# For-Hire Electronic Logbook Pilot Study in the Gulf of Mexico 

Final Report

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This pilot study was preceded by a review of nationwide data collection methods for for-hire fisheries, with participation from data collection specialists across the country, and by a workshop with stakeholders throughout the Gulf of Mexico to gather input on data needs and methods to improve regional data collections from for-hire fisheries. The design of this pilot study greatly benefitted from both sources of input. The design and analyses for this study were conducted in consultation with professionals in the fields of fisheries data collection, survey design, statistical analysis, and catch and effort estimation. All of this work was supported by the Marine Recreational Information Program (MRIP). The pilot study itself was a cooperative effort between the National Marine Fisheries Service, Gulf States Marine Fisheries Commission, the state of Texas, and the state of Florida. This pilot study could not have been successful without support and cooperation from the for-hire industry, and we are especially grateful to representatives of the industry who supported this project on the docks and fostered support among their colleagues. Credit for the success of this project is also given to the dedicated staff who worked directly with the for-hire industry to collect accurate field validation data, assist with individual reporting needs, and maintain high levels of cooperation throughout the course of the one year pilot study. We also thank Bluefin Data, Inc., for designing the electronic reporting tool, providing technical support, and maintaining the Gulf Logbook website beyond the one-year pilot study. Three peer-reviewers provided technical comments that contributed to improvements in this final report: Dr. Alicia Carriquiry and Dr. Sarah Nusser of Iowa State University, and Dr. Stephanie Eckman of the Institute for Employment Research in Nuremberg, Germany.

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## ABOUT THIS DOCUMENT

This report presents methods and results from a pilot study to test the feasibility of the use of a census-style logbook reporting method for for-hire recreational fisheries. Currently, catch and effort statistics from the charter for-hire fishery are collected through regional surveys administered by the Marine Recreational Information Program (MRIP). This pilot study was conducted in direct response to recommendations at the national level that the universal use of logbook reporting be implemented as the source of catch and effort statistics for for-hire recreational fisheries. The study was conducted in the Gulf of Mexico, but was intended to test methods for use in any region.

The target audience for this report includes managers of fishery-dependent data collection programs, fisheries resource managers, and fishermen that are interested in the results of this study, including those who participated in this pilot study and those that may be affected by decisions pertaining to data collection programs that may result from this study. The purpose of this report is to fully document the methods tested, present results, and interpret in plain language the meaning and implications of results herein. A summary of key findings and specific recommendations from this pilot study are provided in the Executive Summary immediately following this page. A brief introduction into the background, primary goal, and objectives of this study are provided in the Background section of this Document. For readers who are interested in a more detailed background into the importance of collecting catch-and-effort statistics for recreational fisheries and specific challenges to collecting this information, we refer you to the National Research Council Review of Recreational Survey Methods (NRC 2006) cited in the References section of this document. For technical readers who are interested in finer details of statistical methods and results, we have included all pertinent technical documents as Appendices to this report.

## EXECUTIVE SUMMARY

This report summarizes the methods, results and conclusions of a one-year pilot study conducted in the Gulf of Mexico to test the feasibility of a mandatory electronic logbook reporting system, along with methods to independently verify self-reported catch and effort data in the for-hire fishery. The expectation with a mandatory reporting system is that a complete census of effort and catch among all participants in the fishery will be obtained. This would allow managers and scientists to monitor catch and effort in a timely manner to ensure catch limits are not exceeded. However, methods to independently validate self-reported fisheries data are needed to certify whether a true and accurate census of catch and effort is actually achieved, and to account for instances when it is not. Tracking methods are also important with any mandatory reporting requirement so that late or missing reports can be identified and participants in the fishery can be contacted in a timely manner. Tracking is also important to facilitate enforcement, when necessary.

Several potential benefits from a logbook reporting system were recognized from this study, and we do not rule out logbook reporting as a feasible method for the collection of catch and effort statistics from the for-hire sector. However, based on the results and design of this pilot study, a census of for-hire catch and effort using logbooks was not achieved due to non-reporting (both at the trip-level and vessel-level) by vessels required to report. If logbooks were to be used as a census, mechanisms to enforce timeliness and accuracy of reporting would need to be improved. This Executive Summary highlights the key findings from this study. Recommendations included herein are intended to guide decision makers who are considering adopting logbook reporting as a regional data collection method for for-hire fisheries. A separate analysis was completed using data collected during this pilot study to explore the feasibility of combining self-reported logbook data with independent validation data to generate statistically valid estimates for catch and effort. That report, which is currently undergoing peer-review, will provide further guidance on the utility of logbook reporting methods for the collection of catch and effort data from for-hire fisheries.

## Key Findings and Recommendations

## Reporting Tools

Electronic reporting with built-in quality control features that prevent data entry errors and omissions was an effective method for receiving high quality self-reported data from a large population of participants. Paper logbooks and electronic reporting options without built-in quality control features required more follow-up with participants to verify and attempt to correct self-reported data. Electronic reporting options that allow users the ability to record and store logbook data at-sea facilitate better record keeping and accurate recall by offering more flexibility for when and how users keep track of trip details and record logbook data.

## Recommendations:

Recommend that participants in the fishery be involved in the design of electronic logbooks to improve data reporting accuracy and efficiency, and to ensure data entry fields are clearly described.

Electronic reporting is preferred over paper logbook reporting and it is recommended that electronic reporting be required for participation in a fishery, whenever it is practical to do so.

Recommend that electronic reporting tools have quality control features built in to prevent data entry errors and omissions by users, and electronic reporting options be certified to include all required quality controls before they become available for use.

Recommend that electronic reporting tools include a feature that requires an entry of either inactivity or activity for each day in the reporting period. Alternative options, such as hail out/hail in requirements or vessel monitoring systems, should also be considered for reporting activity.

Regardless of whether or not real-time reporting is required of participants in a fishery, electronic reporting options that offer users the ability to record and store logbook data at-sea during reported fishing trips (example, smart-phone applications, tablets, etc.) are highly recommended to facilitate record keeping and accurate recall of logbook information.

Recommend that electronic logbook records be accessible, with password protection, to vessel owners for their record keeping purposes. This will help create cooperation and incentive for participation.

## Enforcement

Current authority to enforce reporting requirements for federally permitted vessels was effective for achieving reporting compliance, but was not effective for achieving timely reporting. Under the current authority, a delinquent vessel may continue to fish until the permit is due for renewal on an annual basis. Prior to the permit expiration date, the permit holder may submit delinquent records for the previous 12 months to become compliant and clear the permit for renewal. These data are not reliable in most cases. After the permit is issued, the same vessel can be noncompliant in the same manner the following year with the same consequences and results. Authority to require and enforce charter vessel trip reporting for non-federally permitted vessels varies by state and some states require legislative changes to gain such authority.

## Recommendations:

As with any mandatory reporting program, timely reporting by participants should be required for logbooks and this requirement should be enforceable. It is recommended that authority for enforcing reporting requirements be modified to enhance the timeliness of reporting. Recommended authority should include permit suspension, permit termination and civil penalties to facilitate enforcement of timely reporting.

It is highly recommended during the initial implementation of a logbook reporting requirement that planned methods are in place for initiating a quick response if compliance is low at the onset of the reporting requirement.

Recommend that follow-up procedures to track reporting compliance are designed to facilitate timely enforcement (see recommendations below under "Reporting Compliance and Timeliness").

## Reporting Compliance and Timeliness

Based on the results and design of this pilot study, a census of for-hire catch and effort using logbooks was not achieved due to non-responses (both at the individual trip-level and vessellevel) by vessels required to report. For an ongoing logbook reporting program to remain effective, a consistent and high level of effort by port samplers and law enforcement is required to validate and maintain reporting compliance and timely reporting. If logbooks were to be used as a census of catch and effort, the timeliness and accuracy of reporting would need to be improved. Throughout the pilot study, reporting compliance gradually improved and most likely would have continued to improve had this pilot study run for a longer period and fishermen became more familiar with reporting requirements. However, the issue of vessels reporting inactivity during weeks when they actively fished would continue to be an obstacle to achieving a complete census and must be accounted for. A requirement to report vessel activity or inactivity each day within a reporting period is needed to effectively track and monitor compliance for a complete census of all trips, and to conduct timely follow-up for late and missing reports (i.e. within a given reporting week, participants should be required to report inactivity or activity for each day). A large number of vessels with federal permits did not actively charter fish during the pilot study ( 100 of 358 in Florida and 43 of 58 in Texas), and different reporting requirements may be necessary for inactive permit holders.

## Recommendations:

While we do not rule out logbook reporting as a feasible method for the collection of catch and effort statistics from the for-hire sector, logbooks are not recommended if a complete census is necessary due to the significant additional resources in manpower and funding required for a logbook reporting method to achieve a complete census.

To achieve maximum compliance and timeliness, we strongly recommend that before any logbook program is implemented, provisions for the following components are included in the initial design and implementation phases for the program, and that long-term, recurring funds are appropriated to ensure that these tasks are maintained over the duration of the program:

- A large up-front effort to inform participants of upcoming reporting requirements prior to implementation
- Methods to track and quickly identify missing and late reports both at the onset of the program and over the long-term duration of the program
- Follow-up procedures that are timely and maintain compliance and timely reporting over the duration of the reporting program
- Multiple stages of follow-up procedures that are maintained over the long-term duration of the program, including an early prompt to remind participants when reporting deadlines are approaching, notifications to participants immediately after the deadlines are missed, and later follow up if reports are still delinquent.


## Reporting Frequency

The frequency with which participants were required to report during this pilot study was weekly, and this frequency was sufficient to produce precise and timely catch and effort statistics. The effort required to effectively monitor compliance with timely follow-up for missing and late reports in this study would have been much greater if the selected reporting frequency was daily, and the cost would be even greater if certifying the accuracy of daily reporting at the individual vessel level was required (such as in commercial fisheries managed with individual fishing quotas or IFQs). Decreasing the reporting frequency (bi-weekly or monthly) to further reduce costs would come at the expense of increased recall bias and is not recommended.

## Recommendations:

Recommend the selected reporting frequency and required reporting accuracy be considered both in terms of the cost and necessity for management and assessment before implementing a region-wide logbook reporting methodology.

Recommend a weekly reporting frequency combined with a daily reporting requirement for a logbook reporting design as the most feasible method, both in terms of cost and the benefits for minimizing recall bias and tracking compliance. Daily reporting frequency is only recommended if adequate resources can be dedicated to compliance tracking and timely follow up, and only if daily or individual vessel monitoring is necessary for fisheries management.

## Validation and Estimation

The logbook reporting methods pilot tested in this study did not achieve a complete census. Logbook reports in this study were submitted for a large portion of the total effort (approximately $70 \%$ overall), which was verified through field validations of vessel status. Comparisons in this study between logbook reports and independent field validations confirm that self reported data are subject to recall bias and inaccuracies in reporting; therefore individual logbook trip reports cannot be considered a one-to-one match with independent validations. However, given an adequate sample size, aggregated logbook data are potentially very useful for developing estimators for total effort, catch-per-unit effort (CPUE), and total harvest at the regional scale. It is unlikely that logbook records can be used to provide precise daily estimates, and precision could also be low for weekly estimates, particularly during months of low fishing activity. We believe it is feasible to develop estimators for cumulative monthly catch and effort during periods of high fishing activity, and bi-monthly during periods of low fishing activity. Seasonal (lower frequency than bi-monthly) estimates would not be useful to regional fisheries managers and are not recommended.

## Recommendations:

The project team worked with an MRIP Consultant to develop appropriate methods for estimating effort and catch using data from this study. A report for this task, which includes recommendations for consideration, was provided to the MRIP Operations Team in December, 2012, and is currently undergoing peer-review.

Given $30 \%$ of total trips validated did not submit logbooks, it is recommended that additional research be conducted to determine if adjustment methods are needed to account for sampling bias associated with vessels that did not report logbooks.

Recommend that methods currently in place to estimate catch and effort for for-hire fisheries in the Gulf of Mexico and Texas be evaluated to determine whether sample sizes are sufficient for precise and accurate estimates. In addition, recommend that potential bias associated with non-response (both refusals and non-successful contacts) be evaluated for each methodology. If sample sizes in current surveys are not sufficient, then the cost to achieve necessary sample sizes should be compared to a logbook reporting system to determine whether a logbook reporting system is a more affordable alternative for achieving larger sample sizes.

## Field Validation

If individual logbook records could be considered one-to-one equivalents of what would result from dockside sampling, then a small validation monitoring program would be sufficient. However, based on the results of this study, logbook records should not be viewed as giving values similar to dockside sampling of the same trip (e.g., a small number of dockside samples should not be expected to agree with a small number of corresponding logbooks reports). The three field validation methods employed in this study were variable both in terms of cost and the granularity of information provided for direct comparisons with logbook trip reports. Effort validation through vessel activity status verification is the least costly method and was effective for measuring reporting compliance, though additional methods may need to be considered during periods of low fishing activity or in states with low numbers of vessels. Dockside sampling is the least costly method for validation of catch, but is not effective for validation or estimation of released catch. At-sea validation is the most costly method for validating catch, but provides high resolution data on numbers and size of landed and released fish, depth of capture and area fished. The feasibility of placing fisheries observers on charter vessels to collect high quality validation data at-sea was demonstrated during this study; however, due to low sample sizes we were not able to determine necessary sample sizes for validating discards at-sea.

## Recommendations:

Recommend for any census-style logbook reporting program that vessel activity validation methods to measure and account for incomplete reporting be employed. This is important both for achieving an accurate estimate for the total number of trips and accounting for unreported catch.

Released catch represents a major portion of total catch and contributes significantly to total fishing mortality for many managed fisheries in the Gulf of Mexico. In this study, neither logbook trip reports nor dockside validations provided accurate estimates for released catch; therefore, it is highly recommended that some form of at-sea validation methodology be incorporated into logbook validations. For harvested catch, data from dockside validations and logbook trip reports were similar in aggregate; therefore a combination of dockside and at-sea validation methods may be employed.

## Feasibility for Regional Implementation

Several potential benefits from a logbook reporting system were recognized from this study, and we do not rule out logbook reporting as a feasible method for the collection of catch and effort statistics from the for-hire sector. Given adequate resources and long-term funding commitments, this method would be feasible for a large geographic area with a large number of vessels, but may not be feasible for small states or regions with small numbers of vessels. This study included only charter vessels with federal permits, and regional implementation would also need to consider whether to include vessels that do not possess federal permits and mechanisms to require and adequately enforce logbook reporting, or else exclude those vessels from logbook reporting and survey them separately. Challenges to surveying small, inshore guide vessels in current survey methods would also apply to field validation sampling if they were required to report in a logbook program.

## Recommendations:

Recommend that if logbooks are implemented on a large regional scale, implementation should be phased in at smaller regional scales so that adequate resources can be dedicated to necessary up-front efforts for outreach and follow-up with non-respondents to achieve high compliance.

Recommend that a regional logbook reporting program exclude non-federally permitted vessels unless each state has authority to require reporting and a mechanism to enforce timely reporting.

State license frames are often not adequate for identifying all vessels in a fishery, and a complete universe of known vessels is recommended before mandatory logbook reporting is implemented for all for-hire vessels in a region.

## BACKGROUND

The Gulf of Mexico supports the largest recreational fisheries in the country in terms of economic value, total effort, and contribution to total fisheries removals (Gentner and Steinback, 2008; Coleman et al., 2004; Hanson and Sauls, 2011). Significant portions of total recreational landings in this region are attributed to the for-hire sector (Table 1 and MRIP, 2008). In 2006, the National Research Council conducted an independent review of recreational fisheries survey methods across the country (NRC 2006). The NRC review recognized that in regions such as Alaska and the Gulf of Mexico, the magnitude of the for-hire sector and the potential scale for fishery removals warrants the use of mandatory logbooks as the source of catch and effort data for the for-hire sector. The NRC recommended essential elements for this type of reporting system to meet acceptable standards for data collection. First, reporting should be mandatory, and they highly favored reporting requirements that are tied to permit renewal for continued participation in the fishery. Census-style reporting is expected to minimize the need for adjustments in catch and effort statistics associated with sample-based data collection designs. Second, the reviewers recognized that data collected through logbook programs will be reliable only if there are strict verification and enforcement components. They recommended that selfreported information collected on both catch-per-unit-effort (CPUE) and effort be verifiable. Thirdly, the reviewers recommended that information collected in a logbook program should be made available in a timely manner.

Table 1: Estimated numbers of fish landed by headboats, charterboats, and private recreational anglers, and percent of total recreational harvest landed by for-hire anglers in 2007.

|  | For-Hire <br> Headboats <br> (FL to TX) | For-Hire <br> Charter/Guide <br> (FL to LA) | For-Hire <br> Charter/ <br> Guide (TX) | Private <br> Anglers (FL <br> to LA) | Private <br> Anglers <br> (TX) | \% of Total Rec <br> Landings <br> Caught by For- <br> Hire |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Red Snapper | 174,262 | 502,275 | 11,611 | 615,093 | 33,024 | $\mathbf{5 1 . 5 0 \%}$ |
| Vermilion Snapper | 223,925 | 123,940 | 1461 | 139,358 | 245 | $\mathbf{7 1 . 4 5 \%}$ |
| Gag Grouper | 11,979 | 49,026 |  | 259,685 |  | $\mathbf{1 9 . 0 2 \%}$ |
| Red Grouper | 6,174 | 26,294 |  | 121,557 |  | $\mathbf{2 1 . 0 8 \%}$ |
| Gray Triggerfish | 34,278 | 66,751 | 781 | 119,108 | 2,460 | $\mathbf{4 5 . 5 8 \%}$ |

In 2009, a more detailed review of for-hire data collection methods was commissioned by the For-Hire Workgroup of the Marine Recreational Information Program (MRIP; Chromy et al., 2009). The MRIP review supported the NRC recommendations and included a list of Best Practice Recommendations for collecting and verifying self-reported logbook data. Best Practice Recommendations are summarized below:

Recommendation 1:
Specifies that master lists to identify all for-hire vessels and landing sites should be developed and maintained and serve as the sampling frame for obtaining vessel-trip data from logbooks, identifying non-respondents, and conducting intercept surveys.

Recommendation 2:
Provides several provisions for implementing the universal use of log-books in for-hire fisheries:
2.1. Recommends that logbook trip reports be required for each trip and specifies types of data to be collected on log-book trip reports, including effort, catch, trip-type and other data as needed for fisheries management.
2.2. Recommends a reporting frequency of no less than weekly for active vessels. Longer periods may be permissible for inactive vessels.
2.3. Recommends web-based electronic reporting as the preferred mode for submission of logbook trip reports, with back-up modes available for vessel-operators with no Internet access.
2.4. Recommends follow-up procedures for non-responding vessels and methods to independently verify fishing status.
2.5. Recommends timely tracking for missing, incomplete, or inconsistent reports and follow-up procedures to maintain compliance.
2.6. Recommends that initial estimates for effort and catch be based on raw logbook data and provides provisions for adjusting initial estimates based on known non-response levels and observed differences between self-reported logbook data and independent verifications, including intercept and at-sea surveys.

Recommendations 3 and 4:
Provides recommendations for sample selection methodologies for dockside intercept surveys specific to the for-hire mode. Sites should be selected with probabilities that are proportional to the size of the primary sample unit (defined as sites), and the time-periods for sampling should be based on fishing practices at the site that are relevant to when vessels (the secondary sampling unit) are expected to return. Also recommends that interviews to verify vessel logbook data should be conducted directly with the vessel operator.

Recommendations 5 and 6:
Defines anglers as the third-stage (tertiary) sampling unit and provides recommendations for collecting samples from anglers' catch.

## Recommendation 7:

Recognizes that raw logbook estimates may suffer from non-response and missing or inconsistent data and recommends development of procedures for adjusting raw logbook estimates.

## Recommendation 8:

Recommends exploration of double sampling estimation methods through the use of complementary logbook data and intercept data.

## Recommendation 9:

Recommends special procedures for large-capacity for-hire vessels (headboats).
These Best Practice Recommendations served as guiding principles for the design and implementation of an MRIP pilot study to test logbook reporting methods in the Gulf of Mexico region. In the Gulf of Mexico, for-hire vessels must have federal permits to fish for reef fish and pelagic fish in the EEZ. Existing permits may be transferred to new owners, but there is currently
a moratorium on the issuance of any new federal permits. Vessels with federal permits must participate in one subsequently approved appropriate data collection system ${ }^{1}$ as a condition for annual renewal, and loss of privilege is strong incentive to comply with reporting requirements. Currently, there are three approved regional programs in the Gulf of Mexico that collect data from for-hire fisheries:

1. The Southeast Region Headboat Survey (SRHS), which is administered by NMFS Southeast Fisheries Science Center, includes approximately 75-80 large capacity headboats operating in the Gulf of Mexico from Texas through Florida. Vessels included in this survey are required to report catch and effort on paper $\log$ sheets for each trip and submit trip level data monthly to National Marine Fisheries Service. A dockside sampling component collects length and weight measurements from harvested fish for calculating harvest by weight. The logbook program has been ongoing in the Gulf of Mexico since 1986. Logbook reporting compliance at the vessel level is high in the Gulf of Mexico, and pilot studies are currently underway to improve trip-level validation of self-reported data. Electronic reporting was also implemented in 2013.
2. The For-Hire Survey, which includes all for-hire vessels operating in the Gulf of Mexico from Louisiana through Florida that are not already reporting in the SRHS. Federally permitted vessels are required to report all trips taken during selected weeks (effort only) whenever they are randomly selected to participate in the survey. Vessel operators are contacted by telephone to collect this data. Catch data are collected in a separate dockside intercept survey, and there is no requirement for these vessels to participate in that portion of the survey.
3. The Texas Parks and Wildlife Survey, which is a field-intercept survey of boat-based fishing, including for-hire vessels. This survey estimates fishing effort and catch (harvest only) on a seasonal basis.

In the SRHS, all large capacity headboats are selected to participate and vessel operators are required to report $100 \%$ of their vessel trips. This data collection method places responsibility for submitting required information directly on the permit holder, and compliance is monitored and enforced as a condition for permit renewal. The obligation to report is periodically reinforced via certified letter to each permit holder. In contrast, the For-Hire Telephone Survey was initially designed to be a voluntary survey and the agent conducting the telephone interviews is responsible for collecting trip information from vessel operators. To enforce the mandatory reporting requirement for federally permitted vessels in the For-Hire Telephone Survey, permit holders who refuse the survey over the phone are notified by letter of their obligation to report as a condition for permit renewal. However, if a vessel operator cannot be contacted after five attempts for a selected week, the final interview status is "unsuccessful contact" and it is impossible to identify permit-holders who are passively evading the survey. Contact rates in the For-Hire Telephone Survey vary by wave ( 2 month sample period) and by state and region, and the percent of selected vessels that are unable to be contacted by phone is quite high in some strata. For example, during wave 3, 2009, $35 \%$ of vessels selected in the Florida Keys and $34 \%$

[^0]of vessels selected in the western peninsula region of Florida could not be contacted in the telephone survey (GSMFC 2009). The Texas Parks and Wildlife Survey samples vessels fishing in inland, state, and federal waters and estimates from this survey are not directly comparable with the For-Hire Survey. The Texas survey estimates harvest for two sample periods, "high use" and "low use" fishing seasons, which are not easily converted to monthly or calendar year estimates. Because the Texas survey does not collect data on numbers of fish discarded, discarded fish for regional stock assessments must be estimated for Texas using proportions from data collected in other states.

Given the high non-response rates that are unaccounted for in the For-Hire Survey methods, mandatory reporting requirements that are often unenforceable, the need for more complete fishing information and compatible estimates for regional stock assessments, and the urgent need for more timely data for fisheries management, there has been strong support for moving to a new system for for-hire data collection in the Gulf of Mexico. The Gulf of Mexico Fishery Management Council has been presented with multiple industry-supported logbook data collection proposals in recent years, and these groups are urging the Council to implement a regional logbook reporting system specifically for red snapper. In response, the Gulf Council made a motion at their January 2009 meeting to request guidance from the NMFS Southeast Fisheries Science Center and the Marine Recreational Information Program (MRIP) on protocols for validation of self-reported recreational data, and recommended that MRIP establish pilot projects to evaluate and ground truth these protocols. Results of the pilot study presented in this report are intended to guide decisions in the Gulf of Mexico and other regions where data needs for for-hire fisheries are being evaluated.

## Goal and Objectives

The goal of this study was to design and test the feasibility of a mandatory census-style logbook methodology for reporting catch and effort by the for-hire fishery in the Gulf of Mexico. Components of the reporting system included:

- Complete census reporting for all selected vessels
- Trip-level reporting of effort, catch (harvest and discards), and area fished
- Electronic reporting with paper reporting option
- Mandatory weekly reporting deadlines
- Independent verification of self-reported effort and catch
- Follow-up protocols for incomplete, late, and missing reports
- Enforceable through non-renewal of federal permits

The objectives of this project were to:

1. Develop a logbook reporting system and pilot test in two regions of the Gulf of Mexico. The pilot test focused on all charter vessels in one small geographic region in Texas and one large geographic region in Florida (Figure 1) that possessed federal for-hire permits for reef fish and/or pelagic fish in the Gulf of Mexico. Headboats that already participate in the SRHS were not required to participate in this pilot logbook reporting system.
2. Conduct outreach to the for-hire industry in each region to facilitate industry support and solicit feedback regarding the proposed methods.
3. Develop protocols and pilot-test methods to track missing and late reports; conduct followups for incomplete, late, and missing reports; and facilitate compliance.
4. Develop protocols and pilot-test methods to independently validate self-reported effort and catch data. Methods in each region included:
a. Statistically sound sampling methods for dockside validation of harvest.
b. Statistically sound sampling methods for at-sea validation of discards.
5. Evaluate the reporting system and validation methods based on the following criteria:

- Response rates
- Verifiability of self-reported data
- Timeliness
- Practicality and industry support
- Cost efficiency
- Capacity to produce complementary landings data among regions
- Capacity to meet reporting requirements and data needs of multiple data users
- Employs sound statistical methods
- Capacity to produce reasonably precise estimates at state and regional (within state) levels for stock assessment and fisheries management


## METHODS

The description of methods includes six sections. The first section provides background on methods to obtain stakeholder input into the early design phase of this study. The second section describes the study area and process for selecting vessels for mandatory reporting in each of the study regions. The third section describes procedures for vessel operators to report trips in the logbook reporting system and methods for tracking compliance against weekly reporting deadlines. The fourth section describes procedures for independently verifying information reported through the logbook reporting system. The fifth section describes how data collected during this study were analyzed. The sixth section describes the methods used to survey participants at the end of the mandatory reporting requirement.

## 1. Stakeholder Input

In August, 2009, a stakeholder workshop was held in New Orleans to define requirements for a MRIP-funded pilot electronic logbook reporting system for the Gulf of Mexico for-hire fishery. The workshop included representatives from the for-hire industry from each state in the Gulf of Mexico, state resource management agencies, Gulf States Marine Fisheries Commission, Gulf of Mexico Fisheries Management Council, and federal fisheries managers and stock assessment scientists. The workshop was also open to public viewing and input via the Internet. Audio and visual equipment and technical support were provided by Gulf States Marine Fisheries Commission. The live broadcast was announced prior to the workshop through an MRIP Newscast, and was also announced at the August Gulf of Mexico Fisheries Management Council meeting. Participants included for-hire industry representatives that were otherwise unable to
participate in person, as well as interested parties from various resource management agencies around the country. A live chat room enabled online participants to post comments and ask questions that could be addressed during the workshop. Recommendations generated during this workshop were used to guide the design of this pilot study, and details of the workshop were summarized (see report in Appendix A).

## 2. Study Region and Vessel Selection

Two regions of the Gulf of Mexico were selected for this pilot study: the Corpus Christi/Port Aransas region of Texas and the panhandle region of Florida (Figure 1). These two regions were chosen so that results could be compared and contrasted between small and large geographic areas. The NOAA Permits office provided a list of all federal permit holders for Gulf of Mexico for-hire reef fish and coastal pelagic fish, and all vessels for which the home port fell within in the study region were selected for the study, with the exception of vessels that were already required to report logbook trip reports in the Southeast Headboat Survey. Most vessels selected for the study have passenger capacities ranging from 6 to more than 20 anglers. A master participant list was generated, which contained the state or federal documentation number; vessel name; home port city; and the name, physical address, and telephone number of the vessel owner/permit holder for each vessel selected in the study area.


Figure 1. Study areas in the Gulf of Mexico. The Florida study area included vessels with a home port in the region encompassing Escambia County east to Dixie County and the Texas study area included all vessels with home port cities in the area surrounding Corpus Christi.

On June $1^{\text {st }}, 2010$ letters from the Regional Director of NMFS Southeast Fisheries Science Center were sent via certified mail to each permit-holder on the master participants list. The letter served to notify permit holders of their selection to participate in the logbook pilot program and the requirement to report activity or inactivity for each permitted vessel on a weekly basis beginning September 1, 2010 (letter is provided in Appendix B). Many Florida vessel owners who were participating in the Vessel of Opportunity Program during the summer of 2010 following the Deepwater Horizon oil spill (April 20, 2010) were difficult to contact initially, and required multiple attempts for successful delivery of their notification. Upon delivery for each certified letter, a signed and dated receipt was returned to Gulf States Marine Fisheries

Commission (GSMFC) by the U.S. Postal Service. Included in the letter were details on public meetings being held in their area, contact information to register for electronic reporting, and contact information for GSMFC. Permit-holders who contacted GSMFC regarding vessels that had recently moved out of the study area or permits that were transferred to another vessel outside the study area were removed from the study on a case-by-case basis. As receipts were returned, GSMFC entered the signature date for each vessel in the master participant list to track when representatives received their notification letter to begin reporting. Undelivered certified letters were returned to GSMFC and a list was sent to the state coordinators, who attempted to contact permit owners to verify their mailing address. Once the correct address was obtained, GSMFC mailed the certified letter again. In a few cases, certified letters were hand delivered by state Agency staff or Law Enforcement and signed and dated receipts were returned to GSMFC. The master participant list was checked against NOAA's permit list each month. Permits that were transferred to new vessels in the study area were added to the master list and permit owners were sent certified letters notifying them of the date they were required to begin reporting for the new vessel. There were two reasons an existing vessel in this study may not appear on an updated permit list provided by NOAA: 1) the permit was transferred to another vessel (either inside or outside of the study area); or 2) the permit renewal application was not approved by NOAA prior to the permit expiration date, in which case the permit owner was given up to one year from the expiration date for the permit to either be approved for renewal or revoked. In either case, the vessel was not permitted to participate in the federal reef fish and/or pelagic forhire fishery in the Gulf of Mexico and the vessel was marked "inactive" on the master participant list. Inactive vessels were only reactivated in the pilot study if they reappeared on an updated permit list provided by NOAA. Inactive vessels were not required to report during the period in the study that they were listed as inactive, and they were also not tracked for reporting compliance during that period.

## 3. Vessel Trip Reporting Procedures

The following section summarizes reporting procedures for submitting logbooks. It also describes compliance tracking and follow-up procedures used to identify and reconcile delinquent reports on a weekly and monthly basis, as well as procedures for placing holds on permits for not submitting logbooks. These methods were developed to track and quickly identify missing and late reports with timely follow-up procedures to maintain compliance and timely reporting.

## Reporting Frequency

Mandatory reporting authority in the Gulf of Mexico comes from Federal regulation (50 CFR $622.5(\mathrm{~b})(1)(\mathrm{i})$ and (ii)) which specifies that charter vessels with certain federal permits for pelagic and reef fish species or vessels that fish for those species in waters adjacent to the EEZ may be required to report on a weekly basis if selected by the Southeast Regional Director (NMFS). Based on this authority, logbook participants selected for this study were required to report all for-hire recreational trips or inactivity on a weekly basis, Monday through Sunday, with the reports due the following Sunday. Vessels that were actively charter fishing were required to submit trip reports for each individual trip, including when more than one trip was taken in a given day. If a vessel was inactive (not charter fishing), vessel operators were required to report inactivity (zero trips) for each week and were allowed to report weekly inactivity up to one month in advance. Inactivity reports were not required for individual days within a week;
therefore, missing reports were defined as any week that a vessel operator did not either 1) report inactivity for the entire week or 2) report at least one trip within that week.

## Electronic Reporting

Bluefin Data Incorporated was contracted to develop a secure internet website for permit holders to report trips and inactivity (www.gulflogbook.com). Participants were instructed to contact Bluefin Data to register and gain password access to the Gulf Logbook website. If a caller indicated they were unable to report electronically, the person was provided with contact information for the appropriate state Agency representative to request paper logbook trip reports. Bluefin Data used the master participants list provided by GSMFC to verify that a vessel was selected for the study before sending the vessel representative an email message with a unique access code, which allowed entry into the website. A User's Manual (Appendix C) and instructive video were available to users of the website upon successful registration with their access code. The website allowed registered permit holders to manage permissions for designees, such as vessel captains, to report vessel activity or inactivity for their vessels. Trip reports could be saved and edited by the registered user, however, once trip reports were submitted, users could only view the records and editing was no longer permitted. If a submitted record needed to be corrected, users were required to contact state agency personnel with administrative privileges who could make changes to submitted records at the request of a user. Trip reports were datestamped to indicate the date the report was entered and saved by the user and the date it was submitted.

In June 2011, a smart phone application called iSnapper was made available by the Harte Research Institute based in Corpus Christi, TX. A description of the application is provided on their website at www.harteresearchinstitute.org/isnapper. The application was designed in cooperation with MRIP to collect the same information that was provided by charter vessel operators through the Gulf Logbook Website. Ten vessels that were selected to participate in the Gulf Logbook study (7 in Texas and 3 in Florida) were recruited to pilot test the iSnapper application. For those ten vessels, logbook data were submitted by vessel operators directly through iSnapper rather than logging onto the Gulf Logbook website. Data received through iSnapper was delivered to Bluefin Data Inc. for inclusion in the Gulf Logbook database.

## Paper Reporting Option

For participants that contacted Bluefin Data Inc. during the registration process and indicated that they were unable to report electronically, they were instructed to contact the state coordinator for the state where the vessel operates from to obtain paper logbook reporting forms. Participants that were unwilling to report electronically were also given the option to report with paper logbooks to ensure that they were given every opportunity to be compliant with reporting requirements. Paper logbooks, instructions and a binder were mailed to paper logbook participants at the beginning of the pilot and as needed throughout the duration of the study (Paper logbook data sheets and instructions located in Appendix D). Participants were instructed to fill out paper logbook reports for each fishing trip, or indicate inactivity on a single logsheet for each reporting week, and mail completed logs to the state coordinator postmarked within seven days of the end of the reporting week. The state coordinator then checked for errors, contacted participants to verify corrections and entered the paper reports into the Gulf Logbook website using an administrative access code provided by Bluefin Data Inc.

## Fishing Area

For each reported trip, vessel operators were required to report the primary area where fishing took place. For consistency, the fishing areas chosen for reporting charter fishing activity in this study match the fishing areas used by commercial harvesters throughout the Gulf of Mexico to report where fish were harvested from. Printed copies of fishing area maps and codes were provided to participants during public meetings and were mailed to participants that chose to report with paper $\log$ sheets (provided in Appendix E). A link to the map was also provided on the Gulf Logbook website and a drop-down menu provided a list of areas and codes applicable to the study area.

## Compliance Tracking and Follow-Up for Non-Response

A routine process was developed to identify vessels with missing trip reports and conduct follow-up with vessel operators in a timely manner. The process that was employed during this pilot study included multiple stages of communication with logbook participants and required a high degree of communication between state, regional and federal agencies (Figure 2). The intent of this process was to insure that participants had ample opportunity to successfully submit missing reports in a minimal time-period, with active enforcement employed as the last resort.

To track weekly compliance, GSMFC downloaded trip reports and inactivity reports from the electronic reporting tool and compared those reports to the master participant list in order to identify vessels for which reports were outstanding. Compliance reports included vessels that had not registered for electronic reporting or requested paper logbooks, as well as vessels that were reporting but for which one or more weekly trip reports were outstanding (identified as missing reports). Compliance reports were generated on a weekly basis and each report began with the first week reporting was required (Sept. 1, 2010) up to the most recent reporting week. Compliance reports were re-generated each week to reflect reports that were received one or more weeks late.

After the first five weeks of the pilot study, compliance reports identified 114 vessels from Florida which received certified letters prior to the beginning of the September 1, 2010 reporting requirement that had not submitted any trip reports. Many of these vessels remained unregistered for electronic reporting or had not contacted their state Agency representative for paper logs. This was due in part to the initial difficulty contacting vessel owners that were participating in the ongoing Vessel of Opportunity Program for clean-up response following the April 2010 Deepwater Horizon event in the Gulf of Mexico. State Agency staff in Florida attempted to contact all representatives of unregistered vessels through January 2011 and assisted willing participants with registration and reporting as needed. In December 2010, a second (noncertified) letter signed by the Regional Administrator for the NMFS Southeast Regional Office was sent to non-compliant permit holders. This letter served as a final courtesy to inform permit holders of their requirement to report and consequences for continued non-compliance (letter is provided in Appendix F). In February 2011, the first official list of non-compliant permit holders was provided to NMFS Southeast Fisheries Science Center and the NMFS Southeast Regional Office. No further attempts to contact non-compliant permit holders were made by state Agency representatives.


Figure 2. Gulf Logbook reporting system. Vessel operators reported weekly fishing activity electronically on the Gulf Logbook Website maintained by Bluefin Data (1). Alternatively, paper log sheets were filled out weekly by vessel operators and entered electronically into the Gulf Logbook Website by State Agency staff (2). Data were downloaded weekly by Gulf States Marine Fisheries Commission (3) and lists of delinquent vessels were developed (4) and sent weekly and monthly to State Agency staff (5). State Agencies contacted vessel operators to remind them of reporting deadlines and notify them of missing reports via weekly email notices (6). State Agencies also contacted vessel operators via telephone to notify them of delinquent reports at the end of each month (7) and notified GSMFC of vessels that remained non-compliant (8). Each month, GSMFC compiled a list of vessels identified as non-compliant (9) and provided the list to National Marine Fisheries Service (10). NMFS placed holds on federal permits for vessels identified as non-compliant (11). Vessels were removed from the Non-Compliance List during the week that missing reports were received through the Gulf Logbook Website (3). As permits expired for vessels on the Non-Compliance List, permit holders were informed by NMFS of their reporting requirement (12) and permits were not renewed until missing reports were received through the Gulf Logbook Website (3).

For vessels that were registered and successfully reporting either electronically or via paper logbooks, a bulk e-mail system developed by Bluefin Data was used by state coordinators to routinely generate weekly e-mail reminders to registered participants in the Gulf Logbook website. Weekly reminders served to notify participants of the current reporting week and reporting deadline. State coordinators also used weekly compliance reports generated by

GSMFC to notify participants of outstanding reports for their vessel(s) via weekly email notifications. At the beginning of each new month, state coordinators attempted to contact representatives by telephone regarding vessels for which reports remained outstanding for one or more weeks during the previous month. At least three telephone attempts were made during the new month to contact vessel representatives and notify them of outstanding reports. At the end of the new month, vessels that still had outstanding reports for the previous month were considered to be out of compliance. These vessels were included in an updated list of non-compliant vessels that was maintained by GSMFC and provided to NMFS at the end of each one-month callingcycle.

Beginning in February 2011, the NOAA Permit Office at NMFS Southeast Regional Office was notified to check the Gulf Logbook non-compliance database before renewing federal for-hire permits for Gulf of Mexico reef fish and coastal migratory pelagics. If a vessel was determined to be out of compliance, a cover letter was generated by the Permit Office informing the applicant of the reporting deficiency and applicants were instructed to contact NMFS staff to resolve the deficiency. When contacted, NMFS staff explained the logbook reporting requirements, informed them of all weeks for which reports were outstanding, and directed permit-holders to the appropriate contact person for resolving logbook discrepancies. The applicant was given 30 days to resolve the deficiency. If the deficiency was not resolved within 30 days, then the permit application was abandoned and the applicant was required to re-apply for permits. Each week, GSMFC provided an updated list of vessels that cleared and were removed from the non-compliance list to the Permit's Office and SEFSC. Once a noncompliance vessel was cleared, all holds were lifted and the permit(s) could be issued.

## Quality Assurance and Quality Control

Bluefin Data Inc. worked closely with GSMFC and state coordinators to make any changes necessary for the website to run effectively. Error checks were incorporated into the Gulf Logbook website at the start of the pilot study and additional entry restrictions were added to various fields as reporting errors in electronic logbook submissions were discovered. Examples of built-in restrictions included requirements that a field be entered before allowing the user to move to the next field or screen, restrictions on reporting trips into the future, not allowing users to enter multiple trips within the same time frame, not allowing hours fished to be greater than the trip length, and not allowing multiple records of catch for the same species to avoid duplicate entries.

Logbook data were downloaded weekly and run through a quality control checking program every month developed by GSMFC. The program identified missing values for number of anglers and passengers on the vessel, whether hours fished was greater than dock to dock hours, whether minimum depth fished was greater than the maximum depth fished, and whether trips were coded as multiday trips with a low number of fishing hours. Records with grossly large harvest numbers for individual species that might indicate a key entry mistake and species records that might be unusual for that area of fishing were also flagged. Restrictions were added to later versions of the Gulf Logbook website to prevent these errors in future reports. Error reports were delivered to each state and attempts were made to contact vessel operators and determine if corrections were necessary. When errors were confirmed state biologists with
administrator level privileges logged into Gulf Logbook and made the changes. GSMFC downloaded the edited records and applied those to the master data file.

## End of Reporting Period

Near the end of the study period, permit owners were notified by letter, email, and personal contact (if necessary) and informed that they were no longer required to report vessel trips after August 31, 2011. A notice was also posted on the front log-in page of the Gulf Logbook Website. After the reporting deadline for the last fishing week, participants continued to have full access to the website to view submitted reports and submit late trip reports. Participants were also allowed to continue reporting on a voluntary basis.

## Participant Feedback

Two surveys were developed to gain feedback from the Gulf Logbook participants, one for electronic reporters and one for paper reporters (Appendix G). The survey for electronic reporters was made available on Survey Monkey, and a link to the electronic survey was posted on the front log-in page of the Gulf Logbook Website, e-mailed to registered participants, and provided on a reminder postcard mailed at the end of the pilot study. This survey focused on questions related to reporting electronically, along with questions about the logbook pilot study in general. The survey for paper reporters was printed on paper and mailed to participants along with a self-addressed and postage-paid envelope to encourage participant feedback. The paper survey included questions pertaining to the reason(s) participants chose paper logbooks over electronic reporting and the importance of receiving postage-paid envelopes for returning paper logbooks, in addition to general questions about the logbook pilot study.

## 4. Validation Procedures

Validation procedures are critical to assessing the accuracy and completeness of submitted logbook reports. This section describes procedures for validating catch and effort dockside and at-sea. Methods for validating vessel activity are also discussed. Data obtained from validation sampling was then compared with logbook reports to determine how closely they compared.

## Dockside Validation of Logbook Trip Reports (Catch and Effort)

A list of known docking sites for vessels selected to report in the pilot study was created using information collected for each vessel in the master participant list. Each unique site was listed in the site register and given a unique id code based on the state, county, and a 4 digit random site code. Other information contained in the site register included site location descriptions, site telephone numbers, contact person at the site, and GPS location coordinates. Field intercept assignments for dockside validation of catch were selected from the list of known sites each month for each region (Florida and Texas). The number of vessels selected to report in the pilot study was tallied at each site and probability proportional to size (PPS) sampling with replacement, available in the SAS Survey Select procedure, was used to randomly select sites weighted by the number of vessels at each site. This method is used in statistical sampling designs where sample clusters (in this study, sites where charter vessels dock) differ widely with respect the number of sample units (charter vessels) contained within them (Levy and Lemeshow, 1999). PPS sampling selects sites with a higher number of vessels more frequently and prevents potential sample bias by insuring that vessels at low pressure sites did not have a higher probability for selection. The goal for dockside sampling was to complete 200 sampling
days in Florida and 100 sampling days in Texas. Sample days were distributed across months and weekend/weekday strata giving more weight towards high fishing activity periods (summer and weekends). The number of sample days was input into the SAS program each month. Additional sample days were selected each month to provide states with reserve assignments that could be completed if manpower was available. Sites were randomly selected and then assigned a random number corresponding to a weekend or weekday within the month. The final draw files were provided to the states monthly. Additional variables were included that allowed states to enter the sampler name, sampler id number, and the number of dockside interviews collected for each completed assignment. These draw files were returned to GSMFC at the end of each month and GSMFC generated tallies of the number of completed assignments and successful interviews.

During an assignment, field samplers were instructed to arrive at the assigned site at least one hour before half-day charter fishing trips were expected to return. For sites where overnight fishing trips take place, field staff would call or visit the site the day before the assignment to determine if overnight trips were returning and arrive on site early if necessary to intercept those vessels. Upon arrival, samplers would survey the site and attempt to locate each vessel that was listed on the vessel register for that site. Each vessel at the site was recorded on the Assignment Summary Form (Appendix H) and coded as one of the following:

```
\(1=\) vessel in
\(2=\) vessel out, charter fishing (this must be verified)
\(3=\) unable to validate (vessel sold, moved to unknown location, etc.)
\(4=\) vessel out, NOT charter fishing (this must be verified)
\(5=\) vessel out, fishing status unknown (use when unable to verify the fishing status)
```

For vessels that were coded as 2 (out charter fishing), the field sampler would attempt to verify the expected return time and record this time on the Assignment Summary Form.

As each vessel returned from fishing, the sampler recorded on a separate Dockside Intercept Survey Form (Appendix H) the vessel name, vessel ID number, and the return date and time. Samplers would first approach the vessel and ask the operator for permission to weigh and measure harvested fish. If the operator refused, the interview was coded as a refusal and the sampler would move to the next vessel. When permitted to inspect the catch, the sampler recorded the total number of fish for each species observed on the survey form and recorded length at the mid-line ( mm ) and weight ( kg ) of whole fish. After the catch was inspected, the field sampler would conduct the remainder of the interview in person with a crew member (captain and/or mate). If crew members were busy with their customers, samplers were permitted to collect catch data from a nearby vessel and come back to complete the in-person interview immediately after. It was important to conduct interviews directly with vessel operators, rather than with charter vessel clients, since the purpose of the dockside validation was to measure recall error and bias in trip data recorded by vessel operators on logbook trip reports that were not due for submission until up to two weeks after completion of the trip.

During the in-person interview, samplers recorded the following information:

- Departure date
- Departure time
- Number of passengers (fishing and non-fishing, not including crew)
- Number of anglers (total number of passengers that fished at any time during the trip)
- Number of crew, including captain
- Target species
- Primary area fished (crew were asked to identify the statistical area where the majority of fishing took place during the trip using statistical maps provided)
- The minimum and maximum depths (in feet) fished for the trip
- The percent of fishing time spent fishing in federal waters, state waters, and inland waters
- Primary fishing methods (bottom fishing, drifting, trolling, spear fishing)
- Hours fished (number of hours spent with gear in the water)
- For each species released or could otherwise not be observed by the field sampler, the total number released for each disposition:

1 - Thrown back alive, $\leq 120^{\prime}$ of water
2 - Thrown back alive, >120' of water
3 - Eaten/plan to eat
4 - Used for bait/plan to use for bait
5 - Sold/plan to sell
6 - Thrown back dead/plan to throw away
7 - Other purpose
Samplers were instructed to remain on site until the last vessel that was verified as out fishing and expected to return that day was intercepted. If the last expected vessel did not arrive as anticipated, the assignment could also be terminated. Prior to leaving the site, the sampler recorded the time the assignment was completed and, for each vessel listed on the assignment summary form, the final interview status was coded as:

1 - Questionnaire completed
2 - Refused observed catch
3 - Missed interview
4 - Vessel did not return
5 - Vessel did not fish
Below is an example of how the status of each vessel was recorded on the Assignment Summary Form at the end of a completed assignment:

| Vessel ID | Vessel Name | Status on | Expected Time of | Final Interview |
| :--- | :--- | :--- | :--- | :--- |
| Number |  | Arrival | Return from Fishing | Status |
| 1209999 | Bandit | 2 | 1600 | 1 |
| 1200000 | Rebel | 1 |  | 1 |

The first vessel was out fishing when the sampler arrived on site and the interview was completed when the vessel returned from fishing. The second vessel was in the slip on arrival at the site and was still in the slip when the sampler ended the assignment.

## Validation of Vessel Activity and Inactivity (Effort)

Validation of vessel activity (or inactivity) is critical to determining compliance with logbook reporting requirements. Information on whether or not a vessel was in or out of port on a particular day can be matched with logbook records to determine if vessel activity was accurately reported. To validate vessel activity and inactivity before reporting in the logbook reporting system, sites in Florida were clustered and assigned to one of six vessel activity validation regions (Table 2 and Figure 3). Vessel activity validation regions were of sufficient size that all sites within the selected region could be visited within a 6 to 8 hour time period, including driving time. Five vessels in the far eastern region of the Florida study area (Florida F) were clustered into one vessel activity validation region, and the remaining sites were clustered into vessel activity validation regions that contained between 30 and 71 vessels (Table 2). Up to three sample regions in Florida were selected each week using simple random sampling without replacement, available in the SAS Proc Survey Select Procedure. Control numbers were assigned by GSMFC and one to three vessel activity validation regions were assigned in order of their control number to available field staff in Florida. The study area in Texas was much smaller than Florida (Figure 1) and all sites in this region could be visited within a 6 to 8 hour time period. Therefore, all sites in Texas were clustered in a single region that was validated each week.

During a scheduled vessel activity validation assignment, the field sampler would visit all sites within a selected vessel activity validation region and attempt to verify the fishing status for all vessels at each site within that region. The sampler recorded the fishing status and time for each vessel on a Vessel Status Validation Form (Appendix H) and then entered data into an online database. The following codes were used when pre-validating a vessel:

1-Vessel in
2-Vessel out, charter fishing (must be verified)
3-Unable to validate
4-Vessel out, not charter fishing (must be verified)
5-Vessel out, status unknown
If possible, the sampler verified the fishing status with someone at the dock or in the booking booth. If unable to verify the fishing status of a vessel, the sampler would use code 5 .

Table 2: Vessel activity validation regions and number of vessels assigned to each region at the start of the study (August, 2010). See Figure 3 for map of sample regions.

| Sample Region | County | Number <br> of Sites | Number of <br> Vessels |
| :--- | :--- | :--- | :--- |
| Florida, A | 33 | 13 | 30 |
|  | 113 | 0 | 0 |
| Florida, B | 91 | 8 | 49 |
| Florida, C | 91 | 7 | 52 |
|  | 131 | 1 | 1 |
| Florida, D | 5 | 12 | 71 |
| Florida, E | 5 | 3 | 6 |
|  | 45 | 2 | 7 |
|  | 37 | 9 | 20 |
|  | 129 | 4 | 8 |
|  | 65 | 0 | 0 |
| Florida, F | 123 | 2 | 3 |
|  | 29 | 1 | 2 |
| Texas | 1 | 6 ports | 58 |



Figure 3. Vessel activity validation regions in the Florida study area (top figure, see Table 2 for counties and numbers of sites and vessels included in each cluster designated by capital letters) and sites included in the single vessel activity validation region in Texas.

## At-Sea Validation of Logbook Data

In order to directly validate self-reported logbook catch data for released fish, vessels in both regions were randomly selected to voluntarily carry at-sea observers during selected for-hire fishing trips. Neither state has authority to require that observers be accommodated on for-hire vessels.

In Texas, vessels were randomly selected from the master participant list each week to carry an at-sea observer during one scheduled recreational for-hire fishing trip. Prior to each month's draw, Texas biologists provided updates as to which vessels were actively fishing during the upcoming month. Boats that were inactive were not included in the monthly draw. In Florida, atsea observers have been deployed on charter vessels since June, 2009. Vessels were not randomly selected from the master participant list as they were in Texas due to the established effort in Florida to identify charter vessels that were both active in the fishery and cooperative in at-sea surveys. A total of 107 active charter vessels selected to report via logbook trip reports in this pilot study also voluntarily participate in at-sea observer surveys in Florida. Vessels from this list were randomly selected each week to carry an at-sea observer during one scheduled recreational for-hire fishing trip.

The goal for at-sea sampling was 50 at-sea trips in Texas and 80 at-sea trips in Florida during the 12 month study period. Sample days were distributed across months and weekend/weekday strata, with more weight given to months with high fishing activity. The number of randomly selected sample days was input into the SAS program each month. Simple random (SRS) sampling (without replacement), available in the SAS Proc Survey Select procedure, was used to randomly select vessels each week and a monthly schedule of selected vessels was provided to field staff. Field staff attempted to contact vessel representatives prior to the week selected and arrange to accompany the fishing party during a scheduled charter fishing trip. Additional vessels were selected each week to provide field staff with the opportunity to contact alternate vessels if the primary selected vessel was not fishing or unable to take a biologist on the trip.

During at-sea trips, observers collected data that could be used to validate trip information selfreported by vessel operators in the logbook system. For each sampled trip, observers recorded the vessel name; date and time of departure and return; and the number of passengers, anglers and crew. Within a sampled trip, the approximate latitude and longitude, species targeted, and depth fished was recorded at each individual fishing station. Observers attempted to monitor every angler onboard a sampled vessel as they recreationally fished. Observers were typically instructed by the mate or captain as to where they could set up their sampling equipment on the vessel without disrupting fishing activity. Since some vessels were permitted to carry more than 10 passengers, observers were not always able to monitor every angler in the party. If all anglers could not be effectively monitored, observers selected the maximum number of anglers stationed within their line of sight that they could monitor for $100 \%$ of their fishing time. For each angler monitored, observers recorded the total fishing time and the number of discarded and harvested fish for each species caught, and also recorded lengths (mm measured at the midline) for as many harvested and discarded fish as possible.

At the end of each month, staff from Texas and Florida sent a tally of completed assignments to GSMFC, which included the sample date, names and identification codes for assigned observers, number of anglers on board and number of anglers observed. A reason was also provided for each selected vessel that was not sampled (i.e. vessel had no scheduled trips during selected week, no room for observer, primary vessel was successfully sampled and alternate vessels not used, etc.).

## Quality Assurance and Quality Control

Validation data were processed through an error checking program to identify duplicate entries, missing values, values which fell outside an acceptable range, and other general data entry errors. Fish lengths and weights were compared to $95 \%$ confidence intervals for length regressed against weight to identify outliers. At-sea data sheets were reviewed and edited prior to electronic data entry, and electronic data proofed for key entry errors. Potential errors were reviewed by Florida and Texas state coordinators and corrections were made if possible.

## 5. Statistical Analyses

Statistical consultant support was contracted through Marine Resources Assessment Group Americas (MRAG Americas) based in Saint Petersburg, Florida. Analyses included direct comparisons between self-reported logbook data and field validations and Monte Carlo simulations to determine optimum field validation sample sizes. Methods are described in four reports submitted to the MRIP Logbook Pilot Project Team and are included as appendices to this document (Appendices I-L). Results presented in the appendices are preliminary, and figures and tables presented in the following results section have been updated with additional data from the consultants and represent final results for the pilot study. While figures and tables presented in this document may differ from those in Appendices I-L, the conclusions did not change.

## 6. Stakeholder Survey

At the conclusion of the logbook reporting requirement for this pilot study, participants were asked to complete a survey. Two surveys were developed to gain feedback from the Gulf Logbook participants, one for electronic reporters and one for paper reporters (Appendix G). The survey for electronic reporters was made available on Survey Monkey, and a link to the electronic survey was posted on the front log-in page of the Gulf Logbook Website, e-mailed to registered participants, and provided on a reminder postcard mailed at the end of the pilot study. This survey focused on questions related to reporting electronically, along with questions about the logbook pilot study in general. The survey for paper reporters was printed on paper and mailed to participants along with a self-addressed and postage-paid envelope to encourage participant feedback. The paper survey included questions pertaining to the reason(s) participants chose paper logbooks over electronic reporting and the importance of receiving postage-paid envelopes for returning paper logbooks, in addition to general questions about the logbook pilot study.

## RESULTS

Results are reported in six sections. The first section presents results for the logbook trip reporting system used by vessel operators in this pilot study. The second section presents results on the productivity of validation assignments and the proportion of trips reported through the logbook trip reporting system that were validated (validation rate) during this study. The third section presents results of comparisons between validation records and logbook trip reports to evaluate the accuracy of submitted reports. The fourth section evaluates the sample sizes that were achieved during field validations in this study to determine if they were adequate, inadequate, or could be reduced to lower the cost if this method were implemented in the future. The fifth section provides information on the cost for conducting this pilot study as it was designed and tested. The sixth section presents results of a survey with participants conducted at the end of the pilot study.

## 1. Reporting Tools, Compliance, and Timeliness

The Gulf of Mexico For-Hire Electronic Logbook Pilot Study officially began September 1, 2010 and ended August 31, 2011. At the start of the pilot study, 358 charter vessels in Florida and 58 charter vessels in Texas were selected to report. In the Florida study area, 36 vessels were non-cooperative and submitted zero trip reports or inactivity reports during the 12 month period, and all selected vessels in the Texas study area were cooperative. The majority of vessels reported electronically through the Gulf Logbook website maintained by Bluefin Data (Table 3). In Florida, 73 vessels opted to submit paper logbook reports, which were entered electronically into the Gulf Logbook website by state representatives. Most vessel operators that were provided with paper forms indicated during the registration process that they were unable to report electronically (no computer/internet access or stated they were not capable of operating a computer), and a small number requested paper forms after they were registered to report electronically. In June 2011, 10 vessels recruited to a pilot study initiated by Texas A\&M and switched to submitting weekly reports through the iSnapper smart phone application (Table 3). Trip reports submitted through iSnapper were delivered by Texas A\&M to Bluefin Data for inclusion in the electronic database.

Table 3. Number of vessels that submitted weekly reports by reporting method (note, some vessels used more than one reporting tool over the course of the 12 month study). A total of 358 vessels from Florida and 58 vessels from Texas were selected to report at the beginning of the pilot study.

| Reporting Tool | Texas | Florida |
| :---: | :---: | :---: |
| Gulf Logbook website | 54 | 252 |
| iSnapper smart phone application | 7 | 3 |
| Paper forms | 0 | 79 |
| Refusals (no submitted reports) | 0 | 36 |
| Ineligible, dropped from study | 9 | 24 |

A significant number of reports were submitted through iSnapper with missing values for hours fished, numbers of fish released or caught, and the minimum depth fished (Table 4). Reports entered through the Gulf Logbook website could not be submitted unless a value was entered for these fields. Consequently, trips reported through iSnapper were not included in several analyses reported here and were only a small portion of the total trips reported through the Gulf Logbook

Reporting System. In any future electronic logbook reporting system with multiple data entry applications, consistent data entry restrictions should be incorporated into each application.

Table 4. Total number of trips reported through the iSnapper smart phone application, and numbers of reported trips with missing values for select required data fields.

|  | Texas <br> (7 vessels) | Florida <br> (3 vessels) |
| :--- | :---: | :---: |
| Total number of iSnapper reported trips | 135 | 122 |
| Reported trips missing hours fished data field | 10 | 20 |
| Reported trips missing released or harvested fish data field | 7 | 12 |
| Reported trips missing minimum depth data field | 10 | 8 |

The amount of effort required to register vessels and achieve compliance at the beginning of this study was not anticipated. After the first five weeks of the pilot study, there were 114 vessels selected in the Florida study area for which zero trip reports were submitted, and a large effort was made by state agency staff during the initial months of the pilot to contact permit holders and assist them with starting weekly reporting. If a vessel was not registered on the Gulf Logbook website and had not contacted their state agency to receive paper log sheets, staff made multiple attempts to contact a representative of the vessel by telephone or in person (dockside). Some vessel operators were difficult to contact because they were participating in BP's Vessel of Opportunity Program following the 2010 Deepwater Horizon event, and multiple attempts were necessary for successful contact. During successful contacts, operators of many unregistered vessels did not understand that they were required to report because their vessel was used solely for commercial fishing or was otherwise inactive in the for-hire fishery. In some cases, the permit holder was not the primary vessel operator and details about the reporting requirement were not communicated to the person or persons who were most knowledgeable about the fishing activity of the vessel(s). Making personal contact and providing assistance often cleared up these types of issues and resulted in successful reporting and compliance. For operators registered to report electronically, technical support was available from staff at Bluefin Data by phone and email to provide assistance with the reporting start-up. Some vessel operators also required personal assistance from state personnel before they could begin completing paper log sheets.

In the third month of the study (December 2010), permit owners for non-reporting vessels in Florida received a final courtesy letter signed by the NMFS Regional Administrator informing them again of their requirement to report. In February 2011, any vessel that had not submitted a single trip report or inactivity report was considered non-compliant and NMFS placed holds on those federal permits. Once a vessel was non-compliant, the permit holder was not contacted again until they submitted an application with NMFS to renew a federal permit. Figure 4 shows the number of non-compliant vessels in the months following the courtesy letter and permit holds, and the decrease in non-compliance through the end of the study period. Applications to renew federal permits are submitted to the NMFS Southeast Regional Office and a permit is valid for one year following the date of renewal. For permits that expired between February and August 2011, those permits with holds placed on them were not renewed until delinquent reports were submitted. Permits for non-compliant vessels that expired prior to February 2011 were renewed before a hold was in place and notification to those vessels continued as their permits
expired after the close of this study. As of the writing of this report, there have been no permits that could not be renewed as a result of non-reporting in this study.


Figure 4. Number of vessels in Florida that were not reporting through the Gulf Logbook reporting system during all weeks between January 1, 2011 and the end of the pilot study (August 31, 2011). A final warning letter to non-cooperative permit-holders was mailed in December 2010 and the first holds were placed on federal permits in February 2011.

Reporting timeliness was tracked weekly for the duration of the 12 month study. Note in this report that each reporting week is numbered sequentially, starting with week 1 beginning in January 1 of a calendar year through week 52, the last week in a calendar year. Reporting weeks for this study include weeks 35-52 during 2010 (September through December) and weeks 1-35 during 2011 (January through August). Vessel operators were allowed seven days following a fishing week to submit reports electronically or provide paper reports to state personnel. Reports were due by Sunday during each reporting week, and data were downloaded each Monday a.m. from the Gulf Logbook website. Each weekly download was checked against the master participants list to identify vessels that had not submitted an inactivity report for the entire fishing week or at least one or more trip reports for any day during the fishing week. Reports that were submitted late for previous fishing weeks were also identified and deducted from the running tally of missing reports. Figure 5 below shows the tally of vessels with missing reports for each week of the study at the close of week 35 in 2011 (the last week that reporting was required). This figure reflects the updated frequency of vessels with missing reports for each week in the study through the last week data were downloaded for. During the first weeks of the reporting requirement (beginning with week 35 on the far left side of the horizontal axis in Figure 5), the frequency of vessels with missing reports declined as vessels registered with Bluefin Data and started routine reporting. The solid black line indicates the baseline number of vessels in the study that were non-cooperative and for which reports were missing for every week in the study. The frequency of vessels above the solid black line indicates vessels which were cooperative in the study but had not submitted reports during some weeks of the study. The increasing trend in the later weeks (far right side of horizontal axis) illustrates the time lag for receiving late reports.

The majority of late reports were received during the weeks immediately following a missed reporting deadline, which also corresponded to the period when non-response follow-up was conducted by state personnel via e-mail notifications and telephone calls to participants. As the period of non-response followup was advanced forward to later reporting weeks, a residual number of late reports from cooperative vessels remained outstanding (illustrated by the reduced frequency of vessels above the solid black when moving from right to left along the horizontal axis of Figure 5). The following figure (Figure 6) is similar to Figure 5, but shows the percentage of vessels that were missing reports as of the last reporting week of the study (week 35).


Figure 5. Number of vessels ( y axis) by reporting week ( x axis) that did not report through the Gulf Logbook reporting system as of August 31, 2011 (the last reporting week of the study). By this time, 36 remaining vessels in Florida had not submitted any reports for the duration of the pilot study (represented by the horizontal line). Vessels above the horizontal line represent those that were cooperative, but remained delinquint for one or more weeks at the time this report was generated. Tracking reports such as this one were routinely generated at the end of each reporting week during the course of the pilot study, and each prior week was updated for reports that were received late through the Gulf Logbook reporting system.


Figure 6. Percentage of vessels that did not report (y axis) by reporting week (x axis) through the Gulf Logbook reporting system as of August 31, 2011 (the last reporting week of the study).

## Vessel Activity Status

A large proportion of permitted vessels selected to report in this study were inactive in the charter fishery. This is largely due to the fact that federal permits are under moratorium, which means that if an owner transfers or gives up a permit, they can not reaquire those permits unless another permit holder transferred a permit to them. Consequently, many permit holders continue to renew permits, even during years when they are not using the vessel to charter fish. In the Texas study area, 43 vessels that were required to report vessel activity or inactivity for any duration of time over the course of the pilot study reported inactivity for every week, compared to 27 vessels that reported at least one trip during the study. In the Florida study area, 100 vessels reported inactivity for every week and 234 vessels submitted at least one trip report over the duration of the study. When viewed by month, the number of vessels that were inactive in the charter fishery varied, and was greatest during winter months (Figure 7).


Figure 7. Numbers of vessels in Texas (top) and Florida (bottom) by month that submitted inactivity reports for all weeks, versus vessels that submitted at least one or more trip reports.

## 2. Validation Productivity and Percent of Trips Validated

Before discussing the accuracy of the submitted logbook reports, details about validation rates and the percent of trips validated are first provided. Validation productivity refers to how productive assignments were at validating fishing activity; for example, the number of trips that were validated each day during scheduled validation assignments. The distribution of validation
assignments is also reported in this section; for example, the number of days in a given month that fishing trips were validated. The percent of trips validated refers to the percent of total trips reported on logbook trip reports that were also verified during validation efforts.

## Validation of Vessel Activity and Inactivity (Effort)

The number of days that vessel activity validation regions were visited by field staff to verify the fishing activity status of vessels in the logbook study each month is provided in Table 5. The majority of vessel activity validations ( $93 \%$ ) during this study verified that vessels were at the dock and not fishing or their fishing status could not be validated (Figure 8 and Figure 9).
Consequently, large numbers of vessel activity validations were necessary to find vessels that were confirmed to be out fishing, particularly during low activity months (September-March).

The percent of fishing trips reported by vessel operators in the Gulf Logbook reporting system that were also pre-validated during site visits was calculated as the number of pre-validated trips that were also reported in the Gulf Logbook system, divided by the total number of trips reported in the Gulf Logbook system (Table 6). In Texas, where fewer vessels were included in the study region, $40.1 \%$ of the overall trips were validated, but varied widely between months. In Florida, the percent of trips validated was comparatively lower (6.3\%), but more evenly distributed throughout the year.

Table 5. Number of sample days that vessel activity was monitored by month. In Texas, all sites in the region of the study were visited each day to validate vessel activity. In Florida, all sites in one randomly selected region were visited (see Table 2 and Figure 3). A sample day is defined as one field sampler visiting all sites in one selected region on an assigned day.

| Region | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Total |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Texas | 18 | 25 | 21 | 14 | 19 | 15 | 16 | 6 | 22 | 20 | 20 | 18 | 214 |
| Florida | 18 | 18 | 14 | 8 | 19 | 17 | 22 | 21 | 19 | 23 | 23 | 20 | 222 |

Table 6. Percent of vessel trips reported in the Gulf Logbook Reporting system that were also validated during vessel activity validation site visits.

| Texas |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Month | Reported | Validated | Percent <br> Validated | Reported | Validated | Percent <br> Validated |
| Sep | 57 | 18 | $31.6 \%$ | 465 | 10 | $2.2 \%$ |
| Oct | 42 | 15 | $35.7 \%$ | 1,144 | 35 | $3.1 \%$ |
| Nov | 11 | 3 | $27.3 \%$ | 343 | 12 | $3.5 \%$ |
| Dec | 5 | 1 | $20.0 \%$ | 57 | 1 | $1.8 \%$ |
| Jan | 2 | 0 | $0.0 \%$ | 21 | 2 | $9.5 \%$ |
| Feb | 2 | 0 | $0.0 \%$ | 62 | 1 | $1.6 \%$ |
| Mar | 26 | 3 | $11.5 \%$ | 635 | 44 | $6.9 \%$ |
| Apr | 10 | 1 | $10.0 \%$ | 1,047 | 87 | $8.3 \%$ |
| May | 39 | 24 | $61.5 \%$ | 1,280 | 88 | $6.9 \%$ |
| Jun | 114 | 56 | $49.1 \%$ | 3,523 | 256 | $7.3 \%$ |
| Jul | 215 | 88 | $40.9 \%$ | 3,068 | 189 | $6.2 \%$ |
| Aug | 130 | 53 | $40.8 \%$ | 1,286 | 85 | $6.6 \%$ |
| Total | 653 | 262 | $40.1 \%$ | 12,931 | 810 | $6.3 \%$ |



Figure 8. Numbers of validations of vessel activity collected each month by fishing status. Status $1=$ vessel in slip and not charter fishing; Status $2=$ vessel verified to be out of slip and charter fishing; Status 3 = unable to validate fishing status; Status 4 = vessel out, not charter fishing; Status 5 = vessel out, status unknown.


Figure 9. Total numbers of vessel activity validations and the numbers of validations where vessels were verified to be out fishing by month in Texas (top) and Florida (bottom).

## Dockside Validation of Logbook Data

Over the course of the study, a total of 1,119 vessel trips were intercepted during 441 dockside validation assignments (Table 7). Interviews were completed for 150 trips in Texas and 945 trips in Florida. A total of 24 trips ( 1 in Texas, 23 in Florida) refused to be interviewed (Table 7). Sampling productivity (completed vessel interviews per assignment) was higher in the Florida study area, where the number of vessels per site is large compared to the Texas study area, and productivity varied seasonally in both regions (Figure 10). Productivity was low during winter months when many vessels were inactive (Figure 10 below). Fewer assignments were attempted during winter months; however, given the low vessel activity, more assignments were needed to obtain adequate numbers of completed vessel interviews. Sampling productivity was highest
during summer months (May through August), which corresponds to a period of high tourist activity and open harvest seasons for red snapper and other managed reef fishes in federal waters. Recreational harvest seasons in state waters of Florida ( 0 to 9 nautical miles) are consistent with federal seasons (with some exceptions); and harvest is permitted year round in state waters of Texas. The federal harvest season during 2010 was June 1 through August 14; however, sampling productivity was also likely influenced by a supplemental red snapper harvest season from October 1 through November 21 (Friday through Sunday only) following the reopening of large closed areas during the Deepwater Horizon event.

Table 7. Number of dockside assignments and vessel interviews by region and month.

| Texas |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Month | Completed <br> Dockside <br> Assignments | Completed <br> Vessel <br> Interviews | Refused <br> Vessel <br> Interviews | Completed <br> Dockside <br> Assignments | Completed <br> Vessel <br> Interviews | Refused <br> Vessel <br> Interviews |
| Sep | 10 | 4 | 0 | 25 | 53 | 0 |
| Oct | 15 | 9 | 0 | 26 | 107 | 1 |
| Nov | 12 | 2 | 0 | 25 | 36 | 0 |
| Dec | 9 | 2 | 0 | 16 | 1 | 0 |
| Jan | 7 | 0 | 0 | 21 | 1 | 0 |
| Feb | 9 | 1 | 0 | 20 | 8 | 0 |
| Mar | 10 | 3 | 0 | 20 | 17 | 0 |
| Apr | 7 | 2 | 0 | 21 | 69 | 2 |
| May | 16 | 16 | 0 | 28 | 111 | 0 |
| Jun | 21 | 39 | 0 | 24 | 173 | 4 |
| Jul | 24 | 35 | 0 | 26 | 258 | 14 |
| Aug | 24 | 37 | 1 | 25 | 111 | 2 |
| Total | 164 | 150 | 1 | 277 | 945 | 23 |



Figure 10. Mean number of completed vessel interviews obtained during dockside validation assignments for the Texas (top graph) and Florida (bottom graph) study areas with $95 \%$ confidence intervals.

The percent of trips validated was calculated as the number of trips validated during dockside assignments as a percentage of total trips reported in the Gulf Logbook reporting system (Figure 11 and Table 8). To account for the fact that some vessel trips were not reported by vessel operators, the calculated percent validated uses only validated trips with a corresponding logbook trip report received through the Gulf Logbook system. The percent of trips validated ranged from $0 \%$ (during some low activity months when no dockside interviews could be obtained) to as high as $40 \%$. The percent of trips validated was greater in Texas where fewer vessels were included in the study, and validation was especially high during winter months when vessel activity was low and at least one vessel trip was validated (for example, Texas
validated two vessel trips in December, which equated to $40 \%$ ). The percent of trips validated was lower in the Florida study area; however, it was also less effected by low activity seasons and trips validated were more evenly distributed throughout the year (Figure 11).

Table 8. Numbers of vessel trips reported in the Gulf Logbook reporting system, and numbers and percent validated during dockside interviews.

| Texas |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Month | Trips <br> Reported | Trips Validated <br> and Reported | Percent <br> Validated | Reported <br> Trips | Trips Validated <br> and Reported | Percent <br> Validated |
| Sep | 57 | 3 | $5.3 \%$ | 465 | 28 | $6.0 \%$ |
| Oct | 42 | 8 | $1.9 \%$ | 1,144 | 80 | $7.0 \%$ |
| Nov | 11 | 2 | $18.2 \%$ | 343 | 30 | $8.7 \%$ |
| Dec | 5 | 2 | $40.0 \%$ | 57 | 0 | $0 \%$ |
| Jan | 2 | 0 | $0 \%$ | 21 | 1 | $4.8 \%$ |
| Feb | 2 | 0 | $0 \%$ | 62 | 3 | $4.8 \%$ |
| Mar | 26 | 2 | $7.7 \%$ | 635 | 14 | $2.2 \%$ |
| Apr | 10 | 2 | $20.0 \%$ | 1,047 | 46 | $4.4 \%$ |
| May | 39 | 13 | $33.3 \%$ | 1,280 | 85 | $6.6 \%$ |
| Jun | 114 | 19 | $16.7 \%$ | 3,523 | 140 | $4.0 \%$ |
| Jul | 215 | 28 | $13.0 \%$ | 3,068 | 205 | $6.7 \%$ |
| Aug | 130 | 29 | $22.3 \%$ | 1,286 | 63 | $4.9 \%$ |
| Total | 653 | 108 | $16.5 \%$ | 12,931 | 695 | $5.4 \%$ |



Figure 11. Percent of for-hire fishing trips reported in the Gulf Logbook reporting system that were validated with dockside interviews by state.

## At-Sea Validation of Logbook Data

A total of 45 at-sea trips in Texas and 87 at-sea trips in Florida were sampled during the course of this study (Table 9). The distribution of sampled trips was influenced by availability of trips, with few trips sampled during winter months. In Texas, where a small number of active vessels were available to sample, no trips were sampled using at-sea methods during the months of November through February. No trips were sampled using at-sea methods in Florida during December. The highest number of trips sampled in Florida were during months that red snapper was open for harvest (October, November, and June).

Compared to dockside validation samples, the percent of at-sea trips validated was considerably lower due to the smaller sample quotas. Like dockside validations, the percentage of at-sea trips validated was higher in the Texas study area, $5.8 \%$ compared to $0.6 \%$ in the Florida study area. The dockside method is a direct validation of harvested catch and an indirect validation of released catch (subject to recall of interviewed vessel operators); whereas the at-sea method directly validates both. When considered additively, the combined dockside and at-sea validations of harvested and released catch were $22.4 \%$ of reported trips in Texas and $6.1 \%$ of reported trips in Florida.

Table 9. Numbers of at-sea trips sampled per month and percent of trips validated.

|  | Texas |  | Florida |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Total | Percent <br> Validated | Total | Percent <br> Validated |
| Sep | 5 | $7.0 \%$ | 4 | $0.65 \%$ |
| Oct | 4 | $9.5 \%$ | 15 | $1.3 \%$ |
| Nov | 0 | 0 | 13 | $3.5 \%$ |
| Dec | 0 | 0 | 0 | 0 |
| Jan | 0 | 0 | 1 | $4.8 \%$ |
| Feb | 0 | 0 | 4 | $3.2 \%$ |
| Mar | 2 | $7.7 \%$ | 6 | $0.63 \%$ |
| Apr | 1 | $10.0 \%$ | 7 | $0.57 \%$ |
| May | 4 | $10.3 \%$ | 8 | $0.55 \%$ |
| Jun | 9 | $6.1 \%$ | 12 | $0.31 \%$ |
| Jul | 11 | $4.2 \%$ | 9 | $0.26 \%$ |
| Aug | 9 | $5.4 \%$ | 10 | $0.62 \%$ |
| Total | 45 | $5.8 \%$ | 87 | $0.60 \%$ |

## 3. Accuracy and Completeness of Logbook Reporting

## Validation of Vessel Activity and Inactivity

For vessels that were verified to be out fishing (status=2) during vessel activity validation site visits, $69 \%$ of trips in Texas and $71 \%$ of trips in Florida were reported through the Gulf Logbook reporting system (Figure 12). For trips that were not reported through the Gulf Logbook system, $11 \%$ of pre-validated vessels in Texas and $14 \%$ in Florida reported fishing trips for other days
during the sampled week, but did not report a trip for the specific day that the vessel was verified to be out fishing (Reported No Trip for Day/Time in Figure 12). This could be due to inaccurate reporting (the trip was reported on the wrong day of the week), or incomplete reporting (trips were correctly reported for other days that week, but no trip was reported for the day a trip was verified). Another 17\% of pre-validated vessels in Texas and 5\% in Florida inaccurately submitted an inactivity report through the Gulf Logbook reporting system, indicating that the vessel did not take any fishing trips during the sampled week (Reported Inactive for Week in Figure 12). For 4\% of vessel activity validations in Texas and 7\% in Florida, no trip report or inactivity report was submitted through the Gulf Logbook reporting system for the week it was validated (no trips/inactive submitted for week in Figure 12). In Florida only, 3\% of vessel activity validations were for vessels that were $100 \%$ non-compliant with their reporting requirement for the 12 month study period (refusals in Figure 12).


Figure 12. Logbook reporting status of vessels that were verified to be active and fishing (status=2) during a vessel activity validation. Percentages indicate proportions of validated trips that were accurately reported through the Gulf Logbook reporting system (reported trip), reported incorrectly (reported inactive for week, reported no trip for day/time), or did not report (refusals, no trips/inactive submitted for week).

The proportion of verified trips for which logbook reports were received through the Gulf Logbook reporting system was consistent across months; however, low sample sizes should be noted for some months (Figure 13 and Table 10). Overall, approximately $68 \%$ of all validated trips were reported through the Gulf Logbook system, with a range of uncertainty between 58\% to $77 \%$ in Texas and $63 \%$ to $72 \%$ in Florida. Given these results, logbook reports may not be considered a census under the constraints of this study design, but may provide a consistent measure of fishing effort when combined with an effective validation program.


Figure 13. Percentage of vessels verified to be out fishing during vessel activity validation site visits that were also reported in the Gulf Logbook system by month and state. Note, low sample sizes during winter months (numbers provided in Table 10).

Table 10. Number of vessel trips in Texas and Florida that were verified to be out fishing during vessel activity validation site visits, and number and percent of validated trips that were reported in the Gulf Logbook Reporting System.

| Texas |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Month | Trips <br> Validated | Trips Validated <br> and Reported | $\%$ <br> Reported | Trips <br> Validated | Trips <br> Validated and <br> Reported | $\%$ <br> Reported |
| Sep | 33 | 18 | $55 \%$ | 24 | 10 | $42 \%$ |
| Oct | 18 | 15 | $83 \%$ | 55 | 35 | $64 \%$ |
| Nov | 3 | 3 | $100 \%$ | 16 | 12 | $75 \%$ |
| Dec | 1 | 1 |  | 2 | 1 |  |
| Jan | 1 | 0 | Pooled | 7 | 2 | Pooled |
| Feb | 4 | 0 | $36.4 \%$ | 3 | 1 | $63 \%$ |
| Mar | 5 | 3 |  | 64 | 44 |  |
| Apr | 1 | 1 | $100 \%$ | 131 | 87 | $66 \%$ |
| May | 30 | 24 | $80 \%$ | 114 | 88 | $77 \%$ |
| Jun | 102 | 56 | $55 \%$ | 326 | 256 | $79 \%$ |
| Jul | 114 | 88 | $77 \%$ | 262 | 189 | $72 \%$ |
| Aug | 70 | 53 | $76 \%$ | 129 | 85 | $66 \%$ |
| Total | 382 | 262 | $69 \%$ | 1,133 | 810 | $71 \%$ |

For pre-validated vessels that were verified to be inactive (not fishing, status=1 or status=4), 94\% of those vessels in Texas and $86 \%$ of those vessels in Florida also reported no activity through the Gulf Logbook reporting system (Figure 14). A small percentage of pre-validated vessels inaccurately reported a fishing trip when they were verified to be inactive ( $1 \%$ in Texas, $2 \%$ in Florida). In both Texas and Florida, 5\% of vessels that were pre-validated as inactive did not report through the Gulf Logbook reporting system for the week they were pre-validated (no trips/inactive submitted for week in Figure 14); and an additional 7\% of vessels in Florida did not report during any week of 12 month study period (refusals in Figure 14).


Figure 14. Logbook reporting status for vessels that were verified to be inactive (not fishing, status=1 or status=4) during the day of a vessel activity validation site visit. Percentages indicate proportions of prevalidated vessels that accurately reported through the Gulf Logbook reporting system (reported inactive for week, reported no trip for day/time), reported incorrectly (reported trip), or did not report (refusals, no trips/inactive submitted for week).

## Dockside Validation of Logbook Data

The percentage of trips validated during dockside assignments with a corresponding trip report received through the Gulf Logbook reporting system was equivalent in the two study regions ( $72 \%$ in Texas and $74 \%$ in Florida; Table 11). These reporting compliance rates are only slightly higher than the percentages reported in Table 10 for validations of vessel activity ( $69 \%$ in Texas and $71 \%$ in Florida). During dockside validations, vessel operators were directly interviewed by field samplers and, during validations for vessel activity, vessel operators were out fishing when samplers validated the site. Therefore, vessel operators were less likely to know when their vessel status was checked during vessel activity validations. Similar reporting compliance rates for dockside validated trips and pre-validated trips suggests that vessel operators were no more likely to submit a trip report when they were interviewed during a dockside validation.
Therefore, it may be feasible to combine vessel activity validations from the two methods, which
would increase sample sizes for estimating the number of fishing trips that were not reported in the Gulf Logbook Reporting System.

The monthly percentage of trips sampled during dockside validation assignments with a corresponding trip report that was received through the Gulf Logbook reporting system is provided in Table 11. Note that sample sizes for validated trips are low during December through April due to low fishing activity (Figure 8). Not including the low fishing activity months (December - April), the percentage of validations that corresponded to a reported trip in the Gulf Logbook system ranged between 55\% and $80 \%$ in Florida, and between 50\% and 90\% in Texas (Figure 13).

Table 11. Number of trips validated during dockside vessel interviews by region and month, and number and percent of validated trips with a corresponding logbook trip report received through the Gulf Logbook system.

| Texas |  |  |  | Florida |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Month | Trips <br> Validated | Trips Validated <br> and Reported | $\%$ <br> Reported | Trips <br> Validated | Trips <br> Validated and <br> Reported | $\%$ <br> Reported |
| Sep | 4 | 3 | $75.0 \%$ | 53 | 28 | $52.8 \%$ |
| Oct | 9 | 8 | $88.9 \%$ | 107 | 80 | $74.8 \%$ |
| Nov | 2 | 2 | $100 \%$ | 36 | 30 | $83.3 \%$ |
| Dec | 2 | 2 | $100 \%$ | 1 | 0 | $0 \%$ |
| Jan | 0 | 0 |  | 1 | 1 | $100 \%$ |
| Feb | 1 | 0 | $0 \%$ | 8 | 3 | $37.5 \%$ |
| Mar | 3 | 2 | $66.7 \%$ | 17 | 14 | $82.3 \%$ |
| Apr | 2 | 2 | $100 \%$ | 69 | 46 | $66.7 \%$ |
| May | 16 | 13 | $81.3 \%$ | 111 | 85 | $76.6 \%$ |
| Jun | 39 | 19 | $48.7 \%$ | 173 | 140 | $80.9 \%$ |
| Jul | 35 | 28 | $80.0 \%$ | 258 | 205 | $79.5 \%$ |
| Aug | 37 | 29 | $78.4 \%$ | 111 | 63 | $56.8 \%$ |
| Total | 150 | 108 | $72.0 \%$ | 945 | 695 | $73.5 \%$ |

For dockside validated trips that were not reported through the Gulf Logbook Reporting System, vessel operators either: 1) did not report for the week the vessel was validated, 2) inaccurately reported the vessel was inactive for the week, or 3) reported trips for the vessel during other days of the week but not for the day the vessel was validated (Figure 15).


Figure 15. Logbook reporting status for trips that were sampled during dockside validation assignments. Percentages indicate proportions of pre-validated vessels that accurately reported through the Gulf Logbook reporting system (reported trip), reported incorrectly (reported inactive for week or did not report trip for day/time of interview), or did not report for the week of the interview. "Refusals" means the vessel was intercepted during a dockside validation assignment but the vessel operator refused to be interviewed.

Comparison of Dockside Responses and Logbook Reports for Corresponding Trips
Dockside validation interviews from the first nine months of the pilot study were compared directly with logbook data reported through the Gulf Logbook system for 88 corresponding trips in Texas and 674 corresponding trips in Florida. Two statistics were used to analyze differences in reporting: mean absolute mean difference and the difference of means. The mean absolute difference is the expected amount (absolute value) by which we would expect a single logbook report and corresponding dockside sample (for the same trip) to disagree and can only be positive. The more a value differs from zero, the greater the difference in expected logbook reports and dockside samples. In comparison, the difference of means (=mean dockside - mean logbook) is the difference between the average value for all dockside validation responses aggregated (mean dockside) and the average value for all logbook reports (mean logbook) aggregated. A large negative value for the difference of means would indicate values were consistently over reported on logbooks, whereas a large positive value would indicate variables were consistently under reported. The primary difference between the two statistics is that one calculates differences on a per report/sample basis and the other calculates differences in aggregate across all reports/samples. Although variables reported in logbooks might differ from dockside samples on a per trip basis, it is useful for data collectors to know whether or not those differences would exist when aggregated across all reports/samples.

The number of anglers reported on logbooks for each fishing trip is important for measuring total fishing effort in terms of angler trips and for calculating catch rates (fish per angler trip). The
number of anglers reported on logbooks exactly matched dockside validation responses for $76 \%$ of trips in both Texas and Florida (Table 12). The mean absolute difference between logbook reports and dockside validation responses was 0.488 anglers for any given trip in Texas and 0.450 anglers for any given trip in Florida (Table 12). The difference of means for numbers of anglers per trip was 0.458 anglers in Texas and -0.107 anglers in Florida, which indicates that vessel operators did not consistently over report or under report this value (Table 12). Large over or under reporting of fishing effort variables could preclude the use of data reported in logbooks as an expansion factor for un-reported trips. Based on the results of this study, numbers of anglers reported in logbook reports would produce similar results as estimates based on dockside samples, provided that samples for dockside validations are of adequate size to be representative. Hours fished is useful for calculating catch rate per unit of time, and can be combined with anglers fished to calculate catch rates per angler hour fished. The proportion of exact matches between logbook reports and dockside validation responses for hours fished was low compared to anglers fished ( $29 \%$ in Texas and $52 \%$ in Florida), though differences between means were small (Table 12).

Table 12: Proportion of dockside interviews and corresponding logbook trip reports that were exact matches for numbers of anglers and hours fished; and the mean absolute difference and difference of means between responses given during dockside interviews and corresponding logbook trip reports (Sept. 2010 - May 2011). See Appendix I for details on statistics.

| State | Variable | Proportion Matched Exactly | Mean Absolute Difference | Root mse | Dockside Mean | Logbook Mean | Difference of Means |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { Texas } \\ & \mathrm{n}=24 \end{aligned}$ | Anglers | 0.79 | 0.488 | 1.061 | $\begin{gathered} 3.96 \\ (3.35,4.57) \end{gathered}$ | $\begin{gathered} 4.42 \\ (3.84,4.99) \end{gathered}$ | -0. 458 |
|  | Hours Fished | 0.29 | 1.369 | 2.237 | $\begin{gathered} 6.92 \\ (6.09,7.74) \end{gathered}$ | $\begin{gathered} 6.41 \\ (5.84,6.97) \end{gathered}$ | 0.510 |
| $\begin{aligned} & \text { Florida } \\ & \mathrm{n}=263 \end{aligned}$ | Anglers | 0.77 | 0.450 | 1.220 | $\begin{gathered} 6.29 \\ (5.93,6.65) \end{gathered}$ | $\begin{gathered} 6.40 \\ (6.06,6.74) \end{gathered}$ | -0.107 |
|  | Hours Fished | 0.52 | 0.676 | 1.286 | $\begin{gathered} 3.99 \\ (3.80,4.19) \end{gathered}$ | $\begin{gathered} 3.89 \\ (3.71,4.08) \end{gathered}$ | 0.098 |

The percentage of time spent fishing by jurisdiction (Exclusive Economic Zone or EEZ, State Territorial Seas, and Inland waters) is important for assigning effort to different state and federal jurisdictions and calculating catch rates for those areas. Exact matches between logbook reports and dockside validation responses for the percentage of time fished in each jurisdiction (EEZ, State and Inland waters) was high and ranged from $74 \%$ up to $93 \%$ (Table 13). The minimum and maximum depths fished during a trip were collected as a cross check for comparison with the reported fishing jurisdiction (for example, large minimum depths would not be expected in inland waters). Depth range is also an important data need for correctly assigning variable discard mortality rates (related to barotrauma) proportional to the distribution of fishing effort at different fishing depths. The percentage of trips with exact matches between dockside and logbook values was low (Table 13). Providing categorical choices for variables in Table 13 (rather than allowing for continuous variable responses) could improve the degree of correspondence between logbook reports and dockside validations (example, provide categories for percentage of time fished in $E E Z=25 \%, 50 \%, 75 \%$, or $100 \%$, or maximum depth $=<30^{\prime}$, $30^{\prime}$ to 60 ', etc.).

Area fished responses for dockside validations and logbook trip reports matched zones in the Gulf of Mexico used for reporting commercial landings (Appendix E). Since area fished was a categorical variable, logbook reports that were not an exact match with dockside validation responses were considered completely inaccurate. Only $62 \%$ and $63 \%$ of logbook reports in Texas and Florida, respectively, were an exact match with what was reported for area fished during dockside validation interviews. Paper logbook reporters were provided with a hard copy map to look up the area fished codes, and electronic reporters were provided with a drop-down menu on the Gulf Logbook screen which required a selection for the area fished before a trip report could be submitted. Early in the study, electronic participants provided feedback that the selections in the drop down menu were not clear, and changes were made as the study progressed to better define the area fished categories. A link to a reference map with area fished codes was provided in the upper corner of the screen; however, the link was not readily noticeable to many users. Suggestions to provide a link to the reference map next to the drop-down menu and/or provide a click-able map to select the area fished were offered as potential improvements, but those design changes could not be implemented before the end of the pilot study.

Table 13. Proportion of dockside interviews and corresponding logbook trip reports that were exact matches for area fished variables.

|  | Proportion Matched Exactly <br> Texas | Proportion Matched Exactly <br> Florida |
| :--- | :---: | :---: |
| \% Time Fished in EEZ | 0.92 | 0.80 |
| \% Time Fished in STS | 0.79 | 0.74 |
| \% Time Fished Inland | 0.88 | 0.93 |
| Minimum depth fished | 0.42 | 0.43 |
| Maximum depth fished | 0.33 | 0.43 |

Catch data for numbers of red snapper reported on logbook trip reports was compared to dockside validation data for corresponding trips. Harvested red snapper were directly observed and counted by field biologists during dockside interviews. Released red snapper were not directly observed, and dockside responses were based on the recall of vessel operators immediately after the trip was completed (versus what was recorded on logbooks during the same day, the same week, the following reporting week, or potentially much longer, depending on the timeliness of logbook reporting). Similar to other variables discussed above, numbers of red snapper reported on logbook trip reports and recorded during dockside validation interviews did not agree for individual trips, but average values over all trips from logbook reports and dockside samples were similar. For harvested red snapper, individual logbook trip reports and dockside samples for the same trip disagreed by 1.4 fish in Texas and 0.7 fish in Florida, whereas the difference between aggregated means was approximately one tenth of one fish per trip (Table 14, -0.011 in TX, -0.14 in FL). These results indicate that while individual logbook reports for numbers of released fish are dissimilar and may not be considered one-to-one substitutes for dockside validations, the two data sources are comparable when considered in aggregate (given that sample sizes are adequate). For red snapper released alive, there were greater discrepancies between individual values for logbook trip reports and dockside samples for the same trip. For example, the number of red snapper released in Florida for all release categories combined differed by 6.4 fish between individual logbook trip reports and dockside
samples for the same trip. Differences between aggregated means for total numbers of released fish were reduced ( 2.3 fish per trip in Texas and 1.2 fish per trip in Florida); however, these values were still large compared to those for harvested fish (Table 14). Red snapper are subject to a bag limit of two red snapper per angler during the open harvest season, which requires that vessel operators pay close attention to the numbers of fish harvested. Vessel operators may be less likely to keep track of numbers of released fish during a fishing trip, which could explain the larger discrepancies for numbers of released fish between logbook reports and dockside samples. Very few fish were released dead from Texas, resulting in a high rate of exact matches between logbook reports and dockside responses. In Florida, $82 \%$ of dockside responses and corresponding logbook trip reports were exactly matched for the number of red snapper released dead.

Table 14: Proportion of dockside interviews and corresponding logbook trip reports that were exact matches for numbers of red snapper harvested, released alive at depths $\leq 120^{\prime}$, released alive at depths $>120^{\prime}$, released dead, and all released fish ( $\leq 120^{\prime},>120^{\prime}$, and dead released categories combined); and the mean absolute difference and difference of means between responses given during dockside interviews and corresponding logbook trip reports for all months (Sept. 2010 - August 2011). See Appendix J for more detailed statistics.

| Region | Red Snapper (numbers) | Proportion Matched Exactly | Mean Absolute Differen ce | Root Mean Square Error | Dockside Mean | $\begin{gathered} \text { Logbook } \\ \text { Mean } \end{gathered}$ | Difference of Means |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { Texas } \\ & (\mathrm{n}=51 \\ & \text { trips }) \end{aligned}$ | Harvested | 0.63 | 1.392 | 2.960 | $\begin{gathered} 5.67 \\ (4.24,7.13) \end{gathered}$ | $\begin{gathered} 5.78 \\ (4.38,7.19) \end{gathered}$ | -0.11 |
|  | Released alive $\leq 120^{\prime}$ | 0.67 | 1.706 | 3.933 | $\begin{gathered} 1.14 \\ (0.35,1.92) \end{gathered}$ | $\begin{gathered} 0.65 \\ (-0.08,1.37) \end{gathered}$ | 0.49 |
|  | Released alive $>120^{\prime}$ | 0.47 | 2.863 | 5.763 | $\begin{gathered} 3.63 \\ (1.90,5.36) \end{gathered}$ | $\begin{gathered} 1.86 \\ (0.56,3.17) \end{gathered}$ | 1.77 |
|  | Released dead | 1.00 | 0 | 0 | 0 | 0 | 0 |
|  | All releases combined | 0.22 | 4.137 | 6.605 | $\begin{gathered} 4.77 \\ (3.05,6.48) \end{gathered}$ | $\begin{gathered} 2.51 \\ (0.85,1.18) \\ \hline \end{gathered}$ | 2.26 |
| Florida ( $\mathrm{n}=547$ trips) | Harvested | 0.84 | 0.664 | 2.343 | $\begin{gathered} 6.82 \\ (6.19,7.46) \end{gathered}$ | $\begin{gathered} 6.96 \\ (6.33,7.58) \end{gathered}$ | -0.14 |
|  | Released alive $\leq 120^{\prime}$ | 0.44 | 5.733 | 13.085 | $\begin{gathered} 9.17 \\ (7.65,10.70) \end{gathered}$ | $\begin{gathered} 8.57 \\ (7.17,9.96) \end{gathered}$ | 0.60 |
|  | Released alive $>120^{\prime}$ | 0.73 | 3.256 | 8.959 | $\begin{gathered} 3.99 \\ (3.08,4.90) \end{gathered}$ | $\begin{gathered} 3.15 \\ (2.45,3.84) \end{gathered}$ | 0.84 |
|  | Released dead | 0.82 | 0.644 | 2.694 | $\begin{gathered} 0.41 \\ (0.16,0.66) \end{gathered}$ | $\begin{gathered} 0.61 \\ (0.37,0.86) \end{gathered}$ | -0.21 |
|  | All releases combined | 0.35 | 6.428 | 14.226 | $\begin{gathered} 12.33 \\ (11.86,15.29) \\ \hline \end{gathered}$ | $\begin{gathered} 13.57 \\ (10.75,13.91) \\ \hline \end{gathered}$ | 1.24 |

Catch data for total numbers of species and total numbers of fish for all species reported on logbook trip reports was also compared to dockside validation data for corresponding trips. Similar to the red snapper analysis above, all harvested fish were directly observed, identified to species, and counted by field biologists during dockside interviews; whereas, released fish catch was based on the recall of vessel operators immediately after the trip was completed. The proportion of trips for which numbers of species caught exactly matched between dockside validation observations and logbook trip reports was $42 \%$ in Texas and $33 \%$ in Florida, and the
numbers of species caught were under reported on logbooks by less than one species per trip in Texas and slightly more than one species per trip in Florida (Table 15). Some under reporting of species was due to lower resolution in species-level reporting by vessel operators. For example, vessel operators were able to report some species in aggregate (e.g. "grunt, type not known"). Under reporting of species may also be due to loss of recall for low priority species the day after the trip is completed, or low priority may have been given to reporting species not considered important recreationally. As with previous comparisons, the difference of the means for numbers of fish harvested and released between dockside validations and logbook reports was not large (from less than 1 fish up to 2.7 fish per trip).

Table 15: Proportion of dockside interviews and corresponding logbook trip reports that were exact matches for numbers of species caught and total numbers of fish (all species) harvested, released alive at depths $\leq 120^{\prime}$, released alive at depths $>120^{\prime}$, and released dead; the mean absolute difference between responses given during dockside interviews and corresponding logbook trip reports; means (with 95\% confidence intervals) and difference between means for dockside and logbook values. Data are for the first nine months of the pilot study (Sept. 2010 - May 2011). See Appendix I for detailed description of statistics.

|  | All Species | Proportion Matched Exactly | Mean Absolute Difference | Root Mean Square Error | Dockside <br> Mean | Logbook Mean | Difference of Means |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { Texas } \\ & \mathrm{n}=24 \\ & \text { trips } \end{aligned}$ | Number of Species | 0.42 | 0.875 | 1.242 | $\begin{gathered} 3.79 \\ (2.99,4.59) \end{gathered}$ | $\begin{gathered} 3.17 \\ (2.48,3.85) \end{gathered}$ | 0.62 |
|  | Number of Fish Harvested | 0.33 | 3.167 | 5.809 | $\begin{gathered} 9.79 \\ (6.28,13.31) \end{gathered}$ | $\begin{gathered} 10.38 \\ (6.55,14.20) \end{gathered}$ | -0.59 |
|  | Number of Fish Released alive $\leq 120$, | 0.50 | 3.917 | 7.200 | $\begin{gathered} 3.83 \\ (1.32,6.34) \end{gathered}$ | $\begin{gathered} 1.17 \\ (-0.16,2.49) \end{gathered}$ | 2.66 |
|  | Number of Fish Released alive $>120$, | 0.58 | 0 | 7.853 | $\begin{gathered} 5.25 \\ (0.89,9.61) \end{gathered}$ | $\begin{gathered} 3.92 \\ (0.40,7.43) \end{gathered}$ | 1.33 |
|  | Number of Fish Released dead | 0.96 | 0.125 | 0.612 | 0 | $\begin{gathered} 0.13 \\ (-0.12,0.37) \\ \hline \end{gathered}$ | -0.13 |
| $\begin{aligned} & \text { Florida } \\ & \text { n=263 } \\ & \text { trips } \end{aligned}$ | Number of Species | 0.33 | 1.445 | 2.215 | $\begin{gathered} 5.07 \\ (4.77,5.36) \end{gathered}$ | $\begin{gathered} 3.94 \\ (3.66,4.21) \end{gathered}$ | 1.13 |
|  | Number of Fish Harvested | 0.19 | 8.992 | 19.601 | $\begin{gathered} 32.10 \\ (28.00,36.21) \end{gathered}$ | $\begin{gathered} 30.30 \\ (25.92,34.69) \end{gathered}$ | 1.80 |
|  | Number of Fish <br> Released alive $\leq 120$, | 0.37 | 9.578 | 20.354 | $\begin{gathered} 17.44 \\ (14.12,20.76) \end{gathered}$ | $\begin{gathered} 17.32 \\ (13.53,21.11) \end{gathered}$ | 0.12 |
|  | Number of Fish Released alive $>120$, | 0.70 | 9.000 | 11.727 | $\begin{gathered} 7.13 \\ (5.21,9.05) \end{gathered}$ | $\begin{gathered} 5.72 \\ (4.06,7.38) \end{gathered}$ | 1.41 |
|  | Number of Fish Released dead | 0.77 | 1.053 | 3.963 | $\begin{gathered} 0.82 \\ (0.29,1.34) \\ \hline \end{gathered}$ | $\begin{gathered} 1.07 \\ (0.55,1.58) \\ \hline \end{gathered}$ | -0.25 |

Some misreporting of catch was due to confusion regarding common names for different species. Out of 148 dockside validation interviews in Florida where vessel operators reported releasing king mackerel the day of the trip, only $40 \%$ of corresponding logbook trip reports recorded any king mackerel releases. This is very likely due to the selection of "Gulf kingfish" instead of "king mackerel", which were both available in the drop-down menu on the Gulf Logbook website. King mackerel are often called kingfish by fishermen, but the use of this common name in the drop-down menu for the Gulf Logbook website referred to a Sciaenid species. Records submitted on paper reports for "kingfish" were verified with the vessel operators before they were entered into the Gulf Logbook website by state biologists, and those records were frequently corrected to king mackerel. During the pilot study, changes were made in the drop
down menus for the Gulf Logbook website to better distinguish species categories to minimize these types of reporting errors in the latter half of the study. For example, "Gulf kingfish" was modified to "Gulf kingfish (whiting, or ground mullet)" so it was clear that this selection did not refer to king mackerel. Also, if a reporter typed "kingfish" into the data field, selections for both Gulf kingfish and king mackerel were presented to the user. The iSnapper smart phone application provided a picture menu for species selections, and users commented that this was more user-friendly.

## At-Sea Validation of Logbook Data

Logbook trip reports were received through the Gulf Logbook reporting system for $84.4 \%$ of trips sampled during at-sea validations in Texas and $88.5 \%$ of sampled trips in Florida (Table 16). These percentages are high compared to dockside validations and validations for vessel activity, due in part to the fact that only cooperative vessels volunteered to allow fishery observers to board their vessels. Consequently, voluntary at-sea validations are not useful for monitoring overall reporting compliance and are only used here to evaluate the accuracy of reporting for released catch.

Table 16. Number of trips validated by at-sea observers by region and month, and number and percent of validated trips with a corresponding logbook trip report received through the Gulf Logbook system.

| Texas |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Month | Trips <br> Validated | Trips Validated <br> and Reported | Percent <br> Reported | Trips <br> Validated | Trips Validated <br> and Reported | Percent <br> Reported |
| Sep | 5 | 4 | $80.0 \%$ | 4 | 3 | $75.0 \%$ |
| Oct | 4 | 4 | $100 \%$ | 15 | 15 | $100 \%$ |
| Nov | 0 | 0 | - | 13 | 12 | $92.3 \%$ |
| Dec | 0 | 0 | - | 0 | 0 | - |
| Jan | 0 | 0 | - | 1 | 1 | $100 \%$ |
| Feb | 0 | 0 | - | 4 | 2 | $50.0 \%$ |
| Mar | 2 | 2 | $100 \%$ | 6 | 4 | $66.7 \%$ |
| Apr | 1 | 1 | $100 \%$ | 7 | 6 | $85.7 \%$ |
| May | 4 | 4 | $100 \%$ | 8 | 7 | $87.5 \%$ |
| Jun | 9 | 7 | $77.8 \%$ | 12 | 11 | $91.7 \%$ |
| Jul | 11 | 9 | $81.8 \%$ | 9 | 8 | $88.9 \%$ |
| Aug | 9 | 7 | $77.8 \%$ | 10 | 8 | $80.0 \%$ |
| Total | 45 | 38 | $84.4 \%$ | 87 | 77 | $88.5 \%$ |

Released fish were directly observed and counted by field biologists during at-sea sampled trips and compared with what was recorded on logbooks during the same day, the same week, the following reporting week, or potentially much longer, depending on the timeliness of logbook reporting. In Florida, some charter vessels carry more than 10 passengers, and a portion of at-sea sampled trips from Florida ( $\mathrm{n}=16$ ) were excluded from this analysis because it was not possible to monitor all of the anglers fishing from the vessel.

The number of species released was consistently under reported on logbook trip reports by 1.4 species in Texas and 2.2 species in Florida. The total number of released species that were
reported on logbooks and observed during at-sea validation was an exact match for only a small portion of sampled trips ( $21 \%$ in Texas and $25 \%$ in Florida; Table 17). For trips validated at-sea where red snapper were observed to have been released, logbook trip reports reported red snapper in any release category for $58 \%$ of trips in Texas (Table 18, $\mathrm{n}=24$ validated trips), and the total number of red snapper released was under reported by 3.75 fish (Table 19, all release categories combined). Other species could not be evaluated for Texas due to the low numbers of sampled trips. In Florida, the percent of at-sea validated trips with logbooks that reported red snapper released in any category was $79 \%$ (Table 18, $\mathrm{n}=56$ validated trips), and aggregated mean value for the total number of released fish recorded on logbook trip reports was similar to what was observed during at-sea validations (difference of means=0.09 fish for total fish released in all categories combined, Table 19). For other species, including greater amberjack, gag, and red grouper in Florida, aggregated means for numbers of released fish reported on logbook trip reports were close to aggregated means for observed trips (Table 19); however, gray triggerfish was the exception. Larger sample sizes are necessary to evaluate reporting accuracy for other species.

In addition to providing validations for direct comparisons between observed and reported numbers for released fish, the at-sea observer dataset provides high quality information on recreational discards that could not be collected in a dockside methodology. Figure 16 below shows the length frequency distributions for both harvested and released red snapper from trips that were validated at-sea in the Texas and Florida study regions. There are notable differences in the sizes of fish that are caught between the two regions. Charter vessels in Florida catch and release more small red snapper, and charter vessels in Texas catch a more even distribution of red snapper size classes. Measuring fish and recording such detailed information in logbooks would be difficult for vessel operators to do simultaneous with tending to rods for multiple anglers and operating the vessel. This type of information has direct applications for regional stock assessments.

Table 17: Proportion of trips validated with at-sea observers and corresponding logbook trip reports that were exact matches for numbers of species released; and the mean absolute difference with root mean square error, means with $95 \%$ confidence intervals, and difference of means (Sept. 2010 - August 2011). See Appendix I for detailed description of statistics.

| State | Number | Proportion <br> Matched <br> Exactly | Mean <br> Absolute <br> Difference | Root Mean <br> Square <br> Error | At-sea <br> Mean | Logbook <br> Mean | Difference <br> of Means |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Texas | Species | 0.21 | 1.44 | 1.708 | 2.21 | 0.77 | 1.44 |
| $\mathrm{~N}=34$ trips | released |  |  |  | $(1.48,2.93)$ | $(0.58,0.95)$ | 2.20 |
| Florida | Species | 0.25 | 2.20 | 3.062 | 4.25 | 2.05 | 2.20 |
| $\mathrm{~N}=61$ trips | released |  |  |  | $(3.12,5.37)$ | $(1.49,2.60)$ |  |

Table 18. Number of trips validated at-sea where a given species was observed to have been caught and released (positive trips), and the percent of corresponding logbook trip reports where the released species was also reported.

|  | Texas |  | Florida |  |
| :---: | :---: | :---: | :---: | :---: |
|  | At-Sea Trips | Percent Reported | At-Sea Trips | Percent Reported |
| Bank seabass |  |  | 11 | 9\% |
| Cobia | 4 | 25\% | 3 | 34\% |
| Gag |  |  | 26 | 62\% |
| Gray triggerfish | 2 | 50\% | 37 | 57\% |
| Greater amberjack | 4 | 50\% | 31 | 52\% |
| King mackerel | 4 | 75\% | 1 | 0\% |
| Little tunny | 5 | 100\% |  |  |
| Red grouper |  |  | 18 | 61\% |
| Red snapper | 24 | 58\% | 56 | 79\% |
| Scamp |  |  | 11 | 55\% |
| Sharksucker |  |  | 11 | 0\% |
| Tomtate |  |  | 12 | 0\% |
| Vermilion snapper | 1 | 0\% | 9 | 44\% |
| Other unreported species (positive trips <4 per species) | almaco jack, black dusky shark, gaf snapper, lemon hind, remora, ro sandbar shark, s stingray | shark, blue runner, ail catfish, lane , night shark, red nd, rock seabass, hark, southern | banded rudderfi snapper, lizardfish pigfish, remora, Spanish mackere whitefin sharksu | igeye, lane moray, searobin, hern flounder, otted scorpionfish, |

Table 19: Measured differences between numbers of released fish observed during at-sea validated trips and reported on corresponding logbook trip reports for select species, including the mean absolute difference and root mean square error (mse), means (with 95\% confidence intervals), and difference of means between numbers of released fish (Sept. 2010 - August 2011). See Appendix J for details.

| State | Species | Release <br> Category | Mean Abs. Difference | Root mse | At-sea Mean | Logbook Mean | Difference of Means |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Florida | Red <br> snapper <br> $\mathrm{n}=56$ trips | Alive $\leq 120$ | 9.16 | 18.475 | $\begin{gathered} 14.18 \\ (-75.79,104.15) \end{gathered}$ | $\begin{gathered} 14.16 \\ (-96.87,104.13) \end{gathered}$ | 0.02 |
|  |  | Alive >120' | 3.95 | 8.913 | $\begin{gathered} 3.75 \\ (-11.64,19,14) \end{gathered}$ | $\begin{gathered} 2.80 \\ (-13.23,18.20) \end{gathered}$ | 0.95 |
|  |  | Dead | 0.95 | 3.254 | $\begin{gathered} 0.04 \\ (0.03,0.05) \end{gathered}$ | $\begin{gathered} 0.91 \\ (-1.68,0.92) \end{gathered}$ | -0.88 |
|  |  | Combined | 8.52 | 17.799 | $\begin{gathered} 17.96 \\ (-70.18,106.11) \end{gathered}$ | $\begin{gathered} 17.88 \\ (-110.53,106.02) \end{gathered}$ | 0.09 |
| Texas | Red snapper $\mathrm{n}=24$ trips | Alive $\leq 120$ | 3.17 | 6.946 | $\begin{gathered} 2.21 \\ (-9.52,13.93) \end{gathered}$ | $\begin{gathered} 2.63 \\ (-10.76,14.35) \end{gathered}$ | -0.42 |
|  |  | Alive >120' | 5.92 | 11.011 | $\begin{gathered} 6.79 \\ (-35.82,49.41) \end{gathered}$ | $\begin{gathered} 2.38 \\ (-6.98,44.99) \end{gathered}$ | 4.42 |
|  |  | Dead | 0.33 | 0.816 | $\begin{gathered} 0.04 \\ (0.03,0.06) \end{gathered}$ | $\begin{gathered} 0.29 \\ (0.07,0.31) \end{gathered}$ | -0.25 |
|  |  | Combined | 5.75 | 9.713 | $\begin{gathered} 9.04 \\ (-33.63,51.71) \end{gathered}$ | $\begin{gathered} 5.29 \\ (-12.85,47.96) \end{gathered}$ | 3.75 |
| Florida | Greater amberjack $\mathrm{n}=31$ trips | Alive $\leq 120$ | 1.90 | 2.913 | $\begin{gathered} 3.19 \\ (-6.93,13.32) \end{gathered}$ | $\begin{gathered} 2.58 \\ (-7.11,12.71) \end{gathered}$ | 0.61 |
|  |  | Alive >120' | 0.55 | 1.823 | $\begin{gathered} 0.58 \\ (-0.16,1.33) \end{gathered}$ | $\begin{gathered} 0.74 \\ (-0.71,1.49) \end{gathered}$ | -0.16 |
|  |  | Dead | 0.23 | 1.257 | $\begin{gathered} 0.03 \\ (0.02,0.04) \end{gathered}$ | $\begin{gathered} 0.29 \\ (-0.47,0.27) \end{gathered}$ | -0.23 |
|  |  | Combined | 1.65 | 2.389 | $\begin{gathered} 3.81 \\ (-6.30,13.91) \end{gathered}$ | $\begin{gathered} 3.58 \\ (-7.02,13.68) \end{gathered}$ | 0.23 |
| Florida | $\begin{aligned} & \text { Gag } \\ & \mathrm{n}=26 \text { trips } \end{aligned}$ | Alive $\leq 120^{\prime}$ | 2.08 | 3.363 | $\begin{gathered} 2.65 \\ (-0.39,5.70) \end{gathered}$ | $\begin{gathered} 1.81 \\ (-1.73,4.85) \end{gathered}$ | 0.85 |
|  |  | Alive >120' | 0.38 | 0.961 | $\begin{gathered} 0.35 \\ (0.07,0.62) \end{gathered}$ | $\begin{gathered} 0.12 \\ (-0.02,0.39) \end{gathered}$ | 0.23 |
|  |  | Dead | 0 | 0 | 0 | 0 | 0 |
|  |  | Combined | 1.92 | 3.282 | $\begin{gathered} 3.00 \\ (-0.38,6.38) \\ \hline \end{gathered}$ | $\begin{gathered} 1.92 \\ (-1.58,5.31) \end{gathered}$ | 1.08 |
| Florida | Red grouper $\mathrm{n}=18$ trips | Alive $\leq 120$ | 1.78 | 5.022 | $\begin{gathered} 1.72 \\ (-1.15,4.59) \end{gathered}$ | $\begin{gathered} 2.61 \\ (-20.06,5.48) \end{gathered}$ | -0.89 |
|  |  | Alive >120' | 0.61 | 1.225 | $\begin{gathered} 1.00 \\ (-1.34,3.34) \end{gathered}$ | $\begin{gathered} 0.72 \\ (-2.96,3.06) \end{gathered}$ | 0.28 |
|  |  | Dead | 0 | 0 | 0 | 0 | 0 |
|  |  | Combined | 2.06 | 5.083 | $\begin{gathered} 2.72 \\ (-0.80,6.24) \\ \hline \end{gathered}$ | $\begin{gathered} 3.33 \\ (-21.18,6.86) \\ \hline \end{gathered}$ | -0.61 |
| Florida | Gray triggerfish $\mathrm{n}=37$ trips | Alive $\leq 120$ | 4.97 | 8.962 | $\begin{gathered} 6.54 \\ (-27.32,40.40) \end{gathered}$ | $\begin{gathered} 6.00 \\ (-32.86,39.86) \end{gathered}$ | 0.54 |
|  |  | Alive >120' | 1.57 | 3.863 | $\begin{gathered} 1.81 \\ (-2.66,6.28) \end{gathered}$ | $\begin{gathered} 0.46 \\ (-0.29,4.93) \end{gathered}$ | 1.35 |
|  |  | Dead | 0 | 0 | 0 | 0 | 0 |
|  |  | Combined | 5.46 | 9.037 | $\begin{gathered} 8.35 \\ (-23.37,40.08) \\ \hline \end{gathered}$ | $\begin{gathered} 6.46 \\ (-31.32,38.18) \\ \hline \end{gathered}$ | 1.89 |

Texas Red Snapper Length Frequency From 2010-2011 At Sea Trips


Florida Red Snapper Length Frequency From 2010-2011 At Sea Trips


Figure 16. Length frequency distribution of harvested and released red snapper that were measured by at-sea observers during all charter fishing trips validated in Texas (top) and Florida (bottom). Harvest includes fish that were released dead. Note the differences in the number of fish harvested and released off Texas versus Florida.

## 4. Field Validation Sample Sizes

## Validation of Vessel Activity Status

In order to assess the number of vessel activity validation sample days required to adequately measure the proportion of trips for which a logbook trip report was submitted, a Monte Carlo simulation study (see Appendix L) was conducted using the population of calendar days that vessel activity validation assignments were conducted during the pilot study. The purpose of the analysis was to examine how extensive a validation program would need to be in order to determine, with various levels of confidence, whether the proportion of trips having logbook records has changed or not over time. Data from Texas were not included in the analysis; however, reporting compliance across months showed similar trends in both study regions (Table 11).

The results of the Monte Carlo study were that a large fraction (about 75\% or more) of the effort devoted to validation sampling in the pilot study would be needed to produce accurate estimates of the proportion of trips with logbook reports using any type of a hypothesis testing approach. A Bayesian procedure allows the incorporation of prior information based on past years of sampling, which then allows greater precision with smaller sample sizes. The outcome of this Monte Carlo investigation was that a modest sampling effort of 15 to 25 days be combined with a Bayesian analysis. It was also suggested, however, that additional investigation of the ability of such a procedure to detect a true change be conducted, and that a sample size greater than 25 would be preferred if feasible, which could be achieved given the number of days that vessel activity validation assignments were conducted during the pilot study (Table 5). For more details regarding this analysis see Appendix L.

## Dockside Validation of Catch

In order to assess the number of dockside intercepts for individual vessels that are required to adequately assess the accuracy of catch records in logbook trip reports, a Monte Carlo simulation study was conducted for Florida using the population of vessel interviews collected during the duration of the pilot study. The sample size for numbers of trips that were validated and reported through the Gulf Logbook System were too low in the Texas study area for this analysis; however, results from the Florida study area are applicable to Texas if logbooks were to be implemented on a larger scale.

The simulations (Appendix K) compared the following quantities for all species reported and separately for just red snapper; 1) the number of fish harvested, 2) the number of fish released in depths $<120^{\prime}, 3$ ) the number of fish released in depths $>120^{\prime}$, and 4) the number of fish discarded dead. For Monte Carlo simulations, sample sizes (n) of 10, 20, 50, 100, 200, 300, 400, and 500 vessel trips were randomly selected from the population of all validated trips, and for each value of $n$ the population was re-sampled 25,000 times. The primary objective was to determine whether, in aggregate, logbook reports of the quantities given above can be considered equivalent to what would result from dock-side sampling. To determine this, a statistical procedure called equivalence testing was used. Here, a "zone of indifference" is specified, and if an interval estimate of the difference in a quantity between logbook and dock-side data sources is
contained entirely within the zone of indifference, then the two data sources are declared equivalent.

Results of simulations show that for low sample sizes ( $\mathrm{n}=10,20,50,100$ ), the probability of declaring equivalence between logbook and dockside sampling data sources is low (less than half of the simulations are equivalent), but increases with increasing sample size. The probability of declaring equivalence increases with increasing sample size, and beyond $n=300$ the rate of return for increasing sample size is diminished (Figure 17). For more details regarding this analysis see Appendix K.


Figure 17. Probability of declaring equivalence between logbook and dockside validation data sources as a function of dockside validation sample size for all species and for red snapper.

## 5. Project Cost

Costs for this study are divided into two categories: start up expenses and logbook reporting and validation expenses. Start-up expenses include one-time costs associated with development and implementation of the pilot study (Table 20). Project expenses include the annual cost for receiving logbook reports through the Gulf Logbook Reporting System, tracking weekly compliance, conducting routine follow-up for missing or late reports, and conducting field validations for self-reported logbook data (Table 21). A full-time database manager was hired with supplemental funds received through NMFS Southeast Fisheries Science Center. The database manager was responsible for tracking weekly reporting compliance and coordinating with GSMFC, NMFS, and states as vessels were cleared from permit hold lists. This position was not originally budgeted for in the MRIP project proposal, but was vital to the project.

When total annual cost is calculated on a per vessel basis, the cost for this logbook reporting program was high in the Texas study area, which was a small region with a small number of vessels. In the larger Florida study area, which included more vessels, the cost on a per vessel basis was significantly reduced (Table 21). The annual per vessel cost for the Florida study area is a more in line with the expected cost for implementation of a weekly logbook reporting
program on a region-wide scale. The per vessel cost for a logbook reporting program with a daily or real-time reporting frequency is expected to be higher, due to the need for additional manpower to conduct more frequent compliance tracking and follow-up for non-response. Annual costs to run a logbook reporting program in Texas would be an additional expense, since the state survey conducted by Texas Parks and Wildlife would not be replaced by a logbook program. In Florida, annual costs to run a logbook reporting program could be offset if the program replaced the current For-Hire Telephone Survey and Access Point Intercept Survey for for-hire mode.

The chosen method(s) to validate self-reported logbook data also impacts the cost for implementation. This pilot study employed three separate validation methods, and each provided varied degrees of information for comparison with logbook trip reports. Validation of vessel activity is the cheapest validation method, and sample sizes in this pilot study were adequate for measuring the proportion of trips reported on logbooks. However, since this method is only useful for validating effort, it must be accompanied by another validation method for catch. Dockside validation is the cheapest validation method for catch; however, this method does not provide a measure of reporting accuracy for released catch. Based on the results of the sample size analysis, the number of dockside validations collected in the Florida study area could be reduced from 695 interviews with matching logbook trips to as few as 300 without impacting the results. At-sea sampling is the most costly validation method, but provides a direct validation for released catch and high quality data that is also valuable for stock assessments and fisheries management. Sample sizes for at-sea validations in this pilot study were low; however, money saved on fewer dockside validations in a future implementation could be invested in additional at-sea samples.

Table 20. Start-up expenses for Gulf Logbook Reporting System. Project expenses are summarized for both the Gulf States Marine Fisheries Commission and Marine Recreational Information Program.

|  | Gulf States Marine <br> Fisheries Commission | Marine Recreational <br> Information Program |
| :--- | :--- | :--- |
| Stakeholder Workshop <br> Electronic Reporting Tool, development <br> and maintenance | $\$ 48,000$ |  |
| Field Validation Data Entry Program | $\$ 14,000$ | $\$ 125,000$ |
| Certified Notification Letters | $\$ 2,300$ |  |
| Courtesy Letter | $\$ 200$ | $\$ 10,000$ |
| Outreach meetings <br> (2 in Florida, 1 in Texas) |  | $\$ 14,000$ |
| Workgroup meetings |  | $\$$ amount not provided |

Table 21. Operating costs to run the logbook reporting system, track compliance, and conduct field validations during the one-year pilot study.

|  | Texas Study Area | Florida Study Area | Regional Coordination |
| :---: | :---: | :---: | :---: |
| Regional <br> Coordinators and Field Samplers | 2 full-time contract positions, \$67,172 | 1 full-time coordinator plus overhead, \$53,738 | GSMFC administration costs for coordinating survey activities and administering contracts, \$25,000 |
|  |  | 2 full-time field staff plus overhead, \$79,231 | 1 full-time database manager, \$50,000 (responsible for tracking compliance and working with data for both Florida and Texas) |
| Training and Travel Expenses | \$5,000 | \$12,680 |  |
| Equipment | \$3,200 | \$3,000 |  |
| Printing, paper logbook forms |  | \$12,000 |  |
| At-Sea <br> Validations | Passenger fare, \$5,000 | In-kind staff time, travel, and passenger fare, $\$ 81,550$ |  |
| Total Annual Cost | \$80,366 | \$230,199 | \$75,000 |
| Annual Cost per Vessel | \$1,340/vessel for 60 vessels | \$658/vessel for 350 vessels | \$183/vessel for 410 total vessels |

## 6. Post-Pilot Study Participant Survey Results

## Electronic Reporting Responses

A total of 93 surveys were returned by participants at the conclusion of the pilot study (79 responses from Florida and 14 responses from Texas). A response rate cannot be reported because the electronic survey was open to anyone with access to the Gulf Logbook Website and it is not known if more than one person representing a single vessel responded to the survey. A complete summary of the survey responses is provided in Appendix M. When asked whether participants would support using a logbook reporting system in the future, based on their experience with this pilot study, the majority of respondents in both regions said yes $\mathbf{7 0 . 2 \%}$ in Florida and $83.3 \%$ in Texas). In Florida, $42.5 \%$ of respondents preferred to report every week on logbooks ( $30 \%$ preferred not to report weekly), versus $60 \%$ of respondents in Texas who preferred to report every week ( $10 \%$ preferred not to report weekly). In both regions approximately $30 \%$ had no preference. The majority of participants that preferred not to report weekly on logbooks reasoned that it took too much time ( $100 \%$ for Texas and $75 \%$ for Florida), indicating they would prefer to report less frequently rather than more frequently.

Half of respondents in Texas reported that it was very easy to keep an accurate count of released fish ( $20 \%$ said it was not easy at all), compared to $28.2 \%$ in Florida ( $41 \%$ said it was not easy at all). In both regions, $30 \%$ of respondents agreed it was somewhat easy to keep an accurate count of released fish for weekly logbook reporting. Approximately $80 \%$ of respondents in both regions recorded the numbers of released fish either while the trip was underway or sometime during the day the trip took place.

The majority of surveys returned from both regions indicate that participants found the registration and setup process for the Gulf Logbook website to be somewhat easy or very easy (Figure 18). A higher percentage of respondents from Texas reported that it took longer than 10 minutes to fill out a single electronic trip report ( $30 \%$ versus $17.5 \%$ in Florida). Approximately $83 \%$ of respondents in both regions found the weekly email reminders helpful, although a smaller number found the monthly telephone calls as helpful. The majority of Texas respondents $91.7 \%$ found TP\&W staff to be very helpful and the remaining $8.3 \%$ said they did not communicate with state staff. In Florida, $71.5 \%$ of respondents found FWC staff to be somewhat to very helpful and $26.5 \%$ said they did not communicate with state staff. One respondent did not find FWC staff helpful at all.

## Paper Reporting Responses

A total of 29 survey responses were received from paper reporters. All responses were from Florida, since all reporting for vessels in Texas was through the electronic reporting tool. A complete summary of the survey responses is provided in Appendix M. Many of the respondents that identified themselves as paper reporters did not use the electronic reporting tool because they either did not have access to a computer and/or internet or did not know how to use them. The majority of paper reporters, $79.3 \%$, found it somewhat to very important to receive postage paid envelopes for mailing paper logs. Fewer paper reporters kept a written account of released fish the day the trip took place than electronic reporters ( $55.1 \%$ for paper reporters and $82.1 \%$ for electronic reporters). A clear difference between paper and electronic reporters is seen in the percentage of respondents who would prefer to report fishing trip information every week via logbook reports: $42.5 \%$ of electronic reporters prefer to report every week, versus $24.1 \%$ of paper reporters ( $37.9 \%$ and $27.5 \%$ respectively had no preference with regards to weekly logbook reporting). A higher percentage of respondents that reported electronically would support using a logbook reporting system in the future ( $70.2 \%$, versus $44.8 \%$ of the paper reporters). Approximately half of the paper reporters (51.7\%) said they would not support a future logbook reporting system, while only $29.8 \%$ of the electronic reporters did not support this.


Figure 18. Percentage of responses in the end-of-pilot participant survey pertaining to the level of effort required to complete electronic logbook reports ( $1=$ very easy, $2=$ somewhat easy, $3=$ not at all easy, $4=$ not answered).

## CONCLUSIONS AND DISCUSSION

This study was initiated with the support of stakeholders, which were consulted prior to the design and implementation. Efforts were also made in advance of the pilot start date to introduce participants to the new system and formally notify them of the requirement to report. This approach is in accordance with guiding principles identified as critical for the successful development and implementation of new fisheries monitoring programs (MRAG Americas, 2011). Reporting non-compliance in the Florida panhandle, the largest area in the study region, was a hurdle that was not anticipated during the planning of this pilot study. A directed effort was made during the first months of reporting to initiate contact with selected permit holders and bring them into the study voluntarily before resorting to warning letters and the use of enforcement. There were significant improvements in the percentage of compliant vessels immediately following that effort and, for the longer duration of the pilot study. Compliance gradually increased throughout the duration of the study as vessel permits for persistent refusals became due for renewal. By the end of the study period, permits for 39 non-compliant vessels in Florida had not come up for renewal and compliance would have continued to improve if the study had continued beyond August 2011. Prior to implementation of any new logbook reporting program, a well-thought out plan to reinforce the reporting requirement after the start date should be in place so that it can be executed quickly. Sustaining compliance and timeliness of logbook reporting required a continuous and high level of effort throughout the duration of this study. The routine task of tracking missing and late reports and conducting timely follow-up with delinquent vessels required significant manpower and interagency cooperation that was vital for maintaining
compliance and timely reporting by participants in this study. The cost for this effort should not be expected to diminish over time and should be incorporated in the initial design and long-term funding plan before the start of a new logbook reporting program. The reporting frequency and associated cost for compliance tracking and timely follow-up procedures should both be factored into the initial design and long-term funding strategy for any region-wide logbook reporting system prior to implementation. More frequent reporting than what was chosen for this pilot study (e.g. daily or real-time) would have required more frequent tracking and follow-up procedures, and would have increased the cost for this pilot study.

This study was designed to test the feasibility of a logbook reporting system under the current regulatory authority, which specifies that charter vessels with federal permits may be required to report weekly. Because $100 \%$ reporting was not achieved during this study, logbook reports collected during this study may not be treated as a complete census for effort or catch. Vessels in this study were identified as non-compliant during a given reporting week if one or more trip reports or an inactivity report was not received through the Gulf Logbook reporting system. However, if a permit holder either misreported inactivity or did not report a portion of trips for a given week, there was no mechanism in place to identify those vessels as non-compliant. Vessels were not prompted to fill in a response for each day of a reporting week in the electronic reporting tool; however, such a prompt would not resolve the issue of inaccurate reporting (reported no trip when there actually was, or reported only one trip on a day when there were multiple trips).

This study design would not be capable of measuring or certifying reporting accuracy at the individual vessel level. Fishing activity for some vessels could not be validated (field staff were unable to locate the vessel or verify the fishing status) and charter fishing vessels were dispersed across a large geographic area in Florida; therefore, alternative methods would be required to achieve $100 \%$ validation of vessel activity. Designs which can measure reporting accuracy at the level of the individual vessel have been implemented in commercial fisheries. For example, in British Columbia's commercial hook-and-line groundfish fishery, participants are required to submit logbooks for every trip and are subject to $100 \%$ dockside monitoring of harvest and $100 \%$ video electronic monitoring of discards at sea, which is used to audit an individual vessel's logbooks for reporting accuracy (Stanley et al, 2011). Electronic vessel monitoring systems have also been used in commercial fisheries to track vessel activity, including trip length and fishing location. However, $100 \%$ validation of vessel activity is costly and the costs for varying levels of vessel-activity validation should be included in the decision process for how a recreational forhire logbook reporting system is to be designed and utilized. Costs for video-based electronic monitoring programs in three commercial fisheries using equipment and services supplied by Archipelago ranged between $\$ 80$ Canadian/vessel day ( $\$ 81$ current US) to $\$ 250$ US/vessel day and represented between $1 \%$ and $3 \%$ of the value of harvested catch for the monitored trip (McElderry, 2008). In this study, more than 13,000 charter fishing trips were reported through
the Gulf Logbook Reporting System. The value of a charter vessel fishing trip in the Gulf of Mexico is considerably lower compared to the haul of a single commercial trip, and charter fishing trips are shorter in duration and may occur more frequently. Therefore, the cost for $100 \%$ monitoring and validation could potentially be much higher for recreational for-hire fisheries.

The level of validation accomplished in this study was high when compared to current survey methods employed in the region. Logbook reports in this study were submitted for a large portion of the total effort (approximately $70 \%$ overall), which was verified through field validations of vessel status. The For-Hire Survey, which estimates fishing effort for charter vessels in the Florida study area, selects a sample size of $10 \%$ of known active vessels each week (Van Voorhees et al. 2002), and the effective sample size can be considerably less when noncontacts and refusals are factored in (MRIP 2008). Dockside intercept surveys that sample harvested catch and interview anglers about their released catch in the Florida study area also represent less than $10 \%$ of total estimated trips. It may be feasible to combine data from the large logbook sample and the smaller subsample of validated trips to estimate total catch and effort. Average values for harvested and released catch logbook reports and validation samples over all trips in aggregate were similar, at least for the species that were evaluated. However, there may be cause for concern regarding the accurate recall and reporting of released catch. When logbook trip reports were compared with information on released fish recorded during at-sea validations, not all species were reported for a high proportion of those trips. For trips where red snapper were observed to have been released during validations at-sea in the Texas study area, a high percentage did not have red snapper releases recorded on logbook trip reports and the numbers of red snapper released at depths $>120^{\prime}$ were under reported by approximately 1.8 fish per trip (Table 14). However, in the Florida study area, the number of released red snapper reported on logbooks was similar to at-sea samples when aggregated means were compared. Whether this is a true regional difference in reporting accuracy for red snapper or an issue related to the low number of at-sea validations in the Texas study area could not be determined. If the species that are under-reported on logbooks are rare event species that are infrequently encountered, then under-reporting may not be detected by field validation methods with low levels of sampling.

This pilot study demonstrates the feasibility for placing observers on charter vessels to collect detailed information on recreational discards. Initial concerns during the design of this pilot study were that vessel operators would not voluntarily allow observers on board, that charter customers would not welcome the presence of observers on private trips, or that vessel capacities would limit the ability to successfully schedule trips. Charter vessel operators that permitted observers on board expressed a high degree of confidence in the information collected and the presence of observers was well received by charter customers. Such stakeholder buy-in is important for building trust in stock assessment outcomes and management decisions. While the cost for at-sea samples is high, the quality of information collected for released fish provides added benefits for stock assessments and management. At-sea validation in this study was low,
and the required sample size for validating logbooks should be further evaluated. Though sample sizes for at-sea validations in this study were low, larger differences between at-sea validations and logbook reports suggest that numbers of released fish may be under reported in logbook trip reports as well as during dockside validation interviews with vessel operators. Methods developed for commercial fisheries that employ observer data to develop independent estimators for discards (Kaiser 2006) should also be explored for for-hire fisheries.

In small regions with low numbers of active vessels, acquiring adequate sample sizes to validate harvested and released catch may be too costly or not feasible. Sample sizes in the Texas study area were too low for many of the analyses that were able to be performed for the Florida study area. Even during high activity months, the numbers of trips that were validated dockside and atsea were low for many species of interest. The cost per vessel to conduct this study was also significantly reduced in the larger Florida study area. If logbook reporting was implemented statewide in Texas, then such a system should be more feasible; however, the results for the Texas study area may still have important implications for smaller states with small coastlines and/or a low density of charter vessels.

This pilot study placed a high emphasis on electronic reporting. While a paper reporting option was available, it was not offered until participants first contacted Bluefin Data to register for electronic reporting and only if paper was a better reporting option for an individual participant. The electronic reporting tool was available to all participants at no cost, as were paper log sheets, but postage to mail paper forms was not provided. Participants in the Texas A\&M study were provided free equipment and a free smart phone application (iSnapper). Electronic reporting resulted in a high cost savings in terms of data review, follow-up, and data entry. For participants that elected to report via paper log sheets, state coordinators were frequently required to contact vessel operators if data fields were left blank, illegible, or appeared to be filled out incorrectly. In comparison, data entry restrictions built into the Gulf Logbook website resulted in clean data and required much less review and follow-up with participants. The iSnapper application had less built-in restrictions, but features built into the Gulf Logbook website could easily be matched in future versions of smart phone applications. Additional manpower was also required for data entry of paper log sheets by state coordinators into the Gulf Logbook reporting system. The majority of participants in this study reported electronically, and the cost for the paper reporting option was within expected limits. Because paper reporting is more costly, the willingness and/or ability of participants to report electronically should be assessed before a logbook reporting system is implemented on a larger regional scale.

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[^0]:    ${ }^{1}$ Participation means being identified in an active survey frame (i.e., universe of captains or vessels from which persons are randomly selected report) and, if chosen, providing the requested information (GMFMC, 2003).

