

MARINE RECREATIONAL INFORMATION
PROGRAM

Final Project Report

Addressing the Fishery Management Need
for More Timely Recreational Data

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Table of Contents

Executive Summary	4
<i>Increasing Demands on Fisheries Data.....</i>	8
<i>Timeliness and Management Uncertainty</i>	9
Project Objectives.....	11
Approach.....	13
<i>Recreational Fisheries Data Timeliness Workshop</i>	13
<i>Species Fact Sheets</i>	13
<i>Evaluation of Survey Design Alternatives for Improving Timeliness</i>	14
Reducing Lag Time.....	14
Shortening Length of a Sampling Wave.....	15
Findings.....	16
<i>Survey Design Alternatives for Improving Recreational Data Timeliness</i>	16
Reducing Lag Time.....	16
Shortening Length of a Sampling Wave.....	18
Pacific Coast Recreational Surveys	21
<i>Forecasting as a Tool for Reducing Management Uncertainty.....</i>	23
<i>MRIP Recommendations Regarding Data Timeliness</i>	25
<i>Management Approaches for Addressing Uncertainty Associated with Recreational Data</i>	27
Uncertainty Buffers.....	27
ACT Control Rules	Error! Bookmark not defined.
Choice of Regulatory Control.....	30
Timeliness of Management Decision-Making and Specification Process.....	31
State-Level Quotas and Sharing Agreements	32
Stock Complexes ACLs.....	32
Summary of Management Approaches for Addressing Uncertainty Associated with Recreational Data.....	33
Appendices	34
<i>Appendix A. Recreational Fisheries Data Timeliness Workshop final agenda.</i>	34
<i>Appendix B. Organizing questions for workshop breakout group discussions.</i>	36
<i>Appendix C. Example of species fact sheets prepared for timeliness workshop.</i>	37
<i>Appendix D. Detailed timelines showing individual steps associated with the data processing phases for the Coastal Household Telephone Survey, Atlantic Intercept Survey, and Atlantic For-Hire Survey.</i>	40

Executive Summary

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA) of 2006 mandates establishment of science-based annual catch limits (ACLs) and accountability measures (AMs) for most federally managed fish stocks. These new requirements have resulted in increased demands on the fisheries data and statistics used to support stock assessments, monitor catch and effort, and for management decisions. It is important that fisheries data collection programs keep up with increasing demands and match the needs of managers and assessment scientists. It is equally important for managers to use recreational fisheries data responsibly and strive for consistency between management structures and data availability.

Successful implementation and effective monitoring of ACLs and AMs will require improvements in the fisheries data and statistics available to managers. The Marine Recreational Information Program (MRIP) is a collaborative effort to develop and implement an improved recreational fisheries data collection program. While improving data quality and reducing survey bias are primary MRIP objectives, addressing the issue of recreational data timeliness is also critically important for effective ACL management.

Recent cases of recreational fisheries exceeding their allowable catch limits and thereby triggering emergency closures highlight the need for more timely recreational data. Data timeliness, or the lack thereof, contributes to the uncertainty in fisheries managers' ability to constrain catch so the ACL is not exceeded. Uncertainty associated with catch monitoring lag time (i.e. timeliness) and uncertainty associated with quantifying the true catch amounts (i.e., estimation errors or imprecision) are the primary sources of what is commonly referred to as "management uncertainty." More timely recreational data could help in several ways including: 1) reduce potential for overages; 2) help manage for in-season changes and avoid closures; and 3) allow for more timely notice to captains and industry – improving long-term business planning capabilities.

The primary objectives of the study were to:

1. Identify, and evaluate trade-offs among, alternatives for improving the timeliness of recreational fisheries information availability;
2. Provide recommendations for addressing recreational data timeliness needs through MRIP survey design changes;
3. Identify current recreational catch and effort forecasting approaches, evaluate the effectiveness of forecasting in reducing management uncertainty, and explore ways models can be improved;
4. Identify and evaluate management alternatives for addressing the uncertainty associated with time lags in recreational catch availability;
5. Engage the primary MRIP data users and other affected stakeholders in an informed dialogue about alternatives and trade-offs for addressing the issue of recreational data timeliness.

A Recreational Fisheries Data Timeliness Workshop was held in March 2011 with the primary objective of engaging MRIP data users and other affected stakeholders in an informed dialogue about alternatives and trade-offs for addressing the issue of recreational data timeliness. Workshop participants were presented with data collection alternatives for improving the timeliness of recreational survey data. Survey design alternatives for improving the timeliness of recreational fisheries information availability were evaluated in terms of relative cost, data quality, and feasibility. The two types of alternatives evaluated for improving timeliness were: 1) Reduction of the lag time between when catches occur and when estimates are available to fishery managers, and 2) Increasing the frequency of estimation by reducing the length of a sampling wave. The evaluation of survey design alternatives and the ensuing recommendations focused on the recreational surveys NOAA Fisheries administers on the Atlantic and Gulf of Mexico Coasts. However, findings could be applicable to other regions and survey programs, as could the evaluation of forecasting approaches and management alternatives for addressing uncertainty associated with recreational catch lag time.

The lag time analysis indicated that with modest levels of additional funding preliminary wave estimates could be released about 31 days after the end of a wave instead of the current 45 days. Reducing lag beyond this point would put considerable strain on the process which could start to negatively affect the accuracy of estimates. Workshop participants identified the advantages of monthly waves for reducing management uncertainty to avoid exceeding an ACL. While monthly waves would be beneficial, data users were not willing to sacrifice overall annual precision of catch estimates for increased timeliness. Switching from bi-monthly to monthly waves with no increase in overall sample size will likely result in a significant decline in precision on cumulative catch estimates for many species. Switching to monthly waves while maintaining current precision levels will require significant additional funding associated with increasing sample sizes.

Forecasting techniques can provide an efficient, cost effective mechanism for in-season projections of recreational catch and effort in cases where the timeliness of survey data is not adequate for in-season adjustments. Regional variation exists in the extent to which forecasted or projected landings are currently being used as an in-season management tool. The Mid-Atlantic and New England Fishery Management Councils have not, to date, chosen to use forecasting as a tool for in-season management, although workshop participants suggested that this management tool could have more utility in these regions with improved data quality and timeliness. Success in terms of reliably predicting recreational estimates has also varied by approach and by species. Several participants also identified the potential to improve recreational forecasting models by including external correlates (e.g. angler behavior, fuel prices, and weather data).

Specific MRIP recommendations for improving recreational data timeliness include:

1. Move towards implementation of one-month waves:
 - a. New MRIP catch and effort survey designs should have the flexibility to allow for generation of monthly catch and effort estimates.
 - b. MRIP should fund a Recreational Data Timeliness Simulation Project with the goal of developing a model to simulate recreational catch estimates and associated variances from one-month waves. Comparisons of cumulative estimate precision levels using one-month versus two-month waves should be done for key management species.
 - c. Building off the simulation model, a secondary project should develop an Optimal Sample Allocation Tool that will provide information on tradeoffs between timeliness, precision, and cost and allow for more informed decisions regarding sample allocation.
 - d. Recognize that if funds are limited it may be optimal to produce monthly estimates during certain times of year (e.g. “core” months) and bi-monthly estimates during other times. This may also vary by region or sub-region (i.e. coordination of “core” months with “core” geographic areas).
2. Reduce lag time between the end of a sampling wave and production of recreational catch estimates by up to two weeks.
3. If the revised MRIP effort survey design uses a mail survey as part of a mixed survey mode approach, models should be developed that can reliably forecast effort based on partial results from the faster survey mode (i.e., phone) and from early mail survey returns.
4. MRIP should continue to support and encourage development of models for reliably forecasting recreational catch and effort estimates as a potentially more timely and cost effective approach for in-season quota management.
5. MRIP should continue to test the feasibility of innovative electronic data collection options, analyze costs/benefits, and make recommendations for implementation in particular regions as warranted.
6. MRIP should continue to support development of innovative methods for collecting detailed data on catch and effort that may supplement and assist in the interpretation, validation and tuning of data derived from the baseline survey methods or provide improved timeliness and precision to support management of particular species (e.g. rare event, small catch limits, or relatively short seasons).

A general theme of the Timeliness Workshop was the need to consider adapting management to data constraints rather than adapting data to meet management needs. Improvements in recreational data quality and timeliness that can feasibly be implemented through MRIP should not be viewed alone as a panacea for management of recreational ACLs. Rather, management approaches for addressing the management uncertainty associated with data imprecision or estimation lag times must also be considered for successful management of recreational sector ACLs.

Summary of key findings related to management approaches for addressing management uncertainty associated with recreational data:

- Anticipated MRIP improvements in data timeliness, accuracy and precision will reduce but not eliminate management uncertainty associated with recreational estimates. For some stocks, management uncertainty will remain relatively high and fishery managers need to anticipate and address this uncertainty.
- Councils can address management uncertainty and effectively reduce their risk of exceeding an ACL by establishing Annual Catch Targets (ACTs) at some catch level below the ACL.
- ACT control rules for setting reduction buffers should take into account the precision, accuracy, and timeliness of recreational data, as well as the distribution of recreational landings across survey waves.
- The relative advantages and disadvantages of multi-year averages for managing ACL's should be thoroughly analyzed and evaluated, particularly for species with relatively low precision on annual catch estimates.
- The choice of regulatory controls used not only impacts fishery participants and associated businesses but can also influence the level of management uncertainty associated with monitoring an ACL. Fishery managers should thoroughly evaluate trade-offs of longer versus shorter recreational fishing seasons and other associated controls (i.e., bag limits, size limits, and area closures).
- Improvements in the timeliness of recreational data are only as valuable as management's ability to use the information in a timely manner. The ability of management to respond quickly with in-season closures or other regulatory measures varies considerably by region and states within regions. Councils and states may be able to reduce the risk of exceeding ACLs by minimizing the time needed to implement in-season controls once recreational data become available.
- Other mechanisms aimed at buffering the risk of exceeding an ACL should also be considered including sharing agreements between states (for state level quotas) and the use of stock complexes for rare event species with relatively low precisions levels.

Background

Increasing Demands on Fisheries Data

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary law governing marine fisheries management in United States federal waters. Originally passed in 1976, the Act was revised and reauthorized in 1996 with the Sustainable Fisheries Act (SFA), and again in 2006 with the Magnuson-Stevens Reauthorization Act (MSRA). Each revision has brought new and more rigorous requirements to prevent overfishing and rebuild overfished stocks. The SFA required that each fishery management plan (FMP) specify objective and measurable criteria for determining when a stock is overfished or when overfishing is occurring, and establish measures and required time frames for rebuilding overfished stocks. MSRA mandates an end to overfishing and maintains and strengthens the rebuilding provisions of SFA. It includes provisions for establishment of science-based annual catch limits (ACLs) and accountability measures (AMs) for many fish stocks. An ACL is the level of annual catch that if met or exceeded triggers accountability measures, such as a seasonal closure or quota closure, while an AM is a management control to prevent an ACL from being exceeded, or to correct or mitigate overages of the ACL if they occur.

These new requirements have resulted in increased demands on the fisheries data and statistics used to support stock assessments, monitor catch and effort, and for management decisions. The MSA requires that conservation and management measures be based upon the best scientific information available (National Standard 2). However, in some cases the best information available does not fully support management needs resulting in fishery managers having to use data and statistics in ways they were not originally intended. This is particularly true of recreational fisheries statistics data generated from the Marine Recreational Fisheries Statistics Survey (MRFSS) which was first implemented in 1979. Current uses of MRFSS catch and effort estimates were not anticipated in the original survey design. Fishery managers now require data with higher temporal and spatial resolution and estimates with higher levels of precision than the MRFSS was designed to produce¹. It is important that fisheries data collection programs keep up with increasing demands and match the needs of managers and assessment scientists. It is equally important for managers to use recreational fisheries data responsibly and strive for consistency between management structures and data availability. This includes fully understanding and incorporating the risks and uncertainty associated with using statistical estimates for particular decisions, and considering options for managing differently to avoid using data for purposes it was not intended or cannot support (i.e. high levels of uncertainty).

¹ National Research Council. 2006. Review of Recreational Fisheries Survey Methods. The National Academies Press, pp.187.

Successful implementation and effective monitoring of ACLs and AMs will require improvements in the fisheries data and statistics available to managers. The Marine Recreational Information Program (MRIP) is a collaborative effort to develop and implement an improved recreational fisheries data collection program. MRIP improvements are being implemented incrementally as alternative approaches are designed and tested. Initial improvements are focused on addressing fundamental issues identified by the NRC review, including establishment of a Federal angler registry, assessing and reducing the potential for bias in current surveys, and developing data collection standards. These improvements are intended to provide fishery managers and stock assessment scientists with more accurate, precise, and reliable data and statistics on which to base management decisions.

While high quality recreational fisheries data and catch estimates are critically important for management, another important and related criterion is data timeliness. Managing recreational fisheries under ACLs requires fishery managers to accurately predict when an ACL will be exceeded in order to take preventative measures. More timely recreational data could help in several ways including: 1) reduce potential for overages; 2) help manage for in-season changes and avoid closures; and 3) allow for more timely notice to captains and industry – improve long-term business planning capabilities. Recent cases of recreational fisheries exceeding their allowable catch limits triggering emergency closures highlight the need for more timely recreational data. Examples include the Northeast black sea bass emergency closure from October 2009 through May 2010, the Gulf of Mexico greater amberjack emergency closure from October through December 2009, and the South Atlantic black sea bass closure in February 2011.

Timeliness and Management Uncertainty

In an ideal world fishery managers would have access to accurate and precise recreational catch estimates in real-time for making in-season adjustments (e.g., adjust size/bag limits, fishery closures) to avoid exceeding specified catch limits. However, real world constraints, including budget limitations, late reporting of data, and data processing and error checking time, make “real-time” availability of accurate and precise estimates impractical for most recreational fisheries. The sheer number of recreational anglers, their diverse fishing behaviors, and the myriad means by which they access the fishery all add to the challenges associated with monitoring recreational fisheries in a timely manner. Compounding the issue is that previous years and waves are often not good predictors of current year recreational landings due to significant inter-annual variability in factors such as fish availability, targeted fishing effort, and weather.

As the lag time between when catches occur and when catch estimates are available increases, so does the risk of exceeding an ACL. Therefore, data timeliness, or the lack thereof, contributes to the uncertainty in fisheries managers’ ability to constrain catch so the ACL is not exceeded. Uncertainty associated with catch monitoring lag time (i.e.

timeliness) and uncertainty associated with quantifying the true catch amounts (i.e., estimation errors or imprecision) are the primary sources of what is commonly referred to as “management uncertainty.” Management uncertainty differs from “scientific uncertainty” which refers to all the uncertainty associated with stock assessments and establishing an overfishing level. Whereas timeliness only affects management uncertainty, imprecision on catch estimates can affect both management and scientific uncertainty. The NOAA Fisheries revised National Standard 1 Guidelines underscore the importance of accounting for both scientific and management uncertainty when specifying catch limits and accountability measures².

² 50 CFR Section 600.310 National Standard One.

Project Objectives

The primary objective of this project was to identify, and evaluate trade-offs among, alternatives for improving the timeliness of recreational fisheries information availability. There are practical limits to the degree to which the timeliness of the collection, processing, and reporting of recreational fishery survey data and statistics can be improved. This project was intended to provide a better understanding of what survey improvements are possible and what resources will be needed to implement them. Specific recommendations for addressing recreational data timeliness needs through MRIP survey design changes are proposed based on this evaluation.

A different approach to increasing the frequency of estimation involves using models to forecast catch and effort estimates. Another objective of this study was to identify and compare current approaches being used to forecast recreational catch and effort estimates, evaluate the effectiveness of forecasting as a tool for reducing management uncertainty, and explore ways forecasting models can be improved for future application. Forecasting is a fundamentally different approach for addressing timeliness in that it does not necessarily require changes in survey design or data processing. Instead, forecasting utilizes new model-based approaches to estimate catches based on catch and effort data from previous waves and years, and other correlates as available. However, in some instances survey design changes may be needed to improve model inputs, thus enhancing the ability to reliably forecast catch estimates.

Another important objective of this project was to identify and evaluate management alternatives for addressing the uncertainty associated with recreational catch lag time. A data collection system that produces recreational catch data with the temporal and spatial resolution necessary for in-season quota management may not be cost effective, efficient, or reliable for certain species and stock assemblages. Alternative data collection solutions resulting from this project will need to be compared against alternative management solutions for meeting ACL requirements. It is important to identify management solutions as part of this project since any data collection alternatives involving in-season or real-time management will need to be evaluated against these solutions. Ideally, data collection and management systems will be paired with one another so that they are compatible: i.e., the data collection system provides data users with the information they need, when they need it, to responsibly assess and manage marine fisheries following the guidelines mandated in the MSA.

Evaluation of alternatives for improving the timeliness of recreational data would not be possible without significant input from the fishery managers and scientists who rely on the data. An overarching objective of this study was to engage the primary MRIP data users and other affected stakeholders in an informed dialogue about alternatives and trade-offs for addressing the issue of recreational data timeliness.

The evaluation of survey design alternatives and the ensuing recommendations focused on the recreational surveys NOAA Fisheries administers on the Atlantic and Gulf of

Mexico Coasts. However, findings could be applicable to other regions and survey programs, as could the evaluation of forecasting approaches and management alternatives for addressing uncertainty associated with recreational catch lag time.

In summary, the main objectives of the study were to:

1. Identify, and evaluate trade-offs among, alternatives for improving the timeliness of recreational fisheries information availability;
2. Provide recommendations for addressing recreational data timeliness needs through MRIP survey design changes;
3. Identify current recreational catch and effort forecasting approaches, evaluate the effectiveness of forecasting in reducing management uncertainty, and explore ways models can be improved;
4. Identify and evaluate management alternatives for addressing the uncertainty associated with time lags in recreational catch availability;
5. Engage the primary MRIP data users and other affected stakeholders in an informed dialogue about alternatives and trade-offs for addressing the issue of recreational data timeliness.

Approach

Recreational Fisheries Data Timeliness Workshop

A two-day workshop was held in St. Petersburg Florida with the primary objective of engaging MRIP data users and other affected stakeholders in an informed dialogue about alternatives and trade-offs for addressing the issue of recreational data timeliness. Workshop planning and agenda (Appendix A) development included the following tasks:

- Establish participant list of key MRIP data users impacted by the timeliness issue and other affected stakeholders with input from the Project Steering Committee and referrals from identified participants;
- Hire professional workshop facilitators;
- Obtain input for workshop agenda through phone calls with participants, emails, online pre-survey questionnaire, and meetings with outside consultants;
- Recruit workshop speakers, panelists, and regional break-out session group leaders;
- Develop key questions and instructions for regional break-out session groups to discuss and report back on (Appendix B).
- Develop recreational species fact sheets for key management species most affected by the data timeliness issue (see below for details).
- Assess trade-offs associated with options for improving recreational data timeliness and develop alternatives for participants to discuss during workshop break-out sessions (see below for details).

Species Fact Sheets

The purpose of the fact sheets was to provide a graphical presentation of recreational survey data to aid in the workshop break-out session discussion of timeliness for particular species. The project team identified 28 managed stocks covering the Atlantic, Gulf and Pacific Coasts for which recreational data timeliness was currently, or could become, a source of management uncertainty. The focus was on federally managed species with mandated ACL's and AM's that were more likely to require timely and precise data for in-season management actions. Fact sheet content focused on factors that influence management uncertainty including recent landings trends in relation to catch limits or quotas, temporal distribution of landings across waves, precision of estimated landings (by wave and cumulative), and geographic distribution of landings across states. Other basic information about the stock including stock status, geographic range, proportion of overall quota for recreational fishery, and previous year's season dates were also provided. An example fact sheet is provided in Appendix C.

Evaluation of Survey Design Alternatives for Improving Timeliness

Survey design alternatives for improving the timeliness of recreational fisheries information availability were evaluated in terms of relative cost, data quality, and feasibility. The two types of alternatives evaluated for improving timeliness were: 1) Reduction of the lag time between when catches occur and when estimates are available to fishery managers, and 2) Increasing the frequency of estimation by reducing the length of a sampling wave. For this project, the scope of data collection alternatives considered was limited to changes that can be implemented within the basic MRIP re-design of MRFSS. Ultimately, fishery managers must consider the timeliness of all sources of recreational data used to monitor an ACL for a particular fishery. This includes headboat landings reported through the NOAA Fisheries Southeast Headboat Survey (for South Atlantic and Gulf of Mexico fish stocks) and Texas landings estimated through the Texas Parks and Wildlife recreational survey (for Gulf of Mexico stocks). While evaluation of alternatives for improving the timeliness of these additional data sources was not a project objective, the need for more timely data from these programs was discussed during the timeliness workshop.

It was also recognized that for some stocks management needs for recreational data quality and timeliness may only be met through more specialized data collection programs. Evaluation of such programs was not part of this project but should be a consideration of MRIP more broadly.

Reducing Lag Time

The current lag between the end of each 2-month wave and release of preliminary recreational catch estimates is 45 days. For example, preliminary estimates of recreational landings for the period July 1 through August 31 (Wave 4) are typically made available on October 15. The first step in evaluating lag reduction alternatives was to identify all the particular steps involved in the process from data collection to data processing and error-checking to estimation. Conference calls were held with the current federal contractors of the three complementary surveys (i.e., Coastal Household Telephone Survey - ICF Macro, For-Hire Survey - Quantech, Inc., and Atlantic Access Point Angler Intercept Survey – ICF Macro) to better understand the details involved with each step in the process, the time required for each, and to brainstorm ideas for reducing lag at various stages. Input was also obtained from Gulf States Fisheries Information Network (GulfFIN) staff who coordinate the For-Hire and Intercept survey components in the Gulf of Mexico and from Maryland Department of Natural Resources staff for the Chesapeake Bay for-hire logbook component.

Detailed timelines were developed for each of the component surveys that are combined to produce recreational catch estimates. A timeline was also developed for the estimation phase which begins once all component data have been delivered to NOAA Fisheries.

Survey timelines were combined to identify the time limiting steps which could be further investigated for lag reduction. Different scenarios for reducing lag were identified and evaluated by the project team. A formal Request for Information (RFI) was sent by the NOAA Acquisitions and Grants Office (AGO) to the data collection contractors to evaluate the feasibility, relative cost, and data quality impacts of each scenario. The RFI asked the contractors to consider 1) if the shortened data delivery deadline could be met for each particular scenario, 2) whether meeting the deadline would result in some reduction in data quality compared to the status quo, and 3) if there were any special considerations that would be required to meet the revised schedule. Alternatives for reducing lag time and the associated trade-offs were presented to workshop participants and discussed during the workshop break-out session.

Shortening Length of a Sampling Wave

Currently MRIP recreational catch estimates for the Atlantic Coast, Gulf of Mexico, Puerto Rico and Hawaii are available in two-month waves (i.e., wave 1 = Jan/Feb, wave 2 = Mar/Apr...wave 6 = Nov/Dec). Combined with the 45-day lag described above, this means that landings at the beginning of a wave will not be estimated until over three months later. Switching from two-month estimation waves to a shorter wave period (i.e., monthly or bi-weekly) involves trade-offs between timeliness, precision and cost.

The approach for this analysis was to use a simple simulation exercise to demonstrate the trade-offs that need to be evaluated when considering a design change to shorter wave lengths. The objective was to present this simple example to workshop participants to encourage an informed discussion of these trade-offs during the break-out session. The simulation focused on two facets: 1) the relative impacts on precision, both wave precision and cumulative precision, as the sampling wave is shortened while the overall sample size remains constant, and 2) the additional sample size (and cost) needed to maintain precision at the two-month wave level when switching to monthly waves.

Findings

Survey Design Alternatives for Improving Recreational Data Timeliness

Reducing Lag Time

The combined survey component timeline for producing MRIP wave estimates is shown in Figure 1 below. The data collection period, data entry completion date, and data delivery due date were identified for each survey component in relation to the estimates posting date 45 days after the wave ends. To identify segments of the timeline which could be shortened with additional resources, the individual steps associated with the data processing phases for each survey were identified and evaluated in more detail (see Appendix D for more detailed flow charts). The initial focus was on the effort surveys which were identified as the time limiting factor for data delivery. The data delivery due date for the Coastal Household Telephone Survey (CHTS), For-Hire Survey (FHS) and Maryland Logbook program is 28 days after the wave ends (intercept data are delivered 21 days after). The primary reason for this difference is that the effort survey data collection continues for between 7 to 10 days after the end of the wave. Therefore, while the overall lag from the end of the fishing period being estimated is 45 days, the lag from the end of effort data collection is only about 35 days. Feedback from the current data collection contractors suggested that the data delivery timeline for both the CHTS and FHS could be reduced by one week (i.e. 21 days after the wave) without a detectable decline in data quality. The only identified trade-off for this time lag reduction was additional resources (i.e. cost) to speed up the data processing phase.

Both the CHTS and FHS contractors also seemed to suggest that this seven day reduction in data delivery time lag was right around the breaking point beyond which data quality may be affected regardless of how much additional resources are available. Some steps in the process, like following up outliers by re-contacting respondents, are more time limited than cost limited and therefore cannot be easily sped up. Given the overall emphasis on data quality and bias reduction in the MRIP redesign of the MRFSS, the project team decided to focus on options for reducing lag time that would not result in decreased data quality. For the most part, MRIP data users and constituents were also not willing to sacrifice data accuracy for reduction of lag time.

Some options for reducing the data delivery time lag for dockside intercept surveys were also identified including speeding up interviewer data submittal time, increase staffing for data entry and review during high volume periods and near the end of the wave, and electronic data collection. However, using additional resources to deliver catch data before the 21st of the month will not result in quicker estimates since this is the earliest date that effort data can be delivered without a reduction in data quality.

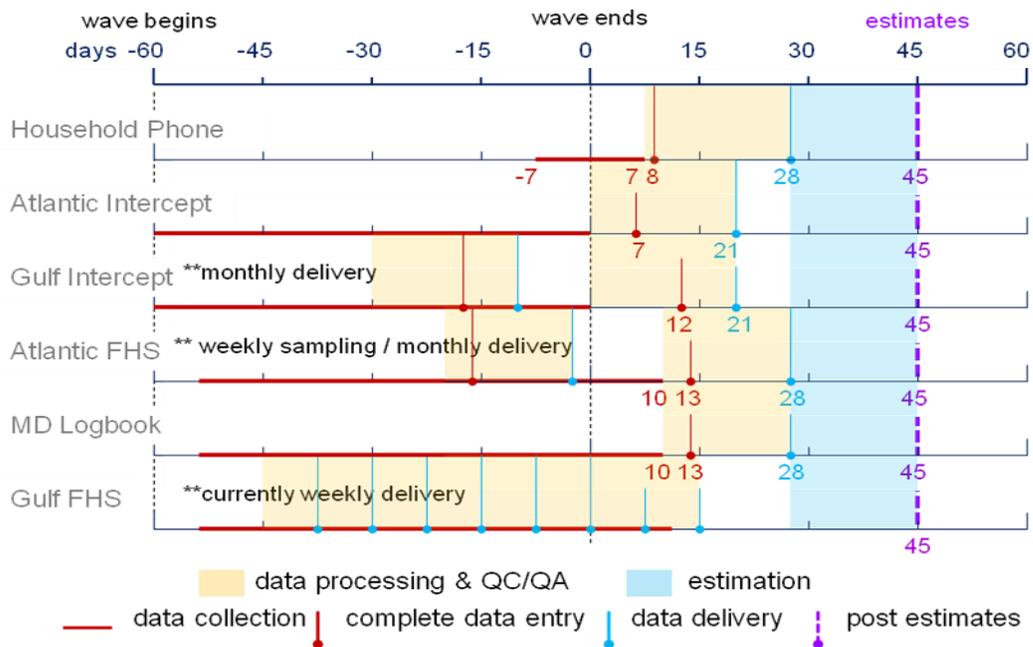


Figure 1. Timelines for data collection and processing for each of the component surveys that are combined to produce Atlantic and Gulf of Mexico recreational catch estimates.

The period between when all data have been delivered (28 days after wave) and estimates are posted (45 days after wave) was also evaluated for possible lag reduction options. Once all the necessary data have been delivered the actual running of estimates is an automated process that can be done in a day or two. Assuming all data are delivered on time and in the proper format, this leaves about two full weeks for review of preliminary estimates in-house by NOAA Fisheries staff. Although estimate review typically does not take this long, extra time is sometimes needed if any data are delivered late, anomalies are found that need to be further investigated, or higher priority tasks need to be done first by staff. This evaluation suggested that the time between data delivery and estimate release could be reduced by about 7 days. The trade-off for this lag reduction is that NOAA Fisheries would need to prioritize estimate review such that this task is the highest priority for designated reviewers once estimates are available. Back-up reviewers would also need to be identified in case a reviewer is on leave or travel and cannot complete the review on time.

This analysis indicated that modest reductions in lag time (about 7 days maximum) could be achieved for both the data delivery and estimation phases if additional resources (i.e. cost) were made available. The combined effect could result in preliminary wave estimates being released about 31 days after the end of a wave instead of the current 45 days. Reducing lag beyond this point would put considerable strain on the process which could start to negatively affect the accuracy of estimates.

Results of the lag reduction analysis were presented to recreational fisheries data users and MRIP constituents at the workshop. Workshop participants were asked to consider the advantages (and disadvantages if any) of reducing the lag time and to evaluate the identified trade-offs in regional break-out sessions. In general, regional groups were more focused on shortening the sample wave (see below) and did not spend much time discussing the lag reduction. Although no one was opposed to reducing estimation lag time by one or two weeks, the general consensus was that by itself such a modest reduction would not significantly improve the ability to manage recreational ACLs using in-season landings estimates. This was particularly true for fisheries with very short seasons (e.g. 1 or 2 months) where the two-month sampling wave may be more of a limiting factor for in-season ACL management.

Shortening Length of a Sampling Wave

Results of the simulation exercise showed that a significant decline in precision of both wave level estimates and, more importantly, cumulative estimates would occur when switching from bi-monthly to monthly wave length with no increase in overall sample size (i.e. splitting the bi-monthly sample across two months; Figure 2 below). Although this was based on one very generic model with many simplifying assumptions, results suggest that for many species to achieve monthly estimates that are as precise as those based on standard bi-monthly estimates sample sizes would need to be roughly doubled. However, the precision of individual monthly estimates should be less important than the precision of the cumulative estimate for managing an ACL in-season. To maintain the status quo precision of cumulative catch estimates when switching from bi-monthly to monthly waves, sample sizes will still need to be increased significantly but likely will not have to be doubled. Based on the simplified model, sample size increases needed to maintain precision on cumulative estimates are expected to vary from 40 to 60% depending on the region, species and the number of months combined in the estimate. Sample size increases will likely be needed for both the effort survey and intercept survey components, although the proportional increase may differ by component. It should also be noted that any increased costs associated with increasing sample sizes to maintain precision on more timely estimates will be in addition to the anticipated increased costs associated with new MRIP survey designs. New MRIP intercept and effort survey designs are still being pilot tested and analyzed so the increased costs associated with implementation are still unknown. A less costly approach to maintaining precision while shortening the sampling wave involves shifting sample among waves. Optimal allocation of sample sizes across months could improve precision for particular species of interest. For example, sampling could be “front-loaded” or targeted at particular times of year to improve cumulative precision for species managed in-season. The trade-off is that less sample would be available for other months which could negatively impact precision of important recreational species with different seasonal landings patterns.

Workshop participants were asked to evaluate the advantages and consider the trade-offs associated with switching to monthly waves. All regional break-out groups identified the advantages of monthly waves for reducing management uncertainty to avoid exceeding

an ACL. Workshop break-out groups noted that for some important recreational fisheries a significant portion of the ACL is landed in one or two high pressure waves. With bi-monthly waves, by the time estimates are available it is often already too late to control a quota overage. As one workshop participant put it “We’re really in the dark during a period of great activity.” In addition to providing more timely information for in-season management, increased estimation frequency would improve and refine fishery managers understanding of seasonal variability in the fishery.

While monthly waves would be beneficial, the general consensus among data users was that they were not willing to sacrifice overall annual precision of catch estimates for increased timeliness. Two regions (South Atlantic and Northeast), however, did indicate that they would be willing to accept lower precision on wave level (monthly) estimates for increased timeliness as long as the cumulative precision was not negatively affected. The Gulf of Mexico group noted that for some recreational species with very short seasons maintaining individual wave precision was still important.

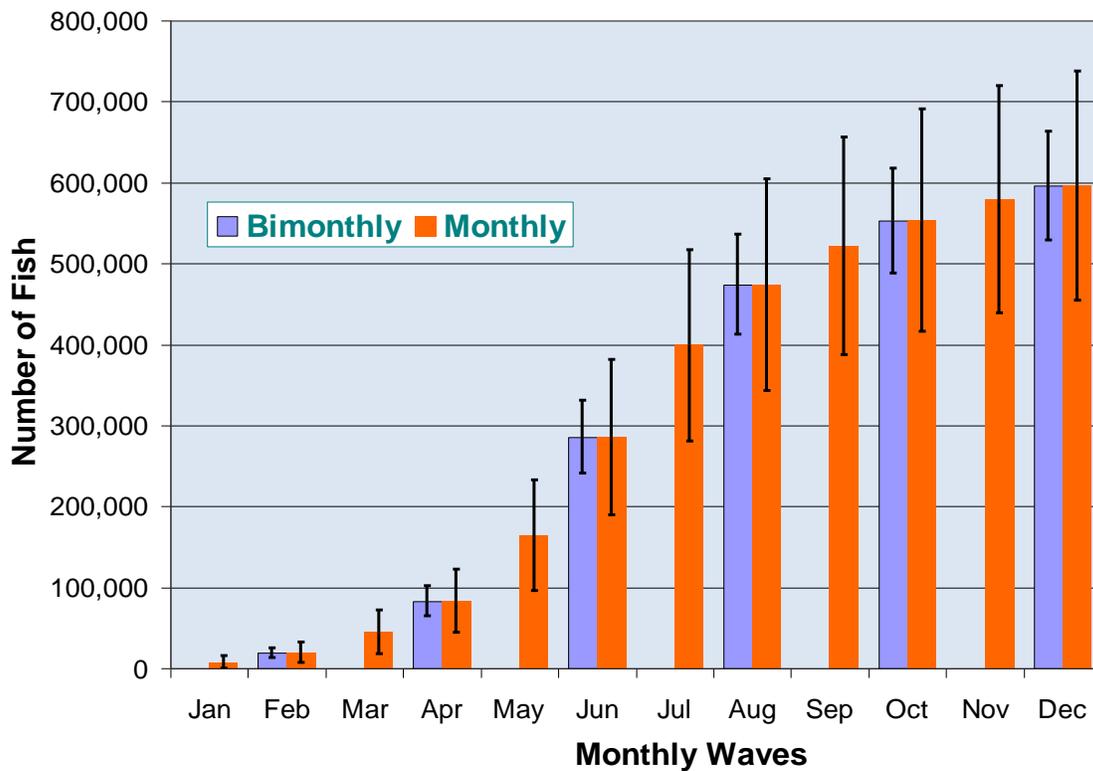


Figure 2. Simulation showing the possible impact on precision of cumulative recreational catch estimates when switching from bi-monthly to monthly estimation waves through splitting of the bi-monthly sample across two months (Bars represent 95th percent confidence intervals around the point estimate).

Switching to monthly waves while maintaining current precision levels will require additional funding associated with increasing sample sizes, and for some species and waves substantial new funds will be needed. Operating under the assumptions that survey funds are limited and data users are not willing to sacrifice overall precision for timeliness, break-out groups discussed ways to optimize additional funds that may be available for improving timeliness to mesh with management priorities. One group suggested that additional funds for timeliness improvements should first be used to switch to monthly effort estimates, and then applied to monthly catch estimates for the “core” months as funds allow. Presumably more frequent effort estimates could then be used to predict or forecast catch estimates (see Forecasting section below). A common theme among all groups was the concept of optimizing for “core fishing seasons” or months when timeliness was particularly critical. Sample size can be added during these more important management waves to allow for monthly, or more frequent, estimates while maintaining (or improving) precision. Similarly, it may be possible to lengthen waves and reduce sampling effort at less critical times with minimal impact on fisheries management. Increasing estimation frequency beyond monthly (i.e., bi-weekly or weekly) may be desirable for certain key management species during particularly critical management months. However, the cost may be prohibitive to maintain precision at desired levels.

The prioritization for shorter waves during particular months varies by region and fishery. Some participants focused on Wave 4 (July/August) as the most critical for many recreational species. Others identified Waves 3 (May/June) and 5 (September/October) as more critical for timeliness for some species despite having lower landings than Wave 4. For some species, landings during these “shoulder” waves may be more variable from year to year compared to Wave 4 and therefore more difficult to predict or control. The wave following the peak landings wave may also be more important for timeliness since more frequent estimates are needed later in the season as you approach the ACL or ACT. It was also noted that increased estimation frequency at particular key times of year could result in additional waves of data being available to fisheries technical advisors at the start of the specification-setting process for the following year.

Following on the idea of “core fishing seasons”, sample sizes can also be optimally allocated to cover “core areas” during particularly important times of year when increased timeliness and precision are needed by management. The concept of “core areas” could be considered for particular regions, states, or sub-regions within a particular state.

Some workshop participants wanted to explore moving away from a fixed “wave” model for recreational data availability and towards a continuous reporting system whereby data are available virtually in “real-time.” However, it was pointed out that there is no estimation design in place to produce catch estimates in real-time without some temporal stratification of sampling. Sampling could be stratified by day in paired surveys of fishing effort and catch, but total sample sizes would have to be extremely large to

support reasonably precise daily estimates of effort that could be paired with catch data collected on site. The costs of implementing an effective daily survey approach would most likely be prohibitive. Surveys for the collection of fishing effort data needed to produce catch estimates are conducted at the end of each wave. A major part of the MRIP re-design is that these effort surveys will rely more heavily on lists of licensed and registered anglers as the effort sampling frame and less on random-digit dialing of households. “Raw” uncleaned intercept data could be provided throughout the wave, perhaps not in “real-time” but at more frequent intervals (e.g. weekly) as it becomes available. Such updates could provide fishery managers with information at critical times during the fishing season. As an example, both Oregon and Washington use raw intercept data to produce weekly “rough” catch estimates for recreational bottomfish species that are occasionally used to inform in-season decisions. Several participants expressed concerns about basing management decisions on “raw” data that had not been subject to at least some error-checking or quality control measures. It was also pointed out that releasing “raw” data for use by fisheries managers may be in violation of the federal Information Quality Act.

If raw intercept data are to be used as a “real-time” rough gauge of catch throughout the wave, data transmittal and processing time will need to be sped up significantly to get data from the field into a usable database. There was some discussion at the workshop about the use of electronic data collection for improving recreational data timeliness. The use of electronic data capture devices could not only speed up the flow of data from field intercept surveys but could also improve data quality if programmed with built-in error-checking routines. Testing of different hand-held electronic data collection devices for application in recreational fisheries intercept surveys continues to be conducted. Electronic logbook data collection programs are also being tested in the South Atlantic and Gulf of Mexico for-hire fisheries. Electronic data collection options should continue to be explored and evaluated through MRIP.

Pacific Coast Recreational Surveys

In response to changing management needs in the late 1990s and early 2000s, the Pacific Coast states developed new, or modified existing, recreational surveys that differed from the predecessor MRFSS design. One primary difference between MRFSS and the newly designed Pacific surveys is the estimation of effort. Whereas MRFSS used a random-digit dialing coastal household telephone survey as the primary frame for effort estimation and the access-point intercept survey to correct for biases, the Pacific surveys use a combination of access-point and roving surveys to estimate effort and a telephone frame to correct for biases. Although variation exists among the three state recreational data collection programs (California, Oregon, and Washington)³, a primary management need addressed by all three was improved data timeliness. The Pacific Coast states recreational surveys currently generate monthly catch and effort estimates. Preliminary

³ See Pacific States Marine Fisheries Commission Recreational Fisheries Information Network (RecFIN) website for detailed descriptions of the recreational survey designs: <http://www.recfin.org/resources>

data used to inform management decisions in-season are available one week after the month and catch estimates are typically available with a one-month lag. By accepting trade-offs between timeliness, cost, and sampling coverage, West Coast fishery managers now have the timeliness needed to effectively manage most recreational sector quotas. To achieve monthly estimates without sacrificing precision, the Pacific states surveys concentrate sampling effort during high effort months (March through September) and particular fishing modes (shore mode not sampled in Oregon and Washington). Pacific coast states have been willing to accept the trade-off of reduced or incomplete sampling coverage in order to achieve desired levels of precision. Estimates for October through February are extrapolated from sampled months based on historical temporal distribution of catch. This approach, which could potentially bias catch estimates, is currently being reevaluated with MRIP funding. MRIP is also in the process of working with Pacific RecFIN to reduce or eliminate other potential biases in the Pacific survey designs and estimation methods.

Even with reduced sampling coverage, the new surveys are still considerably more costly than the (MRFSS) which was conducted on the Pacific Coast prior to 2004. The Pacific RecFIN 2011-2012 budget to conduct all tasks is \$6.9 million (not including another 965,000 for monitoring recreational salmon fisheries). Eliminating shore mode sampling in Oregon and Washington and the Oregon phone survey reduces the budget to \$5.4 million. By comparison, the RecFIN grant to conduct MRFSS on the Pacific Coast in 2003 was \$1.2 million. Therefore, improvements in recreational data quality and timeliness on the Pacific Coast have not come without a price. RecFIN has been funded at \$2.2 million for the past 10 years with the states accounting for the substantial gap between the RecFIN grant and the current costs associated with running the surveys.

A thorough evaluation of the cost, feasibility, and data quality impacts of implementing Pacific Coast survey methods on the Atlantic and Gulf Coasts was not within the scope of this project. Such an evaluation would need to consider significant differences between the recreational fisheries in these regions including the number and type of fishing access sites, temporal and spatial distribution of fishing effort, number of inlets or points of egress for ocean boat trips, among other factors. As mentioned above, the Pacific surveys primarily use a combination of access-point and roving survey methods to estimate effort as opposed to phone surveys. A recent report prepared for The Ocean Conservancy analyzed the relative strengths and weaknesses of the California Recreational Fisheries Survey (CRFS) in comparison to the MRFSS for providing reliable in-season monitoring of the private recreational reef-fish fishery in the Gulf of Mexico⁴. In terms of timeliness, the report notes that both on-site and telephone methods for estimating effort can be made more timely by shortening the estimation period – i.e. telephone waves could be shortened to one month. The report also suggests that given the sheer number of access sites in the Gulf, including a significant private access component, and relatively high costs associated with on-site survey methods, a

⁴ Jones, Cynthia M. Report on a Comparative Analysis of MRFSS and CRFS with Emphasis on the Gulf of Mexico Private Recreational Reef-fish Fishery. Unpublished report prepared for the Ocean Conservancy, July 16, 2010.

phone survey based on a list frame of anglers would be a more cost effective and efficient method for estimating effort. MRIP is currently pilot testing more efficient and less biased recreational fishing effort survey designs. These include dual-frame approaches that utilize angler license frames as well as mixed mode designs that combine phone surveys with mail surveys.

Forecasting as a Tool for Reducing Management Uncertainty

Forecasting techniques can provide an efficient, cost effective mechanism for in-season projections of recreational catch and effort in cases where the timeliness of survey data is not adequate for in-season adjustments. Regional variation exists in the extent to which forecasted or projected landings are currently being used as an in-season management tool. All three Pacific Coast states use in-season projections to track recreational groundfish quotas based on the most recent monthly survey data and, in some cases, “raw” weekly survey data. Recreational landings are also projected in-season by the NOAA Fisheries Southeast Regional Office for greater amberjack and red snapper in the Gulf of Mexico and black sea bass in the South Atlantic. However, in recent years the red snapper season has been so short that season length projections have had to rely on prior year’s data which are often not a reliable predictor or current year landings patterns. The Mid-Atlantic and New England Councils have chosen not to use forecasting as a tool for in-season management due to concerns about the reliability of projected landings as the basis for management decisions. Workshop participants in the Northeast Region breakout group did, however, recognize the value of forecasting and indicated that, if the frequency and quality of data supported reliable forecasts, this management tool could have future utility for Mid-Atlantic and New England recreational fisheries as well.

The workshop provided data users with an opportunity to compare forecasting approaches, share knowledge, and discuss ways to improve current methods for future application. Several methods of forecasting recreational data were presented and discussed during the workshop. These ranged in complexity from ratio estimators and basic regression analysis to more complex model-based approaches such as Autoregressive Integrated Moving Average (ARIMA) and Econometric Time Series (ETS) models. Success in terms of reliably predicting recreational estimates has also varied by approach and by species. Workshop participants identified several challenges associated with forecasting recreational estimates including:

- Accounting for changes in catch rates and fish sizes from one year to the next in stocks that are rebuilding.
- Accounting for the impacts of time/area closures and other regulatory changes on targeted effort, catch rates, and average fish size.
- The ability to forecast estimates reliably and in a timely manner may be hindered by recreational data lags and data imprecision.

Several participants identified the potential to improve recreational forecasting models by including external correlates such as angler behavior, fuel prices and other economic

indicators, weather data, management regulations, and survey metrics. Forecasts of total catch and effort may also be improved with independent indicators of fishing activity from other data sources. MRIP should continue to support development of innovative methods for collecting detailed data on catch and effort that may supplement and assist in the interpretation, validation and tuning of data derived from the baseline survey methods. These innovative methods may include but are not limited to panel surveys, voluntary self-reporting systems (e.g., catch cards, internet surveys, mobile phone apps, or the eLOGBOOK application of SAFIS), alternative platform surveys (i.e., on the water intercepts), or voluntary video monitoring surveys. Specialized species-specific surveys may be needed to help councils manage “rare event” recreational fisheries (e.g. HMS) or fisheries with particularly short seasons or small catch limits.

More timely data (e.g. one month waves) can reduce the time period being forecasted, thus resulting in more accurate projections (i.e., reduced management uncertainty). Forecasting approaches may also be able to make use of timelier intercept data (e.g. weekly updates) throughout the wave. Combined with forecasted effort estimates, this catch information could be used to forecast landings for the entire wave and future waves. As discussed above, the quality of intercept data released throughout the wave is an issue that will most likely need to be addressed before such data can be reliably used for projections. Electronic data collection innovations may improve the speed with which intercept data can be processed and cleaned and thus the utility of mid-wave data for forecasting landings.

Forecasting options should also be explored for recreational fisheries with different sources of data with different time lags. For example, if MRIP landings estimates are timelier than Southeast Headboat Survey data or Texas Parks and Wildlife estimates, landings from these two sources can be projected using MRIP data and possibly other external correlates. Similarly, if timelier data are available for one particular mode of fishing it may be possible to forecast recreational landings in the other modes. For example, if there is a strong correlation between landings in different modes, a mandatory for-hire electronic logbook program could be used to forecast landings in the private boat and shore modes for particular species. However, the effectiveness of electronic logbook data as a forecasting tool will be dependent on compliance rates and the timeliness of captains’ submissions.

MRIP is also exploring more efficient and less biased recreational fishing effort survey designs. Based on initial pilot studies it appears that mail surveys have distinct advantages over phone surveys in terms of survey coverage and possibly response rates. One likely disadvantage of mail surveys is timeliness since they often involve multiple mailings and responses can trickle in weeks or months after the final survey mailing. A mixed survey mode design that uses both phone and mail methods may be optimal. If the revised MRIP effort survey design uses a mail survey as part of a mixed survey mode approach it will be beneficial to develop models that can forecast complete effort based on partial results from the faster survey mode (e.g. phone) and from initial mail returns.

Adjustments could be made later for final catch and effort estimates once complete data from all survey modes have been included.

MRIP Recommendations Regarding Data Timeliness

Based on a critical analysis of recreational survey data timeliness and with significant input from data users, industry representatives, and other interested stakeholders, the project team proposes the following specific recommendations for MRIP consideration:

1. Move towards implementation of one-month waves:
 - a. New MRIP catch and effort survey designs should have the flexibility to allow for generation of monthly catch and effort estimates.
 - b. MRIP should fund a Recreational Data Timeliness Simulation Project with the goal of developing a model to simulate recreational catch estimates and associated variances from one-month waves. Comparisons of cumulative estimate precision levels using one-month versus two-month waves should be done for key management species.
 - c. Building off the simulation model, a secondary project should develop an Optimal Sample Allocation Tool that will provide information on tradeoffs between timeliness, precision, and cost and allow for more informed decisions regarding sample allocation.
 - d. Recognize that if funds are limited it may be optimal to produce monthly estimates during certain times of year (e.g. “core” months) and bi-monthly estimates during other times. This may also vary by region or sub-region (i.e. coordination of “core” months with “core” geographic areas).
 - e. Decisions regarding when to produce monthly estimates and when to produce bi-monthly estimates should be informed by: 1) results from the simulation model and sampling allocation tool, 2) MRIP budget realities and priorities, and 3) sample size add-ons from MRIP partners.
2. Reduce lag time between the end of a sampling wave and production of recreational catch estimates by up to two weeks.
 - a. If telephone surveys are part of the new effort survey design, the Request for Proposals (RFP) should include contractor pricing for delivery of error-free data 21 days after the end of the previous month (in addition to the status quo 28 days after end of month) for comparison.
 - b. NOAA Fisheries Statistics Division should reduce the time needed to produce and review recreational catch estimates to about 1 week (current lag is about 2 weeks) after all data have been delivered and forecasted effort estimates have been produced (if forecasting needed for effort). Additional staff resources should be dedicated to this task, as needed, to achieve the faster turnaround time. Back-up staff should be identified well

in advance to assure timely completion of this task when primary staff responsible are on leave, travel or otherwise unavailable.

3. If the revised MRIP effort survey design uses a mail survey as part of a mixed survey mode approach, models should be developed that can reliably forecast effort based on partial results from the faster survey mode (i.e., phone) and from early mail survey returns.
4. MRIP should continue to support and encourage development of models for reliably forecasting recreational catch and effort estimates as a potentially more timely and cost effective approach for in-season quota management.
 - a. If MRIP landings estimates are timelier than other recreational data sources (e.g. Southeast Headboat Survey data or Texas Parks and Wildlife Survey), landings from these sources can be projected using MRIP data.
 - b. If timelier data are available for one particular mode of fishing it may be possible to forecast recreational landings in the other modes based on the more timely data and other sources of information.
 - c. MRIP should continue to test and analyze the use of other external correlates for forecasting recreational catch and effort such as fuel prices, bait and tackle sales, other economic indicators, weather data, and management regulations.
5. MRIP should continue to test the feasibility of innovative electronic data collection options, analyze costs/benefits, and make recommendations for implementation in particular regions as warranted. Potential benefits of electronic data collection that should be further evaluated include:
 - a. Improve the timeliness of data delivery from the field;
 - b. Shorten time lag for verifying questionable reported values with the data provider;
 - c. Eliminate time needed for data entry or scanning paper forms;
 - d. Built-in error checks and identify errors at point of interview;
 - e. Drop-down menus reduce the amount of writing interview needs to do thus reducing potential for errors and speeding up the interview process;
 - f. May allow for forecasting of catch estimates at various points throughout the wave (e.g., weekly) if data can be processed more quickly.
6. MRIP should continue to support development of innovative methods for collecting detailed data on catch and effort that may supplement and assist in the interpretation, validation and tuning of data derived from the baseline survey methods or provide improved timeliness and precision to support management of particular species.

Management Approaches for Addressing Uncertainty Associated with Recreational Data

A general theme of the Timeliness Workshop was the need to consider adapting management to data constraints rather than adapting data to meet management needs. This will be particularly important in the short-term as improvements in recreational data quality and timeliness are being developed, tested, validated, and implemented gradually over time as part of MRIP. However, as noted by several workshop participants, improvements in recreational data quality and timeliness that can feasibly be implemented through MRIP should not be viewed alone as a panacea for management of recreational ACLs. Therefore, management approaches for addressing the management uncertainty associated with data imprecision or estimation lag times will continue to play an important role even after the MRIP data quality and timeliness improvements are fully implemented. Below are some management approaches or strategies for managing recreational sector ACLs that were discussed during the workshop.

Uncertainty Buffers

Councils can address management uncertainty and effectively reduce their risk of exceeding an ACL by establishing Annual Catch Targets (ACTs) at some catch level below the ACL. ACTs are an optional tool that managers can use as a proactive Accountability Measure to reduce the risk of exceeding an ACL. As illustrated below (Figure 3), the gap or buffer between ACL and ACT will be directly influenced by the timeliness of catch data. Timelier data allows managers to set ACTs closer to ACLs, thus increasing fishing opportunities and revenues for the fishing industry and associated businesses. While overages may still occur, their probability of occurrence and relative magnitude when they do occur will both be decreased with more timely data.

ACT Control Rules

National Standard 1 guidelines also suggest that Councils establish an ACT control rule which specifies an approach to setting the ACT for a stock (or stock complex) such that the risk of exceeding the ACL due to management uncertainty is at an acceptably low level. Control rules for setting reduction buffers should take into account the precision, accuracy, and timeliness of recreational data. The distribution of recreational landings across survey waves may also be an important control rule criterion. For example, stocks where all (or the large majority) of landings occur within 1 or 2 key waves will be subject to higher levels of management uncertainty than stocks with more even distribution of landings across several waves. Inter-annual variability could also be a factor used for setting control rules (i.e., greater uncertainty for stocks with more variability from year to year). ACT control rules can include tiers established based on levels of management uncertainty associated with the fishery, frequency and accuracy of

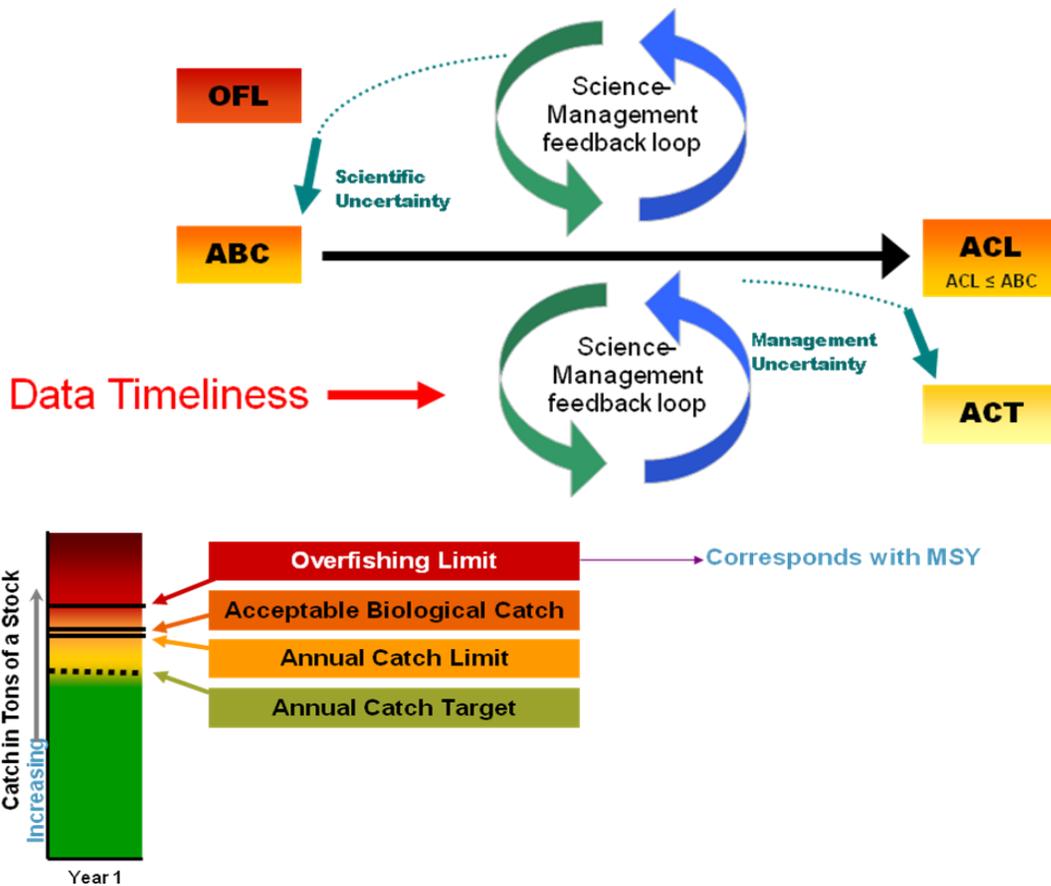


Figure 3. Schematic showing possible reductions in allowable catch to address two kinds of uncertainty (management and scientific) in fisheries management⁵.

catch monitoring data available, and risks of exceeding the limit. An ACT control rule could be established for each tier and have, as appropriate, different formulas and standards used to establish the ACT.

A draft example of an ACL-ACT control rule proposed by the Gulf of Mexico Fishery Management Council was presented at the timeliness workshop (Figure 4). The Gulf Council is considering options for defining each Tier in terms of percent reduction from ABC or ACL. Terms such as “High”, “Medium”, and “Low” in reference to precision and accuracy may also need to be better defined (e.g., High precision = PSE < 10%) as this process continues.

⁵ Mark Nelson, NOAA Fisheries, personal communication.

Multi-year Averaging of ACL

The use of multi-year averages for managing ACLs was discussed during the workshop. This approach has the advantage of smoothing inter-annual variability in landings and allows fishery managers the flexibility to exceed an ACL in any given year so long as the multi-year average landings do not exceed the limit. Precision on landings estimates also improves when several years are combined. While multi-year averages can be viewed as a coping strategy for estimation lags and inadequate data precision, some disadvantages were also noted. For example, while multi-year averages will smooth inter-annual variability, a single high landings year that significantly exceeds the ACL could have multi-year ramifications. Another concern raised is that multi-year averaging could have unknown, and possibly deleterious, impacts on the resource. For example, exceeding an ACL by 50% in Year One and subsequently catching 50% less than the ACL in Year Two may not be equivalent to catching the exact ACL in both years in terms of impacts on the stock (e.g., recruitment, growth, mortality).

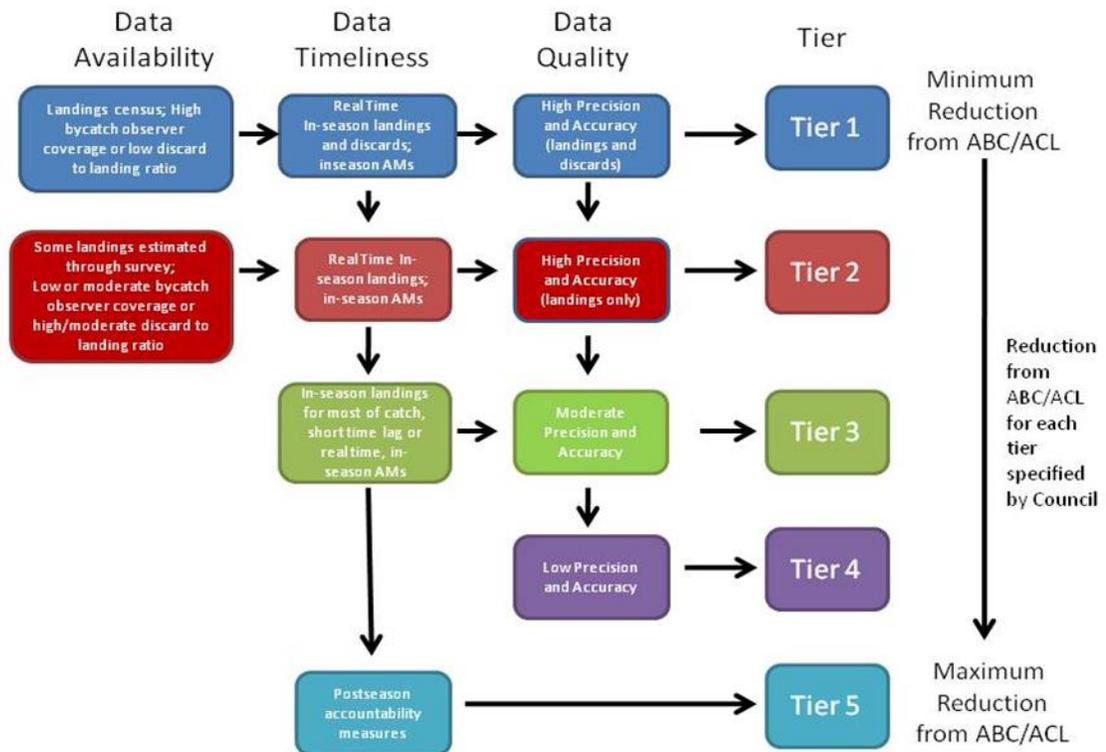


Figure 4. Draft Gulf of Mexico Fishery Management Council Control Rule Schematic for Reducing from ABC/ACL as a buffer to control for management uncertainty.⁶

⁶ John Froeschke, Gulf of Mexico Fishery Management Council, personal communication.

Choice of Regulatory Control

Fishery managers use a variety of catch and effort controls to restrict recreational landings to avoid exceeding specified limits. These include seasonal closures, area closures, depth limits, daily possession limits, minimum size limits, and slot size limits. The choice of regulatory controls used not only impacts fishery participants and associated businesses but can also influence the level of management uncertainty associated with monitoring an ACL. Managers must weigh the advantages and disadvantages in determining which control or suite of controls to use to limit recreational catches. As discussed above with regard to ACT control rules, the distribution of recreational landings across survey waves can influence the probability of not exceeding an ACL. If the majority of landings all occur within a short time frame, by the time fishery managers receive landings estimates for the peak wave it is likely too late to make in-season adjustments to prevent an ACL overage. By contrast, fisheries where landings are more evenly distributed throughout the year allow managers more opportunities to make adjustments based on evaluation of cumulative landings and seasonal trends. The distribution of landings across waves for a given species can be affected by seasonal availability, seasonal distribution of targeted effort, and other fishery related factors.

The choice of regulatory control can also influence the temporal distribution of landings and, in turn, the management uncertainty associated with recreational data lags. For example, seasonal closures that restrict landings to certain times of year often have the effect of condensing landings into a shorter time frame than would be the case with bag limits and size limits alone. Short fishing seasons put more pressure on fishery managers to stay within specified catch limits and provide little margin for error in the models used to predict landings and the assumptions those models are based on. This is particularly true in the Gulf of Mexico where fishing seasons for high profile, popular species such as red snapper and gag have been reduced to two months or less in recent years. Workshop participants noted that for these species fishing seasons would need to be substantially longer to even consider in-season adjustments based on more timely recreational survey catch estimates. For recreational fisheries with particularly short seasons or small catch limits it may be necessary to identify additional management and reporting tools. These could include fishery specific permits, mandatory reporting requirement, catch card and landings tag programs, check stations, and specialized species specific surveys.

If seasons are lengthened as a strategy for reducing management uncertainty, the trade-off will be more restrictive possession limits and/or size limits in order to maintain the same level of fishing mortality. Evaluation of trade-offs among different types of catch and effort controls available to limit recreational landings is a standard part of the fishery management process. Selection of which suite of controls to use will be fishery specific and based on the particular characteristics of each fishery. Management alternatives are routinely discussed and debated at scoping meetings, public hearings, council and commission meetings, technical committee meetings and other gatherings of fisheries

stakeholders. The advantages associated with extending fishing seasons of reducing management uncertainty and possibly allowing for in-season adjustments should be considered and evaluated by fishery managers, and integrated into the regulatory control decision-making process.

Timeliness of Management Decision-Making and Specification Process

The speed with which different fisheries management authorities can implement in-season actions based on more timely recreational landings updates was discussed and compared during the workshop. It was widely recognized by workshop participants that more timely recreational data was only as valuable as management's ability to use the information in a timely manner. The ability of management to respond quickly with in-season closures or other regulatory measures varies considerably by region and states within regions. As discussed above, the Pacific Coast state surveys provide managers with more timely recreational landings updates compared to the Atlantic and Gulf. All three Pacific Coast state agencies have management systems designed to react quickly to utilize the timelier in-season updates. Oregon and Washington can implement closures within a few days of receiving landings updates, and California can react with a few weeks. In addition, all three states have landings laws that can effectively extend state regulations to federal waters. Management reaction time is more variable on the Atlantic Coast where some states can react quickly by proclamation or emergency rule while others can take up to four months. For in-season actions in federal waters, considerable variability exists among Councils, FMPs, and even sectors in terms of providing in-season closure authority to NOAA Fisheries. For example, the Gulf Council provides NOAA Fisheries with in-season closure of the recreational greater amberjack fishery if the sector quota is reached or projected to be reached. By contrast, for gray triggerfish federal in-season closure authority is provided for the commercial sector but not for the recreational sector. Not granting in-season closure authority to NOAA Fisheries could add several weeks (or more) to the process of closing federal waters to recreational fishing. A distinction can also be made between closure authority that is triggered only after an ACL is actually exceeded, versus closure authority that can be implemented to avoid exceeding an ACL based on projected or forecasted landings.

Related to differences in reaction time, workshop participants discussed the challenges associated with institutional coordination for stocks which are jointly managed between federal and state entities. For example, ASMFC has not yet developed complementary measures regarding ACL's and AM's for the stocks that are jointly with the MAFMC. The involvement of multiple agencies increases the complexity of coordination and can complicate timeliness of management responses.

State-Level Quotas and Sharing Agreements

For some stocks the overall recreational quota is further subdivided among individual states. State agencies are then responsible for monitoring landings and staying within the specified state sub-quotas. From a data quality perspective, landings estimates at lower levels of stratification will have lower precision than higher levels (i.e. state level estimates will be less precise than regional or coast-wide estimates). Therefore, management uncertainty typically increases when trying to manage within sub-quotas or smaller shares of the pie. Inter-annual variability will also likely be greater at smaller geographic scales due to natural variability in fish availability, weather events, or other more localized factors that may not impact the entire range of the stock. While there may be valid political or socio-economic justifications for state level quotas, in most cases they increase the risk of exceeding the specified limits and place greater demands on the quality and timeliness of recreational data. One approach to buffering this risk is to establish sharing agreements between states. If one state exceeds its annual recreational limit they can borrow quota from a state that may be under quota. The Pacific Coast states currently have sharing agreements in place for some of their quota managed recreational stocks.

Stock Complexes ACLs

The precision on recreational landings estimates may be inadequate for effectively managing an ACL for some managed species. This is particularly true for less common or “rare event” species. While precision can often be improved through increased sample sizes, for some species the increase needed to achieve adequate precision is impractical given budget realities and other priorities. Specialized surveys could be considered for these species but these too can be very costly to implement on a species by species basis. Another approach that fishery management Councils are currently evaluating for addressing data quality and timeliness deficiencies is the establishment of stock complexes ACLs. The cumulative precision on a stock complex landings estimate will be higher than the precision on each individual species estimate. The use of stock complexes can serve as a buffer against anomalous individual species level estimates that may result in a closure not just for that species but for other species in the same fishery complex (e.g., Pacific rockfish fishery closes if one species quota is exceeded). However, creating effective stock complexes can be difficult. National Standard 1 discusses the principles that should be followed when creating stock complexes, to ensure that overfishing doesn’t occur on any particular stock within the complex.

Summary of Management Approaches for Addressing Uncertainty Associated with Recreational Data

Below is a summary of key findings related to management approaches resulting from the workshop:

- Anticipated MRIP improvements in data timeliness, accuracy and precision will reduce but not eliminate management uncertainty associated with recreational estimates. For some stocks, management uncertainty will remain relatively high and fishery managers need to anticipate and address this uncertainty.
- Councils can address management uncertainty and effectively reduce their risk of exceeding an ACL by establishing Annual Catch Targets (ACTs) at some catch level below the ACL.
- ACT control rules for setting reduction buffers should take into account the precision, accuracy, and timeliness of recreational data, as well as the distribution of recreational landings across survey waves.
- The relative advantages and disadvantages of multi-year averages for managing ACL's should be thoroughly analyzed and evaluated, particularly for species with relatively low precision on annual catch estimates.
- The choice of regulatory controls used not only impacts fishery participants and associated businesses but can also influence the level of management uncertainty associated with monitoring an ACL. Fishery managers should thoroughly evaluate trade-offs of longer versus shorter recreational fishing seasons and other associated controls (i.e., bag limits, size limits, and area closures).
- Improvements in the timeliness of recreational data are only as valuable as management's ability to use the information in a timely manner. The ability of management to respond quickly with in-season closures or other regulatory measures varies considerably by region and states within regions. Councils and states may be able to reduce the risk of exceeding ACLs by minimizing the time needed to implement in-season controls once recreational data become available.
- Other mechanisms aimed at buffering the risk of exceeding an ACL should also be considered including sharing agreements between states (for state level quotas) and the use of stock complexes for rare event species with relatively low precisions levels.

Appendices

Appendix A. Recreational Fisheries Data Timeliness Workshop final agenda.

Recreational Data Timeliness Workshop
March 15-16th
St. Petersburg III Room, Hilton Bayfront, St. Petersburg Florida

FINAL AGENDA

Tuesday March 15th

- 12:45 Arrival and Sign-in
- 1:00 Introductory Remarks, Review Agenda, Ground Rules
Ron Salz, NOAA Fisheries, Fisheries Statistics Div./ Facilitator, CONCUR, Inc.
- 1:15 MRIP Overview - Gordon Colvin, NOAA Fisheries, Fisheries Statistics Division
- 1:45 Overview of Annual Catch Limits and National Standard 1 Guidelines
Mark Nelson, NOAA Fisheries, Sustainable Fisheries Division HQ
- 2:00 Recreational Data Timeliness Case Studies
Pacific Coast Species - Corey Niles, Washington Dept. of Fish and Wildlife and
Lynn Mattes, Oregon Department of Fish and Wildlife
South Atlantic and Gulf of Mexico Species – Andy Strelcheck, NOAA Fisheries,
Southeast Regional Office, Sustainable Fisheries
Black Sea Bass (Northeast) - Mike Ruccio, NOAA Fisheries, Northeast Regional
Office, Sustainable Fisheries
Summer flounder - Toni Kerns, Atlantic States Marine Fisheries Commission
- 3:20 Break
- 3:35 Fish Collaborative Blue Ribbon Panel Summary on Recreational Data Timeliness
Dick Brame, Coastal Conservation Association
- 3:50 Consistency between Management Structures and Data Availability/Quality
Topic Presentation: Jessica Coakley, Mid-Atlantic Fishery Management Council
Panelist Presentations
Panelists: John Froeschke, Gulf of Mexico Fishery Management Council; Chris
Kellogg, New England Fishery Management Council; Russel Porter, Pacific
States Marine Fisheries Commission; David Cupka, South Atlantic Fishery
Management Council.
Discussion/Questions
- 5:05 Public Comment
- 5:20 Synthesis of Day 1 / Preview of Day 2 - Facilitator, CONCUR, Inc.
- 5:40 Adjourn Day 1

Wednesday March 16th

- 8:30 Welcome Back / Preview of Day 2 - Facilitator, CONCUR, Inc.
- 8:35 Options for Improving Recreational Data Timeliness: Forecasting Recreational Catch Estimates
Panelist Presentations
Panelists: 1) Nick Farmer, NOAA Fisheries, Southeast Regional Office, Sustainable Fisheries; 2) Lynn Mattes, Oregon Department of Fish and Wildlife; 3) John Foster, NOAA Fisheries, Fisheries Statistics Division
Discussion/Questions
- 9:35 Options for Improving Recreational Data Timeliness: Increase Frequency of Estimation
Dave Van Voorhees, NOAA Fisheries, Fisheries Statistics Division
- 10:00 Options for Improving Recreational Data Timeliness: Reducing Lag Time
Jun Rossetti, ICF Macro International / Ron Salz, NOAA Fisheries
- 10:30 Break
- 10:45 Regional Break-out Session Introduction
Alternatives for Addressing Recreational Data Timeliness Needs – Ron Salz, NOAA Fisheries
Species Fact Sheets – Ron Salz, NOAA Fisheries
Session Instructions and Objectives - Facilitator, CONCUR, Inc.
- 11:15 Regional Break-out Session: Part One
Regional Leaders:
Northeast – Sarah Heil, NOAA Fisheries, Northeast Regional Office, Sustainable Fisheries
South Atlantic – Kathy Knowlton, Georgia Department of Natural Resources
Gulf of Mexico and Caribbean – Sera Drevenak, Pew Environmental Group
Pacific and Western Pacific – Kevin Duffy, NOAA Fisheries, Northwest Regional Office, Sustainable Fisheries
- 12:15 Lunch
- 1:30 Regional Break-out Session: Part Two
- 2:45 Break
- 3:00 Regional Groups Report Out
- 3:45 Public Comment
- 3:50 Workshop Wrap-up and Next Steps - Facilitator, CONCUR, Inc.
- 4:30 Adjourn Workshop

Appendix B. Organizing questions for workshop breakout group discussions.

**Recreational Fisheries Data Timeliness Workshop
Organizing Questions for Day 2 Regional Break-out Session**

STEP ONE: Categorize recreational fishery species/stocks into 3 groups based on priority need for more timely recreational catch estimates – **high, medium, low**.

Note: You are not limited to the species provided in the NOAA Fisheries Fact Sheets.

STEP TWO: For each high priority species, discuss the following

1. What are the positive and negative impacts of each of the 5 recreational data timeliness alternatives identified in the attached table?
Note: Pacific Region group should develop their own list of alternatives based on the data timeliness needs for their high priority species and particulars of their recreational data collection programs.
2. What are the anticipated tradeoffs between timeliness and data quality for this species/stock? Would you be willing to sacrifice data quality for timeliness for this species/stock?
 - 2a) In particular, would you accept lower precision on catch estimates in exchange for monthly estimates?
 - 2b) If we switch to monthly estimates, where are increased sample sizes particularly important in order to achieve (or maintain) a desired level of precision for this species/stock? Distinguish, as possible, by time of year, geographic location and fishing mode (e.g., private, for-hire, shore).
3. Is forecasting of recreational landings currently used as a management tool?
If not, consider whether forecasting should be explored for this species and what improvements in terms of data timeliness, quality (accuracy/precision) might be needed to effectively forecast estimates.
If forecasting is currently used, in what ways might the models be improved to provide more reliable/predictive estimates for management purposes?
4. Are there solutions to the problem of data timeliness that can be addressed by a different management approach? Is the current management regime for this species/stock consistent with the availability, quality and timeliness of recreational data? If there is a mismatch, are there management changes that can be recommended to work better with the available data?
5. If none of the identified alternatives (more timely estimates, forecasting, or management solutions) result in a significant improvement, discuss what additional steps are needed in terms of recreational data availability, quality and timeliness for this species/stock. Consider if a specialized survey effort or census-based landings program (e.g. carcass tags or catch card program) would be needed to more effectively manage this recreational fishery.

Appendix C. Example of species fact sheets prepared for timeliness workshop.

Species: Black Sea Bass (Northeast)

Current Status: Overfished NO Overfishing NO

States Included: Massachusetts through North Carolina

2010 Recreational ACL or Harvest Quota: 1,830,000 pounds.

% Overall 2010 Limit for Recreational Fishery: 51%

2010 Season: May 22 – Oct. 11, Nov. 1 – Dec. 31

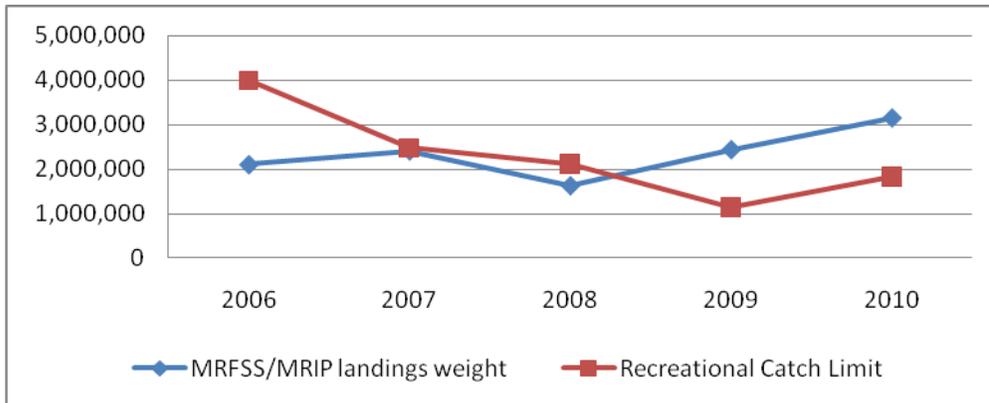


Figure 1. Black Sea Bass (Northeast) MRFSS/MRIP Landings Weight (lbs) and Recreational Catch Limits 2006-2010.

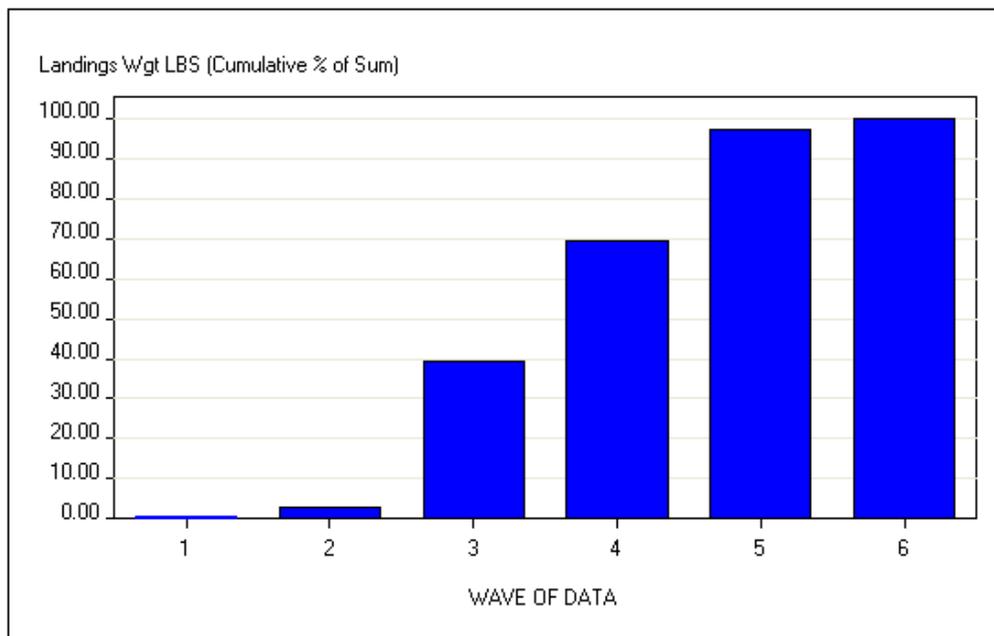


Figure 2. Cumulative Percent of Black Sea Bass (Northeast) MRFSS/MRIP Landings Weight by 2-month Wave, 2006-2010 Combined (Note: Wave 1 landings only for North Carolina as other states not sampled).

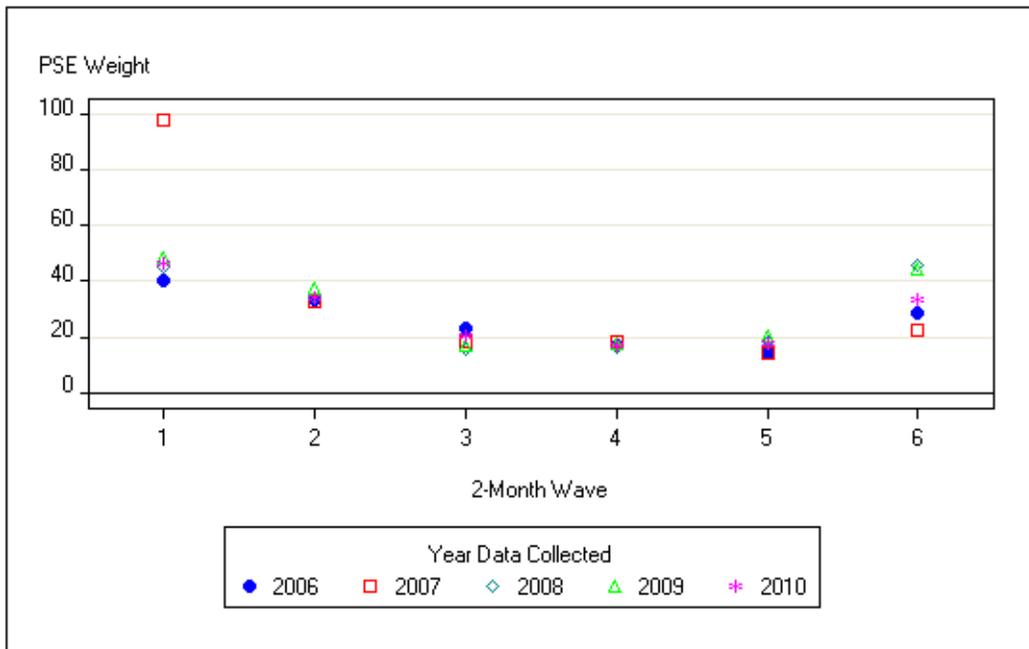


Figure 3. Black Sea Bass (Northeast) MRFSS/MRIP Landings Weight PSE's by Wave 2006-2010.

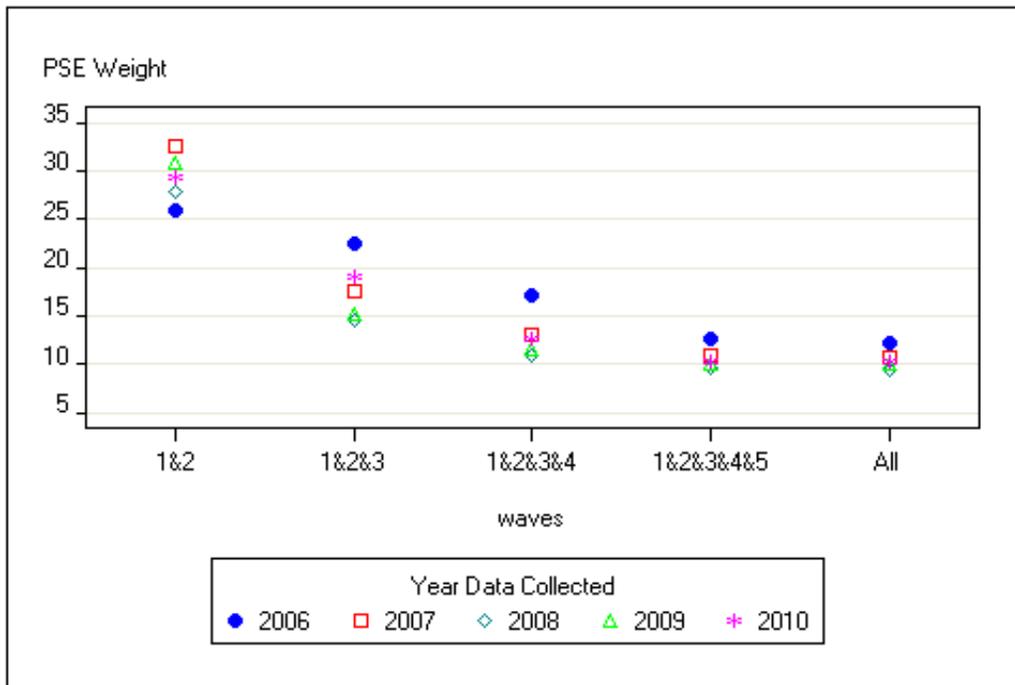


Figure 4. Black Sea Bass (Northeast) MRFSS/MRIP Landings Weight PSE's Cumulative by Wave for 2006-2010.

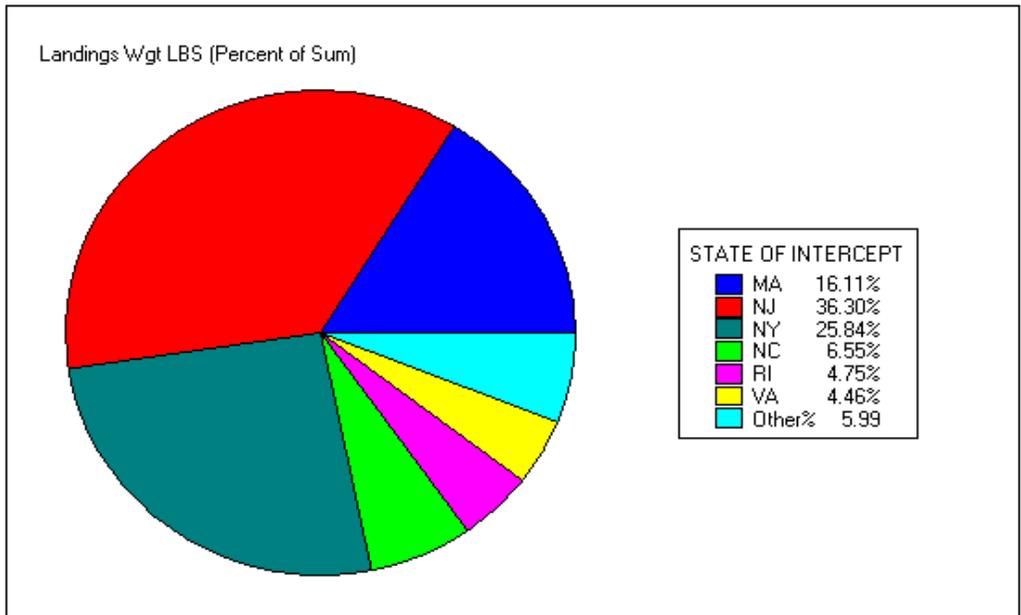


Figure 5. Distribution of Black Sea Bass (Northeast) MRFSS/MRIP Landings Weight by State, 2006-2010 Combined.

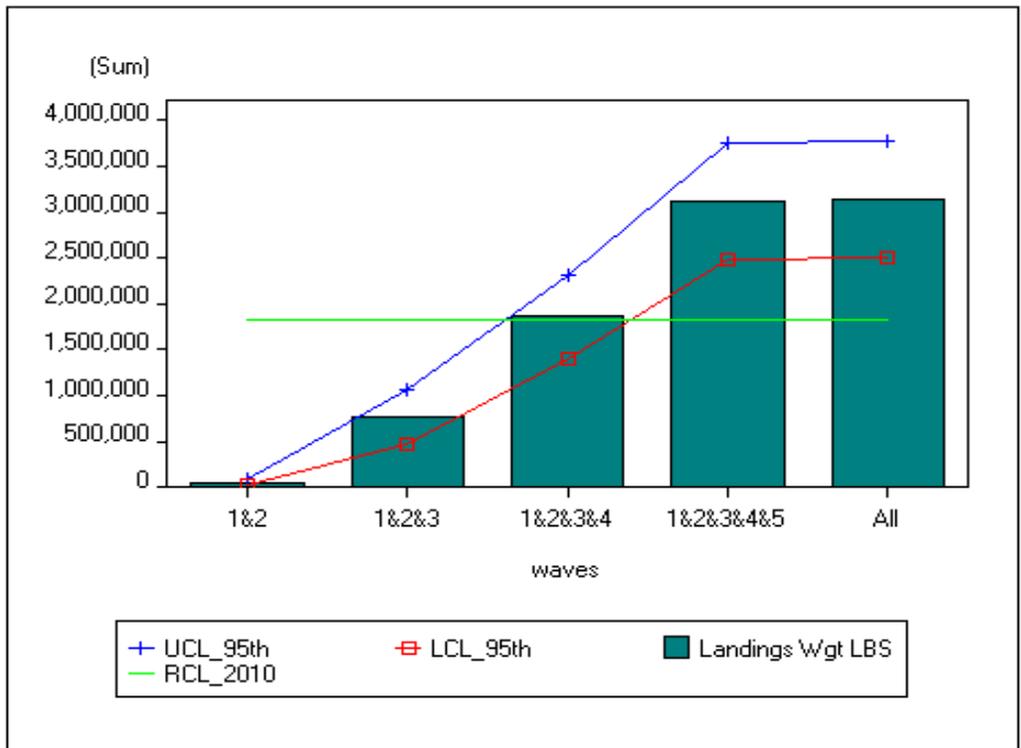
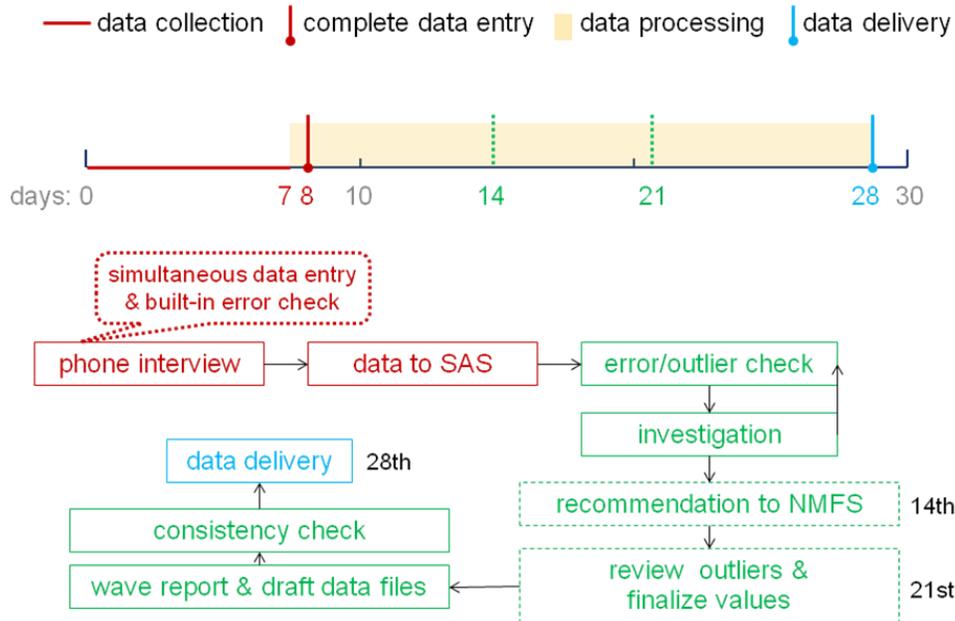


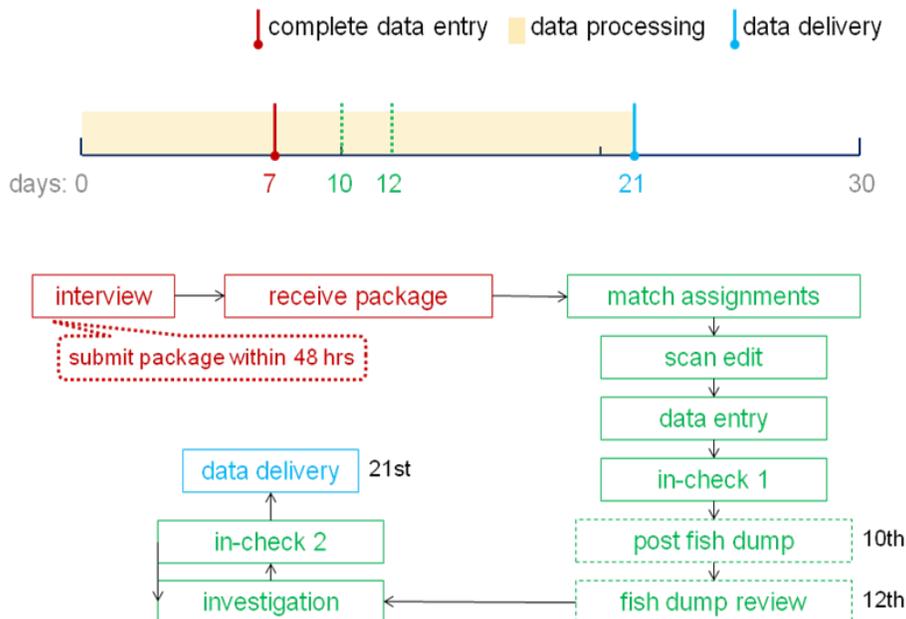
Figure 6. Black Sea Bass (Northeast) 2010 Recreational Landings Weight and 95th Percentile Upper and Lower Confidence Intervals (UCL_95th, LCL_95th) Cumulative by Wave, and 2010 Recreational Catch Limit (RCL).

Appendix D. Detailed timelines showing individual steps associated with the data processing phases for the Coastal Household Telephone Survey, Atlantic Intercept Survey, and Atlantic For-Hire Survey.

Household Telephone Survey Data



Atlantic Intercept Data



Atlantic For Hire Survey Data

