveys	1985-1986
RI	No independent surveys reported	
SC	Surveys on limited specific species and issues	1986-present
VA	Dockside, telephone and logbook surveys on species, issues and modes of fishing	1983-present

Although these efforts have improved the recreational fisheries data base, there is still a great need for accurate and reliable information for use in management on the state level. Consistent long-term data collection remains a problem. For the most part, the individual Atlantic states conduct surveys at irregular intervals using different methodologies. While these efforts are useful for "snapshots" of the existing fisheries, such data cannot be readily used to predict fish population trends.

RECOMMENDATION 10: Most states should be encouraged to increase funding and personnel dedicated to recreational fisheries statistics programs.

RECOMMENDATION 11: Special surveys should be designed for localized fisheries, and/or for unique state fishery issues.

RECOMMENDATION 12: Compatible or cooperative survey efforts should be encouraged for fisheries under shared state jurisdictions.

RECOMMENDATION 13: States initiating long term recreational data collection programs should strive for maximum compatibility with the existing Marine Recreational Fisheries Statistics Survey (MRFSS) framework.

Beyond the importance of compatibility in data collection, this last recommendation highlights the importance of State/Federal MRFSS cooperative efforts in Atlantic Coast recreational fisheries statistics programs. Because of the importance of these cooperative efforts, it is necessary to address the issue of MRFSS cooperative efforts separately.

State/Federal Cooperative Efforts in the MRFSS

The advent of the MRFSS in 1979 enabled every Atlantic state to obtain recreational fishery statistics on an annual basis. The baseline MRFSS is conducted by NMFS and its contractors regardless of the willingness or ability of individual state statistics programs to participate in the MRFSS program. Thus, each Atlantic state had some form of 1988 recreational fishery survey, ranging from the baseline MRFSS only to extensive cooperative State/Federal efforts efforts in the MRFSS. Over the history of the MRFSS from 1979 to present, only one Atlantic state has not been involved in a State/Federal cooperative survey at one time or another (Table 21).

Table 21. Summary of State/Federal Cooperative Efforts with the MRFSS

	Supplements to NMFS	
	Type	Years
CT	Funds additional telephone & intercept interviews	1987-present
DE	Funds additional intercepts	1987-present
FL	Funds additional intercepts, Designed statistical data collection program	1986-present
GA	Provides additional telephone & intercept interviews	1985-present
MD	Funds additional intercepts and survey questions	1987-present
MA	Funds additional intercepts	1987-present
ME	Has not supplemented MRFSS at any time	
NH	Funded field interviews	1980-1981
NJ	Funded field interviews and telephone add-on	1980-1983
NY	Provided field intercepts	1986
NC	Funded additional intercepts and modified survey coverage	1987-present
RI	Doubles funds, no modifications	1987-present
SC	Funds additional supplemental survey	1987-present
VA	Funds additional intercepts and modified survey questions	1985-86, 1989

Beyond its own program efforts, the attainment of cooperative statistical survey data collection systems is a very high priority objective of the NMFS. Data quality and precision are enhanced through the increased sampling and localized fisheries knowledge contributed by state involvement. Past NMFS/State meetings have led to one general strategy to building a cooperative State/Federal program. Using the MRFSS as the base, a four step approach as been formulated: 1) Use State overview in data collection quality control (i.e. check contractor sampling procedures and update site lists); 2) Have states provide funds to increase existing MRFSS sample size or add additional survey questions; 3) Have States conduct on-site portion of MRFSS (through contractual arrangement or using own personnel); 4) Conduct regional programs (multiple states with NMFS), using existing management entities as a project contractor and coordinator.

Some of the steps involved in the above approach have already been taken. Nine states were actively involved in adding on to the 1988 MRFSS - Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Jersey, North Carolina, Rhode Island, and South Carolina. They participated in various ways. Connecticut increased the intercept and telephone household sampling. Florida, Georgia, North Carolina and South Carolina increased intercept sampling at a level up to five times the NMFS allocation. Massachusetts, and New Jersey added questions to the telephone survey instrument. These states committed about $500,000 dollars to the $1.8 million obligated by NMFS for its nationwide recreational fishery statistics data collection program.

The MRFSS survey interviews are conducted for NMFS by a private vendor under a competitive contract. To take advantage of the NMFS design and investment, states have had to negotiate individual contracts with the NMFS vendor. However, the process of negotiating individual state contracts produces several problems and inefficiencies that have hindered participation:

1. Some states (e.g. NJ) which would like to participate cannot negotiate sole source contracts for the desired services because of state laws or regulations.

2. Some states (e.g. N.Y.) which would like to participate have the authority to negotiate a sole source contract, but chose not to because of relatively high administrative costs.

3. Some states (e.g., MA, RI, NC, SC) which are participating have experienced such long delays in obtaining state approval of a sole source contract that their data collections on fishing activities missed 2-6 months of calendar year.

4. Finally, some states have expressed no interest to date for improving statistics on recreational fishing in their state. The prevents obtaining better coastwide recreational estimates.

Thus, many obstacles still prevent the establishment of a coordinated State/Federal marine recreational fishery statistics program that provides the necessary catch and effort data for state, federal and interjurisdictional fishery management goals. Future recommendations for addressing these concerns are as follows:

RECOMMENDATION 14: For migratory fish that support multi-state ocean fisheries, individual states should consider entering into cooperative efforts with NMFS to strengthen the existing MRFSS database for intrastate management purposes. Such efforts may include:

a. States providing funds for increasing sample sizes or modifying the survey instrument to gain additional information from the telephone and/or intercept portion of the MRFSS.

b. States collecting data for the intercept portion of the MRFSS

RECOMMENDATION 15: The Atlantic states should work with NMFS to find solutions to the existing state and federal administrative obstacles hindering present cooperative efforts and incorporate those solutions in the new MRFSS RFP.

RECOMMENDATION 16: ASMFC should consider a role as coastwide or regional coordinator for future cooperative efforts by submitting a proposal for conducting the intercept portion of the MRFSS.

REFERENCES

The following references are divided between the general references found in the first two sections of this report and references listed according to the agency programs covered in the third section of the report.

General References

Clark, J.R., 1962. The 1960 salt-water angling survey. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Circular 153, 36 pp.

Crecco V. 1989. Connecticut Department of Environmental Protection, Bureau of Fisheries, Marine Fisheries Office.

Deuel, D.G. and J.R. Clark, 1962. The 1960 salt-water angling survey. U. s. Department of the interior, Bureau of Sport Fisheries and Wildlife, Resource Publication 67, 51 pp.

Deuel, D.G., 1973. The 1970 salt-water angling survey. U.S. Department of Commerce, Current Fisheries Statistics Number 6200, 54 pp.

USFWS References

1985 National Survey of Fishing, Hunting and Wildlife Associated Recreation, November 1988. U.S. Department of the Interior, Fish and Wildlife Service. 167 pp.

NMFS References

Abramson, N.J., 1972. Evaluation of a household survey's capability for estimating marine sport fish catch - California pilot survey, 1971. 11 pp.

Audits and Surveys, 1971a. A study on methodology to reduce response bias in the reporting of sport fish catch of saltwater species of fish in California and Massachusetts. Contract report to NMFS #1-36082., July - September 1971. 37 pp.

Audits and Surveys, 1971b. A pilot household study designed to yield estimates of the saltwater sport fish catch by persons residing in the state of California. Contract report to NMFS, October - November 1971, vol. 1 - Survey methodology and optimal sample design, 18 pp., vol. 2 - Estimates, 30 pp.

Brown, Gary L., 1977. A review of literature in selected areas relevant to the conduct of marine recreational fisheries surveys. Contract report to NMFS.

Brown, Gary L., Robert L. Hiett and Dhirenda N. Ghosh, 1977. Evaluation of the door-to-door personal interview method as a technique for collecting marine recreational fishing statistics. Contract report to NMFS.

Chandler, Kathryn A., 1977. A methodological study of on-site intercept surveys of marine recreation fishermen on the west coast. Contract report to NMFS.

Chandler, Kathryn A. and Gary L. Brown, 1978. A pretest of an approach to collection of marine recreational fishing data on the East and Gulf coasts. Contract report to NMFS.

Clark, J.R., 1962. The 1960 salt-water angling survey. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Circular 153, 36 pp.

Deuel, D.G. and J.R. Clark, 1962. The 1960 salt-water angling survey. U. s. Department of the interior, Bureau of Sport Fisheries and Wildlife, Resource Publication 67, 51 pp.

Deuel, D.G., 1973. The 1970 salt-water angling survey. U.S. Department of Commerce, Current Fisheries Statistics Number 6200, 54 pp.

Hiett, Robert L. and Dhirenda N. Ghosh, 1977. Recommended approach to the collection of marine recreational finfishing and shellfishing data on the Pacific coast. Contract report to NMFS.

Hiett, Robert L. and Jay W. Worrall, 1977. Marine recreational fishermen's ability to estimate catch and to recall catch and effort over time. Contract report to NMFS.

Human Sciences Research, 1978. Marine recreational fishery statistics survey, November 1978 - December 1978. NMFS contract management report, 45 pp.

Human Sciences Research, 1979. Report on social and economic information for management of marine recreational fishing: identification of data needs and priorities for data collection. NMFS contract report, 81 pp.

Human Sciences Research, 1980. Report on the recall experiment: impact of time on recall of recreational fishing trips. NMFS contract report, 17 pp.

Market Facts, Inc., 1982. a study of recall error associated with the number of fishing trips reported in a telephone survey of households. NMFS contract report, 9 pp.

Metze, Brenda C., 1977. Evaluation of the telephone survey method as a technique for collecting marine recreational fishing data. Contract report to NMFS.

Moshman Associates, 1973. User needs for marine sport fishing data and statistical collection plans. NMFS contract report. 65 pp.

NMFS, 1972. Report to the NMFS Research Council on the Marine Recreational Fishery Statistics Survey. 9 pp.

U.S. Department of Commerce, 1975. Participation in marine recreational fishing, northeastern United States, 1973-74. U.S. Department of Commerce, Current Fisheries Statistics Number 6236, 13 pp.

U.S. Department of Commerce, 1977. Participation in marine recreational fishing, southeastern Untied States, 1974. U.S. Department of Commerce, Current Fisheries Statistics Number 7333, 13 pp.

University of Rhode Island, 1981. Marine sportfishing in Rhode Island, 1978. URI Sea Grant Technical Report No. 83., 26 pp.

Connecticut References

Howell, Penelope T., David G. Simpson, Roderick E. MacLeod and Wayne M. Castonguay. A Study of Marine Recreational Fisheries in Connecticut. 1988. Federal Aid in Sport Fish Restoration F54R7 Annual Performance Report, March 1, 1987 - February 29, 1988.

Sampson, Robert F. Jr., and Roderick E. MacLeod. A Study of Marine Recreational Fisheries in Connecticut. Job 1: Marine Angler Survey. Federal Aid in Sport Fish Restoration F54R Final Report, March 1, 1981 - February 28, 1984.

Delaware References

Seagraves, Richard J. Survey of the Sport Fishery of the Delaware Bay. 1988. Dingell-Johnson and Delaware Division of Fish and Wildlife Project No. F-33-R-7.

Seagraves, Richard J. Survey of the Sport Fishery of Delaware Bay, 1986. Dingell-Johnson and Delaware Division of Fish and Wildlife Project No. F-33-R-5.

Georgia References

Georgia Division of Natural Resources, Coastal Resources Division, 1986. Georgia Marine Recreational Fisheries Survey for 1985. DJ Project F-31.

Maryland References

Fedler, Anthony J. and Cynthia P. Grove, 1989. An analysis of the effects of the Chesapeake Bay sportfishing license and striped bass moratorium on Chesapeake Bay Fishing Participation .

Speir, Harley J., Dale R. Weinrich and R. Steven Early, 1977. 1976 Maryland Chesapeake Bay Sport Fishing Survey. Fisheries Administration, Maryland Department of Natural Resources. USF&WS Federal Project No. F-32-R

Fedler, Anthony J. and Mark P. Jacobsen, 1988. 1985 Maryland Recreational Fishing Study.

Williams, John B., Terrence P. Smith, Harley J. Speir and Steve Early, 1983. 1980 Maryland saltwater sport fishing survey. Maryland Department of Natural Resources, Tidewater Administration, Report No. TA-CRD-83-1. Funded in part by NOAA Office of Coastal Zone Management, U.S. Department of Commerce.

Williams, John B., Terrence P. Smith, Harley J. Speir and Steve Early, 1982. 1979 Maryland Saltwater Sport Fishing Survey. Maryland Department of Natural Resources, Tidewater Administration, Report No. TA-CRD-82-1. Funded in part by NOAA Office of Coastal Zone Management, U.S. Department of Commerce.

North Carolina References

Mumford, Douglas, Angela Bland and Katy H. West, 1988. Marine Recreational Fishery Statistics Survey. D-J Wallop-Breaux Project F-31-1.

New Hampshire References

Fawcett, Robert S. 1988 Creel Survey of Marine Recreational Fishing in New Hampshire. Job Number V, Annual Progress Report Federal Aid in Sport Fish Restoration.

New Jersey References

Andrews, Peggy, Diana Jones and Bill Figley. New Jersey's party and charter boat directory. Federal Aid to Sportfish Restoration Project F-52-E.

Baum, Tom and Diane Harvell. Fishing Survey of the Summer Flounder sportfishery in Great Bay, New Jersey, 1988. Dingell-Johnson Project F-15-R-29.

Brown, Bernard and Douglas Ofiara. Party and charter boat survey. Dingell-Johnson Project F-15-R-30.

Figley, Bill. New Jersey's offshore recreational big-game fishery. Dingell-Johnson Project F-15-R-30.

Figley, Bill. Recreational fishing effort on Wrecks and artificial reefs during 1988. Dingell-Johnson Project F-15-R-30.

Figley, Bill. Creel survey of private and charter boats fishing New Jersey's artificial reefs. Dingell-Johnson Report F-15-R-30.

Figley, Bill. Survey of the fishing and diving effort of New Jersey's party and charter boat fleet. Dingell Johnson Report F-15-R-30.

Giust, Lori and Bill Figley. Creel survey of New Jersey's party boat artificial reef and wreck fishery. Dingell-Johnson Project F-15-R-30.

Himchak, Peter. The Striped Bass Sportfishery Survey. Dingell-Johnson Project F-15-R-30.

South Carolina References

Low, R.A. and C.W. Waltz, 1988. South Carolina Marine Recreational Fishery Statistics Survey 1987. Technical Report Number 68, 58 pp.

Low, R.A., W. Waltz, R. Martore and C.J. Moore, 1986. South Carolina Marine Recreational Fishery Surveys, 1985 and 1986. Technical Report Number 65.

Virginia References

Chartier, N., 1988. The effects of at-sea killing and storage methods on the quality of recreationally-caught northern bluefin tuna, Thunnus thynnus. Masters thesis, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, 177 pp.

Lucy, J., N. Chartier and W. DuPaul, 1988. Catch trends and fish utilization in Virginia's offshore recreational pelagic fishery. Project completion report (Year One), Wallop-Breaux Project No. F-62-R, prepared for Virginia Marine Resources Commission, Newport News, VA: 44 pp.

Lucy, J., C. Barr and W. DuPaul, 1988. Development and implementation of a catch and effort data collection system for monitoring trends in fishing success rates on Virginia's artificial reefs. Project completion report (Year One). Wallop-Breaux Project No. F-63-R, prepared for Virginia Marine Resources Commission, 68 pp.

Virginia Marine Resouces Commission, 1986. Marine Recreational Fishing in Virgina, 1985. VMRC Technical Report Number 87-01 in cooperation with the National Marine Fisheries Service.

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