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REPORT OF THE MARINE RECREATIONAL FISHERIES STATISTICS COMMITTEE

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Preface

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Acknowledgements

This report is the result of the initial meeting of the Marine Recreational Fisheries Statistics Committee of the Atlantic States Marine Fisheries Commission (ASMFC) on June 11-12, 1993. Information on individual agency programs was provided by the individual noted in the agency overviews. The cooperation of those individuals and all participating agencies is greatly appreciated. This meeting was funded by Cooperative Agreement No. 14-48-0009-93-1256 between the U.S. Fish and Wildlife Service and the Atlantic States Marine Fisheries Commission. Special thanks are extended to the staff of the Fisheries Statistics Division, National Marine Fisheries Service, Silver Spring, MD for their assistance in finalizing the workshop and meeting agendas, and their presentations on the NMFS's Marine Recreational Fisheries Statistics Survey.

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Executive Summary

Marine recreational fisheries generated $5.0 billion in saltwater fishing expenditures in 1991, with approximately 85% of the fishing effort being expended within state jurisdictions. Due to the social and economic importance of marine recreational fishing, the use of statistical data on recreational catch and effort should be a significant component in the assessment and management of these fish stocks. Until recently, however, data on recreational fisheries has been incorporated into Commission and Council fishery management plans only for qualitative purposes.

Since the 1980's, fishery management agencies on the Atlantic coast have begun to critically examine marine recreational fisheries programs and have attempted to identify the problems associated with the collection of marine recreational fisheries statistics. These efforts have focused primarily on providing recommendations to increase state and federal funding and personnel dedicated to recreational fisheries statistics programs, and to the encouragement of state/federal cooperative programs to provide for greater efficiency of sampling effort and increased compatibility between data collection programs.

Through recommendations produced by Atlantic States Marine Fisheries Commission (ASMFC) surveys conducted in 1989 and 1993 of ASMFC member states and through meetings of the Management and Science Committee, the ASMFC has established a Marine Recreational Fisheries Statistics Committee to provide an open forum for discussion of State, Federal, and Council problems and concerns with existing marine recreational fisheries statistics programs. This Committee will also provide technical assistance in the coordination of a more comprehensive coastal marine recreational fisheries statistics program, and will evaluate the potential benefits of a national program.

The management of Atlantic coast marine recreational fisheries is complicated by the interjurisdictional nature of the fish resources. The majority of states rely on the National Marine Fisheries Service's (NMFS) Marine Recreational Fisheries Statistics Survey (MRFSS) to provide catch and effort statistics for management on a state basis. Many states also augment the MRFSS to increase accuracy of the estimates or conduct state-specific surveys designed to provide specific data to assist in management of fisheries resources in state jurisdictions. At the present time, there is little coordination between Federal and State surveys in providing accurate and reliable catch and effort statistics to fishery managers.

A list of 23 topics of concern associated with marine recreational fisheries programs was developed by the Marine Recreational Fisheries Statistics Committee. Each topic was defined by the Committee, with emphasis on specific tasks within each topic. Committee membership is comprised of technical level personnel so as to provide the expertise to evaluate each of these topics on a technical and statistical basis. The goal of the Committee is to provide tangible products and/or recommendations to State, Federal, and Council

fishery managers for the improvement of marine recreational fisheries statistics programs. The specific topics to be addressed by the Committee include:

- sampling site selection and allocation
- accessibility of the data
- timeliness of the data
- accuracy and precision of estimates
- waterbody level data
- anadromous/tidal freshwater fisheries data
- use of data in management and stock assessment
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Introduction

Marine recreational fishing continues to be a favorite national pasttime, with 8.9 million anglers taking approximately 64 million fishing trips and generating $5.0 billion in saltwater fishing expenditures (1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). Marine fisheries of the Atlantic coast contribute greatly to these national trends, with approximately 85% of fishing effort expended within state jurisdictional waters in 1991. Considering the social and economic importance of marine recreational fisheries, there is an overall lack of use of recreational fisheries data in the assessment of the status of Atlantic coast fish stocks. Until recently, marine recreational fisheries (MRF) data has been incorporated into Commission and Council fishery management plans (FMP) only for qualitative purposes. The joint Commission/Council FMP for bluefish was the first to quantitatively utilize both recreational and commercial statistics to assess the status of the bluefish stocks and to attempt a more holistic approach to management of this species. The Atlantic States Marine Fisheries Commission (ASMFC) has resolved to provide coordination between state and federal marine recreational fisheries statistics programs, with the goal of furthering the use of marine recreational fisheries statistics in the overall management of Atlantic coast fisheries.

Beginning in the late-1980's, fishery management agencies began to critically examine the quantity and diversity of marine recreational fisheries programs, both federal and state, and the problems associated with the collection of marine recreational fisheries statistics. In June 1989, the ASMFC published "A Handbook for Recreational Fisheries Statistics Programs of the Atlantic Coast" (McGurrin and Moore 1989), which reviewed the various state and federal marine recreational fisheries statistics collection programs on the Atlantic Coast. The results indicated that the majority of Atlantic coastal states relied on the National Marine Fisheries Service's (NMFS) Marine Recreational Fisheries Statistics Survey (MRFSS) to provide catch and effort data for specific species of interest for individual states. The Handbook also identified priority issues in recreational fishery research, development, and management. The improvement of recreational fishery statistics, particularly catch and effort data, was identified as the top priority.

The recommendations produced from this survey centered on states increasing their funding and personnel dedicated to recreational fisheries statistics programs, and the encouragement of compatibility between state and federal surveys. The second major focus of these recommendations was the encouragement of cooperative efforts between state and federal agencies to provide more accurate and reliable catch and effort estimates for inter-jurisdictional fisheries.

In January 1993, the ASMFC surveyed its member states to assess state participation levels in the MRFSS, the level of MRF statistics collection by each state, and how state and federal resources can be directed to improve existing MRF statistics programs on the Atlantic coast (Christian 1993). States were also asked to provide criticisms and/or concerns of the MRFSS. The concerns listed in this survey include increased sample sizes, increased

precision of catch and effort estimates at the state level, improvements in random sampling techniques, and more even geographic distribution of the survey.

Similar concerns are shared by fishery management agencies on the Pacific and Gulf coasts. The Gulf and Pacific Marine Fisheries Commissions addressed these issues by submitting a proposal to the National Marine Fisheries Service to establish a program called the Recreational Fisheries Information Network (RecFIN). RecFIN is designed as a state/federal cooperative program with the Commissions taking a lead role in coordinating the collection and processing of marine recreational fisheries statistics. The RecFIN-Southeast program includes states along the Gulf of Mexico, as well as the Atlantic coastal states of Florida, Georgia, South Carolina, and North Carolina.

The position adopted by the ASMFC Management and Science Committee is to support the Pacific and Gulf RecFIN programs in concept. The Committee recommended that the ASMFC staff be authorized to coordinate marine recreational statistics activities with the ASMFC member states, the New England, Mid-Atlantic, and South Atlantic Fishery Management Councils, the Pacific and Gulf Marine Fisheries Commissions, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service as a means of improving Atlantic coast marine recreational fisheries statistics programs. To assist in coordination of recreational statistics programs, the ASMFC has established a Marine Recreational Fisheries Statistics Committee consisting of the technical level personnel from state and federal agencies, as well as the regional councils. The role of this Committee is to provide an open forum for the discussion of the problems and concerns with existing MRF statistics programs, and to provide technical assistance in the coordination of a more comprehensive coastal, and possibly national, marine recreational fisheries statistics program.

This report provides the foundation for the future role of the Marine Recreational Fisheries Statistics Committee by providing summaries of state and federal MRF data collection programs conducted in 1992 and by documenting the overall objectives of the Committee. Specific topics concerning marine recreational fisheries statistics programs have been identified and defined by the Committee.

Committee Overview

The broad objectives of the ASMFC Marine Recreational Fisheries Statistics Committee are designed to provide guidance to the Committee in drafting specific tasks to address the concerns of State, Federal, and Council fishery management agencies. The role of the Marine Recreational Fisheries Statistics Committee is to foster cooperation and coordination between agencies for the overall purpose of improving MRF data collection programs and ensuring that these programs provide reliable statistics on recreational fisheries. Major program goals include:

- to enhance coordination and cooperation among state and federal marine

recreational fisheries statistics programs

- to ensure compatibility of data collected through state and federal programs
- to identify common data needs and levels of precision/accuracy for efficient management of important Atlantic coast fish stocks on a regional and state level
- to advance uniform quality control standards for state/federal data collection programs
- to encourage greater efficiency in statistical survey programs, and to reduce duplication of sampling effort between state and federal marine recreational statistics programs
- to encourage an increase in timeliness and dissemination of marine recreational fisheries data to state and federal management agencies, and the fishing public
- to evaluate and recommend innovative data collection technologies
- to encourage training and increased knowledge in the use of marine recreational fisheries statistics data in management of Atlantic coast fisheries
- to encourage long term data collection systems or special surveys to supplement state/federal marine recreational fisheries statistics programs

Marine Recreational Fisheries Survey Overviews

The U.S. Fish and Wildlife Service (USFWS) conducts the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation on a five-year basis to provide estimates of participation and expenditures in fishing, hunting, and non-consumptive activities. This survey also provides the basis for the state level freshwater to saltwater participation proportions used by the majority of states for the allocation of Wallop-Breaux funds between their fresh and saltwater fisheries agencies.

The National Marine Fisheries Service (NMFS) conducts the Marine Recreational Fisheries Statistics Survey (MRFSS) to provide estimates of catch, effort, and harvest for marine recreational fish species along the Atlantic coast. The survey was designed to provide species-specific estimates on a regional basis to assist the Fishery Management Councils in assessing the status of the stocks and developing fishery management plans for the Exclusive Economic Zone (EEZ). The survey also provides species-specific estimates on a state basis; however, depending on the type and scope of the fishery in state territorial waters, the estimates may not be accurate enough for use in state fishery management plans.

The majority of Atlantic coastal states from Maine to Florida conduct state-specific marine recreational fisheries statistics surveys to assist in managing their respective recreational fisheries. The temporal and spatial scope of these state programs varies, with some states conducting only limited one-time surveys for a particular species, and other states having a long-term dedicated program for the collection of MRF statistics.

Of the 14 states providing a presentation of their 1992 state-specific surveys, eight states presently provide some augmentation to the MRFSS (see Appendix A for state reports). The majority of states augment the MRFSS through add-ons; the increase of access-intercept or telephone interview sample sizes through state funds, so as to provide greater precision on species-specific catch estimates at the state level. Several states (CT and NC) have also added special questions to the telephone portion of the MRFSS survey to provide information on specific management issues of concern to that state.

Of the 14 states surveyed, all but two states conducted marine recreational fisheries surveys in 1992 separate from the MRFSS. The majority of these surveys were conducted to provide information on a specific fishery of importance within that state. Several of the states (MA, CT, NJ, MD, VA, and NC) conduct surveys that are specifically designed to provide catch, effort, and harvest data for their striped bass fisheries. Several of the northern states (ME, MA, CT, NJ, and MD) conduct, or will conduct in 1994, surveys designed to collect MRF data through the cooperation of volunteer anglers (log book surveys).

Specific Topics of Concern

The management of Atlantic coast marine recreational fisheries is complicated by the interjurisdictional nature of the majority of these fishery resources. Proper management of these fisheries depends on the availability of accurate and reliable catch and effort statistics. The MRFSS was designed to provide species-specific catch and effort data on a regional basis. The overview of state-specific surveys provides some indication of the expense and increased effort expanded by the states to increase sample sizes in the MRFSS. The majority of state fishery management agencies do not have a dedicated program for the collection of marine recreational fishery statistics. However, several states are examining the potential of designing a state-wide MRF statistics program with dedicated funds through a licensing base. At present, there is little coordination among the various state and federal marine recreational fisheries statistics programs. To provide more reliable data over a wider range of recreational fishery species, a more coordinated effort needs to be instituted. The ASMFC Marine Recreational Fisheries Statistics Committee will provide the forum for discussion of common concerns and/or problems with existing programs, and the potential to provide the coordination necessary to initiate a coastwide program for the collection, analysis, and dissemination of marine recreational fisheries statistics.

A list of 23 topics of concern associated with marine recreational fisheries programs was developed through open discussions among State, Federal, and Council Committee members. Each topic was defined by the Committee, with emphasis on specific items of concern within each topic. The Committee did not attempt to prioritize the topics, therefore, the following list is not arranged in order of importance. A survey of all Committee members is presently being conducted to determine the priority of these topics.

1. Site selection and allocation

Sampling site selection and allocation of interviews to specific sites is important in assuring the temporal and spatial coverage of sampling of the fishery. Specific issues concerning the MRFSS include the low number of sampling sites and access-intercept interviews allocated to the Delaware Bay and the omission of Pennsylvania from the MRFSS survey. Site selection and allocation problems may be due to the overall survey sampling design or possibly due to problems with the comprehensiveness of the sampling frame. Irrespective of the causes of the problems, limited coverage or omissions of certain regions can cause large gaps in catch and effort data for a specific species or area. Overall, this will cause problems for fishery managers when attempting to assess the status of the stock and manage across the distributional range of the species.

2. Accessibility of data

Due to the great variety of MRF sampling programs, a major concern to fishery managers is the accessibility of marine recreational fishery data. The lack of coordination in survey design and data formatting can cause a general lack of knowledge on how to access the various databases. Many databases will be more easily accessed than others, possibly causing fishery managers to omit relevant data in assessing the status of fish stocks only due to difficulties with data accessibility. A broad standardization of data format, as well as user-friendly computer access programs, could provide fishery managers with the necessary tools to retrieve the pertinent data required to manage the fishery resources.

3. Timeliness of data

In conjunction with the concern over accessibility of MRF data, is a similar concern over the timeliness of data reporting. Many fishery managers utilize published reports of marine recreational fishery statistics for monitoring of the status of a fishery resource or for input into their overall management strategy. With many fishery resources presently being managed under a quota management system, timeliness of data reporting is essential to closely monitor catch quotas. Delays in the reporting of fishery statistics may inadvertently lead to delayed closure of a

fishery, and possibly lead to overexploitation or stock collapse.

4. Accuracy and precision of estimates

Reliable estimates of catch and effort are required for stock assessments of fishery resources during and prior to the commencement of the fishery management planning process. All parameters estimated through marine recreational survey methodologies should be accompanied by measures of their reliability, including estimates of accuracy and precision, as well as sample sizes. Appropriate levels of accuracy and precision need to be determined for all Atlantic coast fisheries, to provide guidance in the collection of accurate fisheries statistics. Alternative methodologies for the determination of accuracy and precision also need to be evaluated.

5. Waterbody level data

Marine recreational fisheries statistics are typically reported on a regional or state-wide basis. The majority of marine recreational fishery data collection programs are not designed to provide fine scale estimates of catch, effort, and participation; ie., specific bays, inlets, and river systems. Survey sampling designs and appropriate sample sizes need to be evaluated so as to provide accurate and precise estimates of MRF statistics for utilization in management of fishery resources on a bay or river system basis. The evaluation of post-stratification schemes of existing MRF databases may provide an alternative method of providing fine scale parameter estimates.

6. Anadromous/tidal freshwater fisheries data

The majority of MRF sampling programs do not collect data for anadromous and/or tidal freshwater fisheries due to the lack of access-intercept sampling sites in the regions where these fisheries are prosecuted. This data deficiency may be important when attempting to manage a fishery throughout its geographic range. At present, there is a lack of concensus on the definition of a tidal freshwater fishery, with fishery boundaries varying by state, area, or region. Specific topics of interest are similar to those previously discussed; ie., survey sampling design, site selection and allocation, appropriate sample sizes, and issues of accuracy and precision.

7. Use of data in management and stock assessment

Accurate and precise estimates of marine recreational fisheries statistics are essential in stock assessment and management of marine fishery resources. Specific data requirements for stock assessment purposes need to be identified and assigned priority in MRF data collection programs. The presence of data gaps, which hinder reliable stock assessments, also need to be identified. With many fishery resources

presently managed under a quota management regime, alternative methodologies and data requirements specific to quota management need to be evaluated.

8. Guidelines for data presentation and use

Presently, there are no standard guidelines for the presentation of MRF data. The reporting of marine recreational fishery statistics should be accompanied by the inclusion of confidence intervals about all parameter estimates. Statements concerning the assumptions of the data analyses and the limitations of the data for other applications may be appropriate. The major concern when presenting any statistical data should be the realization for the potential misuse of that data. An attempt should be made to prevent this from occurring through presentation of the proper uses of the data.

9. Standard protocols for data analysis

Marine recreational fisheries statistics are presently utilized by the regional fishery management councils, the interstate marine fisheries commissions, and state and federal fishery management agencies to assist in the assessment and management of marine fishery resources within their jurisdictions. At present, there is no standard protocol among agencies for the utilization and analyses of MRF data. Assistance could be provided to these agencies by providing standardization in data analyses, possibly through computer programs designed for specific analyses such as bag limits, catch and length frequency, and quota management.

10. Coordination between fishery-dependent (commercial and recreational) and fishery-independent data

Currently, there is insufficient coordination among data collection programs, including fishery-dependent sampling programs to collect commercial and recreational statistics, and fishery-independent sampling programs. Until recently, council and commission management plans for marine fishery resources excluded marine recreational fishery statistics, either due to the lack of any data for the recreational fishery or due to extremely unreliable data. Responsible management of fishery resources entails the utilization of data on all aspects of the fishery. To properly assess the status of a fishery several disparate data collection programs may be required. The identification of data needs for stock assessment and management, and the coordination among collection programs to provide that data, may provide the means to manage fishery resources in a more holistic manner.

11. Survey participation issues

The use of telephone surveys is one method for management agencies to collect data concerning participation in marine recreational fishing. However, due to the

overwhelming number of telephone surveys utilized today, there is a potential for oversaturation. This will result in a higher number of refusals to respond to the survey questions. The consequences of oversaturation may be a decrease in sample size, with an associated decrease in precision, or possibly an increase in expended effort required to maintain sample size. The potential for oversaturation needs to be examined, with focus on possible mechanisms to evaluate refusal rates.

12. Non-finfish and non-hook and line data

The majority of marine recreational fishery statistics survey programs target recreational hook and line finfish anglers, resulting in a lack of data on shellfishing, tournament fishing, recreational trawling, gillnetting, and dipnetting. The collection of MRF statistics on these fisheries typically requires alternative survey methodologies. Several states have designed and conduct special state marine recreational fishery surveys to collect catch and effort statistics on these atypical fisheries. An evaluation of the adaptability of these special surveys to the needs of other states may provide an efficient method of collecting data on a variety of fisheries with a limited amount of effort. It may even be possible to design a suite of special surveys to address the concerns of a broad array of specific fisheries.

13. Charter/party boat data

The majority of marine recreational fisheries statistics surveys are stratified on the basis of mode of fishing; ie., private/rental boat, shore, and charter/party boat fishing. Comparatively, there are fewer numbers of charter/party boat interviews, leading to higher variances about catch and effort estimates produced for this mode of fishing. An evaluation of specific survey methodologies to enhance the data collected on charter/party boat fishing is required to provide managers with more reliable estimates.

14. Design of special surveys

Most marine recreational fisheries statistics programs are designed to collect data on traditional fisheries, and therefore, data on a variety of unique fisheries, such as night fishing, rare event fisheries, and pulse fisheries is either nonexistent or extremely limited and unreliable. Special MRF surveys and alternative analytical techniques are required to provide accurate and precise catch and effort statistics on these fisheries for monitoring and management purposes.

15. Public information and education

Fishery-dependent collection programs, such as those typically utilized to collect data on marine recreational fisheries, rely on the cooperation of the public fishing sector. Education of the general public on the various data collection programs, the diverse

types of data collected, and the need for this data in management of marine resources will enhance public awareness and understanding of the importance of these programs. This increase in public awareness could be accomplished through the publication and distribution of brochures, slideshows, and periodic non-technical reports. Distribution of this information should include the general public, the fishing public, sport fishing media, and sport fishing industry, as well as the various management agencies.

16. Socio-economic data

The majority of marine recreational fisheries surveys are designed to collect data on catch, effort, and participation. Occasionally, socio-economic data have been collected in conjunction with this biological data, and in some cases, special surveys have been designed to collect socio-economic data on marine anglers. State and federal fishery management agencies are required to utilize socio-economic data, as well as biological data, in the drafting of fishery management plans. However, for the majority of species, socio-economic data is completely lacking. To provide more comprehensive management of marine resources, a determination of the data requirements and data gaps concerning socio-economic data is required, as well as an evaluation of the various collection and analytical/assessment methodologies available to fishery managers in the analysis and use of socio-economic data in fishery management.

17. Effort estimation methods

There are various analytical methods of estimating fishing effort through marine recreational fisheries statistics surveys. However, the majority of surveys utilize only a few of these analytical methods. An evaluation is needed of alternative methods to estimate fishing effort, in conjunction with the evaluation of corresponding estimates of accuracy and precision produced by these various techniques.

18. Cooperative angler programs

Several state fishery management agencies collect data on marine recreational fishing through cooperative angler programs; ie., volunteer angler surveys, logbooks. These cooperative angler programs provide a means of collecting data on marine recreational fishing with limited financial resources and agency personnel. With expansion of these programs, it is essential that the various methodologies be identified and an evaluation be conducted of the application of these volunteer programs to specific management issues and to various fisheries. Evaluations of possible avidity bias and accuracy/precision problems also need to be conducted.

19. Southeast Headboat Survey

The Southeast Headboat Survey, conducted by the National Marine Fisheries Service, in Beaufort, NC, exclusively provides data on the charter/headboat fisheries of the Southeast region. To thoroughly evaluate the appropriateness of the data provided by this survey to state and federal fishery management agencies, the overall survey design and analytical methodologies should be examined, with particular emphasis on review of the assumptions of the analytical methods. A thorough evaluation of this survey should also include a determination of the compatibility of the data collected by the Southeast Headboat Survey with other surveys, such as the MRFSS.

20. Recreational license data bases

The initial step in the design of any survey is the determination of the sampling frame. In the case of a marine recreational fishing survey, such as the MRFSS, the sampling frame could be all fishing sites for an access-intercept survey, or all dialing codes for a telephone survey. A great deal of wasted effort is expended when using random dialing codes as a sampling frame for a telephone survey, due to the high potential of calling households where no anglers reside. The use of a recreational license data base as a sampling frame will greatly increase the efficiency of the data collection program. A thorough evaluation of the possible biases and estimation of license exemptions is necessary prior to utilization of the license data base as a survey sampling frame.

21. MRFSS Add-ons

To increase the reliability of species-specific estimates of catch, effort, and participation at the state level, the majority of Atlantic coastal states provide for some form of augmentation of the MRFSS. An analytical examination of the benefits of adding-on to the MRFSS is necessary, in conjunction with a guide to state agencies on how to optimally allocate their financial resources to the access-intercept and telephone portions of the MRFSS survey. To fully evaluate the necessity of and the potential benefits of MRFSS add-ons, each state needs to draft specific objectives and data requirements for use in stock assessment and resource management.

22. USFWS National Survey

The U.S. Fish and Wildlife Service conducts the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation every five years to determine levels of participation in hunting, fishing, and nonconsumptive recreation. The Survey also provides states with the proportion of fresh and saltwater anglers, which is used by the individual states to allocate Wallop-Breaux funds to fresh and salt water fishery agencies. Due to changes in survey methodology from the 1985 to the 1991 National Survey, the proportion of anglers in fresh and saltwater shifted for many of the

Atlantic coastal states, causing some concerns over Survey sampling and estimation methodologies. Furthermore, the NMFS's MRFSS also provides state-specific estimates of participation in saltwater fishing, many of which do not correspond with estimates produced by the USFWS's National Survey. An evaluation of the differences in survey methodologies between the two federal surveys, and possible future coordination and cooperation between the federal agencies responsible for the collection of this data should be pursued. State assistance in the design of the 1996 National Survey is recommended as a means of providing reliable and pertinent data to the states on fishing participation.

23. Private Versus Public Access

The majority of marine recreational fisheries surveys provide reliable catch and effort estimates for public ramps, marinas, and shore access points. However, catch-per-unit-effort data for private access points are much more difficult to collect due to limited sampling accessibility. An evaluation of alternative methodologies to collect this data from private access points, both private residences and marinas, is necessary.

Summary

A variety of marine recreational fisheries statistics programs are conducted by Federal and State fishery management agencies. The National Marine Fisheries Service's Marine Recreational Fisheries Statistics Survey (MRFSS) and the U.S. Fish and Wildlife Service's National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, were initially designed to provide estimates of catch, effort, and participation on a regional basis, essentially for utilization in Council fishery management plans. However, due to the interjursdictional nature of Atlantic coast fisheries, it was also necessary to provide harvest data on recreational fisheries on a finer scale. Fishery management plans drafted by the Atlantic States Marine Fisheries Commission require harvest statistics on a statewide basis for use in stock assessments and state level management regimes. Individual states may also require data on a waterbody level basis for management of limited localized fish stocks or fisheries.

Presently, the majority of Atlantic coastal states conduct independent surveys for the collection of marine recreational fisheries statistics to provide for more reliable management of fisheries in state jurisdictions. Many of the states also supplement the MRFSS through augmentation of interviews in the telephone and/or access-intercept portions of the survey, with the express purpose of increasing precision of catch and effort estimates.

Reliable data on recreational fisheries are essential for proper assessment and

management of Atlantic coastal fisheries. Historically, many of the fishery management plans drafted by the Councils and Commissions could only utilize data on marine recreational fisheries in a qualitative manner in stock assessments due to inaccuracy or lack of data on certain species. With the advent of quota management systems for management of several fisheries in territorial and state waters, the need for accurate and timely data is essential. In recent years, management agencies have attempted to identify the basic data elements necessary to meet minimal management needs. However, the identification of data requirements and deficiencies is only the first step in the process of overall improvement in the collection of marine recreational fisheries statistics.

The overall goal of the ASMFC's Marine Recreational Fisheries Statistics Committee is to enhance coordination and cooperation among State, Federal, and Council marine recreational fisheries statistics programs, and to provide a forum for fishery managers to discuss and identify the concerns and problems common to marine recreational fisheries statistics programs. The specific items of concern identified by the Committee ranged from problems with particular surveys (ie., MRFSS, National Survey, and Southeast Headboat Survey), to more general concerns pertaining to survey sampling design, data analysis, and data presentation and dissemination. Specific items of concern within these broad areas included accuracy and precision issues, accessibility of data, and lack of data on more unique fisheries or modes of fishing.

Committee membership is comprised of technical level personnel, thereby providing a forum for the evaluation of these topics on a technical and statistical basis. The overall goal of the Committee is to provide tangible products and advise to State, Federal, and Council fishery managers for the improvement of marine recreational fisheries statistics programs. Products will include, but not be limited to, a users manual for the MRFSS, as well as on-site training sessions for State and Council personnel; critical evaluations of alternative statistical and analytical techniques for the estimation of accuracy, precision, fishing effort, and confidence intervals; public education programs on marine recreational fisheries surveys; technical evaluations of existing surveys and databases; and the evaluation of alternative and complementary survey designs.

STATE-SPECIFIC SURVEYS

Maine

by

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In 1989 the Maine Department of Marine Resources (DMR) conducted a sea sampling program to collect MRF data.

Sea Sampling Program

The sea sampling program was initiated to survey recreational charter boats (>16 passengers) targeting groundfish. This program is part of "Ecology of Groundfish Along the Coast of Maine" funded under the Sport Fish Restoration Act. A list of all vessels licensed to operate out of Maine ports was obtained from the U.S. Coast Guard and recreational vessels targeting groundfish were identified and contacted. During the 1992 season, DMR identified 16 vessels hailing from the ports of York to Eastport, with the majority of vessels operating west of the Boothbay Harbor region. The primary season along the Maine coast is during the months of June, July, and August, however, a few vessels begin in April and fish to the end of October.

Sea sampling was done on a "boat availability" basis. Boats were initially selected haphazardly from the listing and operators were contacted to see if DMR personnel could go on board sometime during a given week. Problems with either weather, scheduling, or other unforeseen complications on the part of the boat occasionally frustrated scheduling plans and led to a non-random sampling scheme. The intent of this program was to sea sample each vessel at least once during the season.

Data collected on each sea sampling trip included:

1. Start and stop time of fishing at each stop.
2. Geographic location.
3. Number of anglers fishing at each stop.
4. Water depth.
5. Type of bait or jig used.
6. Fishing strategy; ie., drift or anchor.
7. Each fish caught, regardless of whether it was released, measured to the nearest cm.
8. Otoliths removed from each legal cod, pollock, and haddock, as well as noting the stage of sexual maturity.

Results

Results of the 1992 Maine sea sampling program are summarized in Table 1. The data for each sampling date is summarized by species of fish and includes the total numbers of fish caught and the average length. Each of these dates represents a specific charter boat and fishing location, but to maintain confidentiality DMR did not identify the vessel by name or include the specific fishing location in their report.

Atlantic cod was the most frequently targeted fish by the charter boat industry. Atlantic cod stocks are presently heavily overfished in the Gulf of Maine and have come under special scrutiny by the recently established Plan Development Team (PDT) of the New England Fishery Management Council. In particular, questions were raised concerning the size of fish caught, the size of fish discarded, and frequency of discard versus legal size fish. The PDT is considering the consequences of increasing the minimum legal size of cod from 19" to 21" in Federal waters in New England.

The data collected by DMR from 1989-1992 is some of the only data available on Atlantic cod discard rates (Figure 1). The data clearly shows the dependence of the charter boat fleet on a single year class of cod. In 1989 greater than 50% of the fish caught were sublegal and consequently were discarded. By 1991 over 70% of the cod landed were greater than 19" in length.

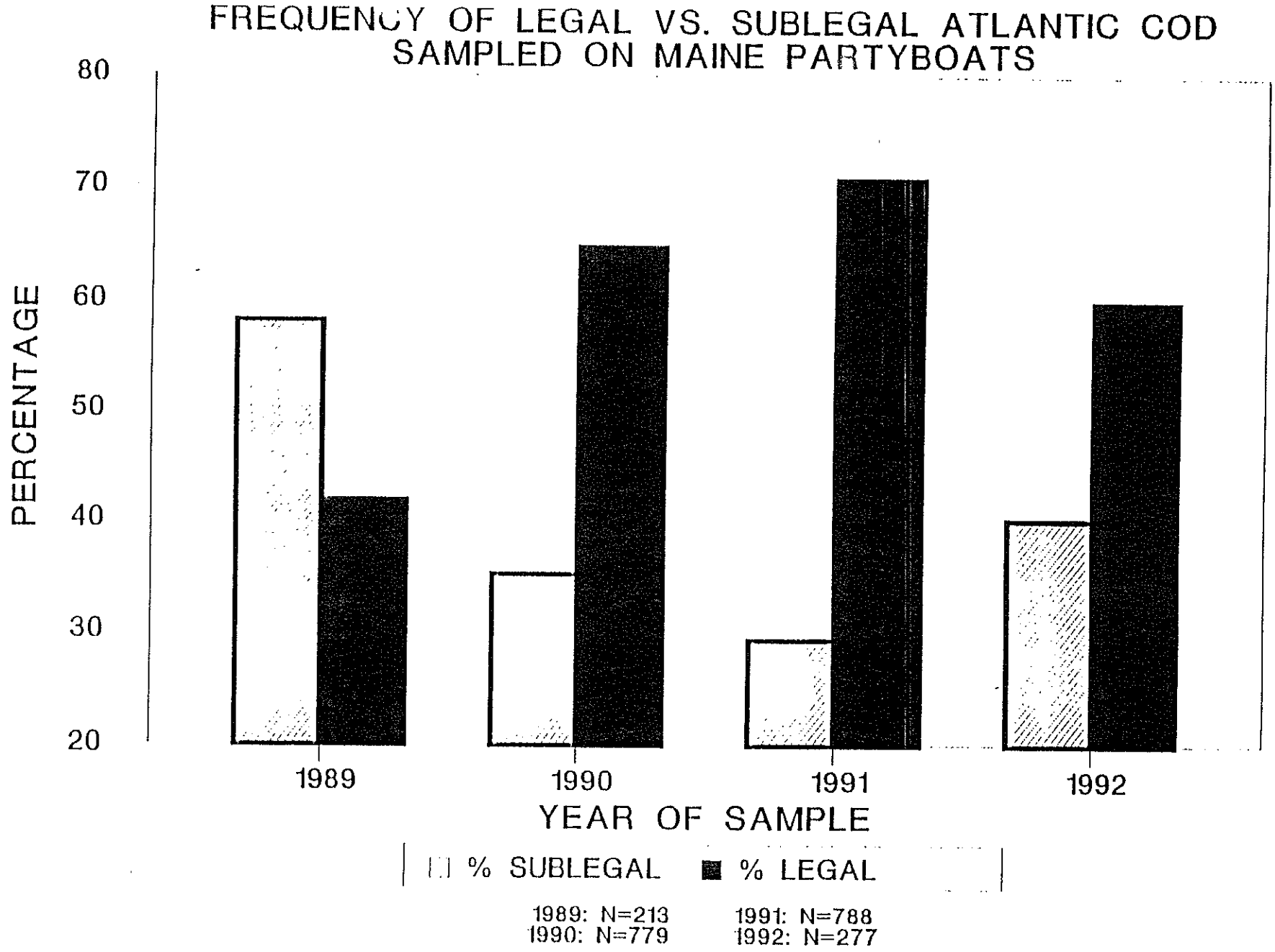
Table 1. Summary of the sea sampling data collected on sport fishing charter boats working out of Maine ports during the 1992 season. Each date represents sampling on board a single charter boat. The data are summarized by date for each species caught. The length is in centimeters and represents total length or fork length where appropriate.

Date	Species	Count	Average Length (cm)
5-30-92	Cusk	6	49.0
	Atlantic Cod	76	48.7
	Herring	1	0.0
	Pollock	3	25.3
	Sea Raven	2	0.0
Subtotal		88	
6-09-92	Cusk	4	65.7
	Atlantic Cod	8	47.4

	Cunner	1	0.0
	Herring	1	0.0
	Mackerel	66	35.4
	Ocean Pout	1	61.5
	Pollock	1	27.1
	Redfish	1	26.3
	Unidentified Sculpin	4	0.0
Subtotal		87	
6-10-92	Cusk	1	61.6
	Atlantic Cod	32	43.9
	Dogfish	2	0.0
	Herring	2	28.3
	Mackerel	14	35.6
	Pollock	6	28.3
	Redfish	1	39.4
Subtotal		58	
6-15-92	Atlantic Cod	98	44.5
	Dogfish	19	0.0
	Longhorn Sculpin	10	26.4
	Mackerel	19	35.1
	Pollock	1	31.5
	Sea Raven	1	37.7
	Wolffish	2	60.5
Subtotal		150	
6-18-92	Atlantic Cod	3	40.9
	Longhorn Sculpin	1	27.8
	Shorthorn Sculpin	4	27.5
	Sea Raven	5	32.2
Subtotal		13	
6-25-92	Cusk	2	57.2
	Atlantic Cod	69	49.7
	Pollock	12	45.6
	Red Hake	1	40.1
	Wolffish	1	59.5

Subtotal		85	
6-30-92	Atlantic Cod	2	48.3
	Longhorn Sculpin	3	0.0
	Mackerel	1	0.0
	Shorthorn Sculpin	5	0.0
Subtotal		11	
7-08-92	Dogfish	1	0.0
Subtotal		1	
Total		493	

Figure 1. Frequency plot comparing the percentage of legal versus sublegal sized cod landed on charter boats during the 1989-1992 Maine fishing season.


FREQUENCY OF LEGAL VS. SUBLEGAL ATLANTIC COD
SAMPLED ON MAINE PARTYBOATS
80
70
60
50
40
30
20
PERCENTAGE
1989
1990
1991
1992
YEAR OF SAMPLE
% SUBLEGAL
% LEGAL
1989: N=213
1990: N=779
1991: N=788
1992: N=277

New Hampshire

by

Douglas Grout
New Hampshire Fish and Game Department

The Marine Fisheries Division of the New Hampshire Fish and Game Department currently conducts three types of MRF surveys: 1) a general open water survey, 2) a winter survey of the recreational smelt fishery, and 3) a voluntary logbook survey of the fall sea run brown trout fishery.

Open Water Survey

New Hampshire's open water marine recreational fishing survey has been conducted annually from April to October (June-September prior to 1987) since 1979, with the exception of 1983 and 1985. The survey is a stratified random sampling design with stratification by weekday/weekend and fishing mode (party boats, private boats, bridge-pier-jetty). Sampling intensity for the boat modes is currently 10% on weekends and holidays and 5% on weekdays. Sampling intensity for the bridge-pier-jetty strata is 3% of the time on both weekends and weekdays. The probability of choosing specific survey locations are weighted by historical angler counts at each location. Sampling times are currently in two hour blocks between noon and 6 PM (daytime only for earlier survey years).

Party boats are sampled at docking times. The bridge-pier-jetty mode is sampled by a roving clerk type survey, and thus angler interviews are of incomplete trips. The private and party boat modes are sampled by access point surveys with interviews being of completed fishing trips.

All private boat and bridge-pier-jetty anglers encountered are interviewed. At least 10% of the anglers on party boats are interviewed and the average catch is expanded by the total number of anglers to provide an estimate of the daily party boat catch. Data collected include:

1. Number of anglers in fishing party.
2. Number of hours fished during the current fishing trip.
3. Number of fish caught and kept for each species.
4. Number of fish caught and released for each species.
5. Length and/or scale sample taken from a sample of fish caught and kept.
6. Target species.

Results

Results of the 1992 Open Water Survey are shown in Tables 2-9.

Winter Smelt Survey

The winter smelt survey targets the rainbow smelt ice fishery in the Great Bay Estuary System and has been conducted annually since 1979, with the exception of the period 1983 to 1986. The survey is a stratified random sampling design with some modifications. Stratification is by weekend/weekday with greater sampling effort on weekends and holidays. One survey is scheduled for each day from ice in to ice out with the time and location selected at random. The probability of choosing specific survey locations are weighted by historical fishing efforts at each location. Each of the four survey locations must be sampled at least once during each weekday period and once on the weekends with supplemental surveys being conducted if random selection does not accomplish this.

Survey periods are two hour blocks of time that occur during a seven hour time period around any high tide that occurs between 6 AM and midnight. The survey uses a roving clerk methodology and thus measures incomplete trips for the most part.

All private boat and bridge-pier-jetty anglers encountered are interviewed. At least 10% of the anglers on party boats are interviewed and the average catch is expanded by the total number of anglers to provide an estimate of the daily party boat catch. Data collected include:

1. Number of anglers in fishing party.
2. Number of hours fished during the current fishing trip.
3. Number of fish caught and kept for each species.
4. Number of fish caught and released for each species.
5. Length and/or scale sample taken from a sample of fish caught and kept.

Results

Results of the 1992 Winter Smelt Survey are shown in Table 10.

Sea Run Brown Trout Logbook Survey

Log books are handed out to any willing angler observed fishing at either of the two rivers managed for sea run brown trout. Anglers are asked to fill out the logbooks any time they fish at either of the two rivers, and mail the logbook in at the end of the fishing season.

Results

Results of the 1992 Sea Run Brown Trout Logbook Survey are as follows:

Number of trips = 44
Number of angler hours = 156.5
Fish/angler hour = 14.2
Number of fish caught = 11

Table 2. Estimated catch (numbers of fish), effort, and CPUE, by month and fishing type, for New Hampshire's marine recreational fishermen in 1992 as derived from New Hampshire's marine recreational fishing survey.

Type of Angler	Month of survey							Total
	April	May	June	July	August	September	October	
Party Boat (or Charter)								
Estimated catch (fish)	1,296	14,747	57,283	16,170	28,491	13,457	3,228	134,672
Angler trips	648	4,912	5,788	12,419	10,932	4,134	1,695	40,528
Angler hours	3,240.0	20,473.9	17,280.5	37,529.8	34,636.0	17,348.9	5,267.0	135,776.1
Fish per angler hour	.40	.72	3.31	.43	.82	.78	.61	1.01
Fish per angler	2.00	3.00	9.90	1.30	2.61	3.26	1.90	3.42
Private Boat								
Estimated catch (fish)	0	7,319	17,684	10,298	6,798	2,597	1,424	46,119
Angler trips	96	851	3,244	3,911	3,517	1,558	245	13,422
Angler hours	448.0	3,899.3	16,786.5	20,123.9	18,348.9	7,124.5	1,148.2	67,879.3
Fish per angler hour	.00	1.88	1.05	.51	.37	.36	1.24	.77
Fish per angler	.00	8.60	5.45	2.63	1.93	1.67	5.80	3.73
Bridge-Pier-Jetty								
Estimated catch (fish)	NS	0	690	326	210	126	0	1,352
Angler trips	NS	297	2,250	2,115	2,760	986	25	8,432
Angler hours	NS	323.3	3,660.0	3,586.6	4,132.5	1,801.1	6.2	13,509.8
Fish per angler hour	NS	.00	.19	.09	.05	.07	.00	.07
Fish per angler	NS	.00	.31	.15	.08	.13	.00	.11
Total								
Estimated catch (fish)	1,296	22,066	75,656	26,794	35,499	16,180	4,651	182,143
Angler trips	744	6,059	11,282	18,444	17,209	6,678	1,965	62,382
Angler hours	3,688.0	24,696.6	37,727.0	61,240.3	57,117.4	26,274.5	6,421.4	217,165.2

NS - NOT SURVEYED

Table 3. The percentage species distribution in the catch of all types of marine recreational angling, by month, in New Hampshire, 1992 (N = sample size).

	Apr.	May	June	July	Aug.	Sept.	Oct.	TOTAL
Bluefish			0.5	15.9	51.6	31.1	0.4	11.5
Atlantic Cod	86.8	41.3	10.6	18.0	11.0	34.0	74.9	21.4
Cunner			0.1	0.2	0.3			0.1
Cusk	2.6	0.5	0.4	1.3	1.5	1.1	1.1	0.8
Conger Eel		0.2						
Winter Flounder		0.9	4.3	13.5	9.5	2.6	0.4	5.7
Yellowtail Flounder				0.2	0.2			0.1
Haddock	2.6		0.2			0.2		0.1
Atlantic Herring					0.2		0.4	0.1
Atlantic Mackerel		52.2	57.2				12.7	33.6
Menhaden				0.2				
Redfish		2.9	0.6	0.7	0.2	2.0	0.7	1.0
Ocean Pout		0.1	0.2					0.1
Pollock		0.7	16.8	13.4	12.6	8.1	7.3	12.0
Sculpins	5.3	0.5	2.0	1.5	0.2	0.2	1.8	1.3
Sea Robins		0.5	0.8					0.4
Dogfish			0.9	21.5	7.9	14.3		6.1
Sharks Unc.				0.1				
Skates Unc.			3.5	9.0	2.6	2.6		3.6
Striped Bass			1.3	4.0	1.2	1.5		1.5
Tautog							0.4	
Wolffish	2.6	0.1	0.4	0.1	0.5	1.1		0.4
Yellow Perch				0.2				
Unknown			0.2	0.1	0.2	1.1		0.2
N	38	1156	3032	1235	881	456	275	7073

Table 4. The percentage species distribution in the catch of full day party boat marine recreational angling, by month, in New Hampshire, 1992 (N = sample size).

	Apr.	May	June	July	Aug.	Sept.	Oct.	TOTAL
Bluefish					5.7	0.6		0.5
Atlantic Cod	86.8	93.0	65.4	77.1	47.1	67.7	94.5	78.4
Cunner								
Cusk	2.6	0.9	0.4	5.7	17.1		2.8	2.6
Conger Eel								
Winter Flounder								
Yellowtail Flounder								
Haddock	2.6		2.6			0.6		0.7
Atlantic Herring					2.9			0.2
Atlantic Mackerel		1.2	29.0					6.5
Menhaden								
Redfish		2.0		0.7		5.2		1.5
Ocean Pout								
Pollock		2.0		6.4	1	9.0	1.8	3.6
Sculpins	5.3	0.6					0.9	0.5
Sea Robins		0.3						0.1
Dogfish				1	12.9	13.5		4.1
Sharks Unc.								
Skates Unc.								
Striped Bass								
Tautog								
Wolffish	2.6		2.6		4.3	3.2		1.4
Yellow Perch								
Unknown								
N	38	342	231	140	70	155	109	1085

Table 5. The percentage species distribution in the catch of half day and evening party boat marine recreational angling, by month, in New Hampshire, 1992 (N = sample size).

	Apr.	May	June	July	Aug.	Sept.	Oct.	TOTAL
Bluefish		0.2	62.8	97.3	72.6	1.5	0.6	18.8
Atlantic Cod	25.8	2.6	2.2	1.6	16.6	38.8	73.3	12.5
Cunner								
Cusk	0.9				3.2		1.7	0.5
Conger Eel	0.9							0.1
Winter Flounder								
Yellowtail Flounder								
Haddock								
Atlantic Herring								
Atlantic Mackerel	61.0	92.8				37.3	14.2	59.6
Menhaden								
Redfish	8.9	0.1			0.6	3.0	1.1	1.1
Ocean Pout	0.5							
Pollock	0.5	2.4	2.8	1.1	1.3	17.9	8.0	3.0
Sculpins	0.9	0.1				1.5	1.1	0.3
Sea Robins								
Dogfish		1.9	31.7		5.7			4.1
Sharks Unc.								
Skates Unc.			0.6					
Striped Bass								
Tautog								
Wolffish	0.5							
Yellow Perch								
Unknown								
N	213	1213	180	185	157	67	176	2191

Table 6. The percentage species distribution in the catch of private boat marine recreational angling, by month, in New Hampshire, 1992 (N = sample size).

	Apr.	May	June	July	Aug.	Sept.	Oct.	TOTAL
Bluefish			1.0	9.9	46.8	19.3		10.4
Atlantic Cod		17.5	9.5	13.5	10.3	17.1	77.8	13.9
Cunner			0.1	0.1	0.2			0.1
Cusk		0.2	0.7	1.0	0.2			0.5
Conger Eel								
Winter Flounder		1.7	8.8	19.9	14.4	7.1	1.0	10.6
Yellowtail Flounder				0.2				0.1
Haddock								
Atlantic Herring			0.1				1.0	0.1
Atlantic Mackerel		78.2	37.3				10.1	27.9
Menhaden				0.2				0.1
Redfish		1.3	1.2	0.9	0.4			0.9
Ocean Pout			0.4					0.2
Pollock			25.3	14.4	10.1	15.0	6.1	15.5
Sculpins		0.3	3.9	2.2	0.4	0.7	3.0	2.3
Sea Robins		0.8	1.6					0.8
Dogfish			0.3	17.9	11.0	25.0		6.7
Sharks Unc.				0.1				
Skates Unc.			7.2	13.6	3.8	8.6		6.8
Striped Bass			1.8	5.9	2.0	3.6		2.5
Tautog			0.1				1.0	0.1
Wolffish			0.5	0.1	0.2			0.2
Yellow Perch								
Unknown			0.3		0.4	3.6		0.3
N	NF	601	1451	810	555	140	99	3656

NF = NO ANGLERS WITH FISH ENCOUNTERED

Table 7. The percentage species distribution in the catch of bridge-pier-jetty marine recreational angling, by month, in New Hampshire, 1992 (N = sample size).

	Apr.	May	June	July	Aug.	Sept.	Oct.	TOTAL
Bluefish								
Atlantic Cod								
Cunner								
Cusk								
Conger Eel								
Winter Flounder			17.4	50.0	50.0	50.0		34.0
Yellowtail Flounder					25.0			4.3
Haddock								
Atlantic Herring								
Atlantic Mackerel								
Menhaden								
Redfish								
Ocean Pout								
Pollock			13.0					6.4
Sculpins			4.3					2.1
Sea Robins								
Dogfish								
Sharks Unc.								
Skates Unc.			4.3		25.0			6.4
Striped Bass			60.9	16.7		50.0		38.3
Tautog								
Wolffish								
Yellow Perch				25.0				6.4
Unknown				8.3				2.1
N	NS	NF	23	12	8	4	NF	47

NS - NOT SURVEYED
NF - NO ANGLERS WITH FISH ENCOUNTERED

Table 8. Percent frequency distribution of number of fish caught per trip, by fishing type and month, in New Hampshire's marine recreational fishery, 1992.

	N	Number of Fish Caught per Trip								
		0	1	2	3	4-5	6-10	11-15	16-24	> 24
PARTY BOATS										
April	19	5.3%	42.1%	36.8%	5.3%	5.3%	5.3%			
May	180	31.1%	11.1%	13.3%	12.8%	10.6%	17.2%	2.8%	1.1%	
June	178	5.6%	9.0%	7.9%	14.6%	14.6%	26.4%	9.0%	5.1%	7.9%
July	300	44.0%	22.7%	14.7%	6.3%	7.7%	4.7%			
August	176	31.8%	19.9%	27.8%	9.1%	3.4%	6.8%	1.1%		
September	102	22.5%	16.7%	16.7%	11.8%	16.7%	11.8%	2.9%		1.0%
October	38	34.2%	15.8%	7.9%	5.3%	2.6%	13.2%	15.8%	5.3%	
Season Total	993	29.3%	17.1%	15.9%	10.0%	9.4%	12.3%	3.2%	1.3%	1.5%
PRIVATE BOATS										
April	13	100.0%								
May	70	47.1%	5.7%	10.0%	1.4%	11.4%	2.9%	1.4%	7.1%	12.9%
June	290	30.7%	12.8%	9.3%	10.3%	11.4%	12.4%	4.8%	1.7%	6.6%
July	325	41.5%	12.6%	13.5%	10.2%	8.0%	10.8%	1.8%	.9%	.6%
August	305	54.4%	20.3%	7.2%	4.9%	4.3%	3.0%	4.3%	1.0%	.7%
September	87	44.8%	20.7%	14.9%	5.7%	4.6%	9.2%			
October	17	41.2%	11.8%	5.9%		11.8%		5.9%	23.5%	
Season Total	1107	43.5%	14.8%	10.3%	7.6%	7.8%	8.1%	3.2%	1.8%	2.9%
BRIDGE-PIER-JETTY										
May	14	100.0%								
June	75	88.0%	5.3%	2.7%		2.7%	1.3%			
July	80	93.8%	2.5%	1.3%	1.3%	1.3%				
August	92	92.4%	6.5%	1.1%						
September	27	88.9%	7.4%	3.7%						
October	1	100.0%								
Season Total	289	91.7%	4.8%	1.7%	.3%	1.0%	.3%			
ALL FISHING TYPES	2389	43.4%	14.6%	11.6%	7.7%	7.6%	8.9%	2.8%	1.4%	2.0%

Table 9. Catch per unit effort statistics (number fish/angler hour), by month and fishing type, for open water marine recreational fishery in New Hampshire, 1992.

	April	May	June	July	Aug.	Sept	Oct.
PARTY BOAT (OR CHARTER)							
Mean	0.4	0.78	2.96	0.5	0.65	0.82	1.16
Variance	0.13	0.77	9.33	0.49	0.84	0.83	1.88
Standard Deviation	0.36	0.88	3.06	0.7	0.91	0.91	1.37
Standard Error of Mean	0.08	0.07	0.23	0.04	0.07	0.09	0.22
Coeff. of Variance (%)	90.0	112.8	103.4	140.0	140.0	111.0	118.1
Relative Standard Error (%)	20.0	9.0	7.8	8.0	10.8	11.0	19.0
95% Confidence Interval (+%)	39.2	17.6	15.2	15.7	21.1	21.5	37.2
PRIVATE BOAT							
Mean	0	1.7	1.01	0.5	0.28	0.35	1.19
Variance	0	9.38	2.67	0.88	0.25	0.21	2.31
Standard Deviation	0	3.06	1.63	0.94	0.5	0.46	1.52
Standard Error of Mean	0	0.38	0.1	0.05	0.03	0.05	0.37
Coeff. of Variance (%)	0	180.0	161.4	188.0	178.6	131.4	127.7
Relative Standard Error (%)	0	22.4	9.9	10.0	10.7	14.3	31.1
95% Confidence Interval (+%)	0	43.8	19.4	19.6	21.0	28.0	60.9
BRIDGE-PIER-JETTY							
Mean	NS	0	0.11	0.06	0.04	0.07	0
Variance	NS	0	0.12	0.07	0.02	0.05	0
Standard Deviation	NS	0	0.35	0.26	0.15	0.22	0
Standard Error of Mean	NS	0	0.04	0.03	0.02	0.04	0
Coeff. of Variance (%)	NS	0	318.2	433.3	375.0	314.3	0
Relative Standard Error (%)	NS	0	36.4	50.0	50.0	57.1	0
95% Confidence Interval (+%)	NS	0	71.3	98.0	98.0	112.0	0

NS - NOT SURVEYED

Table 10. Estimates of catch, effort, and CPUE, by month and location, for the marine recreational ice fishery for rainbow smelt in New Hampshire, 1992.

WEEKEND/WEEKDAY COMBINED

	LOCATION				
	Squamscott River	Lamprey River	Bellamy/ Oyster	Great Bay	TOTALS & MEANS
DECEMBER					
No. of Angler Trips:	60	588	0	336	984
No. of Angler Hours:	120	1,176	0	648	1,944
No. of Smelt Caught:	326	2,607	0	291	3,224
Catch per Angler Hour:	2.7	2.2	0.0	0.4	1.7
Number of Interviews:	5	37	0	28	70
JANUARY					
No. of Angler Trips:	3,490	2,088	294	2,500	8,372
No. of Angler Hours:	6,924	3,823	588	5,000	16,336
No. of Smelt Caught:	9,453	7,840	158	5,142	22,592
Catch per Angler Hour:	1.4	2.1	0.3	1.0	1.4
Number of Interviews:	262	142	8	230	642
FEBRUARY					
No. of Angler Trips:	1,373	2,937	60	1,940	6,311
No. of Angler Hours:	2,446	4,949	120	3,881	11,395
No. of Smelt Caught:	1,770	10,147	0	5,554	17,470
Catch per Angler Hour:	0.7	2.1	0.0	1.4	1.5
Number of Interviews:	133	109	2	178	422
MARCH					
No. of Angler Trips:	6	0	0	0	6
No. of Angler Hours:	12	0	0	0	12
No. of Smelt Caught:	0	0	0	0	0
Catch per Angler Hour:	0.0	0.0	0.0	0.0	0.0
Number of Interviews:	1	0	0	0	1
TOTAL TRIPS	4,929	5,613	354	4,776	15,673
TOTAL ANGLER HOURS	9,502	9,948	708	9,529	29,687
TOTAL CATCH	11,548	20,594	158	10,988	43,287
% CATCH	26.7%	47.6%	0.4%	25.4%	
CPUE	1.2	2.1	0.2	1.2	1.5

Massachusetts

by

Paul Diodati
Massachusetts Division of Marine Fisheries

Massachusetts conducts three MRF survey programs: 1) MRFSS add-ons, 2) the Massachusetts Sportfishing Tournament Monitoring Program, and 3) the Cooperative Saltwater Angler Survey.

MRFSS Add-ons

The Massachusetts Division of Marine Fisheries relies on the MRFSS to provide baseline information on recreational fisheries statistics. To improve the accuracy of survey estimates, the Division contracts David C. Cox and Associates, KCA Research Division to conduct 4,048 on-site interviews (intercepts) along the Massachusetts coastline. These intercepts are in addition to the 2,024 that are normally allocated by the NMFS. The Division began the intercept add-on in 1988.

Results

Table 11 shows the 1979-1992 MRFSS survey estimates for the Massachusetts striped bass catch. The improvement in accuracy (based on lower proportional standard errors) since 1988 is quite evident.

Tournament Monitoring Program (TMP)

The Division began the Tournament Monitoring Program (TMP) in 1987 in an effort to characterize the relative abundance of pelagic tunas, sharks, and marlins off the Massachusetts coast. Although the imposition of minimum sizes, species eligibility restrictions, and other tournament related biases are introduced to these data, it still provides accurate catch and effort information which is often lacking for offshore recreational fisheries. The TMP also allows an excellent opportunity to collect biological information. Given the highly migratory nature, large sizes, and long life span of marlins, tunas, and sharks, data acquisition and biological studies can be expensive and difficult to execute.

Results

In 1992, five marlin/tuna/shark tournaments, two shark tournaments, and two bluefin tuna tournaments were attended. Catch per unit effort estimates from these events are summarized in Tables 12 and 13.

Cooperative Saltwater Angler Survey (CSAS)

The Cooperative Saltwater Angler Survey (CSAS) was drafted in 1992 and is being conducted as a pilot program during 1993. The survey is based on survey booklets, similar to those used in Connecticut, which will be provided to volunteer anglers. The survey will provide the following information:

1. Catch composition, by species and by size.
2. Effort, hours fished.
3. Area fished.
4. Tag recovery information.
5. Disposition of the catch on a trip by trip basis.

It is hopeful that this survey will in some way augment the MRFSS, provide fishermen with an opportunity to contribute to the research effort, and help educate its participants on how to increase the chance of survival of their released catch.

Table 11. MRFSS estimates of Massachusetts striped bass catch, 1979-1992. PSE = proportional standard error.

Year	Estimate	PSE
1979	66	38
1980	24	41
1981	27	42
1982	129	40
1983	68	45
1984	132	45
1985	123	79
1986	655	43
1987	138	28
1988	302	18
1989	236	16
1990	481	14
1991	567	14
1992	980	14

Table 12. Total catch, HPUE, and CPUE estimates from Massachusetts marlin/tuna tournaments.

Species	Number					HPUE (X100)	CPUE (X100)
	Hooked	Released	Tagged	Boated	Lost		
Blue Marlin	5	0	2	0	3	0.324	0.130
White Marlin	5	1	1	0	3	0.324	0.130
Bluefin Tuna	19	12	6	1	0	1.230	1.230
Yellowfin Tuna	58	6	1	49	2	3.756	3.627
Albacore Tuna	27	5	0	22	0	1.749	1.749
Bigeye Tuna	4	0	0	4	0	0.259	0.259
Blue Shark	35	24	11	0	0	2.267	2.267
Mako Shark	7	3	0	3	0	0.453	0.389
Dolphin	2	0	0	2	0	0.130	0.130
Wahoo	1	0	0	0	0	0.065	0.065

Table 13. Total catch, HPUE, and CPUE estimates from Massachusetts shark tournaments.

Species	Number					HPUE (X100)	CPUE (X100)
	Hooked	Released	Tagged	Boated	Lost		
Blue Shark	294	146	119	29	0	22.844	22.844
Mako Shark	32	7	4	18	3	2.486	2.253
Sandbar Shark	3	1	2	0	0	0.233	0.233
Thresher Shark	3	2	0	1	0	0.233	0.233

Rhode Island

by

John Karlsson
Rhode Island Division of Wildlife and Estuarine Resources

Rhode Island conducts one survey for MRF data: 1) MRFSS add-ons.

MRFSS Add-ons

Since 1988 Rhode Island has cooperated with the MRFSS by providing for additional intercept sampling effort. The effect of this effort has been a tripling of intercepts with only minor changes in sample allocation. Rhode Island contracts with the contractor selected by NMFS (KCA Research) to conduct sampling within the state. Rhode Island has not yet received other than preliminary data for 1992 from NMFS.

Results

Data presented in the NMFS reports on the MRFSS program seem to indicate that the precision of estimates for Rhode Island has generally improved since the sampling effort has increased (Table 14).

Table 14. Precision estimates from the Marine Recreational Fishery Statistics Survey (MRFSS) annual catch estimates (number of fish caught in Rhode Island).

Species	1987	1988	1989	1990	1991
Striped Bass	47	30	32		
Black Sea Bass	28		33		
Atlantic Cod	54	24	26	27	29
Winter Flounder	45	21	18	19	27
Summer Flounder	34	23	23	25	21
Tautog	34	19	17	16	24
Scup	25	27	19	20	20
Bluefish	17	16	19	19	15

Connecticut

by

Rod MacLeod
Connecticut Department of Environmental Protection

The Connecticut Department of Environmental Protection (DEP) conducts two surveys for MRF data: 1) a modified MRFSS, and 2) the Connecticut Volunteer Angler Survey.

MRFSS

In 1987 the DEP divided the labor with the NMFS for the collection of MRF data through the MRFSS. Presently, DEP staff perform the MRFSS intercept portion of the survey, while the telephone survey is contracted out by the NMFS. The initial MRFSS Connecticut intercept allocation was tripled in order to estimate catch at the state level with reliable precision (CV<20%) (Table 15). The telephone survey allocation for Connecticut was increased by 2,656 interviews to improve angler and trip estimates (Table 16). In addition, questions were also added to the MRFSS telephone survey, including:

1. The proportion of successful trips and the number of striped bass creeled and released.
2. The prevalence of anglers participating in marine fishing tournaments.
3. The proportion of fresh and saltwater anglers in Connecticut.

Intercept assignments are drawn, by KCA Research, from a master list of known fishing sites. Each site is weighted by activity level (pressure rating) by mode and weekday type for each month and wave combination. The master site list and angler pressure ratings per mode are updated by DEP staff. Intercepts collected for each completed assignment are mailed to KCA Research for data entry and error checking. Species identification, and fish length and weight measurement data are reviewed by both KCA Research and DEP personnel. Once intercept data entry and error checking are complete, the NMFS provides Connecticut with the intercept data on diskette.

Results

A total of 2,849 intercepts were collected during March-December 1992. The intercept distribution comprised 21.1% shore mode, 17.3% party/charter boat mode, and 61.6% private/rental boat mode (Table 17).

Preliminary MRFSS 1992 estimates of total fish harvested (Catch Type A + B1) and total number of fish caught (Catch Type A + B1 + B2) in Connecticut were approximately

3 million and 5 million fish, respectively. Bluefish, scup, tautog, summer flounder, and winter flounder comprised 99% of harvested fish and 91% of the total catch. Precision estimates on harvested fish and total catch were not available from the NMFS. However, precision estimates on the 1991 catch estimates for these species were adequate, with CV's < = 25%.

The estimated number of marine recreational anglers (derived from the telephone survey) that fish in or from Connecticut ports ranged from about 194,000 to 410,000 anglers during 1979-1991. However, precision estimates were inadequate (CV= >50%) with the exception of the 1979 estimate.

Connecticut marine recreational fishing trip estimates ranged from 979,000 to over 1.6 million trips (mean = 1.4 million) from 1979 to 1991 and were computed with good precision (CV < = 20%).

Connecticut Volunteer Angler Survey

The Connecticut Volunteer Angler Survey (VAS) has been in operation since 1979. The survey is designed to collect trip and catch information from avid marine recreational (hook and line) anglers who volunteer to record their angling activities via logbook. Volunteers in the program contribute valuable fisheries-specific information concerning striped bass and other important finfish species. The logbook format collects the following information:

1. Fishing effort.
2. Target species.
3. Fishing mode (boat vs. shore).
4. Areas fished (includes subdivisions of Long Island Sound and adjacent waters).
5. Catch information concerning finfish kept and released.
6. Striped bass length (total length) and weight (lbs.) measurements.

Anglers participating in the program are assigned a code number on their logbooks for confidentiality. Recording instructions are provided on the inside cover and the logbooks are pre-postage paid for mailing. Anglers that send in logbooks are rewarded with a survey fishing hat and updated results of the program.

Results

During 1992, forty-five anglers participated in the Connecticut Volunteer Angler Survey. A total of 2,714 fishing trips were taken by volunteers and their fishing partners. Approximately 56% of the fishing trips were boat trips and 44% were shore trips. Of the trip total, about 1,732 (64%) of the fishing trips targeted striped bass. The percent of successful trips targeting and catching striped bass, of any size, was estimated at about 74%.

A total of about 2,416 striped bass were caught by volunteers. Of the total, 1,923 fish or approximately 80% were measured (total length). Figure 2 describes the length frequency distribution. The number of striped bass measured that were equal to or greater than Connecticut's minimum size limit of 36 inches total length was about 165 fish or about 9% of the measured catch. The percent of legal sized striped bass caught and released was estimated at about 70%.

The striped bass length frequency distribution was converted into an age frequency distribution (Fig. 3). The age of striped bass ranged from approximately 1 to 20+ years. Most of the striped bass measured were of age 2-6 (74%). The average age for striped bass caught by anglers was estimated at approximately 4 years of age.

Catch per unit of effort (CPUE), or fishing effort, was estimated as the number of striped bass caught per successful fishing trip. CPUE for both boat and shore trips combined was estimated at approximately 1.9 fish per trip including kept and released fish.

The number of fishing trips taken by volunteer anglers varied by area (Table 18). In previous years, most volunteer anglers lived in western Connecticut, therefore, most trips occurred in western Long Island Sound. However, in recent years, including 1992, new anglers recruiting into the program recorded fishing trips in areas where data was missing, vastly improving the integrity of the data.

Table 15. MRFSS 1992 intercept survey allocation for Connecticut by mode and wave.

	Wave						
Mode	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	**Total**
Shore	-----	108	138	213	147	102	708
Party/ Charter	-----	93	192	156	183	93	717
Private/ Rental	-----	144	318	645	438	129	1,674
Total	-----	**345**	**648**	**1,014**	**768**	**324**	**3,099**

Table 16. MRFSS 1992 telephone survey allocation for Connecticut by wave (number of households to be contacted).

Wave						
Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	**Total**
------	1,108	1,530	1,920	1,767	1,030	**7,355**

Table 17. Total number of intercepts collected by wave and mode, 1992.

	Wave						
Mode	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	Total	%
Shore	35	140	218	169	39	601	21.1%
Party/ Charter	51	96	148	164	35	494	17.3%
Private/ Rental	30	317	785	571	51	1,754	61.6%
Total	116	553	1,151	904	125	2,849	

Table 18. Percent distribution of angler trips by area from the Connecticut Volunteer Angler Survey, 1992.

Area fished	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
% Trip Distribution	4.1	9.6	6.7	16.7	2.6	0.7	5.4	8.9	10.0	11.1	7.3	8.3	0.3	0.2	3.9	0.6	0	3.6

Figure 2. Connecticut Volunteer Angler Survey 1992, striped bass length frequency distribution.

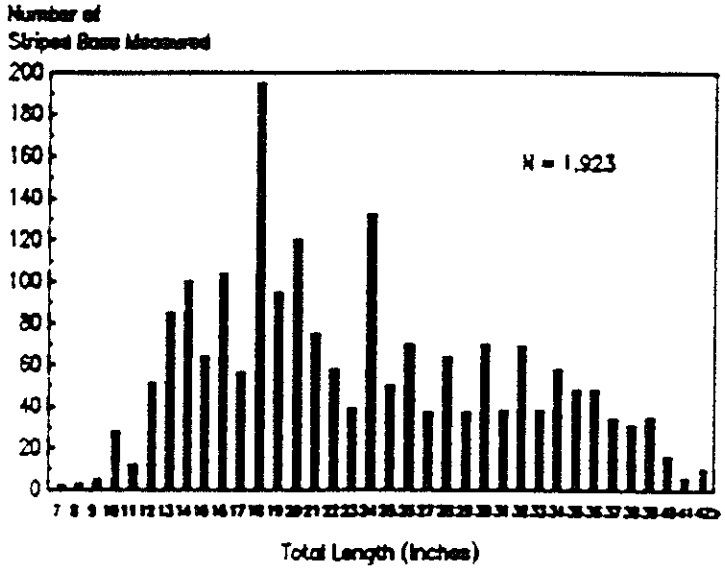
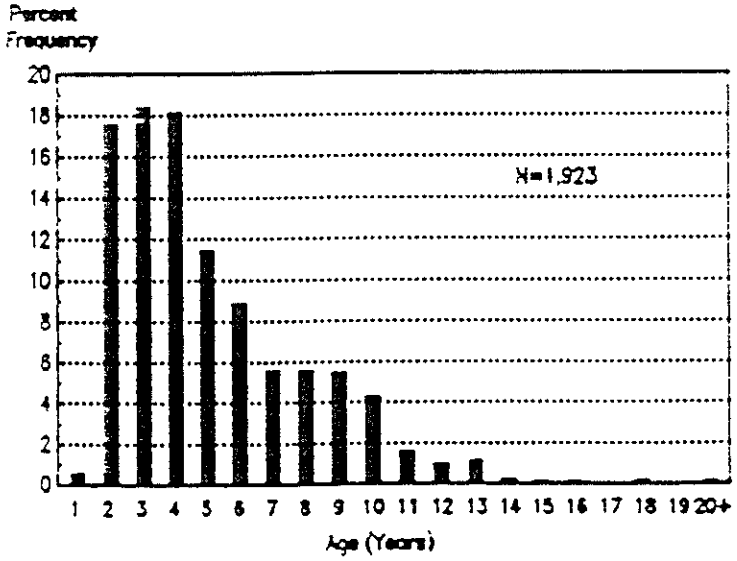


Figure 3. Connecticut Volunteer Angler Survey 1992, approximate age frequency distribution (percent) of striped bass caught and measured by volunteer anglers.



New York

by

John Mason
New York Department of Environmental Conservation

New York has MRF sampling programs for four specific species or species complex: 1) weakfish, 2) summer flounder, 3) winter flounder, and 4) scup/black sea bass/blackfish.

Weakfish Survey

The purpose of this survey is to determine the age and size structure of New York's recreational fishery through a voluntary angler survey. Volunteer anglers are solicited to provide scale samples, lengths, and weights on their weakfish catch. Since the methodology is dependent on the cooperation of anglers, sampling was not stratified but is believed to be representative of angling effort and fish availability.

Summer Flounder

This survey is designed to collect scale samples and length data for summer flounder caught out of Captree, Great South Bay from the open boat fishery (May through September). Approximately 20 trips will be made each year. All summer flounder are measured and a subsample of 30 fish (20 keepers and 10 discards) are sampled for age analyses per trip. All bycatch is noted.

Winter Flounder

This survey was designed to collect scale samples, length, sex, and catch-per-effort data for winter flounder caught out of Captree and the western Long Island Sound area from the open boat fishery (March through November). Approximately 30 trips will be made each year. Scale samples are taken from 30 fish (20 keepers and 10 discards) per trip.

Scup/Black Sea Bass/Blackfish

This survey was designed to monitor the age and size composition of recreational landings of scup and black sea bass. Sampling is confined to July through October since the MRFSS indicates the majority of fishing for scup and black sea bass occurs during this period of time. Initially, the survey will target the party and charter boat fishery as the most cost efficient method of collecting samples for black sea bass. The survey will attempt to target the private and rental boat fishery of scup samples, since these fisheries account for 73% of New York's total recreational catch of scup. Anglers targeting scup will be interviewed for catch, effort, and discard rate data, as well as length and age samples. Initially, a target sample size of 500 scale samples from each species is expected.

New Jersey

by

Bernard Brown
New Jersey Division of Fish, Game and Wildlife

New Jersey has 2 MRF sampling programs: 1) MRFSS add-ons, and 2) a Trophy Fish Program.

MRFSS Add-ons

The Interstate Fisheries Management Plan for Striped Bass requires monitoring of catch and harvest of each state's recreational striped bass fishery. States identified as key states, those whose recreational fishery accounts for a substantial portion of the fishing mortality on the coastal migratory population of striped bass, are further required to demonstrate catch statistics with a defined level of precision (CV < =20%). New Jersey, as a key state, previously (1990-1992) augmented the number of field intercepts of the MRFSS by 1800 interviews during waves 5 and 6 each year to obtain the required level of precision on its catch statistics.

In addition to a state's relying solely on the MRFSS catch statistics to monitor its recreational fishery, other methods are acceptable if they meet the level of precision criterion. The State of Connecticut (a key state) monitors its sport fishery using targeted striped bass catch-effort data from its Volunteer Angler Survey in combination with total fishing effort data from the MRFSS (Crecco 1989). This method of monitoring the striped bass fishery in a key state was approved by the Striped Bass Technical Committee prior to the 1990 fishing season under Amendment 4.

Trophy Fish Program

In 1990 New Jersey instituted a Trophy Fish Program for striped bass sport fishermen based on its historical commercial allocation of 63,800 pounds. As defined by regulation, participants in the Trophy Fish Program are required to submit detailed records on all their striped bass directed fishing trips, completing standard forms supplied by the NJ Division of Fish, Game and Wildlife. While trophy fish landings have not been substantial each year (approx. 2200 lbs.), the contribution of the program's end of season reporting forms on striped bass recreational fishing has been excellent.

Results

To date, New Jersey has received detailed records on catch, effort, and size composition for 7,883 striped bass directed trips in 1991 and over 15,000 trips in 1992 (Table

19). Using CPUE data from the end of season reporting forms for 1991 in combination with total fishing effort data from the MRFSS (Table 20), New Jersey can successfully demonstrate estimating sportfish catch statistics with the required level of precision following the methods outlined in Crecco (1989) (Table 21).

Table 19. Striped bass recreational catch in number, directed effort and catch-per-unit-effort (CPUE) from the 1991 Trophy Fish Program end of season reporting forms in New Jersey. The SE is the standard error about the mean CPUE.

Striped Bass Catch	Total Directed Trips	Successful Trips	Percent Successful Trips	Mean CPUE	SE
8800	7883	3092	39.2	1.11	0.020

Table 20. Total marine recreational fishing trips in New Jersey and the fraction of trips catching one or more striped bass from the MRFSS and Trophy Fish Program end of season forms. The SE is the standard error about the mean total trips.

Mean Total Trips ($X\ 10^3$)	SE Trips ($X\ 10^3$)	Fraction Successful Trips (MRFSS) ($X\ 10^{-2}$)	Fraction Successful Trips (Volunteer Anglers) ($X\ 10^{-2}$)	SE ($X\ 10^{-2}$)
533	382	3.0	39.2	5.49

Table 21. Estimates of total directed effort and total striped bass recreational catches in New Jersey in 1991. The SE is the standard error about the mean directed fishery effort and mean total catch.

Total Directed Fishing Trips ($X\ 10^3$)	SE Trips ($X\ 10^3$	Total Striped Bass Catch ($X\ 10^3$)	SE Catch ($X\ 10^3$)	CV Catch (%)
408.1	55.1	453.0	61.5	13.5

Delaware

by

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Delaware Division of Fish and Wildlife

Delaware has conducted several MRF sampling programs including: 1) independent surveys (1950-1987), 2) MRFSS add-ons.

Independent Surveys

Delaware has a long history of involvement in the collection of recreational statistics on marine fishing. The Delaware Division of Fish and Wildlife began conducting surveys at odd intervals using a variety of collection techniques in the mid 1950's. These surveys intensified in the late 1960's and early 1970's and have been conducted annually since 1982. When the NMFS began conducting annual estimates of marine recreational fishing in 1979, the Division continued their independent estimates of marine fishing and effort through 1987. The Division surveys utilized aerial counts of boats and shore anglers to estimate effort. The Division still conducts estimates of fishing effort independent of the MRFSS estimates in essentially the same way as it has since 1968 (Lesser 1968). The Division has estimated catch and catch per unit effort in a variety of ways over the years, including dockside interviews using seasonal employees, interviews using enforcement or biological personnel, and by means of mail surveys (Lesser 1968, Martin 1973, Miller 1978, Miller 1980, and Seagraves and Rockland 1982).

MRFSS Add-ons

Beginning with the 1988 fishing year, the Division abandoned conducting independent estimates of marine recreational catches and instead began augmenting the MRFSS. In 1988 the Division provided $35,000 to the NMFS contractor for additional dockside interviews and $5,000 for additional phone interviews. Eventually the Division ceased augmenting the phone intercepts and presently, only augments the field intercepts. The 1993 commitment to the MRFSS from the State of Delaware is $43,545 for augmentation of the field intercept program. This amount is expected to generate an additional 1,648 interviews yielding 2,507 total interviews in Delaware, including 859 funded by the NMFS.

Maryland

by

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Maryland Department of Natural Resources

Maryland has occasionally conducted creel surveys of its marine fisheries (Chesapeake Bay and oceanside) since the 1960's. In addition to the MRFSS, Maryland Department of Natural Resources currently conducts three surveys that monitor its recreational and charter fisheries: 1) a creel survey of the recreational striped bass fishery, 2) charterboat logbooks, and 3) a survey of size and number creeled for selected resident and migratory species. Maryland has also added questions onto the MRFSS telephone survey to gain additional information on its recreational fisheries. During 1990, a recreational crabbing survey was conducted as a MRFSS add-on.

Creel Survey of Recreational Striped Bass Fishery

Since 1990, Maryland has conducted a recreational creel survey, conceptually based on the MRFSS, as a requirement of its quota based management of the striped bass fishery. Catch rates and biological characteristics of the harvest are determined from access-intercept interviews and effort is determined from telephone interviews. The design, scheduling, and allocation of sampling effort for the access-intercept and telephone surveys were based on results of a simulation model that estimated sample sizes needed to estimate harvest with a coefficient of variation $<=20\%$, given the range of expected catch and trip rates.

Anglers participating in the recreational fishery are required to obtain a permit and these permits are the basis for a telephone survey which determines trip rate and total effort. To estimate total participation, the number of permit holders is expanded by the proportion of anglers in the access-intercept fishery who did not hold a permit. Trip rate is determined as the proportion of respondents reporting taking a trip on a given day. Approximately 140-200 successful calls were made each sampling week during the 1992 season. Daily effort is estimated by multiplying trip rate by the cumulative number of permits. During 1992, the number of permits increased from 43,224 at the beginning to 136,182 at the end of the season.

Sampling sites for the access-intercept survey are selected from a master list of 155 marinas and 157 boat ramps. The expected use of ramps was assumed to be a function of the number of ramps at the site. The shore fishery and private access were not sampled. Private boat mean daily harvest rate was determined by dividing the mean number of fish kept by the number of people interviewed in the access-intercept survey. Mean catch rates for days when interviews are not conducted are the weighted average of the day preceding

and following. Length samples of the catch were taken from cooperating fishermen and weight of the catch was determined from length-weight regressions. Shore harvest was determined from the telephone survey; shore anglers were asked if they caught a fish. To monitor progress towards the quota, daily harvest is estimated by multiplying trips, harvest rate, and mean fish weight.

CharterBoat Logbooks

The charterboat fishery in Maryland is monitored by logbooks issued to registered charterboats. The captain (owner or other designee) is required to fill out these reports daily and submit them weekly. The number of clients, number of trips, area fished, and species-specific numbers of fish and total pounds kept are recorded.

Survey of Selected Resident and Migratory Species

During 1993, Maryland DNR initiated a project to provide timely information on the populations and recreational harvest of important resident (white perch, catfish, yellow perch) and migratory species (bluefish, weakfish, spot, Atlantic croaker, summer flounder). Creel surveys are being used to gather information on average catch, frequency of catch, and size of fish harvested. This data will be compared to fishery independent size and relative abundance data collected from pound nets, fyke nets, and trawls to assess angler size selectivity. The fishery dependent and independent data will be used to judge the effect of creel and size limits imposed or contemplated by DNR.

This survey has two parts, a spring survey of the tidal freshwater fisheries of the Chesapeake Bay's tributaries (resident and anadromous fishes) and a summer-fall survey of the Bay fisheries (primarily ocean migrants). The tidal freshwater and anadromous spawning migration recreational fisheries of Maryland are short-lived, primarily shore-based fisheries which may have sizeable harvests, but they are not covered by the MRFSS. A nonuniform probability based creel survey is conducted at shore access sites along the Choptank and Chester Rivers during the spring. In the summer, a boat-based roving creel survey will be conducted in the vicinity of pound nets being sampled for fishery independent data. Areas and times sampled will be assigned randomly. The summer roving creel survey will also address differences in trip and catch characteristics of fishermen using public or private access.

Virginia

by

Lewis Gillingham
Virginia Marine Resources Commission

Virginia conducts a MRF survey program to monitor the recreational striped bass fishery.

Striped Bass Recreational Fishing Survey

Virginia conducts a survey to monitor the striped bass recreational fishery, which extends from October 10-24 and November 26 through December 12. A roving creel survey is used to monitor catch rates in eight subregions (Upper Bay, Lower Rappahannock, Upper Rappahannock, Lower York, Upper York, Lower James, Upper James, and Lower Bay). Within each subregion there are one to three "routes" for a total of 19 unique routes. Each route has one to six sites for a total of 60 sites. Sites used in the 1990 and 1991 surveys where no interviews occurred were eliminated; this included sites on the Eastern Shore and in the Potomac River tributaries.

The survey is designed to cover only boat based recreational fishing. Access sites included public boat ramps and marinas with public access. Shore and charter fishing sites were not specifically included although some shore and charter fishing occurred at survey sites and were recorded. Charter harvest was not estimated by the survey. Charter boats were required to obtain a permit and maintain catch logs.

A total of 128 sample periods were planned, with 16 sample days being allocated to each subregion. For each two week season, four weekdays and four weekends were randomly chosen for each of the two fishing seasons for each subregion. For each subregion, the following procedure was followed to develop the final survey schedule:

1. Select days of season to be sampled. As described, for each two week fishing season randomly select four weekdays and four weekend days.

2. For each sample date, a route was chosen at random. Two sites were selected at random without replacement from the chosen route. The first site selected was visited first, the second was visited last.

3. Early shift or late shift sampling was selected at random. Departure times from the first to the second site were selected at random between two hours and six hours after arrival. Minimum time at a site was approximately 1.5 hours.

4. A final constraint on scheduling was placed on the subregions with night sampling.

Since, for the most part, individual agents worked each subregion alone, sampling assignments for morning work were not made immediately following a late evening assignment. If this occurred, the sample days were reversed or shifted to another day within the weekend/weekday time period.

Catch rates were estimated for each geographic area by dividing the total number of fish kept and released by the number of angler trips observed in the intercept survey. 1991 striped bass permittees were contacted by phone after each open fishing period to derive estimates of participation; ie., number of trips taken. Total trips taken by 1991 permittees was estimated by multiplying the average trips per permittee derived from the phone survey by the total number of 1991 permittees. This estimate was further expanded to account for trips taken by anglers not permitted in 1991; as based on the percentage of un-permitted anglers observed in the 1992 intercept survey. Trip estimates for each subregion were calculated by multiplying the total trip estimate by the percentage of trips recorded by subregion in the phone survey. Subregion trip estimates were matched with catch rate estimates by subregion to calculate subregion harvests. Total harvest was the sum of the subregion estimates.

Catch rate data from private access fishing, shore based fishing, or off-hour fishing (late night fishing) was not obtained by the intercept survey. Catch rates for trips nor directly sampled were assumed to be equal to the estimated average for public boat based fishing obtained in the intercept survey. Catch rates for areas with no intercept data, ie. Eastern Shore/Potomac tributaries/Atlantic Ocean, were derived from phone survey catch data.

Results

Tables 22 and 23 detail the estimates of harvest and releases for each fishing period and area. A total of 1,508 anglers were intercepted by the access survey and 1,114 were contacted in the phone survey. The total estimated harvest was 35,443 fish (CV = 7.5), and an estimated 34,362 fish (CV = 16.1) were released, totaling 69,805 fish caught in 69,571 trips. Note that the MRFSS estimate of harvest from November to December in 1992 totaled 36,750 fish.

Statistics for recreational fishing from charter boats were reported by permitted charter boat captains. In 1992, 148 captains were permitted; 48% of those permitted fished. Charter captains reported 1,016 trips, 1,713 fish harvested, and 2,172 fish released. These reports have been added to the estimates for private recreational fishing to derive the total estimates for hook and line fishing depicted in Table 22.

The estimated number of fish at size was derived from length frequency data collected in the access survey (Table 24). For the 618 fish measured, the average length was 24.8 inches. Average weight at length data from the 1992 fall commercial fishery was used to estimate the total pounds landed by the recreational fishery. The estimated recreational

harvest was 224,819 pounds; the average weight was 6.1 pounds per fish (Table 24). Sex and scale samples for approximately 300 fish were collected from the recreational fisheries but have not yet been processed. It is assumed that the age and sex composition would be comparable to the striped bass sampled in the fall commercial fishery.

Table 22. Estimates of 1992 recreational H&L striped bass trips, harvest, and releases for Virginia.

AREA		TRIPS REPORTED ON PHONE BY AREA	PERCENT TRIPS BY AREA	ESTIMATED TRIPS BY AREA[1]	OBSERVED HARVEST FROM INTERCEPT[2]	REPORTED RELEASES FROM INTERCEPT[2]	COMPLETED TRIPS OBSERVED[2]	HARVEST RATE[3]	RELEASE RATE[3]	ESTIMATED HARVEST	ESTIMATED RELEASES
1	LBAY	195	0.344	23,932	182	134	294	0.619	0.456	14,814	10,913
2	LJAM	110	0.194	13,497	137	163	277	0.495	0.588	6,681	7,936
3	UJAM	51	0.090	6,261	58	57	144	0.403	0.396	2,523	2,479
4	LYRK	95	0.168	11,688	64	11	153	0.418	0.072	4,886	842
5	UYRK	11	0.019	1,322	18	11	210	0.086	0.052	114	69
6	UBAY	33	0.058	4,035	47	11	115	0.409	0.096	1,650	387
7	LRAP	28	0.049	3,409	84	58	135	0.622	0.430	2,120	1,466
8	URAP	23	0.041	2,852	31	13	159	0.195	0.082	556	234
9	PRTS	16	0.028	1,948	9	67	16	0.563	4.188	1,097	8,158
10	EBAY	5	0.009	626	8	15	5	1.600	3.000	1,002	1,878
11	OCN	0	0.000	0	0	0	0	0	0	0	0
TOTAL		567	1.000	69,571	638	540	1,508	0.509	0.494	35,443	34,362

[1] Total estimated trips are calculated by multiplying the average trips per permittee (1.060) called in the telephone survey by the total number of permits (56,379) issued in 1991, then expanding by the percentage of non-permitted trips observed in the 1992 intercept survey (0.141).

[2] Areas 9-11 were not included in the intercept survey, so telephone catch data alone is used to calculate catch rates for these three areas.

[3] Overall harvest and release rates are calculated by dividing total estimated harvest or releases by the total estimated trips.

Table 23. Summary of 1992 recreational H&L and charter fishery statistics for Virginia.

	TRIPS	HARVEST (# of Fish)	RELEASES (# of Fish)	CATCH (Harv + Rel)	CATCH/TRIP
Recreational H&L October 10-24	39,433	9,170	14,809	23,979	0.61
Recreational H&L Nov. 26-Dec. 12	30,138	26,273	19,553	45,826	1.52
Recreational H&L Season Total	69,571	35,443	34,362	69,805	1.00
Proportional Standard Errors	2.8	7.5	16.1	10.1	---
Reported Charter Statistics (full season)	1,016	1,713	2,172	3,885	3.82
Total H&L: Charter + Recreational	70,587	37,156	36,534	73,690	1.04

Table 24. Estimated length frequency (inches) and weight (lbs) of recreational H&L harvest in 1992 for Virginia.

LENGTH INTERVAL	FREQUENCY[1]	ESTIMATED # AT LENGTH[2]	AVERAGE WEIGHT[3]	ESTIMATED WEIGHT
17-17.99	0.000	0	1.98	0
18-18.99	0.030	1,115	2.33	2,598
19-19.99	0.050	1,858	2.72	5,054
20-20.99	0.070	2,601	3.15	8,193
21-21.99	0.080	2,972	3.63	10,788
22-22.99	0.090	3,344	4.14	13,844
23-23.99	0.080	2,972	4.71	13,998
24-24.99	0.110	4,087	5.32	21,743
25-25.99	0.080	2,972	5.98	17,773
26-26.99	0.130	4,830	6.70	32,361
27-27.99	0.100	3,716	7.47	27,759
28-28.99	0.070	2,601	8.29	21,562
29-29.99	0.020	743	9.18	6,821
30-30.99	0.030	1,115	10.12	11,284
31-31.99	0.020	743	11.13	8,270
32-32.99	0.010	372	12.20	4,538
33-33.99	0.010	372	13.33	4,959
34-34.99	0.010	372	14.53	5,405
35-35.99	0.010	372	15.80	5,878
TOTAL	1.000	37,156	6.05	224,819

[1] Length frequency was derived from 618 fish measured by the access survey.

[2] Total number of fish is the sum of the estimated harvest for recreational fishermen and the reported harvest for charter boat fishermen.

[3] Average weights were calculated from a length/weight relationship (LOG W=2.9358 LOG TL - 3.3524) derived from the Fall 1992 commercial harvest samples (n=2,738; r^2=0.92).

North Carolina

by

Paul Phalen
North Carolina Division of Marine Fisheries

North Carolina Division of Marine Fisheries (DMF) conducted three recreational fisheries surveys in 1992: 1) MRFSS, 2) Albemarle Sound Creel Survey, and 3) Dare County Headboat Survey.

MRFSS

North Carolina has participated in the National Marine Fisheries Service (NMFS) MRFSS since 1987 by conducting the intercept interviews and increasing both the telephone and intercept sample size. The DMF participates in the MRFSS to avoid duplication of effort, to take advantage of the NMFS MRFSS funds and design, and because of the need for a regional database.

Modifications to the MRFSS by DMF include the splitting of the beach/back and manmade modes, adding detailed North Carolina waterbodies to the intercept questionnaire, increasing the sample size (intercept and telephone surveys), and maintaining several specialized questions to meet specific North Carolina needs.

In 1992, 12,876 anglers were interviewed at public access points. Distribution of interviews was 45% from shore access points, 35% from private/rental boats, and 20% from charter boats. Anglers indicated no target species in 51% of the interviews. Bluefish (*Pomatomus saltatrix*), Spanish mackerel (*Scomberomorus maculatus*), and tuna (*Thunnus spp.*) were the most often identified target species. A total of 25,151 telephone interviews was conducted, producing an estimate of 3.9 million trips by recreational anglers in 1992. Detailed catch results are available from DMF.

Albemarle Sound Creel Survey

The Albemarle Creel Survey is designed to estimate the total number, total pounds, release rate, and size distribution of the annual recreational harvest of striped bass (*Morone saxatilis*) and other major species in Albemarle Sound. A stratified probability access point creel census, combined with aerial boat counts, was used to provide data needed to generate estimates.

In 1992, a total of 3,689 fishing parties (vessels) was interviewed. Estimates were generated for all major species and are available from DMF.

Dare County Headboat Survey

One area of recreational harvest not covered by the MRFSS and the NMFS Headboat Survey is the headboats that work out of Dare County, North Carolina. These headboats work in both the Pamlico Sound and Atlantic Ocean. Many of the finfish species targeted by this fishery are of major importance to fisheries management in North Carolina. In 1992, DMF conducted a pilot survey of the Dare County headboat fishery to determine catch composition, catch and effort, and to evaluate sampling methodology.

Catch-per-effort data was collected by conducting on-board intercept interviews with anglers. Every angler was interviewed at the completion of the trip and length/weight data for each species in the catch were collected. Effort data were collected by interviewing the booking agents and vessel captains. The catch of each finfish species was estimated for each vessel and trip type by multiplying the number of angler/trips by the mean catch/angler of each species within that specific vessel and trip type.

A total of 3,831 intercept interviews was conducted from July through November 1992. Distribution of effort found 7,068 angler-trips fishing half days in the Atlantic Ocean, 7,207 angler-trips fishing half days in Pamlico Sound, and 1,190 angler-trips fishing full days in the Atlantic Ocean. Forty-two species of finfish were harvested with a total of 38,559 and weight of 13,869 kg. Proportional standard errors for the estimated number harvested of the seven species that comprised >90% of the harvest ranged from 5 to 22. Recommendations were to conduct the survey annually using the same methodology. Detailed results are available from DMF.

South Carolina

by

Wayne Waltz
South Carolina Wildlife and Marine Resources Department

South Carolina has historically conducted a variety of MRF monitoring programs, including: 1) a billfish tournament monitoring program, 2) a survey of oceanic pier anglers, 3) collection of socio-economic data, 4) recreational shellfishing survey programs, 5) various surveys conducted simultaneously in 1985-86, 6) MRFSS add-ons, 7) the State Finfish Survey, and 8) a survey on recreational shrimp baiters. In addition, South Carolina is anticipating future MRF survey efforts.

Billfish Tournament Survey

In South Carolina, recreational fisheries data collection programs began in 1972 with a billfish tournament monitoring program, which was a cooperative effort with the NMFS. Data was collected by direct interview and by making telephone calls to key locations. This effort is still underway and in 1985 it was expanded to include data on coastal pelagics.

Survey of Oceanic Pier Anglers

A survey of oceanic pier anglers was conducted in 1974 using an intercept survey (Hammond and Cupka 1977). This survey collected socio-economic data, as well as catch and effort statistics.

Collection of Socio-Economic Data

A combination intercept, telephone, and mail survey was conducted in 1977 to collect socio-economic data on offshore sport fishermen (Liao and Cupka 1979). This included private boat, charterboat, and headboat anglers.

Recreational Shellfishing Survey

A subsample of registered boat owners was surveyed in 1981 through a mail survey to collect information on recreational shellfishing (Moore et al. 1984).

Simultaneous Surveys 1985-86

During the period 1985 through 1986 several surveys were conducted simultaneously by different investigators. These surveys included:

1. A roving creel survey was conducted to collect information at boat ramps on boat length, site usage, type of activity, catch data, etc.

2. An on-site drop box survey was conducted at selected boat ramps and tackle shops to collect information on activity, preferred species, perceived problems, etc. (Low et. al. 1986)

3. A night time windshield survey to collect information on recreational shrimping activity, etc. was conducted.

4. A survey of the recreational shad fisheries in the Tailrace Canal of the Cooper River was conducted (Low 1987).

MRFSS Add-ons

In 1987, due solely to the availability of Sport Fish Restoration funds, MRD hired a few people to work exclusively with recreational statistics. In mid-1987 they began to participate in the MRFSS and expanded the survey to three times the base level. South Carolina Marine Resources (MRD) personnel conducted the intercept survey from 1987 through 1990 (Low and Waltz 1988, Low et.al. 1992a, Low et.al. 1992b).

Sport Finfish Survey

In 1990, MRD adopted a two tier survey approach by continuing the MRFSS at the base level and adding the State Finfish Survey. The State Finfish Survey (SFS) uses procedures and interview forms similar to the MRFSS, but the site selection is systematic rather than random. The SFS is more flexible than the MRFSS and can be redirected to address specific state concerns. The SFS has been used to collect length frequency and CPUE data on selected species, such as red drum and spotted sea trout, with most SFS effort being conducted at the private boat mode. The SFS has been used to assist South Carolina stock enhancement programs and a gigging survey was conducted in 1991 (Low et.al. 1992c, Low 1992b). South Carolina plans to conduct a pier survey using drop boxes and a waterborne survey as part of this program in 1993.

Recreational Shrimp Baiters Survey

A routine annual survey to collect catch and effort data from recreational shrimp baiters was started in 1987 (Theiling 1988, Waltz and Hens 1989, Low 1990, Low 1991a, Low 1992a). This is a post-season mail survey to a random sample of permit holders. Limited recreational shellfish surveys were conducted in 1988, 1989, and 1991 (Waltz et. al. 1990, Low 1992b). MRD also has an economist that is collecting information related to artificial reel usage. He has recently completed a survey that targeted recreational divers and is presently working on a survey of registered boat owners to collect information on

artificial reef usage and expenditures.

Future MRF Surveys

Future survey efforts will probably revolve around the Saltwater Stamp Program. In 1991 the governor signed into law the Recreational Fisheries Conservation and Management Act which became effective on 1 July 1992. This law requires that all recreational fishermen who gather shellfish or fish from privately owned boats have a Saltwater Fishing Stamp. In addition, commercial fishing pier owners, party boat owners, and rental boat owners must purchase an annual permit. A monthly reporting requirement is a condition of the permit. As of June 1, 1993 there have been 73,701 stamps sold to saltwater fishermen, 151 partyboat permits, 32 rental boat permits, and 10 fishing pier permits sold in South Carolina. All names and mailing addresses of stamp holders have been entered into a computer system. Beginning in July, 1993, telephone numbers will be added to this database as well. Over the next year, MRD will be developing a mail survey to send to a random sample of stamp holders to collect information on finfishing, shellfishing, socio-economic data, and angler opinions.

As of January 1993 MRD had received information on 2,789 hook and line trips and 27 dive trips from 99 charterboats (>=6 passengers). All information related to charterboats is being sent to NMFS in Panama City, FL to help expand the sample size of the Southeast Charterboat Survey. Headboat data is identical to that sent to the NMFS Headboat Survey in Beaufort, NC.

Georgia

by

Nick Nicholson
Georgia Coastal Resources

At present, the Georgia Department of Natural Resources (GADNR) is not performing any saltwater recreational fishing surveys. However, GADNR has conducted various MRF surveys in the past, including: 1) MRFSS add-ons, 2) a survey to monitor recreational cast net fishermen, 3) a recreational crabbing survey, and 4) a mail survey.

MRFSS Add-ons

From January 1985 to December 1989, GADNR participated in the MRFSS and augmented both the telephone and site intercepts. Due to the importance of the spotted sea trout fishery, Wave 1 intercepts were also conducted. Data was to be analyzed to produce estimates at the state and county levels. For 1990 and 1991, GADNR conducted its own stratified random site intercepts along the same design as the MRFSS. In order to improve effectiveness of intercepts, samples were selected to emphasize the boating modes and performed only during the peak abundance waves.

Recreational Cast Netting Survey

A survey of the recreational cast net fishery in Georgia was conducted to develop estimates of participation, harvest, and effort. Survey design followed that of the MRFSS.

Recreational Crabbing Survey

A survey was conducted to provide estimates of recreational crabbing participation and harvest in Georgia. This survey was also designed similar to the MRFSS.

Mail Survey

GADNR performed a stratified random mail survey of saltwater recreational anglers, polling their attitude and/or opinion on issues affecting the saltwater recreational fishery. Anglers were screened by telephone and asked if they were willing to participate in the survey. Affirmative answers resulted in the angler being sent the survey by mail, which provided a self-addressed, postage paid return envelope. No rewards for participation were offered and only 38% were returned.

Florida

by

Joe O'Hop
Florida Department of Natural Resources

The State of Florida conducts surveys of recreational fishing access sites around the state and angler preferences in a few areas, but does not conduct a recreational fishing survey for estimating catch and effort. The state relies upon the National Marine Fisheries Service (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) to provide catch, effort, and length-frequency estimates for the recreational finfish fisheries in Florida. Florida has an estimated 2 million people participating in recreational fishing. Of the 55 million recreational fishing trips taken in the Southeast Region (North Carolina to Louisiana), 22.7 million trips (41%) are taken in Florida. An estimated 75% of these Florida trips are taken by residents of the state. In the Southeast Region, about 40% (71.6 million) of the kept (A+B1 catch) fish are caught in waters adjacent to Florida.

Beginning late in 1989, Florida required most residents between the ages of 16 and 64 who recreationally fish from boats or from structures not permanently fixed to land and all non-residents who recreationally fish to obtain the Florida saltwater fishing license. There are exemptions from the license requirements such as for those fishermen fishing from licensed piers or from licensed charter boats, and for residents who are members of the Armed Forces not stationed in Florida or those fishermen in some types of rehabilitation programs. The state obtains a 10% sample of the fishing licenses and stamps for snook and lobster issued and all of the charter boat and pier licenses issued. These samples of license data are used for surveys of recreational fishing and are public information. During 1991 and 1992, a survey of recreational spiny lobster harvest was conducted by mail to a sample of the holders of the spiny lobster stamp and saltwater fishing license. The results of the mail survey estimated the recreational harvest of spiny lobster to be nearly 1.3 million pounds for the August 1991 through March 1992 season.

Florida's access site surveys began in 1987 and is an inventory of recreational access sites in all coastal counties of Florida. Access sites are visited and attributes (location, number of ramps, types of facilities, access for handicapped persons, types of fishing seen, bottom types, etc.) of the site are recorded. At present, access site maps have been published for eight counties and are available at no charge to the public. A portion of the access sites are selected at random for angler interviews and other data collection purposes in areas where field staff are located, and all of Florida's 34 coastal counties are completely reinventoried for recreational fishing access sites every four years.

Federal Surveys

National Marine Fisheries Service

Marine Recreational Fisheries Statistics Survey

by

John Witzig
National Marine Fisheries Service

The purpose of the MRFSS is to establish a reliable data base for estimating the impact of marine recreational fishing on marine resources. MRFSS information is used by Fishery Management Councils and State and Federal resource agencies to formulate fishery management plans, to evaluate future demands on fish stocks, to predict and evaluate the impact of fisheries regulations, and to plan recreational facilities for anglers. The MRFSS collects data on shore, private/rental boat and party/charter boat recreational fishing on a bimonthly basis using a complementary survey methodology.

Telephone Survey

Telephone survey interviews are carried out in two-week periods starting the last week of each wave and continuing in the first week of the following month. Respondents are asked to recall on a trip-by-trip basis all marine recreational fishing trips made within their state during the 60 days prior to the interview.

Sampling effort is directed at households located in counties within 25 miles of the coast or major bays or estuaries. Sampling effort in the South Atlantic and Gulf of Mexico subregions is expanded during May through October to include households in counties within 50 miles of the coast. Currently in North Carolina, households in counties within 50 miles of the coast are surveyed during November to April, and in counties within 100 miles of the coast during May through October, because of the high proportion of non-coastal anglers intercepted in the access intercept portion of the survey.

The telephone survey interview quota for each wave varies with the amount of seasonal fishing activity expected. To maintain statistical properties of expanded estimates, telephone sampling effort is probabilistically allocated at the household level. Interview allocations for each county are based on the ratio of the square root of the population within each county to the sum of the square roots of all county populations in the dialing area in the state. Add-on questions and surveys have been used to gather economic data, shellfishing participation and other items of special interest.

Intercept Survey

The intercept survey consists of on-site interviews which gather catch and

demographic data from marine recreational anglers in three fishing modes: shore-based, private/rental boat, and party/charter boat. Party boats are not currently sampled by the MRFSS in the South Atlantic and Gulf subregions. Sampling is conducted continuously in two-month sampling periods (waves) from January through December, with the exception that sampling is not conducted during January and February on the Atlantic coast north of North Carolina.

Sampling is stratified by state, mode, and wave with a minimum base number of intercepts in each stratum. Samples are allocated beyond the minimum in proportion to average estimates of fishing pressure from the previous three years. Complete coastwide site lists were created and are updated each wave: sites are randomly selected but are weighted by expected fishing activity. Sampling includes weekends, weekdays, and holidays (included in the weekend category), and is allocated among the day types in proportion to historical effort.

Anglers are interviewed at assigned sites at the completion of their fishing trips. In the beach/bank subcomponent of the shore mode only, 50% or less of the interviews may be conducted with anglers who have not completed their fishing trip; however, they must have fished for at least a third of their estimated trip time.

Effort Estimation

The MRFSS measure of fishing effort is the estimated number of individual angler fishing trips. Trips are estimated for each wave, mode, and area. Data from the telephone survey are used to derive mean number of trips per household by mode and wave. This number is multiplied by the number of permanent full-time occupied households in the coastal dialing zone of each state to estimate total number of coastal county resident trips by mode. To adjust for trips taken by anglers who reside in households beyond the coastal dialing zone, a ratio estimator is derived from the intercept survey from the number of coastal resident anglers intercepted to the number of intercepted anglers who reside outside the coastal dialing zone. Similar procedures are used to estimate non-resident trips, and in some areas to adjust for trips by anglers residing in coastal counties who do not have telephones.

Catch Estimation

The catch of each finfish species is estimated for each subregion, state, mode, area, and wave. The total number of fish caught is calculated from the total number of fishing trips by mode from the telephone survey, and the average number of fish caught per trip and percent of intercepts by fishing area from the intercept survey. The intercept survey and the estimation procedures distinguish between fish brought ashore in whole form which are available for inspection by the sampler (Type A Catch), and those not brought to shore in whole form. Those not brought ashore in whole form are separated into those used for bait, filleted, or discarded dead (Type B1 Catch), and those released alive (Type B2 Catch).

Lengths and weights are obtained by sampling the fish that are caught and brought ashore in whole form. In estimating the mean weight of Catch Type B1, it is assumed that the mean weight is equal to that of Catch Type A for each subregion, state, mode, fishing area, wave, and species.

Participation Estimates

Estimates of the number of participants are derived from telephone and intercept data, and are calculated to account for varying levels of reported fishing avidity. The probability of selection in the intercept survey is higher for a person who fishes frequently than for a person who seldom fishes. These differences in probability of selection are corrected by using the reciprocal of the number of trips each intercepted angler reported having taken in the previous 12 months.

National Marine Fisheries Service

Large Pelagic Recreational Fishery Survey

by

John Witzig
National Marine Fisheries Service

The large pelagic recreational fishery of the Atlantic coast of the United States, targeting tunas, swordfish, sharks, and billfish, is an important source of recreation and food, as well as a vital component of the economic well-being of many coastal communities. In 1992, over 11 thousand vessels were active in this fishery in eight eastern states, and many individuals participated in the fishery on private, charter, and party boats. The fishery supports a diverse industry providing goods and services such as bait, tackle, boats and motors, fuel, charter services, and hotels and restaurants for tourist anglers.

The U.S. National Marine Fisheries Service (NMFS) and cooperating States have conducted annual surveys of the rod and reel fishery for large pelagic fishes off the mid-Atlantic and New England coasts since 1985. Beginning in 1992, these surveys have been used to monitor within season catches of Atlantic bluefin tuna (ABT) with respect to the quota recommended by the International Commission for the Conservation of Atlantic Tunas (ICCAT).

The survey consists of:

1. Telephone interviews,
2. Dockside interviews and fish sampling, and
3. Interviews at fuel pumps and launch ramps.

Each part of the survey is designed to collect information used to estimate aggregate catches, fleet size, fishing effort, catch and species and size composition. Individual observations are strictly confidential and used only to generate aggregate statistics. The sampling techniques and models used in the Survey are statistically sound and proven methods that are used throughout the U.S. and other countries and are based on years of scientific research.

The telephone survey is conducted weekly, and targets captains of private, charter, and party boats fishing for large pelagic species. The primary information collected during telephone interviews is the number of fishing trips. Dockside interviews are conducted with recreational fishermen from May through October to collect information on the number and species composition of fish caught.

Fleet size estimation is based on mark-recapture methods that are used extensively in fisheries and wildlife research to estimate the size of a population. Interviews are conducted at fuel pumps and launch ramps to identify vessels participating in the fishery. This information is used to expand the lists of known vessels to obtain estimates of total fleet size. Finally, sampling at weighing stations is also conducted to obtain more precise information on the average size of fish (for calculation of weight of the total recreational catch) and to collect biological samples.

The Survey also provides critical information for monitoring the status of migratory pelagic fish stocks. Catch and catch rate information from the survey are used in ICCAT assessments of many large pelagic species including several species of tunas and marlins. Socio-economic questions asked during the survey present a unique opportunity for anglers to document the economic contribution and value of their activity, such as employment and participation rates. This survey provides the documentation to ICCAT of the magnitude and value of the U.S. recreational fishery.

United States Fish and Wildlife Service

National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

by

Sylvia Cabrera
U.S. Fish and Wildlife Service

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation has been conducted since 1955 and is one of the most comprehensive, long-term recreational surveys. The purpose of the Survey is to gather information on the number of anglers, hunters, and nonconsumptive participants, as well as levels of participation and expenditures.

The planning process for the 1991 Survey began in 1988, with consultations with State and Federal agencies and nongovernmental organizations. Four regional technical committees were set up under the auspices of the International Association of Fish and Wildlife Agencies (IAFWA) to ensure that State fish and wildlife agencies had an opportunity to participate in all phases of the survey planning and design.

The Survey was conducted in two phases by the U.S. Bureau of the Census for the Fish and Wildlife Service. The first phase interviewed a sample of 129,500 households nationwide, primarily by telephone, to determine who in the household had fished, hunted, or engaged in a nonconsumptive wildlife-related activity in 1990, and who planned to engage in those activities in 1991. In most cases, one adult household member provided information for all household members.

The first phase was conducted in January and February 1991 and achieved a 95 percent response rate from those households that were eligible. It is important to note that the first phase covered 1990 activities while the next, more in-depth phase covered 1991 activities.

The second phase of the Survey consisted of three detailed interviews conducted every 4 months from May 1991 to March 1992 with samples of likely anglers, hunters, and nonconsumptive participants who were identified in the initial screening phase. These interviews were conducted primarily by telephone, with in-person interviews for those respondents who could not be reached by telephone. Respondents in the second interviewing phase were limited to those at least 16 years old. Each respondent provided information pertaining only to his/her activities and expenditures. Sample sizes were designed to provide statistically reliable results at the State level for fishing, hunting, and nonconsumptive activities. Altogether, interviews were completed for 23,179 anglers and

hunters and 22,723 nonconsumptive participants.

The 1991 Survey questionnaires were similar to those used in the 1980 and 1985 Surveys, and the sample sizes for the three Surveys were roughly the same. Ways in which the 1991 Survey differed from the 1980 and 1985 Surveys are:

1. The interviews were conducted primarily by telephone rather than by in-person interviews. The previous two Surveys required in-person interviews because data were collected for sub-state activity which required the use of visual aids.

2. The first phase interview was done at the beginning of the Survey year, rather than at the end. This meant people had to be screened into the second phase based on anticipated activity, rather than past activity.

3. In 1985 the Bureau of the Census made a weighting adjustment to account for persons incorrectly screened out of the sample. It caused a positive bias in estimates of totals, but had little effect on summary estimates such as percentages and means. In 1991, this adjustment was not appropriate because of the change in the screening procedures. The Bureau of the Census did make an adjustment to account for persons who were screened out in 1991 but did participate in fishing or hunting that year. This adjustment was smaller than the 1985 and 1980 adjustments.

4. Three 4-month recall periods for each respondent were used rather than the one 12-month recall period used in previous Surveys. The recall period was changed as a result of research on recall bias, which found that the amount of activity and expenditures reported in 12-month recall surveys was over-estimated in comparison with that of shorter recall periods.

The 1991 Survey estimates are more accurate as a result of changes in methodologies. However, because of these changes, the 1991 estimates are not directly comparable with similar estimates of previous Surveys. The differences in data between the 1991 Survey and that of previous Surveys will be due at least in part to changes in the recall length and weighting adjustment, and not due to actual declines in participation in those activities.

Results of 1991 Survey:

Results from Detailed Phase

Total Angler Participation:	35.6 million
Saltwater Angler Participation:	**8.9 million saltwater**
Total Angler Expenditures:	$24.0 billion
Saltwater Angler Expenditures:	**$5 billion saltwater**

Total Number of Fishing Days:	511 million
Saltwater Fishing Days:	**75 million days saltwater**
Total Number of Fishing Trips:	454 million
Saltwater Fishing Trips:	**64 million trips saltwater**

Trend Results from Screening Phase:

Analysis of the data from the screening phase of the Survey showed an increase of 11% in the number of anglers 6 years old and older from 1985 to 1990, while fishing expenditures increased 27%.

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Marine Recreational Fisheries Statistics Committee Meeting
Annapolis, MD July 11-12, 1993

Attendance:

Lisa Kline	ASMFC
Douglas Grout	NH Fish and Game
Gerry Gray	NMFS, Silver Spring
Gerry Butler	NMFS, Silver Spring
Ron Salz	NMFS, Silver Spring
Dave Van Voorhees	NMFS, Silver Spring
Marjorie C. Lambert	NMFS, Woods Hole
Nick Nicholson	GA Dept. of Natural Resources
Bill Eaton	MD Dept. of Natural Resources
Chris Moore	Mid-Atlantic Fishery Management Council
Najih Lazar	DFWER
Roy Miller	DE Division of Fish and Wildlife
Bill Whitmore	DE Division of Fish and Wildlife
Amir Ehtisham	NY Dept. of Environmental Conservation
Jim Uphoff	MD Dept. of Natural Resources
Carolyn Foster	KCA Research
Lewis Gillingham	VA Marine Resources Commission
Paul Perra	ASMFC
Cynthia Field	KCA Research
Paul S. Phalen	NC Division of Marine Fisheries
Roger Pugliese	South Atlantic Fishery Management Council
Bernard Brown	NJ Division of Fish, Game and Wildlife
John F. McClain	NJ Division of Fish, Game and Wildlife
Bruce Joule	ME Dept. of Marine Resources
Paul Diodati	MA Dept. of Marine Fisheries
Mark Alexander	CT Dept. of Environmental Protection
Wayne Waltz	SC Wildlife Dept.
Joe O'Hop	FL Marine Research Institute
Maury Osborn	NMFS, Silver Spring
John Witzig	NMFS, Silver Spring
Ron Schmied	NMFS/SE Region
Ron Essig	USFWS, Region 5
Connie Young-Dubovsky	ASMFC
Arnold Greenland	KCA Research
Kimberly Dawson	KCA Research
Mike Street	NC Division of Marine Fisheries
John Mason	NY Dept. of Environmental Conservation
Sylvia Cabrera	USFWS
Richard Aiken	USFWS

Marine Recreational Fisheries Statistics Survey Workshop

A workshop on the National Marine Fisheries Service's Marine Recreational Fisheries Statistics Survey was held June 10-11 in conjunction with the MRF Statistics Committee meeting. The workshop was directed by Dr. John Witzig and the staff of the Fisheries Statistics Division of the NMFS, Silver Spring, MD office. The MRFSS workshop was designed to provide a hands-on forum for the training of state, federal, and council personnel in the access and use of the MRFSS data.

General overviews of the MRFSS survey design and estimation procedures, quality assurance methods, and MRFSS data files and structures were presented as an initial introduction to the MRFSS data. Specific analyses were presented as a means of providing participants with the ability to reliably use the MRFSS data in fisheries stock assessment and management. Topics included the proper utilization of weighting factors when analyzing data for catch and length frequency analyses, methods of post-stratification of MRFSS data, use of MRFSS data in bag limit analyses, and necessary adjustments for missing weight data. Discussions were conducted on the use of MRFSS data for rare species and pulse events, as well as the use of MRFSS data for analyses involving directed effort. The final presentation focused on the issue of optimum state allocations to the telephone and/or access-intercept portions of the survey, as well as to different time periods (waves). State- and species-specific tables were provided to each state representative as a means of optimizing the allocation of state financial resources to the MRFSS survey.

A users manual for the MRFSS data is currently in preparation. This manual, in combination with personal training sessions conducted by the ASMFC Marine Recreational Fisheries Statistics Coordinator, will provide the knowledge required by State, Federal, and Council personnel to access and utilize the MRFSS data in stock assessments. This should assist states in overall fisheries management by allowing more timely access of the data.