



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

June 25, 2018

MEMORANDUM FOR: The Record

FROM: Cisco Werner, Ph.D., Director, Scientific Programs and Chief
Science Advisor, National Marine Fisheries Service

SUBJECT: Conditional Certification of Marine Recreational Information Program (MRIP)
Fishing Survey Method for Alabama Department of Conservation and Natural
resources (ADCNR) Snapper Check

This memorandum conditionally certifies the Alabama Department of Conservation and Natural resources (ADCNR) Snapper Check survey designs described herein as approved methods for collecting data needed to produce estimates of recreational fishing catch and effort for Gulf of Mexico Red Snapper (*Lutjanus campechanus*). The MRIP certification process is described at <https://www.st.nmfs.noaa.gov/recreational-fisheries/MRIP/making-improvement>. For ADCNR Snapper Check, specific Terms of Reference were also adopted (see attached).

BACKGROUND

Prior to 2008, the Marine Recreational Fisheries Statistics Survey (MRFSS), initiated in 1979, was the primary source for national recreational fishery statistics in the United States. In response to a growing demand for an improved recreational fishing data collection program, NMFS commissioned the National Research Council (NRC) of the National Academies of Science to conduct a high-level scientific review of the existing survey methods used by NMFS and its partners to monitor catch, effort, and participation in marine recreational fisheries throughout the U.S.

The NRC's Ocean Studies Board formed a 10-member committee of experts in sampling design and statistics to conduct the requested review independent of NMFS. A final report of their findings (*Review of Recreational Fisheries Survey Methods*) was published in April 2006. The committee identified a number of potential problems with the MRFSS sampling and estimation designs, and questioned the adequacy of existing surveys in providing the statistics needed to support stock assessments and the kinds of fishery management decisions required by current law and practice. The report included recommendations to redesign current surveys to improve: their effectiveness, the



appropriateness of their sampling procedures, their applicability to various kinds of management decisions, and their usefulness for social and economic analyses.

Section 401(g) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which was added via the 2006 Magnuson-Stevens Reauthorization Act (MSRA), P.L. 109-479 (Jan. 12, 2007), includes requirements for improving recreational fisheries data collection:

- “Within 24 months after the date of enactment of the [MSRA], the Secretary, in consultation with representatives of the recreational fishing industry and experts in statistics, technology, and other appropriate fields, shall establish a program to improve the quality and accuracy of information generated by the Marine Recreational Fishery Statistics Survey, with a goal of achieving acceptable accuracy and utility for each individual fishery.” 16 U.S.C. § 1881(g)(3)(A).
- “The program shall take into consideration and, to the extent feasible, implement the recommendations of the National Research Council in its report *Review of Recreational Fishing Survey Methods* (2006), including...redesigning the survey to improve the effectiveness of sampling and estimation procedures, its applicability to various kinds of management decisions, and its usefulness for social and economic analyses...” *Id.* § 1881(g)(3)(B).
- “Unless the Secretary determines that alternative methods will achieve this goal more efficiently and effectively, the program shall, to the extent possible, include...use of surveys that target anglers registered or licensed at the State or Federal level to collect participation and effort data...collection and analysis of vessel trip report data from charter fishing vessels.” *Id.* § 1881(g)(3)(C)(ii)-(iii).

NOAA Fisheries initiated the Marine Recreational Information Program (MRIP) in 2006 to address the findings and recommendations of the NRC report and to carry out the above requirements. MRIP was formally established upon adoption of an Implementation Plan in October, 2008. It is a collaborative effort among NOAA Fisheries, regional fisheries managers and stock assessment scientists, and the recreational fishing community to develop and implement an improved recreational fisheries statistics program. The new program consists of a system of regional surveys, which, after being designed, tested, and peer-reviewed, will provide recreational catch and effort statistics that fulfill the requirements of 50 CFR § 600.315 (National Standard 2 guidelines) and that will be eligible to be considered best scientific information available in the assessment and management of fisheries, taking into consideration other relevant factors.

Decisions to implement new data collection methods are informed by a technically-sound scientific process that includes testing of new or enhanced survey methods, peer reviews of survey methods and project results, reviews by stakeholder groups, and development and execution of transition plans that assure an orderly and scientifically sound process for incorporating the catch and effort estimates derived from new methods into catch history databases as necessary for fisheries stock assessments and management.

In response to the NRC findings and recommendations, and as directed and authorized by § 401(g) of the MSA, MRIP has undertaken a series of actions to establish more suitable sample frames and to develop and test survey methods which will result in more accurate estimates of fishing effort. MRIP follows the requirements of the Information Quality Act (P.L. 106-554 § 515), which ensures the quality, objectivity, utility, and integrity of disseminated information.

Many regional partners have also initiated development of alternative and supplemental survey designs that are intended to provide catch estimates that directly address partner needs that are not fully met by the general MRIP surveys. In order for the data generated by these surveys to be utilized by NMFS, NMFS developed a certification process under which survey designs are pilot tested, the design and pilot results peer reviewed, and NMFS certifies whether the survey and estimation methods are scientifically sound.

In 2014-2015, the Alabama Department of Conservation and Natural Resources (ADCNR) developed specialized survey designs to provide state level recreational catch estimates for charter boat and private boat anglers participating in the Gulf of Mexico Red Snapper fishery. The goals of the survey designs were: to provide Red Snapper catch estimates that were more precise than those currently available through the MRIP general surveys and to facilitate improved monitoring of Red Snapper catches with respect to annual catch limits. The survey designs were tested in 2014-2015 MRIP funded pilot studies. A key component of the pilot tests was the introduction in 2014 by ADCNR of a mandatory reporting requirement for recreationally harvested Red Snapper. At ADCNR's request, NMFS conducted an initial peer review of the Snapper Check survey designs in October 2015. ADCNR has responded to the peer review comments and there have been subsequent rounds of review and response, as documented in the attachments.

Description of Survey Methodology

The Snapper Check surveys were specifically designed to provide estimates of Red Snapper catch that are unbiased and more precise than estimates available through MRIP. To meet this goal, ADCNR introduced a regulation in 2014 that required private boat and for-hire vessel captains to report all Red Snapper harvested and released. Both Snapper Check survey designs consist of two complementary components: the Snapper Check self-reporting system and a dockside angler intercept survey. Through a capture-recapture sampling approach, catch and effort information reported by anglers is validated and corrected using observations of trips and catch obtained by the dockside intercept survey and the MRIP Access Point Angler Intercept Survey (APAIS). The dockside intercept survey is conducted during state and federal recreational Red Snapper seasonal openings.

- The Snapper Check System is the mechanism whereby required reporting of Red Snapper catch is facilitated. Web-based (online), mobile app and paper reporting options are currently available to vessel captains to report Red Snapper catch and effort.

- The dockside private boat and for hire vessel validation component is a randomized access point intercept survey conducted at public fishing access points based on fishing pressures at those sites. Sampling assignments are randomly selected by site-day and time block using probability proportional to size (PPS) protocols. When it is not possible to interview all anglers, randomization protocols exist for the selection of anglers within sampling assignments.

Angler compliance and the matching of dockside validation data with angler reports are recognized as challenges to effective implementation of the ADCNR Snapper Check Survey design. Critical to the validity of the methodology is the ability to match reported trip level information with dockside validation data in the absence of unique trip identifiers. In addition, the estimation method assumes that trip reports are submitted prior to offloading fish and are, therefore, independent of the dockside intercept surveys. Violation of the independence assumption can lead to estimates of unreported trips and catch that are biased. If being intercepted by the dockside survey makes fishing participants (charter boat captains or private boat owners) more, or less, likely to report their trip, there can be a significant correlation bias in the estimates. The direction and magnitude of potential correlation bias in the Snapper Check estimates is currently unknown.

Conditional Certification

NOAA Fisheries conditionally certifies the ADCNR Snapper Check survey designs described in the attached documents. The survey designs have been appropriately developed and peer-reviewed and are considered statistically valid. However, as noted in the prior paragraph above, there are concerns regarding implementation of the survey designs. Thus, NMFS is conditionally certifying the survey designs until the following issues are addressed:

1. ADCNR will take affirmative measures to continue to measure and improve compliance with reporting requirements, matching of intercepted and reported trips, and validation of the independence assumption.
2. Following each red snapper fishing season, ADCNR will conduct sensitivity analyses to monitor the effect of matching criteria on the stability of any catch estimates produced for catch monitoring.
3. Annually, not later than December 31, ADCNR will prepare a report that describes the affirmative measures taken pursuant to condition 1 above and the resultant measured improvements, and that presents the results of sensitivity analyses prepared pursuant to condition 2 above.
4. Based on the reports provided pursuant to condition 3 above, ADCNR will need to reach agreement with NOAA Fisheries on the performance of the Snapper Check survey in meeting its design assumptions, and the appropriateness of assumptions regarding matching criteria and independence of trip reports to intercepted trips. If such agreement is not reached by February 28 of the calendar year following the submission of the first two reports submitted pursuant to condition 3 above, this Conditional Certification will be re-evaluated by NOAA Fisheries.

The practical effect of certification, or conditional certification, is that NMFS may fund use of the survey designs and/or provide technical support and funding for other similar surveys proposed or used by partner organizations. It should be noted that any modifications of the documented survey design are not automatically deemed certified, but will require review for consistency with this determination for the survey to remain certified.

NMFS and ADCNR's next steps will be to: (1) review sensitivity analyses and develop and agree on final assumptions regarding matching criteria and independence of trip reports to intercepted trips that are consistent with the scientifically valid application of the survey design (see conditions 1-4 above); (2) determine how best to integrate the supplemental survey with the general MRIP surveys; (3) develop a calibration method to adjust historic estimates based solely on the MRIP general surveys to be comparable to estimates derived from the integrated approach; (4) have the new calibration method peer reviewed; and (5) apply the method to catch history time series in updated stock assessments. These steps will be undertaken through execution of a Transition Plan pursuant to NMFS Policy Directive 04-114.

Attachments:

Review of AL Snapper Check Program proposed for certification.pdf

ToR-9_SERO_ST1.docx

Alabama DCNR Response to Snapper Check review.pdf

ADCNR-MRD Snapper Check Reporting Program March 2018.pdf

Alabama Snapper Check Sampler Protocols April 2017.pdf

Snapper Check Private Report 2014-2015 FINAL 122016.pdf

Snapper Check For-Hire Report 2014-2015 FINAL 122016.pdf

Review of AL Snapper Check Program Proposed for MRIP Certification

**Jay Breidt (Colorado State University), Mike Brick (Westat), Ginny Lesser (Oregon State University),
Jean Opsomer (Colorado State University), Lynne Stokes (Southern Methodist University)**

October 29, 2017

After reviewing the materials provided to us by NOAA staff, we address each of the terms of reference below.

1. *Does the survey design follow a formal probability sampling protocol with known inclusion probabilities at all stages and/or phases of sampling?*

The data collection consists of two components: the Snapper Check self-reporting system, and the dockside intercept survey. The former is based on mandatory but nevertheless imperfect and incomplete reporting of red snapper catch by recreational vessel captains, while the latter is a randomized intercept survey similar to the APAIS, which is used here as a validation and correction mechanism for the Snapper Check self-reported data. Considered in combination, these two data collection mechanisms are a valid approach to provide statistical estimates of red snapper catch, using ideas of capture-recapture sampling as described in the provided documentation.

Both Snapper Check and the intercept survey are well documented, and the latter has randomization protocols that are appropriate. At the level of the selection of the site-day assignments, the method currently used is that of the APAIS survey based on fishing pressures provided by ADCNR (for simplicity, we will continue to refer to the assignment as a site-day, even though it is in fact a time block within a day at a site). Within the site-day assignment, efforts are made to intercept all anglers or randomly select an angler among the arriving anglers if they are too numerous.

However, we have a number of concerns with the weighting procedure as described on p.5 of "Alabama Snapper Check: Summary of Estimation Procedures," which does not appear correct. As noted, the weight will consist of several components, based on the randomized selection of site-days and that of returning red snapper anglers within selected site-days, with the latter depending on some additional adjustments. For the site-day selection step, the weight is "...calculated by dividing the total of the individual predicted Red Snapper fishing pressure values for each site/time block/day type into 1." However, while this is related to the weight, it is not the weight itself. Under PPS (probability proportional to size) sampling, which is what is used here, the inclusion probability of the element is equal to the pressure of the site-day, divided by the pressure of all the other site-days within the same stratum, multiplied by the sample size within that stratum. The weight attributed to the sampling design, is then obtained by dividing

this probability into 1, i.e., taking the inverse of the inclusion probability, as indicated in the summary.

The following two paragraphs address the angler weights, assuming that catch data is selected individually from anglers as it is in APAIS intercept surveys. However, it is not clear to us from the Interviewer protocol document that individual angler data is collected. We will return to that concern later. For now, assume that anglers are selected for interview individually, and their catch recorded.

For the angler selection step and assuming equal probability of selection of anglers during an assignment, the sampling weight is equal to the total number of red snapper anglers that were present for the duration of the site-day assignment, divided by the number of red snapper anglers interviewed. However, unless every angler is intercepted, it is not always possible to determine whether each observed angler is a red snapper angler, which necessitates some estimation of the weight. So one approach would be to estimate the fraction of all anglers who are red snapper anglers (say, the fraction among those interviewed, unless it can be observed based on gear without interviewing), and then obtain the weight as total observed number of anglers times the estimated fraction of red snapper anglers, divided by the number of red snapper anglers interviewed (variations on this are possible).

The red snapper angler weight in the description on p.5 of the report does not match the above. In the documentation provided, the final weight is a product of two weights, with the first weight equal to the number of red snapper angler intercepts at the site-day divided by the total number of the red snapper angler intercepts in a stratum, and the second weight is based on the site-day level fraction of all anglers who are red snapper anglers. We do not see this as corresponding to the way site-days and anglers are selected, and hence will not lead to correct estimation.

Now we return to the issue of the sampling unit for catch. According to the document *Alabama Snapper Check Validation Survey: Sampler Protocols*, the sampling unit for the catch data is the vessel trip (see below for the data collection form excerpt for catch). Since the trip level catch is not associated with anglers, it is not clear why weighting by anglers is needed, but rather it appears that trip level weighting for non-response is required. If the recorded catch per trip is for only a subset of the anglers on the trip, then the angler weighting would not apply to all trips, but only those missing angler catch. In summary, if the data collection form below is the one in use, the weighting for anglers to be applied to all trips seems inappropriate.

8310269086 SNAPPER CHECK VALIDATION FORM									
1. YEAR		MONTH		DAY		2. SAMPLER ID		3. COUNTY	
4. SITE		5. TIME		6. VESSEL REGISTRATION #		7. # ANGLERS		8. MODE FISHED?: <input type="checkbox"/> PRIVATE <input type="checkbox"/> CHARTER	
9. IF CHARTER TRIP, TRIP LENGTH: <input type="checkbox"/> SINGLE <input type="checkbox"/> MULTI-DAY		10. TRIP COMPLETED?: <input type="checkbox"/> YES <input type="checkbox"/> NO		11. WERE RED SNAPPER KEPT DURING TRIP TODAY?: <input type="checkbox"/> YES <input type="checkbox"/> NO		(If "No", and interview and "Thank" angler.)			
12. # RSN RETAINED: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		13. # RSN DISCARDED DEAD: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		14. ALL RETAINED RED SNAPPER OBSERVED: <input type="checkbox"/> YES <input type="checkbox"/> NO					

We recommend revising the weighting procedures for both the site-day assignments and the red snapper angler selection, so that they correspond more closely to the design, and we are certainly willing to work with ADCNR staff on this. We would also recommend that the weighting procedure be described in mathematical notation as well as words so that its meaning is unambiguous.

Finally, a crucial component of the Snapper Check Program is the matching of individual trip records between the self-reports and the intercepts. This part is also well documented, and it is clear that ADCNR staff took care in determining how best to perform this matching. Given the importance of this step in the creation of the final estimates, we recommend continued attention to the matching procedures, including investigating ways to collect data in either the self-reports or the intercepts to facilitate this, and evaluating the accuracy of the matching criteria and algorithm. A recently completed pilot program in the South Carolina charter fishery also looked at matching for a similar self-reporting/intercept combination survey, which might provide useful relevant insights.

2. *Do the estimation methods appropriately weight the sample data to account for the sampling design and produce design-unbiased point estimates and variance estimates?*

See the comments to question (1) above, related to the weighting issues we identified. Estimation and inference for the survey are done using standard survey software, so once the weights for the intercept survey are corrected, this should indeed lead to statistically valid point and variance estimates.

3. *Are appropriate methods in place to measure and/or correct for potential biases due to undercoverage, nonresponse, or response errors?*

There are several sources of potential bias in Snapper Check, not all of which can be readily addressed. Several also occur in the APAIS, including angler nonresponse and lack of access to private sites. New sources of bias in the Snapper Check Program are matching errors between the two data sources, and possible violation of independence between the self-reports and the intercepts. All three are acknowledged in the documentation provided, and methods are proposed to address them, even if they are not able to completely eliminate them. We believe that on balance, they are addressed appropriately, and recommend that over time, further efforts be investigated to see whether further progress can be made, e.g. by putting methods in place to make early reporting prior to returning to the dock easier for vessel captains.

4. *How sensitive is the accuracy of the survey to assumptions made about segments of the target population that are not covered by the survey frame? What can be done to reduce or limit that sensitivity?*

The undercoverage due to vessels returning to private sites is inherent in this intercept survey, as it is in the APAIS. This can be partly corrected by applying the ratio of private to public return sites reported in the Snapper Check database, but the accuracy of this depends on the assumption that this ratio in the self-reports is not itself different from that in the general population. This is recognized by ADCNR and noted in the document, which we believe is appropriate.

5. *How sensitive is the accuracy of the survey to other potential sources of nonsampling error? What can be done to reduce or limit that sensitivity?*

The major source of non-sampling error in the Snapper Check Program is likely to be the record matching. This is a clearly a challenging issue, and one for which there is no obvious short-term solution. ADCNR staff have already considered several ways to perform the matching and selected an approach that certainly seems reasonable. We recommend continued efforts, both in the design of the self-reporting forms and intercept questionnaires to improve matching, and in the investigation of alternative matching criteria. The goal would be to try to minimize this source of nonsampling error and also to gain further understanding in the sensitivity of the estimates.

6. *How sensitive is the survey design to potential errors in implementation? What can be done to evaluate, reduce or limit that sensitivity?*

In most survey programs, careful and accurate implementation of the stated procedures is an essential underpinning of the quality of the resulting estimates and associated measures of precision. The Snapper Check Program, because it involves a number of separate data collection programs and relies on record matching, is particularly sensitive to this, since implementation errors in any of the components can affect the final results. We do not have any major concerns with the methods as currently described, but we strongly recommend continued attention to all aspects of implementation to avoid this potential sensitivity leading to actual problems.

7. *How does the survey design compare to the survey design it would replace or supplement? Is it more statistically sound and efficient, or is it at least comparable in its statistical validity and efficiency? What design features are most important in supporting this assessment?*

The Snapper Check Program is intended to provide more data (i.e., higher response rates are expected given the requirements of the program to complete the reports) on red snapper catch and to do so in a more timely manner than the general-purpose APAIS and CHTS (or FES). Properly implemented, which includes combining the self-reports with the intercept validation data, this program indeed can achieve these purposes. The statistical methodology underlying the combined estimators is not in doubt, because it can be explained using standard design-based theory, but it does rely on assumptions related to the quality of the matching and the independence between the “capture” and “recapture” events. Hence, continued attention to these aspects of the program will be important to ensure the future quality of the estimates.

It should also be noted that, by using the self-reports as the basis with which to “anchor” the fishing effort targeting red snapper, this program also avoids the need for estimating this effort using a general population mail or telephone survey. These survey modes have their own issues with nonresponse and coverage, which are by-passed in this case.

8. *How does the survey design compare with other survey designs previously certified by MRIP for estimating fishing effort and/or catch for the same fishing mode(s)? Is it more statistically sound and efficient, or is it at least comparable in its statistical validity and efficiency? What design features are most important in supporting this assessment?*

The intercept component of the Snapper Check Program is very similar to the APAIS, which has been used as the standard MRIP catch data collection approach. The self-reporting component is not yet part of any certified programs and neither are the matching and estimation procedures. They are, however, being investigated in a number of pilot programs and appear promising for more targeted sections of the fisheries such as charter vessels or specific high-value species. We believe that there are no issues with the overall statistical validity of the methods, but there are additional implementation complexities as described above, which will require both care and further investigation.

9. *Is the survey collecting data and producing information products that will meet the needs of the primary customers (stock assessment scientists and fishery managers)? [To be addressed by NMFS staff.]*

Term of Reference #9: Is the survey collecting data and producing information products that will meet the needs of the primary customers (stock assessment scientists and fishery managers)?

Concerns were broadly characterized as (a) implementation related challenges to the production of stable estimates and (b) the need for additional information from the dockside survey to characterize red snapper trips.

Implementation

Summary: There were a number of concerns regarding the stability of estimates provided through Snapper Check. Although it was understood that 100% compliance was not needed for effective implementation of the capture-recapture methodology, there remained concerns about the representativeness of reporting rates as low as 31% (2017) for what was intended to be a census reporting system. There was also a concern about the impact of low reporting rates on the ability to match reports with field validations when reporting rates are low. There is a great deal of uncertainty in the matching process which relies on assigning bounds around interview times to identify trips rather than trip identifiers that could be assigned to angler reports. Unique trip identifiers could be used to match angler reports with dockside validations with 100% certainty. An analysis done by ADCNR appears to indicate that matching criteria can affect the stability and magnitude of the estimates. A way to at least assess this effect would be to produce estimates using a range of matching criteria as a sensitivity analysis. The survey design relies on the assumption that reports and validations are completed independently of each other. The concern would be that whenever a report is not received prior to the validation interview there is some likelihood that the validation interview influenced reporting by those anglers who would not necessarily have reported had they not been interviewed. A sensitivity analysis provides a reproducible way to assess the relative impact of different matching criteria on estimation. To test the validity of the independence assumption CPUEs would be compared for matching criteria examined in the sensitivity analysis. The proportion of unreported trips has the potential to change significantly based on matching.

For improved compliance, ADCNR has focused on encouraging anglers through outreach, media etc. to participate in the program rather than more direct penalty based enforcement of compliance. Compliance rates are about 31% according to an article in the Tuscaloosa News. It would be a simple enough task to monitor improvements in compliance rates and would presumably result in improved matching and a reduction of the proportion of unreported trips.

Additional information needed to better characterize fishing trips

In terms of the information provided to help characterize red snapper fishing trips, data provided by Snapper Check appears to be limited to those trips that landed or discarded red snapper. Additional information that would be useful would include species targeted, and number of individuals of other species caught and biostatistics (e.g. lengths, weights) on the trip. It was pointed out that the APAIS does obtain these pieces of information and could continue to do so in lieu of the information being available through Snapper Check.

Needs:

- Snapper Check Compliance monitoring plan (100% reporting not a requirement for Capture-recapture).
- Sensitivity analysis for Snapper Check reports/validation matching criteria
 - Monitor stability of estimates with respect to matching criteria.
 - Independence assumptions
- ADCNR to work with SEFSC and SERO on data needs for stock assessments (Trip characterization)
 - APAIS remains an option for characterization of red snapper trips.
- Examine alternative estimation methods (future research with NOAA consultants).

Alabama DCNR Response to Snapper Check review

From Email (3/20/2018)

“...attached revised estimation protocols for Snapper Check (ADCNR-MRD Snapper Check Reporting Program March 2017.pdf) which addresses Question 1 in the consultants' Review report dated Oct. 29, 2017. The section that was edited to address Q. 1 was 'Dockside Validation Survey' (pages 4-6) in the document. I have also attached the previously submitted April 2017 SC Sampler Protocols for reference as it is mentioned in the edited section. “

ALABAMA SNAPPER CHECK: SUMMARY OF ESTIMATION PROCEDURES



**Alabama Department of Conservation and Natural Resources /
Marine Resources Division**

March 20, 2018

Snapper Check Program

Purpose

Snapper Check was developed to provide timely estimates of recreational Red Snapper landings in Alabama to aid fishery managers responsible for this important fishery. Snapper Check estimates will be available to managers in less time compared to traditional survey methods which could provide greater opportunities to provide increased access to anglers while ensuring sustainable harvests.

Methodology

Captains of recreational vessels (for-hire and private) landing Red Snapper in Alabama are required to report the number of landed Red Snapper prior to offloading fish from the vessel. From the landings reports a base the number of landed fish is tabulated. This number is considered incomplete as some vessel representatives will not report landings. Therefore, a dockside survey of vessels is conducted at publically accessible sites where Red Snapper anglers are anticipated to use. From the survey responses, a ratio estimator of reporting vessels to non-reporting vessels is calculated. Estimates of total harvested fish are the product of the ratio estimator and total landings from reports. In addition, Red Snapper are measured and weighed during dockside surveys to determine mean weight of landed fish. Harvest estimates of the weight of landed fish are generated by multiplying the estimate of harvested fish and the mean weight of fish.

ANGLER REPORTING

Vessel representative reporting

Per Alabama Department of Conservation and Natural Resources regulation, the representative (captain) of a recreational vessel with Red Snapper is required to report the number of Red Snapper on board the vessel prior to removing the fish from the vessel or bringing the fish onshore (i.e. retrieving vessel with a trailer). Reports can be submitted through a smartphone app, online through the Department's website or on paper tickets at six of the most popular public boat launches and one marina along the immediate Alabama coast. Since the promulgation of the regulation in 2014, various attempts have been made prior to the start of the fishing season to remind anglers of the reporting requirement.

Reported data QA/QC

Landings data reported by Red Snapper anglers via electronic means cannot be reviewed for accuracy and are accepted as is. Data from paper reports are entered by staff, checked against original copies and if any discrepancies are found, the electronic data are corrected as

appropriate. A couple of weeks prior to the start of the fishing year, a database of Alabama state-licensed and NOAA Fisheries permitted for-hire (charter) vessels is created. The database for these vessels is updated periodically throughout the fishing season to include new entrants. Vessel registration numbers from this database are compared against the vessel registration information provided in the angler provided landings reports. Instances where the fishing trip type on a landings report is checked 'Private' but the registration number matches a licensed/permitted for-hire vessel the fishing status is subsequently changed to 'For-Hire'. Likewise, if a landing report lists 'For-Hire' fishing status and the vessel registration does not match a licensed/permitted for-hire registration number for a vessel in the database the fishing status on the report is changed to 'Private'.

DOCKSIDE SURVEY

Site Sample Frame

Dockside surveys are conducted at public boat launches and marinas where anglers with Red Snapper are likely to be encountered. Sites where recreational Red Snapper anglers are anticipated to found are maintained in a master list and each site is assigned estimates of fishing pressure (expected number of Red Snapper anglers) by month, fishing mode (for-hire and private), day (weekday or weekend/holidays) and six-hour time blocks. Time blocks are 8:00am-2:00pm, 2:00-8:00pm, 8:00pm-2:00am, 2:00-8:00am, 11:00am-5:00pm and weekend days include Friday. The sample weight assigned to interviews collected during the 11:00am-5:00pm time block is adjusted down to account for double-counting pressures for the two overlapped time blocks.

Sampling Design

For each site/day/time sampling unit within each county a value is assigned corresponding to a defined range of Red Snapper fishermen expected during the designated sampling unit (Table 1). Sampling sites are selected in proportion to their anticipated level of Red Snapper angler activity using a random, stratified probability proportional to size sampling methodology without replacement. The higher the number of anticipated anglers at a given site the higher the value assigned to the sampling unit. Pressure categories mirror those used in the APAIS.

At least one assignment will be issued for each day the Alabama state or federal season is open to Red Snapper harvest. In order to efficiently utilize available staff a maximum number of assignments are available on any given day. If a month has more federal season days than state days, the majority of assignments will be assigned to the federal fishing season as the fishing effort is higher compared to the state only fishing season. Prior to the 2017 fishing season, a stratified, multi-stage assignment draw process for Snapper Check sampling assignment

Table 1. Red Snapper pressure categories for identified public access sites where Red Snapper harvest is anticipated to occur.

Pressure Category	Estimated Red Snapper Anglers
0	1 - 4
1	5 - 8
2	9 - 12
3	13 - 19
4	20 - 29
5	30 - 49
6	50 - 79
7	≥ 80

selection was performed using Excel® software. Red Snapper fishing activity (pressure) values for all sites by fishing mode (charter and private) within each site/day/time block sampling unit were tallied for each county. A range of numbers corresponding to the combined fishing activity values was created using the product of the combined time-block values and 100. The beginning value for each site's range is the product produced in the prior site added to the previous site's combined time-period value. The random number generator function in Excel® was used to generate a series of random numbers which were used to match the corresponding pressure range for each site. Sites were selected using replacement.

A second stage site selection procedure was performed to determine which day of the month to assign selected site/day type/time period assignments selected during the first stage of sample selection. Fishing pressure values were developed in the same manner as the site selection process described above. Random numbers were generated and matched to the appropriate fishing value range. Approximately 60% of the assignments are selected for holidays/weekends to account for higher numbers of anglers on the weekends.

In 2017, the assignment draw process will be performed using the stratified, randomized site selection procedure utilized by the MRIP's Access Point Angler Intercept Program (APAIS). Updated angler pressure files similar to those used in prior years will be provided to MRIP staff and fishing pressures for Private and For-Hire modes will be combined into an "offshore" strata from which Snapper Check assignments will be selected. Assignments will be drawn monthly and the number of assignments drawn will be based on fishing season length as described above.

Dockside Validation Survey

Alabama Department of Conservation and Natural Resources/Marine Resources Division (ADCNR/MRD) samplers will attempt to collect information from as many vessels and count all recreational anglers during their respective assignment; refer to *Alabama Snapper Check Validation Survey: Sampler Protocols* for detailed interview procedures. Samplers will monitor vessel traffic at each site in order to count the number of anglers arriving at the site during the assigned sampling time block. Samplers will attempt to interview all anglers during the assigned sampling period in order to determine the proportion of anglers with Red Snapper harvest. Sampling during periods of higher angler activity may result in fewer vessel interviews but samplers are instructed to interview a minimum number of vessels to determine the ratio of Red Snapper anglers to non-Red Snapper anglers.

The dockside survey will only collect data from public access anglers and ratio estimators derived from the data will be applied to all landings reports including those from private access anglers. Previous efforts to survey anglers on vessels before they made landfall indicate reporting rates are slightly lower for private access anglers compared to public access anglers. ADCNR/MRD staff will periodically review reporting activity from private anglers through special surveys to determine the extent of the reporting rate differences and access impacts to final landings estimates.

Validation samples selected for private boat and charter boat sites will be weighted based on a multi-stage weighting procedure currently used in NOAA Fisheries' APAIS assignment site selection process and described in detail in *MRIP Survey Design and Statistical Methods for Estimation of Recreational Fisheries Catch and Effort* (In prep.). In summary, the first stage of sample weighting accounts for the survey sample design; randomly selected assignments of fishing sites with estimated fishing pressures using probability proportional to size without replacement. An initial inclusion probability ($\pi_{i,h}$) of the i th assignment out of N_h total assignments in stratum h (region, state) is calculated as

$$\pi_{hi} = \frac{z(a_i)}{\sum_{i=1}^{N_h} z(a_i)} n_h$$

where $z(a_i)$ is the size measure (Table 2) of the i th assignment, and n_h is the number of assignments from stratum h . Due to logistical limitations, such as sampler availability, a large number of replicate sample selections are made and a subset of these selections are randomly selected through a screening process related to the sampler constraints. The additional step requires calculation of a new inclusion probability which is calculated as

$$S_c : \pi_{hi} = P(hi \in A_{hi}|S_c) = \sum_{a \in A_{hi}|S_c} p(a)$$

where the inclusion probability (π_{hi}) of the i th assignment in stratum h represents the fraction of the final assignment draw (A_{hi}) that contains the assignment i out of the subset of selected assignments (S_c) from the replicate draw. The survey sample design weight (w_s) for each assignment is determined as follows

$$w_s = \left(\frac{1}{S_c : \pi_{hi}} \right)$$

where $S_c : \pi_{hi}$ is the inclusion probability previously calculated for selected assignments.

Table 2. Size measures for pressure categories assigned to each site, day type, and time block.

Pressure Category	No. of Anglers	Size Measure
0	1 - 4	0.5
1	5 - 8	2.5
2	9 - 12	9
3	13 - 19	13
4	20 - 29	20
5	30 - 49	30
6	50 - 79	50
7	80+	80

The second stage of sample weighting used within APAIS accounts for angler non-response during the assignment. At sites with low angler activity it is possible to interview all of the returning anglers during the sampling interval. In this instance, assuming at least one vessel with red snapper catch was intercepted, the stage weight assigned to the interview will be 1. However, at sites with high fishing pressure, it may not be possible for the sampler to interview an angler from all returning vessels. During these assignments, samplers will attempt to intercept some of the vessels when time allows while making sure the total number of anglers returning to the site are accurately counted. Before the sample weight for non-response can be calculated, the number of Red Snapper anglers (n_p) who were recorded as counted but not interviewed on the Snapper Check Assignment Summary Form (see Alabama Snapper Check Validation Survey: Sampler Protocols) is determined as follows

$$n_p = \left(\frac{n_s}{n_o + n_s} \right) * n_n$$

where n_s is the number of Red Snapper anglers sampled by staff, n_o is the number of anglers sampled without Red Snapper, and n_n is the number of counted anglers. The sample weight for non-response (w_u) is calculated as follows

$$w_u = \left(\frac{n_p + n_s}{n_s} \right)$$

where n_p is the number of Red Snapper anglers estimated from the counted anglers and n_s is the number of sampled Red Snapper anglers.

Current Snapper Check protocols assign Red Snapper catch status to all anglers of a vessel when an angler affirms that at least one Red Snapper was retained during the trip. Assigning catch status to all anglers on the vessel may result in reducing sample weighting compared to identifying catch status for each angler encountered. This difference should be relatively small as red snapper are abundant and most anglers targeting Red Snapper catch at least one fish.

The final stage weight is the product of the sample design weight, and assignment under-coverage. A third, independent stage weight is calculated for each weighed fish and is calculated as the ratio of harvested fish to weighed fish within the interview. This stage weight is multiplied by the final stage weight.

Validation Data QA/QC

Validation survey data are entered by ADCNR/MRD staff and checked against the field copy. Data entry errors are corrected and discrepancies in the data are reviewed with samplers and, when necessary, the data are updated. When time and anglers allows fish are weighed with hand-held spring scales or digital scales certified for accurate weight readings and measured fork length (millimeters). Individual fish weights and lengths are compared to a regression of fish lengths and weights collected in recent years. Any fish weight outside the 99% confidence interval is excluded from final sample weight calculations. As is done with reported data, vessel registration numbers from validation survey samples are compared to the for-hire vessel list. Instances where the trip fishing mode status provided to the sampler is 'Private' but the vessel is matched to a vessel in the for-hire vessel list the fishing status is changed to 'For-Hire'. Supervisors will periodically check samplers conducting Snapper Check assignments to ensure sampling procedures are being followed.

Matching Landing Reports to Validation Surveys

Records from each database are initially merged by vessel registration number and date. To account for multiple reports submitted on the same day, either due to late report submissions or due to two or more trips being conducted on the same day of fishing, as can occur with some for-hire vessels, the time of the landing report has to be within 3.5 hours of the time of validation to be counted as a matched record. To further increase the confidence that each report and validation is correctly matched the total numbers for harvested Red Snapper, anglers, and dead discards from each record must also match one another.

ESTIMATES CALCULATION

The two sources of data (landing reports and validations) collected via Snapper Check are considered to be similar to a typical capture-recapture experiment whereby the landings reports are the capture sample and the validations are the recapture sample. The landing reports submitted by anglers serve as the initial value for effort and harvest. Validation data is compared to reported data to determine the proportion of matched validated and reported trips to those trips that are validated and not reported. Breidt et al. (2016) indicate this proportion, or ratio estimator, does not require the reports to be representative of the entire population of fishing trips with Red Snapper harvest and the estimator does not require the reports to be accurate. The samples collected for validation; however, are assumed to be collected based on a probability sample where the validation sample may occur regardless of whether or not a report is submitted.

Breit et al. further provided details of a ratio estimator which was derived from the standard estimator of population size used in capture–recapture studies:

$$\hat{N} = \frac{n_1 n_2}{m},$$

where n_1 and n_2 are the capture and recapture samples and m is the number of units in the recaptured sample that were previously captured (matched records). The standard estimator can be considered a ratio estimator where $t_y = N$, $n_1 = \sum_{i=1}^N r_i$, $n_2 = \sum_{i=1}^{n_2} y_i$, and $m = \sum_{i=1}^{n_2} r_i$; $r_i = 1$ if the i^{th} unit in the population represents a matched report and validation and $r_i = 0$ if the report does not occur in the sample, and $y_i = 1$ for every validation. The ratio estimator with auxiliary variable r could be expressed:

$$\hat{N} = \sum_{i=1}^N r_i \frac{\sum_{i=1}^{n_2} y_i}{\sum_{i=1}^{n_2} r_i}.$$

Expressing \hat{N} as the ratio estimator is a method whereby an estimate of its standard error (SE) could be derived. The PROC SURVEYMEANS procedure in SAS® software is used to calculate ratio estimators and their associated standard errors from the matched validation and reported data and associated sample weights.

To calculate estimates of total harvest for private and for-hire anglers, ratio estimators for harvested fish/vessel for each fishing mode are applied to totals of reported landed fish from landing reports and detailed in the following equation:

$$\hat{t}_y = \sum_{i=1}^N r_i y_i^* \frac{\sum_{i=1}^{n_2} y_i}{\sum_{i=1}^{n_2} r_i y_i^*} ,$$

where y_i is the Red Snapper harvested or discarded for validated trip i , and where $r_i y_i^*$ is the number of fish harvested or discarded on the i^{th} trip. If no report matched the validated trip then $r_i y_i^* = 0$.

Breidt et al. stressed \hat{t}_y is an appropriate estimator of total harvest and discards as long as the reports and validations are matched accurately, the validation sample is a probability sample, and reporting by anglers is not influenced by field staff conducting the validation surveys. Procedures are taken to ensure validated vessel trips matched reported trips accurately and the sample data is collected based on probability proportional to size sampling. However, the validation encounter could bias the reporting response of vessel representatives. Representatives may be influenced to report as a result of the encounter whereas they may not have reported if there was no validation encounter. If this scenario were widespread estimated landings would be much less than actual landings. A validation encounter may also cause some vessel representatives to refrain from reporting because they believe the gathering of trip information by an identified state sampler constitutes a landing report. Surveys will be conducted periodically to determine the magnitude of this bias.

LITERATURE CITED

Breidt, J., V. Lesser, J. Opsomer, and L. Stokes. 2016. *Consultant Report: AL Red Snapper Reporting Program Review, Mobile. December 14-15, 2015.* 7 pp.

MRIP Survey Design and Statistical Methods for Estimation of Recreational Fisheries Catch and Effort. NOAA Fisheries, Fisheries Statistics Division, Silver Spring, MD. In preparation.

ALABAMA SNAPPER CHECK VALIDATION SURVEY: SAMPLER PROTOCOLS



**Alabama Department of Conservation and Natural Resources /
Marine Resources Division**

April 2017

INTRODUCTION

As per a 2014 Department of Conservation and Natural Resources regulation, captains of recreational vessels (private and charter) are required to report all Red Snapper landed in Alabama prior to landing fish. A landing is defined as the time when fish are offloaded to shore or a dock attached to shore or, if the fish are kept on a vessel, when the vessel is brought ashore via a trailer. Reporting individuals may use a smartphone app or paper forms at select coastal boat ramps. The infrastructure used to facilitate reporting and to calculate landings is referred to as Snapper Check.

It is anticipated some recreational Red Snapper vessel trips will not be reported and some reported catches of Red Snapper will be misreported. If the magnitude of unreported trips and misreported fish can be determined, the reported trip information can be adjusted to estimate total landings. In order to determine the rates of unreported vessel trips with Red Snapper and to calculate average weight of harvested Red Snapper, a dockside survey is included in the Snapper Check program. Marine Resources Division staff will conduct visits to area public ramps and marinas where Red Snapper anglers are likely to be encountered and interview anglers to collect the information needed to calculate the extent of trips being unreported and the average weight of landed fish. Interviews (validations) will be at the vessel level. Random validation assignments will be issued throughout the Red Snapper season which will include periods when state waters, federal waters, or both are open.

VALIDATION SURVEY

Prior to the recreational Red Snapper fishing season, a list of sites where recreational Red Snapper fishing activity can be expected will be developed and levels of fishing pressure will be assigned to six-hour time blocks (8:00am-2:00pm, 11:00-5:00pm, 2:00-8:00pm, 8:00pm-2:00am, 2:00-8:00am) by month, fishing mode, and day type (weekend/holidays and weekdays) for each site. Sampling assignments will be randomly selected using the site/time block pressure combinations by day type. Site/time block combinations with higher relative pressures will be selected more frequently than sites with lower pressures. Each randomly selected validation assignment will be issued a control number; a unique number used to identify the specific assignment. Assignments will contain a single site but may contain an additional site in the future. Assignments will be issued approximately two weeks prior to the start of each month a federal and/or state recreational Red Snapper fishing season occurs.

DETERMINING FISHING ACTIVITY

Fishing Activity Summary

During the assignment, the sampler must count the number of all recreational anglers who return from fishing at the assigned site during the sampling time period similar to the current MRIP Access Point Angler Intercept Survey (APAIS) protocols. Samplers must use the Snapper Check Assignment Summary Form (see Appendix) to record the number of anglers who were not interviewed and the number of anglers with and without Red Snapper who were interviewed. This information will be needed to calculate the appropriate weighting of information from sampled Red Snapper anglers at these sites relative to Red Snapper anglers interviewed during assignments at other lower activity sites.

At sites with low fishing activity, the sampler should be able to approach all of the vessels and determine fishing status and Red Snapper harvest for all anglers. At sites with higher fishing activity, the sampler may not be able to conduct interviews with every vessel as the number of returning anglers and size of access site may require the sampler's full attention just to count suspected recreational anglers. In this situation, the sampler can use the vessel size/type and the presence of fishing rods/nets as cues to assign fishing status to vessels which are not approached. For example, occupants of ski boats or pontoon boats without fishing rods can be identified as non-anglers. Only occupants of vessels who are deemed to be have completed a fishing trip can be recorded on the Snapper Check Assignment Summary Form. At access sites with high activity, samplers should attempt interviews with some vessels during periods of lower activity.

Anglers may be frustrated by Red Snapper management. Samplers should be respectful of comments made by the public but they should not offer an opinion about the situation. Samplers represent the Department of Conservation and Natural Resources and comments may be contrary to current policy of the Department. If anglers need questions answered and wish to speak with someone about this topic, or any other marine resources topic, they can be referred to either the Dauphin Island or Gulf Shores office.

CONDUCTING THE VALIDATION ASSIGNMENT

Assignment Preparation

Samplers should have with them the following items.

- Clipboard with several Snapper Check Assignment Summary Forms and 50 or more Snapper Check Validation Forms (see DATA RECORDING section)
- Measuring board
- Scales (hand-held spring scales and digital scale for marinas with a single fish cleaning station)
- Pencils and pencil sharpener (engineering pencils are not allowed)

Samplers should periodically confirm the accuracy of their hand scales and inspect the expiration date of the digital scale, if used. Samplers must be at their assigned site at the designated start time and stay on-site until the end of the assigned time period. If a sampler has to leave temporarily they should return as soon as possible. If the sampler is unable to finish their assignment they should contact their supervisor as soon as possible. Vehicle traffic patterns during the summer months can add to drive times compared to off peak season so plan accordingly. Samplers must wear Alabama Marine Resources Division issued clothing which will assist anglers with identification and increase trust. All collected information associated with a vessel is confidential and cannot be shared with other individuals except biological section supervisors. If forms need to be duplicated or discarded please be sure paperwork is shredded prior to discarding.

Interviewing Anglers

Participation by anglers in the dockside survey is not mandatory and anglers can choose to be interviewed or not interviewed. Samplers should approach each vessel and introduce themselves to the vessel occupants as a staff member of the Alabama Department of Conservation and Natural Resources or Alabama Marine Resources Division. The sampler should inform the occupants that his/her presence is to conduct a fishing survey and ask for their participation. Attempt to interview an adult, however, a minor can be interviewed if an adult is unavailable. Young children (under 10 years of age) should be avoided for questioning. If the occupants are receptive to further questions the sampler must ask the following question.

“Were you recreationally fishing for saltwater finfish from this vessel today?”

If the response is “Yes” then the sampler proceeds with the Snapper Check Validation Form (see Appendix). If the vessel occupant(s) respond “No” or that they do not want to answer any further questions then “Thank” the occupants for their information and terminate the discussion. Anglers indicating they were on a commercial fishing trip are not to be interviewed.

Samplers must confirm at least one snapper was harvested during the trip by asking permission to observe the fish. Ideally, all of the fish should be counted and if the observed total is different from the angler provided total the observed total should be recorded on the form. If the angler allows and time is available, the sampler should attempt to measure (mm fork length) and weigh (kilograms) each observed Red Snapper. However, when launches or marinas are busy or anglers are in a hurry a portion of the catch can be recorded. Sub-samples should include a representative sample of the entire catch. Samplers should not sample the largest or smallest fish but equal proportions of each size group. To collect a sub-sample, Red Snapper should be organized smallest to largest with every n^{th} fish after the first fish being weighed and measured. To determine the n^{th} fish to sample the sampler should estimate the time available to collect biological information and estimate how much time is needed weigh and measure a fish. For example, during an interview with 18 harvested Red Snapper available the sampler has been told by the angler they have a few minutes to collect biological measurements. If it takes 30 seconds to collect a fish, measure and return it to the cooler, and record the biological information the sampler should sample every third fish in the catch (i.e. $(n = 18 \text{ fish} / (3 \text{ minutes} \times 2 \text{ fish/min})) = 3$).

DATA RECORDING

Sampler Responsibilities

There are two forms to be used by the sampler when conducting validation assignments. The Snapper Check Assignment Summary Form is used to collect summary information related to the time spent at an assigned sampling site and the number of anglers observed. The second form used by the sampler is the Snapper Check Validation Form. This form is used to record information related to fishing activity, Red Snapper harvest, and fish lengths and weights from intercepted vessels.

Data recorded on these forms should be legible and pencil should be used to record information. Samplers should record information within provided boxes as forms may be scanned and all completed forms

should be checked for completeness prior to submission. All forms must be submitted to the project point of contact in the base office of the sampler by 10:00am the day after the assignment is completed.

Samplers are expected to collect information throughout their assignment such that the most accurate accounting of Red Snapper angler activity and harvest for the sampling unit can be determined. Accuracy of data collection may be compromised when high volumes of anglers and fish are observed for some assignments. Each site is different when it comes to angler volume and each day can be different when comparing angler volume for the same site. It will be up to the sampler to determine when the volume of vessel traffic will make it difficult to conduct the individual vessel validations and keep track of the number of anglers using the site. The following list provides the order of priority for data collection during each assignment with the first item having the highest priority and the last item having the least priority.

- Count all recreational anglers using the site
- Interview several vessels with recreational anglers to determine the proportion of Red Snapper anglers
- Interview several vessels with recreational anglers and collect measurements of a portion of harvested fish
- Interview all vessels
- Interview all vessels and collect measurements of a portion of harvested Red Snapper
- Interview all vessels and collect measurements of all harvested Red Snapper

Snapper Check Assignment Summary Form

SAMPLER ID: Four-digit sampler ID number issued to each sampler. A sampler must have one before completing an assignment.

YEAR MONTH DAY: Date of interview.

COUNTY: County where site is found; Baldwin County='003' and Mobile County='097'.

CONTROL #: Unique four digit number associated with each assignment. TIME BLOCK: Six-hour time period assignment is to be conducted.

SITE: Four digit code associated with sampling locations.

START TIME: Military time when sampler arrives at assigned site(s). Leaving a site for any reason for short periods of time must be recorded.

END TIME: Military time when sampler leaves assigned site(s). Leaving a site for any reason for short periods of time must be recorded.

SITE 1: First assigned site for the assignment.

SITE 2: Second assigned site for the assignment. If a second site is not assigned, leave blank.

ANGELRS COUNTED NOT INTERVIEWED: Total number of occupants of vessels who are determined to have been fishing but were not interviewed to determine Red Snapper fishing activity. Samplers should

approach all vessels to determine fishing activity, however, samplers may not be able to contact all vessels as they will be interviewing anglers and measuring fish. Samplers need to be wary of other vessels returning to the sampling site and determine if the occupants were fishing. Verification of fishing status can be positively determined if fishing rods are visible or if conversations of occupants about fishing activity are overheard.

NON-RED SNAPPER ANGLERS INTERVIEWED: Total number of anglers interviewed during the assignment from vessels where harvest of Red Snapper was not reported. This does not include anglers on vessels where the number of Red Snapper harvested was less than the number of anglers on the vessel.

RED SNAPPER ANGLERS INTERVIEWED: Total number of anglers interviewed during the assignment from vessels where harvest of Red Snapper was reported. This includes anglers on vessels where the number of Red Snapper harvested was less than the number of anglers on the vessel.

TOTAL ANGLERS INTERVIEWED: Total number of anglers interviewed; anglers with and without Red Snapper harvest.

REASON FOR LEAVING SITE: Two-digit code associated with a reason for leaving the sampling site before the end of the six-hour assignment time block. Refer to legend to identify appropriate reason code designation.

ANGLER TALLY NOTES: Section on form where angler information can be tallied for tabulation at the end of the assignment. Please be sure to divide box as appropriate to distinguish the groups of anglers.

COMMENTS: Use this section to provide information that is out of the ordinary. Comments may include bad weather during assignment, construction at site, etc.

Snapper Check Validation Form

1. **YEAR MONTH DAY:** Date of the assignment.
2. **SAMPLER ID:** Four-digit number issued to each sampler. A sampler must have a Sampler ID before conducting an assignment.
3. **COUNTY:** County where interview occurs.
4. **SITE:** Four digit code associated with the site where angler interview occurs.
5. **TIME:** Military time at the start of the interview.
6. **VESSEL REGISTRATION #:** Registration number for the vessel interviewed. Registration number can be either a state registration number (i.e. AL-9999-ZZ) or a six or seven digit U.S. Coast Guard issued documentation number. State registration numbers are displayed on the exterior of the vessel near the bow and the sampler should record the number as observed. Do not include the hyphens when recording the registration number (i.e. AL-9999-ZZ should be recorded as AL9999ZZ). Vessels issued a USCG number do not need to display the number where it is readily visible. In those instances where a vessel does not

have a state registration number the sampler can either ask the captain for the USCG documentation number or note the name and port of the vessel (both typically located at the stern of the vessel) and ask the captain for length of vessel. Using the vessel name, its vessel documentation number can be searched at www.st.nmfs.noaa.gov/st1/CoastGuard/index.html. To ensure the correct documentation number is recorded on the Snapper Check Validation Form confirm the vessel port and length recorded in the field matches the website record information. If the vessel port as listed on the vessel does not match the vessel name discard the interview and add the number of anglers interviewed from the vessel to the Anglers Counted Not Interviewed column on the Snapper Check Assignment Summary Form. Samplers should record documentation numbers starting in the first box.

7. # OF ANGLERS: The number of individuals on the vessel during the trip regardless if they retained Red Snapper or not. Do not include the captain or crew member(s) from charter vessels.

8. MODE FISHED: Indicates mode of fishing. If the vessel occupants did not pay a fare to ride the vessel then "Private" should be checked. If a fare was paid to ride the vessel then check "Charter". Trips where only gas expenses were shared are considered a private trip.

9. CHARTER TRIP LENGTH: If Question 8 – *Mode Fished* was "Private" then skip. If Question 8 – *Mode Fished* was "Charter" indicate how many days the charter trip completed. If the vessel was away from shore for more than one calendar day then indicate a "Multi-Day" trip.

10. TRIP COMPLETED: Confirm interviewed angler(s) have completed fishing activities from the vessel for the day.

11. WERE RED SNAPPER KEPT DURING TRIP: Query angler(s) to determine if Red Snapper were harvested during the fishing trip. If Red Snapper were retained, check "Yes" and continue the interview. All anglers with Red Snapper harvest must be added together and the total written in the Red Snapper anglers interviewed column on the Snapper Check Assignment Summary Form. If respondents indicate no Red Snapper were retained during the trip then check "No", "Thank" the anglers for their time and information and terminate the interview. These anglers are to be added to the non-Red Snapper angler interviewed column on the Snapper Check Assignment Summary Form.

12. # RED SNAPPER RETAINED: Total number of harvested Red Snapper reported by angler. Do not include Red Snapper thrown back dead.

13. # RED SNAPPER DISCARDED DEAD: The number of Red Snapper caught during the trip and released dead. Probe anglers to ensure any Red Snapper that were eaten by another fish, mammal or bird upon release are included with number of Red Snapper released dead.

14. ALL RETAINED RED SNAPPER OBSERVED: Indicate if all reported Red Snapper were visually inspected or not. Samplers must identify at least one Red Snapper is on the vessel to retain the information collected during the interview. Samplers must ask a member of the fishing party to inspect harvested Red Snapper. Once permission is granted the sampler should attempt to count all Red Snapper available for inspection. The number of Red Snapper observed should be compared to the number of Red Snapper reported by a

vessel representative. If the observed total is less than the reported total confirm no other Red Snapper are stored on the vessel. Once Red Snapper location(s) are confirmed, recount fish, check “Yes” and, if necessary, update the total fish provided in Question 12 - # *Red Snapper Retained* with the observed total. If the sampler is not able to count all of the fish but is able to identify at least one Red Snapper was harvested check “No”. If the sampler is not provided access to identify at least one Red Snapper the interview must be discarded and the angler(s) are to be included in the tally of *Anglers Counted Not Interviewed* column on the Snapper Check Assignment Summary Form.

RED SNAPPER LENGTHS and WEIGHTS: Samplers should attempt to record the length (mm fork length) and weight (kilograms) of all harvested Red Snapper from interviewed vessels. Record lengths and weights using the columns on the left side of the page first and work down until all rows are filled in.

The blank section in the center of the Snapper Check Validation Form is for additional questions that may be added to obtain to gather information about the characteristics of the fishing trip and/or anglers. For example, questions may include where fishing or depth of water where fishing/harvest occurred or socio-economic questions.

QUALITY CONTROL

Within two weeks before the start of the Red Snapper fishing season, a meeting will be held with samplers to review the interviewing procedures and survey paperwork. Throughout the season, supervisors will visit samplers in the field to review procedures and oversee interview and biological measurement techniques used by the sampler. If samplers have questions about the interview procedures or paperwork they are encouraged to contact their county point of contact immediately.

APPENDIX

Snapper Check Assignment Summary Form

Snapper Check Validation Form

SNAPPER CHECK ASSIGNMENT SUMMARY FORM

SAMPLER ID:

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NAME:

--	--	--	--	--	--	--	--	--	--	--	--

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YEAR

--	--

MONTH

--	--

DAY

COUNTY:

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CONTROL #:

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TIME BLOCK:

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TIME BLOCK 1 = 0200-0800
 TIME BLOCK 2 = 0800-1400
 TIME BLOCK 3 = 1400-2000
 TIME BLOCK 4 = 2000-0200
 TIME BLOCK 5 = 1100-1700

SITE

START TIME

END TIME

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INTERVIEWED ANGLERS

ANGLERS
COUNTED
NOT
INTERVIEWED

NON-RED
SNAPPER
ANGLERS
INTERVIEWED

RED SNAPPER
ANGLERS
INTERVIEWED

TOTAL
ANGLERS
INTERVIEWED

REASON
FOR
LEAVING
SITE

SITE 1:

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SITE 2:

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ANGLER TALLY NOTES:

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REASON FOR LEAVING SITE CODES:

06 - Couldn't find site
 08 - Asked to leave
 11 - End of sampling time
 12 - Site closed after hours (time in comments)
 13 - Site closed other (specify in comments)
 14 - Site unsafe during sampling period
 15 - No activity, darkness
 16 - Departed early (severe illness, injury, other)
 17 - Inclement weather

COMMENTS:

SNAPPER CHECK VALIDATION FORM

(THIS AREA IS BLANK TO PROVIDE SPACE FOR ADDITIONAL QUESTIONS AS NEEDED)

WEIGHTS (KG)

[illegible]



Private Recreational Electronic Census Reporting of Red Snapper Catch in Alabama: 2014-2015

FINAL REPORT

Submitted by:

Kevin Anson

Alabama Department of Conservation and Natural Resources / Marine Resources Division

Acknowledgements:

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1.0 Introduction

1.1 Background

Red Snapper, *Lutjanus campechanus*, is a very popular species among Alabama's recreational anglers and is an important fish to Alabama's private recreational anglers. The majority of Red Snapper landed in Alabama by the recreational fishery are caught in federal waters. Although quotas were gradually increasing in the late 2000's, the federal recreational Red Snapper season length began to decrease during the same time period. Reductions in fishing days were caused primarily by an increasing average weight of fish landed, increasing numbers of fish caught per angler trip, and inconsistent state seasons (SERO-LAPP-2014-04, 2014). In 2013, the 28-day federal water fishing season was the shortest on record, yet, according to federal landings estimates, total recreational (for-hire and private) landings estimates for that year were nearly 200% higher than landings in 2012 which comprised of 42% more federal season days than 2013. Additional federal management measures were implemented in time for the 2014 Red Snapper federal fishing season. These measures included use of a buffer which reduced the amount of quota used to calculate season length and a payback provision which reduced available quota in the subsequent fishing season if quotas were exceeded. The buffer was established to minimize the potential for landings overages in the recreational sector and to reduce the chance for payback penalties being imposed in subsequent years if quotas were exceeded. The recreational data collection system used by federal fisheries managers to monitor landings of red snapper could not provide landings estimates which could be used for in-season monitoring. The two management options and their impact on access to the Red Snapper resource by Alabama's anglers underscored the need for having more timely estimates of harvest to prevent quota overages and maximize access to the resource by reducing the size of the buffer.

Alabama anglers voiced their concerns and frustration with federal management of Red Snapper prior to 2013 but the prospect of further reductions in season days, due in part to the dramatic increase in harvest estimates in 2013 and the new management measures, caused their dissatisfaction to reach a new high. The Alabama Department of Conservation and Natural Resources (ADCNR) was also concerned about management of the recreational fishery and the limited prospect for improving access for Alabama anglers. Therefore, ADCNR managers investigated the use of a mandatory reporting requirement for all anglers landing Red Snapper in Alabama. A complimentary dockside survey of anglers and their catch using a random-stratified sampling design was also considered to account for the average weight of fish being landed and to estimate rates of non-reporting and misreporting. Prior to the 2014 fishing season, the Commissioner of the Alabama Department of Conservation and Natural Resources promulgated a regulation requiring captains of all recreational vessels, for-hire and private, to report all Red

Snapper landed in Alabama prior to landing. Anglers were provided electronic and paper options to submit trip information. The dockside survey results were applied to angler reports to calculate estimates of harvest and discards. This report provides a summary of the results of the reporting program from the 2014 and 2015 fishing seasons. In addition, a brief discussion on the practical use of this reporting program for monitoring in-season landings is provided.

1.2 Fishing Seasons

Table 1.2.1 lists the dates of the federal, Alabama, and Florida recreational Red Snapper seasons, and the total number of fishing days available to recreational anglers during 2014 and 2015. The federal season for private recreational anglers increased by one day in 2015 compared to 2014. During the same period state season lengths also increased. Florida's season is included in the table as a small number of Alabama private anglers typically purchase the Florida saltwater fishing license and target Red Snapper during the Florida state season. Currently, validly licensed Alabama anglers are allowed to harvest fish from another state's jurisdictional waters and return to an Alabama port as long as the harvested fish meet the size and bag limits for the state of harvest for each licensed angler and the vessel does not stop in Alabama waters.

2.0 Landing Reporting

2.1 Reporting Requirements

On May 13th 2014, the Commissioner of the ADCNR promulgated a regulation requiring captains of vessels; both for-hire and private, to report harvested Red Snapper prior to landing in Alabama. The reporting program was called Snapper Check. Although there was a short time period between the promulgation of the regulation and the beginning of the 2014 federal fishing season (June 1st), the ADCNR utilized various media prior to and after the promulgation of the regulation to inform private recreational anglers of the new reporting requirement including; radio advertisements during a popular outdoor show, ADCNR press releases, and articles and public service announcements in multiple news publications and fishing magazines. A fine for non-reporting was included with this regulation; however, as this was the first reporting regulation of its kind used by ADCNR no citations were issued during the first two years of the regulation in order to give the Public enough time to become aware of the need to report.

The reporting regulation identified several items which were required to be completed on all submitted reports. These items included; date and time of report, vessel registration number (U.S. Coast Guard documentation or state registration number), fishing status of vessel trip (for-hire or private fishing trip), county of landing, and numbers of anglers, and the number of Red Snapper retained and discarded dead during the fishing trip. In 2015, an additional question regarding the

access type (private or public) was added to the list of required data. The access question was added to determine the proportion of anglers using private access sites which could be helpful during analysis of trip reports.

2.2 Reporting Options

Anglers were provided multiple means to report trip information including; a toll-free telephone number, online through the ADCNR website, a smartphone app, and paper forms provided at six coastal public boat launches (Baldwin County - Boggy Point, Cotton Bayou and Ft. Morgan; Mobile County - Bayou La Batre Public Docks, Billy goat Hole, and Little Billy goat Hole). Trip information submitted via the toll-free telephone number, online, or app was automatically stamped with the date/time when the report was submitted. In order to successfully complete an electronic report all requested information required a response. For the vessel registration data field, the reporting vessel representative was queried as to the origin of the vessel registration number; U.S. Coast Guard vessel documentation number or state vessel registration. If the vessel representative selected U.S. Coast Guard documentation number they were required to submit a minimum of six numbers to complete the field and continue to the next field. For those anglers who indicated landing Red Snapper with a vessel issued a state registration number (XX-0000-XX format) they were prompted to complete three individual questions – one question for each segment of the registration number. Anglers could not proceed to the next question unless information was provided for each question. There were no restrictions for number of anglers, fish harvested, or dead discards other than the field required a response.

Paper reports (Figure 2.2.1) provided at popular coastal public boat launches frequented by Red Snapper anglers consisted of an original and a carbonless copy and each pair were uniquely numbered. Anglers were instructed to place the original completed copy in secure drop boxes provided on-site and to keep the carbonless copy for law enforcement purposes. ADCNR staff periodically checked drop boxes throughout the fishing season with more frequent visits (once every two days) during the federal portion of the fishing season and less frequent visits during the state water portion of the fishing season. Generally, landings information from paper reports was entered into the database within two business days after collection. For each landing reports (electronic or paper) a unique confirmation number was issued that would allow identification as to which reporting option was used to report and assist with QA/QC procedures.

2.3 Landing Report QA/QC

Data entry errors were expected for electronically submitted data and during the data entry process for paper reports. Date and time data fields on electronically submitted reports were automatically filled in at the time of successful report submission. Data provided for the number

of anglers and fish harvested were checked for outliers. Any reports with harvest rates exceeding two fish per angler or less than one fish per angler were scrutinized. During 2014 and 2015, the daily bag limit for each angler during the federal and state fishing seasons was two Red Snapper. Instances where it appeared the reported data included an error were adjusted. For example, if a report indicated six anglers and 122 harvested fish, the report was changed to reflect a harvest of 12 fish and the value for number of anglers was not changed. Another example where reported data could have been changed would be for a report which indicated 44 anglers and eight fish harvested. In this example, the value for anglers was changed to reflect four anglers were on the trip and the value for harvested fish was not changed. A relatively few number of reports were submitted with "0" harvested fish. As most of the reports with "0" harvested fish contained a value greater than "0" for dead discards it was assumed the person provided the report to report dead discards and the report was not retained in the database. Dead discard information was accepted as submitted as there was no reliable procedure to correct for data entry errors.

A small number of paper reports were submitted with missing or incomplete vessel registration numbers. For these reports, the reported data was entered; however, an invalid vessel registration number was recorded in place of the missing or incomplete registration number. Data from paper reports were checked against the original copy and edited as needed. Data were reviewed for outliers and modified as described for electronically submitted reports.

Prior to each fishing season, a list of active for-hire vessels was created for the purpose of comparing to the reported fishing status. In 2015, the list was updated at least once with new permit information. The vessel list was comprised of the following groups; vessels with a valid federal permit, vessels with an Alabama for-hire license, vessels associated with a for-hire permit or license in the previous year but not the current year, and headboats participating in NOAA Fisheries' Southeast Region Headboat Survey (SERHS). Information for federally permitted vessels was downloaded from NOAA Fisheries' Gulf of Mexico Charter/Headboat for Reef Fish and Historical Captain Gulf of Mexico Charter/Headboat for Reef Fish permits database found in NOAA Fisheries' Southeast Regional Office's Frequent FOIA Requests Regarding Permits, Vessels, and IFQ webpage. Alabama licensed for-hire vessels were obtained from ADCNR's license database. Information for SERHS headboats was acquired from NOAA Fisheries staff administering the program and was included in the vessel list for the purpose of identifying Snapper Check reports. The final source of for-hire vessels included in the for-hire vessel list was the Alabama vessel directory used for the Marine Recreational Information Program's For-Hire Telephone Survey (FHTS). The FHTS vessel directory is used by the MRIP program to identify the universe of active for-hire vessels in states where the FHTS is conducted from which weekly telephone calls are made to determine estimates of fishing effort. New for-hire vessels are regularly added to the FHTS vessel directory when the identified vessel either is associated with a valid permit or Alabama

license or the vessel is determined by ADCNR staff to be operating a for-hire business. Many of the vessels found in the federal permit and Alabama license databases were also found in the FHTS directory; however, a small number of vessels in the FHTS directory were not associated with a current permit/license. Unless otherwise noted, all vessel compilations, data preparation, analysis, and final estimate calculations associated with this project were performed using SAS® software (v. 9.3).

Registration numbers from vessels in the for-hire vessel list were matched to registration numbers provided on all landing reports; both private and for-hire. If the registration number on a report with 'for-hire' fishing status matched a registration number of a vessel in the for-hire vessel list the fishing status was not changed. However, if the registration number on a landing reports with 'for-hire' fishing status did not match any registration number in the for-hire vessel list the fishing status was changed to 'private'. Trip status was changed from 'for-hire' to 'private' for 60 reports (3.2% of private vessel landing reports) and 38 reports (1.7% of private vessel landing reports) in 2014 and 2015, respectively.

2.4 Summary of Landing Reports

A summary of the landing reports from private vessels submitted through Snapper Check by year, license group (federal or state), and reporting option used to report is provided in Table 2.4.1. ADCNR received 1,899 private landing reports in 2014 and 2,193 reports in 2015. In both years, the majority of reports (> 60%) were submitted through the smartphone app.

Percent-frequency distributions of submitted private vessel landing reports by hour of the day for the 2014 and 2015 federal and state fishing seasons are provided in Figures 2.4.1 and 2.4.2, respectively. Nearly a third of all reported trips during the 2014 and 2015 federal seasons were reported from 1300-1559. In both years and seasons, less than 3% of reports were received from 0000-0700.

A percent-frequency distribution of unique vessels by number of trips reported during the 2014 and 2015 federal seasons is provided in Figure 2.4.3. In both years, at least 55% of all reporting vessels reported one trip with Red Snapper. In 2014, 3.1% of all reporting vessels reported five or more trips and 6.6% of all reporting vessels reported five or more trips during the 2015 federal season. During the state seasons of 2014 and 2015, the distribution of reports submitted by unique vessel was similar to the distribution of reports submitted by unique vessel during the federal season (Figure 2.4.4). Of the reporting vessels, over 85% in each year reported two or less trips. Less than 1% of private vessel registrations for all 2014 private landing reports were missing or incomplete and less than 2.5% were missing or incomplete on 2015 private landing reports. Vessel registration data were not checked against state or federal vessel registration databases;

however, cursory review of supplied vessel registrations indicated some of the entries were invalid, particularly for registration numbers missing the state prefix.

Reported data were summarized by year, two-month periods, and fishing season (federal and state). The two-month sampling period or 'wave' is based on a calendar year such that there are six waves in a year; Wave 1 comprising the months of January and February, Wave 2 comprising March and April, etc., The two-month designation follows the design used in the MRIP Angler Point Angler Intercept Survey (APAIS) and will allow for comparisons of harvest estimates from this study to APAIS estimates. The number of landing reports, reported anglers, landed Red Snapper and dead discards from 2014 and 2015 are provided in Table 2.4.2. Landing reports submitted during the federal season were similar to one another (181 reports /d in 2014 and 198 reports/d in 2015). There were more reports submitted during the state season in 2014 compared to the 2015 state season. This may have been due to ADCNR opening state waters to Red Snapper harvest outside the federal season for the first time in 2014.

The means and standard errors for reported anglers, harvested fish/report, harvested fish/angler, and dead discards/report are provided in Table 2.4.3. Mean harvested fish for anglers fishing the federal season in 2014 and 2015 were nearly identical to one another while harvest rates during the state season ranged from 1.24-1.75 fish/angler. Anglers fishing during Wave 4 in both years reported the lowest harvest rates. Red Snapper catches usually decrease during months with the highest ambient temperatures. Mean dead discards/report were generally less than one Red Snapper with the exception of the 2014 federal season where 1.04 fish/report was calculated. The highest means for dead discards were for reports submitted during the federal season. The standard errors for mean dead discards were relatively large and reflect the high variability of this metric. In each year, over two-thirds of the landing reports had zero reported dead discards (2014 - 67.7% and 2015 - 73.0%) while approximately 30% of landing reports had between one and ten reported dead discards. The maximum number of reported dead discards was 26 and 41 in 2014 and 2015, respectively.

Distributions of mean Red Snapper landed per angler during the 2014 and 2015 federal seasons are provided in Figure 2.4.5. Over 75% of the reported anglers had a mean harvest rate of 1.75 fish or greater. A few reports were submitted with landed fish totals which exceeded the daily bag limit of 2 fish per person. These reports could not be amended as per the QA/QC procedure. Distributions of mean Red Snapper landed per angler during the 2014 and 2015 state seasons are provided in Figure 2.4.6. A larger percentage of anglers reported smaller harvests during the state seasons. Approximately half of the anglers in each year reported 1.75 or more harvested fish. A reduction in mean landed fish during the state season compared to the federal season was anticipated as there is less Red Snapper habitat in state waters.

In 2015, a question regarding access type (private or public) used by private vessel anglers was added to the Snapper Check report at the request of NOAA Fisheries consultants. This question provided a means to quantify the number of reports submitted by each access type group and to compare various reported data between the two groups. Anglers were provided one of the following responses on the landing report; use of a private access site (privately-owned docks associated with private residences/condominiums or privately-owned boat launches within subdivisions) or use of a public access site (publicly-owned boat launches, privately-owned boat launches where the public could use for a fee, or privately-owned marinas open to the public). From the reports, 39.7% and 33.8% indicated use of a private access location during the federal and state seasons, respectively. Total number of reports, means for anglers/report, landed fish/angler, and dead discards/report for 2015 by fishing season and access type are provided in Table 2.4.4. All values with means within each fishing season were not significantly different ($p < 0.05$) from one another. In each fishing season, the mean reported anglers provided on private access reports was approximately 0.85 anglers more than the mean anglers provided on public access reports. Mean reported harvest per angler was statistically higher ($p < 0.05$) for anglers using private access sites during the federal season compared to public access anglers. However, mean reported harvest rates for private access anglers during the state season was less than public anglers but were not significantly different ($p < 0.05$). Of these reports, 39.7% and 33.8% indicated use of a private access location during the federal and state seasons, respectively.

3.0 Validation of Landing Reports

3.1 Validation Procedures

A dockside survey of vessels was developed to gather the same information required on the landing report and collect lengths and weights from harvested fish. The data would be used to determine the level of reporting compliance, accuracy of filed reports, and calculate mean weight of landed fish throughout the fishing season for use in estimating pounds of fish harvested. The two sources of data (landing reports and validations) were considered to be similar to a typical capture-recapture experiment whereby the reports were the capture sample and the validations were the recapture sample. ADCNR staff previously developed a simple ratio estimator to adjust for under-reporting using the ratio of unmatched reported and validated trip data to matched reported and validated data. Staff sought guidance from MRIP survey consultants reviewing the preliminary results of the Snapper Check program for recommendations on appropriate estimators which could provide measures of precision for derived estimates. A ratio estimator that could be applied to the Snapper Check data which took into account the issue of precision was offered by a group of MRIP consultants after an initial review of the Snapper Check program (Breidt et. al. 2016). Estimators proposed by this group do not require the reports to be representative of the

entire population of fishing trips with Red Snapper harvest. In addition, the estimator outlined in the consultant report does not require the reports to be accurate. The samples collected for validation; however, are assumed to be collected based on a probability sample where the validation sample may occur regardless of whether or not a report is submitted. More information about the ratio estimator is provided in Section 4.1.

3.2 Description of Sampling Sites

Sites considered for sampling included active locations with private recreational fishing activity listed in the APAIS Site Register. Sites in the Site Register must have saltwater recreational fishing activity and must be accessible to APAIS interviewers (GSMFC, 2016). Generally, sites listed in the Site Register are open to the public and favorable towards APAIS samplers conducting the survey. Potential Snapper Check sampling sites were reviewed to determine the level of private angler Red Snapper fishing activity. Nearly all of the APAIS sites along the immediate Alabama coast with private vessel activity were identified as sampling sites for this study. The sampling sites consisted of thirteen sites (Baldwin County-9 sites, Mobile County-4 sites) where private vessels targeting Red Snapper were known to access the Gulf of Mexico. Sites included public boat launches and privately-owned marinas accessible to the public.

3.3 Site Selection Procedures

Sampling sites were selected using a random, stratified sampling procedure with replacement. In order to efficiently utilize available staff sites were first stratified by county. Next, sites were stratified by day type - weekends (Saturday, Sunday and federal holidays occurring during the sampling period) and weekdays (Monday-Friday), and similar to the APAIS survey, each site/day type combination was divided into six-hour time periods; 0200-0800, 0800-1400, 1100-1700, 1400-2000 and 2000-0200 hours. The time period 1100-1700 hours was added to ensure coverage during the time of day when most of the private vessel trips were anticipated to return to the site. For each site/day type/time sampling unit within each county a value was assigned corresponding to a defined range of Red Snapper fishermen expected during the designated sampling unit. The higher the number of anticipated anglers the higher the value assigned to the sampling unit.

The number of assignments selected varied throughout the season depending upon personnel availability and anticipated fishing activity. For example, during the 2014 federal fishing season private vessel fishing activity was expected to be very high and the number of assignments and staff were increased compared to the state-only fishing seasons. The assignment draw process for Snapper Check sampling assignment selection was performed using Excel® software. Red Snapper fishing activity values for all sites within each site/day type/time sampling unit were tallied for each county. A range of numbers corresponding to the combined fishing activity values was

created using the product of the combined time-block values and 100. The beginning value for each site's range is the product produced in the prior site added to the previous site's combined time-period value. The random number generator function in Excel® was used to generate a series of random numbers which were used to match the corresponding pressure range for each site. Sites were selected using replacement.

A second stage site selection procedure was performed to determine which day of the month or day of the federal season to assign selected site/day type/time period assignments selected during the first stage of sample selection. Fishing pressure values were developed in the same manner as the site selection process described above. Random numbers were generated and matched to the appropriate fishing value range.

In order to maximize data collection during the study period, validation data was also collected during MRIP APAIS assignments. If a time period was selected twice for the same site and calendar day, or if a time period overlapped a previously selected time block for the same day (MRIP selected sites included) another random date was selected for the second time period. Snapper Check validation samples were collected independently from APAIS assignments in 2016.

3.4 Dockside Sampling Procedures

Samplers were trained on how to screen anglers to identify trips with Red Snapper and how to conduct the survey prior to conducting field assignments. Snapper Check validations were also collected by biological staff during APAIS assignments after receiving permission from MRIP staff. Required Snapper Check information not captured during the APAIS interview (e.g. total discards) was asked of the respondent or captain. In 2014, ADCNR biological samplers were instructed to observe, with angler's permission, all of the harvested Red Snapper in order for the validation to be accepted. If samplers could not visually inspect all of the harvested Red Snapper the sampler was instructed to terminate the interview. Upon comparing the 2014 reported trip to the validation data it was determined there were insignificant differences between the two. Therefore, in 2015, samplers were instructed to observe at least one Red Snapper on a vessel to confirm the vessel was required to submit a landing report. The sampler could obtain the harvested total by counting the entire catch or receiving the information from the captain or deckhand. This protocol change resulted in increased vessel validations with minimal impact to estimates.

Samplers were instructed to collect fish lengths and weights if allowed by the angler and as time permitted. Fish were weighed with hand-held Chatillon® spring scales. Fish were measured fork length (millimeters) and total lengths were estimated using the regression formula provided by Schirippa and Legault (1999).

Conservation Enforcement Officers were also tasked with collecting information from Red Snapper anglers on for-hire and private vessels as part of their routine patrols; both dockside and at-sea. Officers were assigned this task because at-sea contacts, particularly with anglers on private vessels, could be helpful to ascertain compliance rates for anglers using private access sites.

3.5 Validation Data QA/QC

Validation data were entered into a database within a few days of collection via an online data entry tool. Entered data was compared to the original copy and edits were made as required, usually within a week. Individual fish weights were compared to the regression of fish lengths collected within each year. A regression of length and weight data was performed to check for measurement errors and those outside the 99% confidence interval were excluded from mean weight calculations.

Vessel registration numbers from validation samples were compared to the for-hire vessel list. Instances where the trip status was recorded as a 'private' fishing trip were changed to for-hire status when the vessel registration number was found in the for-hire vessel list. Likewise, validations recorded with 'for-hire' trip status where the vessel registration number was not found in the for-hire vessel list were changed to private trip status.

3.6 Summary of Validations

A total of 345 and 677 validations were collected by biological staff in 2014 and 2015, respectively (Figure 3.6.1). Eliminating the requirement for samplers to inspect all harvested fish, contributed to the increased number of validations in 2015 compared to 2014. In 2014 and 2015, 14.9% and 10.0%, respectively, of the biological validations were collected during APAIS assignments. The majority of validations were collected at public boat launches, yet approximately 20% of the biological validations were collected during sampling assignments at public marinas. A percent-frequency distribution of validations by time of day is provided in Figure 3.6.2. All of the validations occurred between 0800–2000 hours and over 85% were collected between 1100–1700 hours in both years. Table 3.6.1 contains summary statistics for the number of validations, anglers encountered, red snapper reported as harvested and dead discards from private vessel validations collected during the 2014 and 2015 federal and state fishing seasons. The number of validations collected during the 2015 federal season increased 110% compared to the 2014 federal season. This was due, in large part, to removing the requirement for samplers to count all red snapper. Collecting validations during the state seasons was difficult as the effort decreased dramatically (less than 12% of the landings reports submitted in 2014 and 2015 were during the state seasons).

Summary statistics for validations collected by ADCNR biological staff in 2014 and 2015 are provided in Table 3.6.2. Trip metrics from validation data were similar to those derived from reported data with the highest number of validations and largest means occurring when the federal season was open to harvest. Standard errors increased with decreasing sample size but were generally low except for dead discards. Dead discard information from validations varied widely just as was observed for reported dead discards.

The number of Red Snapper measured and weighed and the mean weights and standard errors from validation data are provided in Table 3.6.3. The highest mean weight in each year was calculated for the federal season and was significantly higher compared to the mean weight calculated for the state season. The percent frequency distribution of fish measured from the federal season is provided in Figure 3.6.3. Less than 2.5% of all fish measured during the federal seasons were below minimum size limits and over 50% of the measured fish were 24 inches total length or larger. Red snapper measured during the state season were smaller than fish sampled during the federal season with 80% of the measured fish less than 24 inches total length (Figure 3.6.4).

4.0 Estimate Calculations

4.1 Matching Landing Reports with Validation Reports

Samplers were instructed to pay particular attention to vessel registration numbers or vessel names (names were used to query NOAA Fisheries' documented vessel directory to determine documentation number) to ensure the number was recorded accurately. Accuracy of vessel identification numbers provided on landing reports was equally important for the matching process but data was accepted as provided as there was no way to determine when a report was submitted with incorrect information. A comparison of registration numbers on private vessel validations to the for-hire vessel list indicated less than 0.01% of validation trip type in 2014 and 2015 required a change from for-hire to private. Records from each database were initially merged by vessel registration and date. A cursory review of the 2014 matched data indicated the majority of 'matched' records had reporting times after the validation time.

Records from each database were initially merged by vessel registration number and date. A cursory review of the matched data indicated a significant number of these records had reporting time after the validation time. Calculating precise harvest estimates using "late" reports could be problematic. The validation encounter could bias the reporting response of vessel representatives. Representatives may be influenced to report as a result of the encounter whereas they may not have reported if there was no validation encounter. If this scenario were widespread estimated landings would be much less than actual landings. A validation encounter may have caused some

vessel representatives to refrain from reporting. This was the case with several private vessel representatives who indicated to ADCNR staff they did not file a Snapper Check report for trips conducted the same day of a validation interview by ADCNR staff because they believed they satisfied the reporting requirement by completing the validation. Non-reporting of trips corresponding to completed validations that would otherwise have been reported could result in over-estimation of harvest. The non-response ratio estimator would increase and it would be applied to the reported trips. This study did not perform follow-up or complimentary surveys to estimate the bias associated with validation sampling activities. However, the impact of non-response due to validation could be significant. In 2014, 17.9% of all private vessels validated did not file a report the same day of validation and in 2015, 32% of all private vessels validated did not file a report on the same day as the validation.

Although the Snapper Check program was promulgated as a mandatory reporting program, ADCNR managers decided not to enforce the reporting requirement during the first two years of the program. This decision was made to allow ample time for anglers to become familiar with the new requirement. As previously described, a significant number of landing reports were submitted after the validation. It was unclear whether or not these reports were submitted for the same trip or for another trip conducted later in the day. Individual anglers are allowed daily bag limits of two fish per angler but there are no vessel limits. The potential existed that some vessels would be used more than once per day to transport two different groups of anglers and two landing reports could be submitted. To minimize incorrectly matching validations to reported trips while providing an opportunity to correctly match late reports to validations an appropriate time range around the validation time was needed. An assumption was made that 3.5 hours was the minimum amount of time anglers using a vessel a second time on the same day could report landed Red Snapper, depart to the fishing grounds and return to the dock with Red Snapper. Therefore, any report with a time that was more than 3.5 hours before the matched validation time or 3.5 hours after the matched validation time was identified as a mismatch. Additional time periods were evaluated including; -3.0 - +3.0 hours, -2.0 - +2.0 hours, and -1.0 - +1.0 hours. To estimate the influence of a validation encounter on response rates further time periods where the report was submitted prior to validation were evaluated including; -3.5 - -0.25 hours, -3.0 - -0.25 hours, -2.0 - -0.25 hours and -1.0 - -0.25 hours.

There were several instances after matching the reports to validation records where two or three landing reports were matched to a single validation. These reports may have been submitted for multiple trips completed during a single day or for a trip completed prior to the day of validation but submitted electronically where the date and time could not be modified to the original date of the trip. To ensure appropriate matching of these landing reports to eligible validations occurred the trip identifier (vessel registration and date) was refined. Various combinations of trip metrics

from the report and validation were added to the vessel registration and date and compared to one another. The additional trip metrics included; the number of anglers, harvested fish, and dead discards. Several combinations of the three metrics were used to determine matched status for submitted landing reports and validations; 1) the total of anglers and landed fish from reports compared to totals of same metrics from validations, 2) the total of anglers, landed fish, and dead discards from reports compared to validations, and 3) the totals of anglers and landed fish and the total for dead discards within one fish of the dead discard total for either the report or validation. Trip metric combination 1 provided the best opportunity to match reports with validations as it required the least amount of data to match records and the number of anglers and fish harvested is easily recalled during reporting and validation. A significant number of incorrectly matched records could occur using just the number of anglers and number of harvested fish as many of the trips were reported with the same passenger capacities and harvested fish totals would be similar due to the relatively small bag limit. For example, many trips could have a total combined value of 6 (2 anglers and 4 landed fish) or 15 (5 anglers and 10 landed fish). Trip metric combination 2 required the dead discards to be added to the total of anglers and landed fish for both records and compared to one another. Use of dead discards further refined the trip identifier to increase the chances of correctly matching a reported trip to a validation within the designated time periods. However; the number of dead discards provided on a report could be misreported during a validation. For example, two different people could provide the information for the two records (e.g. a captain reporting the trip but the mate being questioned for validation data) or the elapsed time between submitting a landing report and completing a validation would provide extra time for additional fish to be recalled. Trip metric combination 3 was used to estimate the impact of misreporting. The last step of the matching process attempted to match the report to the validation by searching for the best 'fit' within the specific time period and trip metric groups by ordering landings report chronologically by vessel and date. The report (if multiple validations existed) closest to the time of validation within each trip metric combination group was considered a match with a validation record when all other conditions for time period and trip metric combination were considered. The numbers of private vessel reports matched to a validation by registration number and date within the -3.5 – +3.5 hour report/validation time period meeting trip combination 2 conditions for 2014 and 2015 are provided in Figure 4.1.1.

4.2 Ratio Estimator Description

Once the matching process was completed, data were available for use in calculating the ratio estimators. Breit et al. (2016) provided details of a ratio estimator which was derived from the standard estimator of population size used in capture–recapture studies:

$$\hat{N} = \frac{n_1 n_2}{m},$$

where n_1 and n_2 are the capture and recapture samples and m is the number of units in the recaptured sample that were previously captured (matched records). The authors proposed that the standard estimator can be considered a ratio estimator where $t_y = N$, $n_1 = \sum_{i=1}^N r_i$, $n_2 = \sum_{i=1}^{n_2} y_i$, and $m = \sum_{i=1}^{n_2} r_i$; $r_i = 1$ if the i^{th} unit in the population represents a matched report and validation and $r_i = 0$ if the report does not occur in the sample, and $y_i = 1$ for every validation. The ratio estimator with auxiliary variable r was proposed:

$$\hat{N} = \sum_{i=1}^N r_i \frac{\sum_{i=1}^{n_2} y_i}{\sum_{i=1}^{n_2} r_i}.$$

The authors believed expressing \hat{N} as the ratio estimator was a method whereby an estimate of its standard error (SE) could be derived. The SURVEYMEANS procedure in SAS[®] software (v. 9.3) was recommended for this study by the MRIP consultants and used to calculate ratio estimators.

The authors proposed applying the ratio estimator to report metrics such as total reported harvest and dead discards in order to calculate an estimate representing the total population. To estimate these metrics they proposed:

$$\hat{t}_y = \sum_{i=1}^N r_i y_i^* \frac{\sum_{i=1}^{n_2} y_i}{\sum_{i=1}^{n_2} r_i y_i^*},$$

where y_i is the Red Snapper harvested or discarded for validated trip i , and where $r_i y_i^*$ is the number of fish harvested or discarded on the i^{th} trip. If no report matched the validated trip then $r_i y_i^* = 0$. The consultants stressed \hat{t}_y was an appropriate estimator of total harvest and discards as long as the reports and validations are matched accurately, the validation sample is a probability sample, and reporting by anglers is not influenced by field staff conducting the validation surveys. The first two requirements have been addressed and the impact of samplers on reporting rates is addressed in Section 4.3.

4.3 Estimates Using Various Matching Procedures

Landings estimates and 95% Confidence Intervals using the three trip metric combinations for each of the selected time periods are provided in Figures 4.3.1 and 4.3.2 for 2014 and 2015, respectively. The trip metric combination using the combined totals for anglers and fish landed had the largest number of matched records and consequently the lowest estimate totals of the three combinations evaluated for all time periods. The trip combination which required the total number of anglers, landed fish, and dead discards from the report to equal the total of the same metric from the validation record was the most conservative of the three combinations evaluated (had the least number of matched records and highest ratio estimators) and resulted in the

highest landings estimates within each evaluated time. The highest landings estimates for each trip metric combination were in the -1.0 - -0.25 hour time block. Sample sizes were small (under 30) for all time periods where the matched report time was before the validation time and contributed to large (imprecise) confidence intervals. Estimates for all time period / trip metric group combinations were not significantly different from one another except the matching angler and landed fish and angler and landed fish and dead discard difference of +/- 1 groups within the -3.5 – +3.5 hour time period were significantly different from the angler and landed fish and matching dead discard group within the -1.0 – +1.0 time period group.

Selecting the most appropriate time period and trip metrics combination to estimate Alabama private angler harvests was needed. The differences between the lowest and highest annual point estimates among all time periods were large, nearly 850,000 pounds in 2014 and nearly 2,740,000 pounds in 2015. The -3.5 - +3.5 hour time period was selected for determining final estimates as estimates calculated for time periods before validation were less precise and precluded the ability to match late landings reports. The use of specific reported and validated information to create refined trip identifiers minimized the chance of incorrectly matching a report to a validation regardless of when the report was submitted relative to the validation. The 2014 and 2015 point estimates for federal and state seasons using the three trip metrics combinations within the -3.5 - +3.5 hour time group are depicted in Figures 4.3.3 and 4.3.4, respectively. The trip metric combination using the total of anglers, landed fish, and dead discards was selected for calculation of final Snapper Check landings estimates. This was the most conservative trip metric combination of the three combinations evaluated and offered the best chance to match reports and validations accurately. Table 4.3.1 provides the number of matched and unmatched validations and ratio estimators for anglers, harvested Red Snapper and dead discards by year, wave, and fishing season. Ratio estimators were calculated for each wave and fishing season if standard errors were able to be calculated from the data. If no standard error was calculated or the standard error was 0.0, the data from the wave were combined to data collected for the year for the appropriate fishing season. The ratio estimators for anglers, harvested fish and dead discards increased in 2015 compared to 2014. The increases were the result of lower reporting rates among sampled trips.

The ratio estimators were applied to the summarized reported data to determine the estimates for total anglers, harvested fish, dead discards, and landings (Table 4.3.2). The majority of angler trips, fish harvested, dead discards, and landings occurred during the federal season in both years. In 2015, the estimated number of anglers landing Red Snapper increased 123% and the landings estimate increased 128% compared to estimates for 2014. In 2014 and 2015, 92% and 90%, respectively, of the estimated angler trips were conducted during the federal season. Proportional Standard Errors (PSE) for annual estimates of anglers, landed fish and landings ranged from 9.7 –

14.5. PSEs for annual estimated total dead discards were much higher; 27.6 in 2014 and 28.1 in 2015.

Ratio estimators calculated from validation data were applied to all reported trip data regardless of the type of access used. However, differences in reporting and catch rates and mean weight of fish harvested between public and private access anglers could result in inaccurate landings estimates. A comparison of trip metrics including mean anglers/report and mean harvest/angler from 2015 landing reports (Section 2.4) between public and private access anglers indicated there were no significant differences ($p < 0.05$) between the two groups. Collection of biological data (including weight) from Red Snapper landed at private access locations was not attempted. Selectivity patterns for the size of fish retained by private access anglers were assumed to be the same as public access anglers. In 2015, 97.5% of submitted landing reports had 'public' or 'private' access responses. Of these landing reports, 39.7% and 33.8% indicated use of a private access location during the federal and state seasons, respectively.

In addition to validations collected by biological staff, ADCNR enforcement personnel were tasked with validating recreational anglers with Red Snapper harvest during routine patrols in 2014 and 2015. The enforcement validations were combined with validations collected by biological staff in order to determine the levels reporting among private access anglers. A total of 620 private vessel validations were collected by enforcement staff during 2014 and 2015 and 57.6% of these validations were collected while conducting patrols on-the-water (at-sea). Vessel registration numbers from landing reports were sorted and matched to vessel registration numbers from validation records. In 2014, 18% of the 1,261 unique vessels that were identified as harvesting Red Snapper (either through a report or validation) did not file a landing report (61% of all unique vessels reported at least one trip but were not validated). In 2015, 32% of the 1,596 unique vessels identified as harvesting Red Snapper did not file a landing report (46.7% of all unique vessels reported a trip but were not validated).

The validations and landing reports from 2015 were evaluated to determine the impact sampling bias may have had on reporting rates of private anglers. Table 4.3.3 provides means and standard errors for number of reports submitted for validated and un-validated vessels by reported access type. Mean number of reports (vessel trips) were higher for vessels using private and public access sites within the validated vessels group compared to the un-validated group. Mean vessel reports submitted during the federal season for vessels indicating use of private access sites and validated at least once during the season was 0.20 reports greater than the mean vessel reports reported for public access vessels that were not validated during the year. Mean vessel reports submitted during the federal season for vessels indicating use of public access sites and validated at least once during the season was 0.48 reports greater than the mean vessel reports for public

access vessels that were not validated during the year. A similar trend for mean number of reports submitted by vessel and access type during the state season was detected; 0.78 reports and 0.38 reports greater for validated vessels using private and public access sites, respectively. Although the differences in means of reports between validated and in-validated vessels submitted during the federal and state seasons were not statistically different from one another ($p < 0.05$) the higher means for validated vessels suggests the encounter by DCNR staff influenced reporting rates. The mean reports/vessel for combined access types was 1.92 reports and 1.39 reports during the federal and state seasons.

4.4 MRIP and Snapper Check Estimates Comparison

Landings estimates and 95% Confidence Intervals for 2014 and 2015 from the MRIP and Snapper Check surveys are provided in Figure 4.4.1. Landings estimates for both surveys increased in 2015. The Confidence Intervals for the point estimates from both surveys in 2014 did not overlap and may indicate the estimates from 2014 were statistically different. Confidence Intervals for estimates from 2015 overlapped which suggests they were not statistically different. Further analysis of the difference between the estimates and tests to determine levels of significance were beyond the scope of this project. MRIP and Snapper Check landings estimates by wave and area of harvest from 2014 and 2015 are provided Table 4.4.1. Both surveys estimated higher landings during the federal seasons compared to the state seasons. Snapper Check estimated fewer landings than MRIP. In 2014, annual Snapper Check landings point estimates were 66.0% lower than MRIP landings point estimates and, in 2015, Snapper Check estimates were 50.3% lower than MRIP estimates. PSEs for Snapper Check annual point estimates were 9.3 and 14.5, and PSEs of MRIP annual point estimates were 28.3 and 28.9 for 2014 and 2015, respectively. Substantial differences in landed pounds between the two surveys were found in most waves. As a percentage, the largest difference in landed pounds estimated for federal waters occurred in Wave 3 2014 where Snapper Check landings were estimated to be 64.4 % less than the MRIP estimate. Snapper Check PSE's for all waves with harvest were lower than PSE's for corresponding wave estimate and suggest the Snapper Check estimates were more accurate than MRIP estimates.

State water harvest estimates within each survey comprised a small percentage of the overall annual harvest. MRIP estimates of state season landings were higher than Snapper Check landings in 2014 but lower than Snapper Check state season landings in 2015. Snapper Check estimates of state landings were more consistent (5.3% and 5.1% of annual estimates for 2014 and 2015) than MRIP estimates (5.8% and 0.6% of annual estimates for 2014 and 2015). Snapper Check PSEs were lower than MRIP estimates in every wave where state water landings were estimated. In 2015, the number of state season days increased 122% from 2014 (including Florida state season days)

while Snapper Check landings estimates for state-licensed vessels increased 227%. The 2015 MRIP landing estimate for state waters decreased 83% compared to the 2014 estimate.

Significant MRIP harvests were attributed to federal waters during time periods when federal waters were closed to recreational fishing – 8.2% of the 2014 annual estimate and 4.7% of the 2015 estimate. This may be attributed to a small number of samples being collected from Alabama anglers harvesting Red Snapper from Florida waters. Florida's territorial seas boundary in the Gulf of Mexico is 9 nautical miles from shore. Eligible 'Distance from Shore' question responses on APAIS survey forms used in Alabama correspond to its 3 nautical mile territorial seas boundary. Catch from an APAIS angler intercepted in Alabama who indicates they fished in the Gulf of Mexico and provides a response to the distance fished question that is greater than 3 miles will be assigned to federal waters.

Harvest estimates from each survey were also compared to fishing season lengths. The 2015 federal season was 11% longer than the 2014 season. Federal MRIP landings period increased by 64% and Snapper Check landings increased by 128%. Mean daily federal season landings were calculated for each survey and compared to one another. Mean MRIP daily landings were 104,225 pounds/day and 153,060 pounds/day in 2014 and 2015, respectively, and mean Snapper Check daily landings during the federal season were 37,145 pounds/day and 76,352 pounds/day, respectively. Increases in both survey estimates may have been the result of better weather during the federal season in 2015 compared to the 2014 season. Wave height data from the National Data Buoy Center's Station 42012 (located approximately 14 miles south of Orange Beach) were reviewed and compared to Snapper Check estimated daily angler trip totals during the 2014 and 2015 federal seasons (Figures 4.4.2 and 4.4.3). Hourly wave height data within 0600-1800 hours were averaged for each day of the federal season. Mean daily wave height during the 2014 federal season was 2.67ft and during the 2015 federal season the mean daily wave height was 1.11ft. The mean anglers/d estimated for the 2015 federal season was 216% higher than the mean anglers/d for 2014 federal season. In 2014, the estimated daily anglers and mean wave height followed an inverse relationship; relatively high numbers of anglers were fishing on days with lower relative wave heights. In 2015, daily mean wave heights for much of the 10 days were nearly ideal which afforded greater access to the fishing grounds. A similar relationship between anglers/d and wave height occurred in 2015.

4.5 Use of Video Cameras to Estimate Effort and Landings

Since 2011, ADCNR has installed 19 video cameras along Alabama's coast to enhance public safety and assist with enforcement and monitoring of commercial and recreational fishing activities. ADCNR managers believed video could be used to estimate landings for private anglers using public boat launches, a large proportion of the component of the Alabama private angler recreational fishery. It is estimated from Snapper Check reports that 60% of the red snapper effort commences at public access sites. Powers and Anson (2016) used archived video to estimate effort and landings for six of the most popular boat launches used by Red Snapper anglers during the federal Red Snapper season in 2014 and 2015. Vessel passengers observed in the video were assigned Red Snapper fishing status if; 1) the type and length of vessel matched those that were known to participate in Red Snapper fishing activities and 2) fishing poles of the type/size used by offshore anglers were observed. The researchers counted potential Red Snapper anglers within randomly-selected 5-minute time blocks during hours when daylight was sufficient to assign trip type (0500-2059). Hourly estimates of departing anglers for each monitored public boat launch were calculated for the remainder of the hour not directly counted and hourly estimated angler trip totals were summed for each day of the fishing season. Mean landed fish/angler trip derived from Snapper Check validations collected at the same boat launches were multiplied by the estimated angler trips to estimate fish landed for the six boat launches. Archived video from four of the six boat ramps were available for 2012 and 2013. The researchers used actual angler counts from all available ramps during 2012-2015 and corresponding weather data (wind speed, wave height and rainfall) to develop a model to predict fishing effort. Effort for the two missing ramps was calculated based on a regression of observed angler trips and weather conditions multiplied by weather observations from 2012 and 2013. Mean landed fish/angler was estimated using MRIP catch data collected at the six boat launches from 2012 and 2013 and multiplied by the modelled effort estimates to generate estimates of harvested fish for 2012-2015.

Federal season estimates from the three surveys were compared to each other to determine how the estimates varied from one another and if trends were evident. Please note that the video camera survey estimates are only for the most popular six boat ramps in Coastal Alabama and account for less than 60% of the private recreational effort. To remove the influence of mean weight only harvested fish were considered for the comparison. The number of harvested fish estimated from the video camera survey represents the number of landed fish. The Snapper Check data represents the total landed fish and total dead discards. The MRIP estimate has two caveats. First, the estimate includes harvest during Wave 3 (May and June). The APAIS survey conducted in Alabama does not differentiate trips conducted in Florida waters greater than 3 miles from angler trips conducted in federal waters greater than 3 miles off Alabama; therefore, some MRIP harvest during Wave 3 could include harvest from Florida waters. Second, the MRIP

estimate includes fish observed by the interviewer (described as Type A fish) and fish unavailable for observation by the interviewer (described as Type B1 fish). Besides landed fish unavailable to the interviewer, other Type B1 fish included fish reported as discarded dead, used for bait or used for some other purpose. The MRIP estimates and Snapper Check estimates should be very comparable as fish reported as used for bait or some other purpose are very uncommon for Red Snapper.

A summary of harvested fish estimates for the 2012-2015 federal seasons from the Powers and Anson video camera, and MRIP surveys and 2014-2015 Snapper Check program is provided in Table 4.5.1. Year-to-year trends in the relative numbers of harvested fish within each survey were similar to one another. The video survey estimates of landed fish expressed as a percentage of MRIP harvested fish from 2012-2015 ranged from 12.2 - 46.5%. The percentages for the same data from 2013-2015 ranged from 12.2 – 19.5%. Snapper Check and MRIP estimates had similar rates of change from 2014 to 2015; 123% and 122%, respectively. The 2012 Red Snapper federal fishing season was the longest in the selected data series yet the number of harvested fish estimated by MRIP in 2012 was 20 – 66% less than the annual harvested fish estimates for 2013-2015. MRIP Red Snapper estimates for 2013 and subsequent years were derived using APAIS dockside sampling methods that were different from those used during 2012 and this change may have contributed to the significant increases in harvested fish estimates in later years. Harvested fish estimates from Snapper Check were 248.4% and 399.5% larger than estimated landed fish from the video camera survey in 2014 and 2015, respectively. MRIP estimates of harvested fish were 512.2% and 819.2% higher than the video camera survey estimates in 2014 and 2015. The percentages of harvested fish from Snapper Check compared to MRIP estimates during 2014 and 2015 were nearly identical, 48.5% and 48.8%, respectively.

5.0 Discussion

5.1 Snapper Check Review and Use for Monitoring In-Season Landings

A large portion of vessels with Red Snapper observed by DCNR staff did not file landing reports in the first two years of the Snapper Check program. Additionally, of the validated vessels with Red Snapper, some landing reports were being submitted after the time of observation. The validation encounter appeared to influence reporting as validated vessels were found to report more than vessels that were not validated. In order to improve reporting rates in the future anglers will be reminded of the reporting requirement and timeliness of reporting will be stressed. In addition, enforcement staff will increase patrols and issue citations for non-reporting. The use of a conservative landing matching procedure incorporating a period of time before and after the time of validation ensured reported trips were matched appropriately to observations. Estimated

reporting rates for all private vessel trips landing Red Snapper were 36% and 18.5% in 2014 and 2015, respectively. However; the low reporting rates did not preclude the Snapper Check program from generating precise estimates of private angler Red Snapper landings during time periods when harvest was anticipated and at levels correlating to season length and weather. Additionally, Snapper Check landings estimates from 2014 and 2015 were of similar proportions to estimates from alternative survey methods. For both 2014 and 2015, the MRIP estimated landings for Alabama were more than 200% higher than the Snapper Check landings estimates (Table 4.5.1). Snapper Check proportional standard errors (PSE) were much lower than MRIP PSE for all waves (Table 4.4.1).

Timeliness of trip reporting is essential to real-time quota monitoring. During the first two years of Snapper Check, over 82% of the submitted private reports were received via electronic methods which may be sufficient for in-season monitoring. Season length projections could be made prior to a fishing season based on average estimated daily trips in prior years. Variables such as weather, average weight of harvested fish, and reporting under-coverage are the areas of largest uncertainty and can cause in-season harvest estimates to be significantly different from projected harvest estimates. Currently, a lag time of approximately 7 days exists between collection and processing of data (both reported data from paper reports and validation data) before data can be used. This is significantly shorter than the time for estimates of catch using the MRIP program. Short seasons with reporting rates significantly less than those used in landings projections could cause in-season landings estimates to be underestimated leading to a quota overage. Also, projection of landings is problematic as the average weight of harvested fish may change as a result of fishing behavior or year class strength. Monitoring of landings for in season closures using Snapper Check would be most effective during season lengths of 14 days or longer to allow time to collect and process data to determine actual reporting rates and mean fish weight.

AMRD believes that working diligently with NOAA MRIP staff and NOAA MRIP consultants during this process that the Alabama Snapper Check Red Snapper Reporting Program has proven to be a valid alternative to MRIP for more accurately capturing the landings in Alabama during a short season fishery such as red snapper.

6.0 Literature Cited

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Unless otherwise noted, MRIP data was gathered from the National Marine Fisheries Service, Fisheries Statistics Division's recreational data webpage, <http://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index> .

Data analysis for this report was generated using SAS software, Version 9.3 of the SAS System for PC. Copyright © 2002-2010 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

7.0 Tables

Table 1.2.1. Red Snapper federal and state private mode season dates and total fishing days during 2014 and 2015. Overlapping days were counted as one day.

Year	Fishing Season Dates			Total Season Days
	Federal	Alabama	Florida	
2014	June 1 - 9	July 4-6, 11-13, 18-20, 25-27	May 24 - July 14	58
2015	June 1 – June 10	July 1 - July 31	May 23 - July 12, Sept. 5-7, 12, 13, 19, 20, 26, 27, Oct. 3, 4, 10, 11, 17, 18, 24, 25, 31 and Nov. 1	70

Table 2.4.1. Number of private vessel reports submitted through Snapper Check by year, fishing season, and method of reporting.

Year	Fishing Season	Reporting Method				Totals
		App	Online	Phone	Paper	
2014	Federal	989	105	227	309	1,630
	State	173	38	36	22	269
	Total	1,162	143	263	331	1,899
	% of Total	61.2	7.5	13.9	17.4	100.0
2015	Federal	1,326	79	220	355	1,980
	State	147	17	23	26	213
	Total	1,473	96	243	381	2,193
	% of Total	67.2	4.3	11.1	17.4	100.0

Table 2.4.2. Number of private vessel reports, reported anglers, landed Red Snapper and discarded dead from Snapper Check landing reports by year, wave, and fishing season.

Year	Wave	Fishing Season	No. of Reports Submitted	No. of Anglers Reported	No. of RSN Harvested	No. of Dead Discards
2014	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	1,630	8,221	14,699	1,699
		State	157	686	1,173	144
	4	Federal	.	.	.	.
		State	112	456	553	64
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
Totals			1,899	9,363	16,425	1,907
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	1,980	9,639	17,625	1,865
		State	43	207	356	32
	4	Federal	.	.	.	.
		State	160	614	755	115
	5	Federal	.	.	.	.
		State	10	35	51	0
	6	Federal	.	.	.	.
		State	.	.	.	.
Totals			2,193	10,495	18,787	2,012

Table 2.4.3. Means and standard errors for reported number of private vessel anglers, harvested Red Snapper, harvest per angler, and discarded dead by vessel trip by year, wave, and fishing season.

Year	Wave	Fishing Season	Mean Anglers /Report (SE)	Mean RS Harvested /Report (SE)	Mean RS Harvested /Angler (SE)	Mean RS Dead Discards /Report (SE)
2014	1	Federal				
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	5.04 (0.07)	9.02 (0.14)	1.76 (0.01)	1.04 (0.06)
		State	4.37 (0.17)	7.47 (0.36)	1.74 (0.06)	0.92 (0.28)
	4	Federal	.	.	.	.
		State	4.07 (0.16)	4.94 (0.35)	1.24 (0.06)	0.57 (0.15)
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	4.86 (0.06)	8.72 (0.12)	1.77 (0.01)	0.94 (0.05)
		State	4.81 (0.33)	8.23 (0.67)	1.75 (0.11)	0.74 (0.13)
	4	Federal	.	.	.	.
		State	3.83 (0.14)	4.72 (0.28)	1.26 (0.05)	0.72 (0.26)
	5	Federal	.	.	.	.
		State	3.50 (0.52)	5.1 (0.81)	1.50 (0.17)	0.00 (.)
	6	Federal	.	.	.	.
		State	.	.	.	.

Table 2.4.4. Number of private vessel landing reports submitted in 2015 and means and standard errors for anglers/report, Red Snapper harvest/angler and dead discards/report by fishing season.

Fishing Season	Access Type	No. Landing Reports	Mean Anglers / Report (SE)	Mean Harvest / Angler (SE)	Mean Dead Discards / Report (SE)
Federal	Private	771	5.40 (0.11)	1.82 (0.01)	0.88 (0.09)
	Public	1,163	4.55 (0.07)	1.74 (0.01)	1.00 (0.07)
State	Private	69	4.58 (0.22)	1.25 (0.08)	1.06 (0.58)
	Public	135	3.71 (0.16)	1.42 (0.06)	0.52 (0.08)

Table 3.6.1. Number of private validations, anglers, Red Snapper harvested and discarded dead from Snapper Check validations by year, wave, and fishing season for 2014 and 2015.

Year	Wave	Fishing Season	No. of Validations	No. of Anglers	No. of RSN Harvested	No. of Dead Discards
2014	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	322	1,444	2,332	139
		State	6	20	28	3
	4	Federal	.	.	.	.
		State	17	55	69	1
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
Totals			345	1,519	2,429	143
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	640	2,838	4,741	356
		State	3	16	21	0
	4	Federal	.	.	.	.
		State	33	102	119	21
	5	Federal	.	.	.	.
		State	1	4	4	0
	6	Federal	.	.	.	.
		State	.	.	.	.
Totals			677	2,960	4,885	377

Table 3.6.2. Mean and standard error ($p < 0.05$) for number of private anglers, Red Snapper harvested per vessel trip, Red Snapper harvested per angler, and dead discards per vessel trip by year, wave, and fishing season from validations collected during 2014 and 2015.

Year	Wave	Fishing Season	Mean Anglers /Validation (SE)	Mean RS Harvested /Validation (SE)	Mean RS Harvested /Angler (SE)	Mean Dead Discards /Validation (SE)
2014	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	4.44 (0.11)	7.18 (0.25)	1.58 (0.03)	0.43 (0.06)
		State	3.33 (0.67)	4.67 (0.99)	1.47 (0.25)	0.50 (0.50)
	4	Federal	.	.	.	.
		State	3.24 (0.25)	4.06 (0.49)	1.29 (0.14)	0.06 (0.06)
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	4.43 (0.08)	7.41 (0.18)	1.65 (0.02)	0.56 (0.05)
		State	5.33 (0.33)	7.00 (1.73)	1.29 (0.26)	0.00 (.)
	4	Federal	.	.	.	.
		State	3.09 (0.23)	3.61 (0.39)	1.21 (0.11)	0.64 (0.32)
	5	Federal	.	.	.	.
		State	4.00 (.)	4.00 (.)	1.00 (.)	0.00 (.)
	6	Federal	.	.	.	.
		State	.	.	.	.

Table 3.6.3. Number of Red Snapper measured and weighed from private vessel validations and mean weight with standard error ($p < 0.05$) by year, wave and fishing season.

Year	Wave	Fishing Season	No.RS Measured	No. RS Weighed	Mean Weight-LBS (SE)
2014	1	Federal	.	.	.
		State	.	.	.
	2	Federal	.	.	.
		State	.	.	.
	3	Federal	1,453	1,434	8.38 (0.12)
		State	23	22	4.28 (0.63)
	4	Federal	.	.	.
		State	41	41	5.69 (0.68)
	5	Federal	.	.	.
		State	.	.	.
	6	Federal	.	.	.
		State	.	.	.
2015	1	Federal	.	.	.
		State	.	.	.
	2	Federal	.	.	.
		State	.	.	.
	3	Federal	536	532	8.52 (0.21)
		State	8	8	3.66 (0.52)
	4	Federal	.	.	.
		State	59	52	6.46 (0.70)
	5	Federal	.	.	.
		State	.	.	.
	6	Federal	.	.	.
		State	.	.	.

Table 4.3.1. Number of validations, validations with matching report and ratio estimators with standard errors ($p < 0.05$) for anglers, harvested Red Snapper, and dead discards by year, wave and fishing season. Reports were matched using the -3.5 – 3.5 hour time period and the combined trip metrics of number of anglers, landed fish, and dead discards.

Year	Wave	Fishing Season	No. Validations	No. Validations w/ Matching Report	Angler Ratio Estimator (SE)	Harvested RS Ratio Estimator (SE)	Dead Discard Ratio Estimator (SE)
2014	1	Federal	.	.	2.71 (0.22)	2.58 (0.21)	3.56 (0.78)
		State	.	.	2.50 (0.70)	2.20 (0.58)	1.00 (0.00)
	2	Federal	.	.	2.71 (0.22)	2.58 (0.21)	3.56 (0.78)
		State	.	.	2.50 (0.70)	2.20 (0.58)	1.00 (0.00)
	3	Federal	322	115	2.71 (0.22)	2.58 (0.21)	3.56 (0.78)
		State	6	4	1.25 (0.26)	1.25 (0.30)	1.00 (0.00)
	4	Federal	.	.	2.71 (0.22)	2.58 (0.21)	3.56 (0.78)
		State	17	4	3.93 (1.76)	3.14 (1.31)	1.00 (0.00)
	5	Federal	.	.	2.71 (0.22)	2.58 (0.21)	3.56 (0.78)
		State	.	.	2.50 (0.70)	2.20 (0.58)	1.00 (0.00)
	6	Federal	.	.	2.71 (0.22)	2.58 (0.21)	3.56 (0.78)
		State	.	.	2.50 (0.70)	2.20 (0.58)	1.00 (0.00)
2015	1	Federal	.	.	5.19 (0.46)	4.79 (0.44)	5.65 (1.20)
		State	.	.	7.63 (3.64)	6.26 (2.98)	5.25 (5.03)
	2	Federal	.	.	5.19 (0.46)	4.79 (0.44)	5.65 (1.20)
		State	.	.	7.63 (3.64)	6.26 (2.98)	5.25 (5.03)
	3	Federal	640	123	5.19 (0.46)	4.79 (0.44)	5.65 (1.20)
		State	3	0	7.63 (3.64)	6.26 (2.98)	5.25 (5.03)
	4	Federal	.	.	5.19 (0.46)	4.79 (0.44)	5.65 (1.20)
		State	33	4	6.38 (2.98)	5.17 (2.39)	5.25 (5.03)
	5	Federal	.	.	5.19 (0.46)	4.79 (0.44)	5.65 (1.20)
		State	1	0	7.63 (3.64)	6.26 (2.98)	5.25 (5.03)
	6	Federal	.	.	5.19 (0.46)	4.79 (0.44)	5.65 (1.20)
		State	.	.	7.63 (3.64)	6.26 (2.98)	5.25 (5.03)

Table 4.3.2. Estimates and proportional standard errors (PSE) of anglers, landed Red Snapper, dead discards, and landings estimates from the Snapper Check Program using the ratio estimators calculated for the -3.5 – 3.5 hour time period and the combined trip metrics of number of anglers, landed fish, and dead discards.

Year	Wave	Fishing Season	Estimated Anglers	Estimated Anglers PSE	Estimated RS Harvested	Estimated RS Harvested PSE	Estimated Dead Discards	Estimated Dead Discards PSE	Estimated RS Landings (LBS)	Estimated RS Landings PSE	
2014	1	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
	2	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
	3	Federal	22,312	7.9	39,893	7.9	4,611	28.8	334,309	8.0	
		State	858	20.8	1,466	23.9	144	0.2	6,272	28.1	
	4	Federal	0	.	0	.	0	.	0	.	
		State	1,791	44.9	2,173	33.3	45	0.2	12,368	35.4	
	5	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
	6	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
Totals			24,961	11.0	43,532	9.7	4,819	27.6	352,949	9.3	
2015	1	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
	2	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
	3	Federal	50,010	8.9	89,576	8.4	9,676	23.1	763,421	8.7	
		State	1,578	47.8	2,229	47.7	168	95.8	8,167	49.8	
	4	Federal	0	.	0	.	0	.	0	.	
		State	3,915	46.8	4,813	37.5	733	79	31,100	39.1	
	5	Federal	0	.	0	.	0	.	0	.	
		State	267	47.8	319	47.7	0	.	1,944	48.8	
	6	Federal	0	.	0	.	0	.	0	.	
		State	0	.	0	.	0	.	0	.	
	Totals			55,770	12.9	96,937	10.9	10,577	28.1	804,632	14.5

Table 4.3.3. Mean number of reported trips (standard errors) submitted by validation status and reported access type during the 2015 federal and state fishing seasons.

Fishing Season	Mean Reported Trips (SE) for Validated Vessels Using Private Access	Mean Reported Trips (SE) for Validated Vessels Using Public Access	Mean Reported Trips (SE) for Un-validated Vessels Using Private Access	Mean Reported Trips (SE) for Un-validated Vessels Using Public Access	Mean Reported Trips (SE) for All Reporting Vessels
Federal	2.14 (0.18)	2.26 (0.09)	1.94 (0.07)	1.78 (0.05)	1.92 (0.04)
State	2.20 (0.80)	1.73 (0.20)	1.42 (0.12)	1.35 (0.08)	1.39 (0.07)

Table 4.4.1. Landings estimates and Proportional Standard Errors (PSE) for the MRIP and Snapper Check surveys. Snapper Check Area Fished was designated based on when landing report was submitted – federal fishing season or state fishing season. Landings estimates represent landed fish only (Type A fish in MRIP survey).

Year	Wave	Area Fished	MRIP Landings (LBS)	MRIP Landings PSE	Snapper Check Landings (LBS)	Snapper Check Landings PSE	Snapper Check LBS Difference	Percent Change from MRIP LBS
2014	1	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
	2	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
	3	Federal	938,028	32.2	334,309	8.0	-603,719	-64.4%
		State	22,466	95.2	6,272	28.1	-16,194	-72.1%
	4	Federal	85,612	45.1	0	.	-85,612	
		State	37,511	52.1	12,368	35.4	-25,143	-67.0%
	5	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
	6	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
Totals			1,038,617	28.3	352,949	9.3	-685,668	-66.0%
2015	1	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
	2	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
	3	Federal	1,530,606	30.5	763,421	10.0	-767,185	-50.1%
		State	4,321	100.3	8,167	43.1	3,846	89.0%
	4	Federal	61,428	50.7	0	.	-61,428	
		State	5,851	75	31,100	65.8	25,249	431.5%
	5	Federal	15,348	65.1	0	.	-15,348	
		State	0	.	1,944	13.6	1,944	
	6	Federal	.	.	.	.	.	.
		State	.	.	.	.	.	.
Totals			1,617,554	28.9	804,632	14.5	-812,922	-50.3%

Table 4.5.1. Federal season private angler estimates of harvested fish for 2012-2015 from Powers and Anson (2016) video camera survey and MRIP, and from Snapper Check for 2014-2015. Shaded cells indicate estimates are modelled estimates of angler trips derived from regression of mean angler counts from observed effort and weather relationships matched to in-year weather data multiplied by mean harvest rates/angler derived from APAIS dockside surveys. Public boat launches used during the camera survey included: Baldwin County - Boggy Point, Ft. Morgan, and Cotton Bayou; Mobile County - Bayou La Batre, Billy goat Hole, and Little Billy goat Hole.

Data / Survey	Survey									
	Video Camera ¹				Snapper Check ²		MRIP ^{3,4}			
	2012	2013	2014	2015	2014	2015	2012	2013	2014	2015
Estimated Fish	28,386	37,460	17,918	24,845	44,504	99,252	61,029	294,897	91,770	203,535
Year-to-Year % Change Within Survey	-	32.0	-52.2	38.7	-	123.0	-	383.2	-68.9	121.8
% of Camera Survey Harvested Fish	-	-	-	-	248.4	399.5	215.0	787.2	512.2	819.2
% of Snapper Check Harvested Fish	-	-	40.3	25.0	-	-	-	-	206.2	205.1
% of MRIP Harvested Fish	46.5	12.7	19.5	12.2	48.5	48.8	-	-	-	-


¹ – Estimates include landed fish only from six public boat launches.

² – Estimates include landed fish and dead discards.

³ – Estimates include Type A and Type B1 fish.

⁴ – Estimates are for federal waters (> 3 nm) during May and June

8.0 Figures



Alabama Marine Resources Division
Red Snapper Reporting Program

Nº 20001

Please fill in all information for this vessel trip. Upon trip completion, place the white copy in the drop box and keep the yellow copy with you for Enforcement verification.

If you have already reported this trip electronically or by phone and have a confirmation number, it is not necessary to report using this form.

Date: _____

Time: _____ AM PM (circle one)

No. of Anglers: _____

Vessel Registration #: _____

No. of Red Snapper Harvested: _____ (this trip)

CHARTER TRIPS ONLY:
This trip was a (circle one):
SINGLE DAY TRIP

MULTI-DAY TRIP

No. of Red Snapper Discarded Dead: _____ (floating, eaten by predators, etc.)

County You are Landing Fish (circle one): **BALDWIN** **MOBILE**
(Baldwin County=Orange Beach/Gulf Shores/Ft. Morgan; Mobile County=Dauphin Island/Bayou La Batre)

You are landing red snapper at (circle one): **PUBLIC ACCESS**

PRIVATE ACCESS

(Public access= public launch, public marinas; Private access= private residence, condo/hotel dock, private landing)

Figure 2.2.1. Example of Snapper Check paper report provided at select coastal public boat launches. The charter trip information contained in the box was added in 2015. The questions for county of landing and landing access (added in 2015) were to be completed by private vessel representatives only.

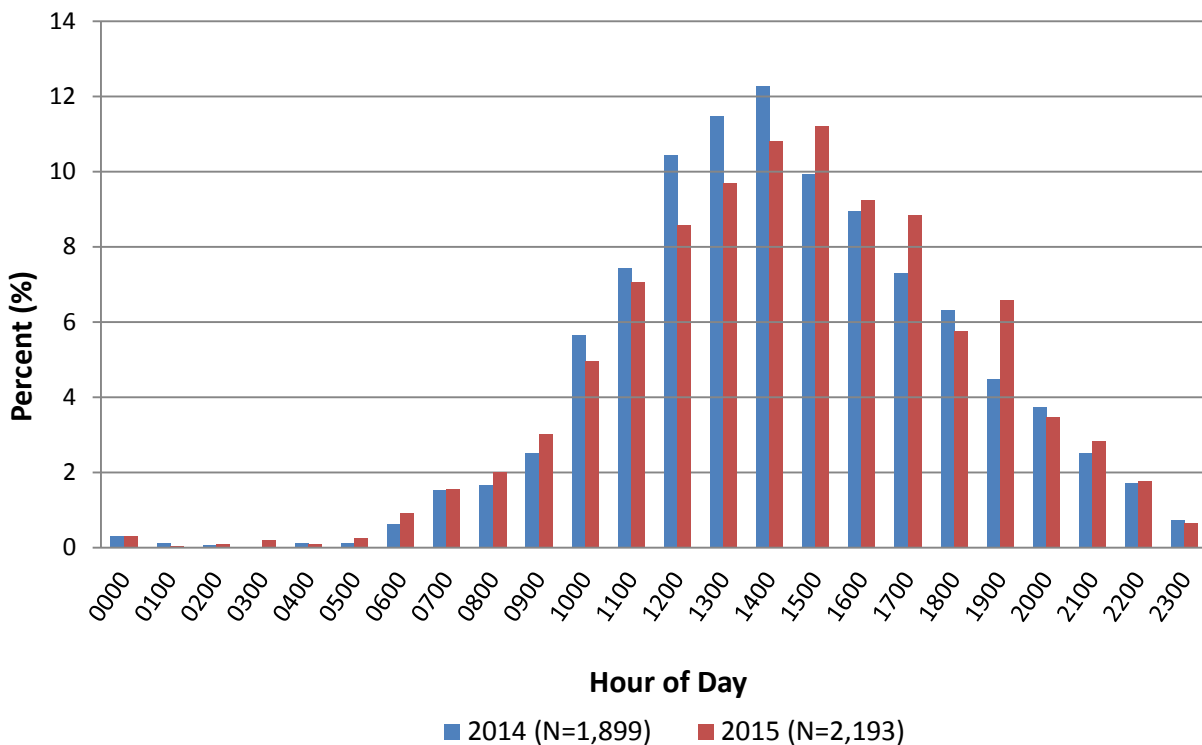


Figure 2.4.1. Percent frequency distribution of time of submission for private vessel landing reports during the 2014 and 2015 **federal** seasons.

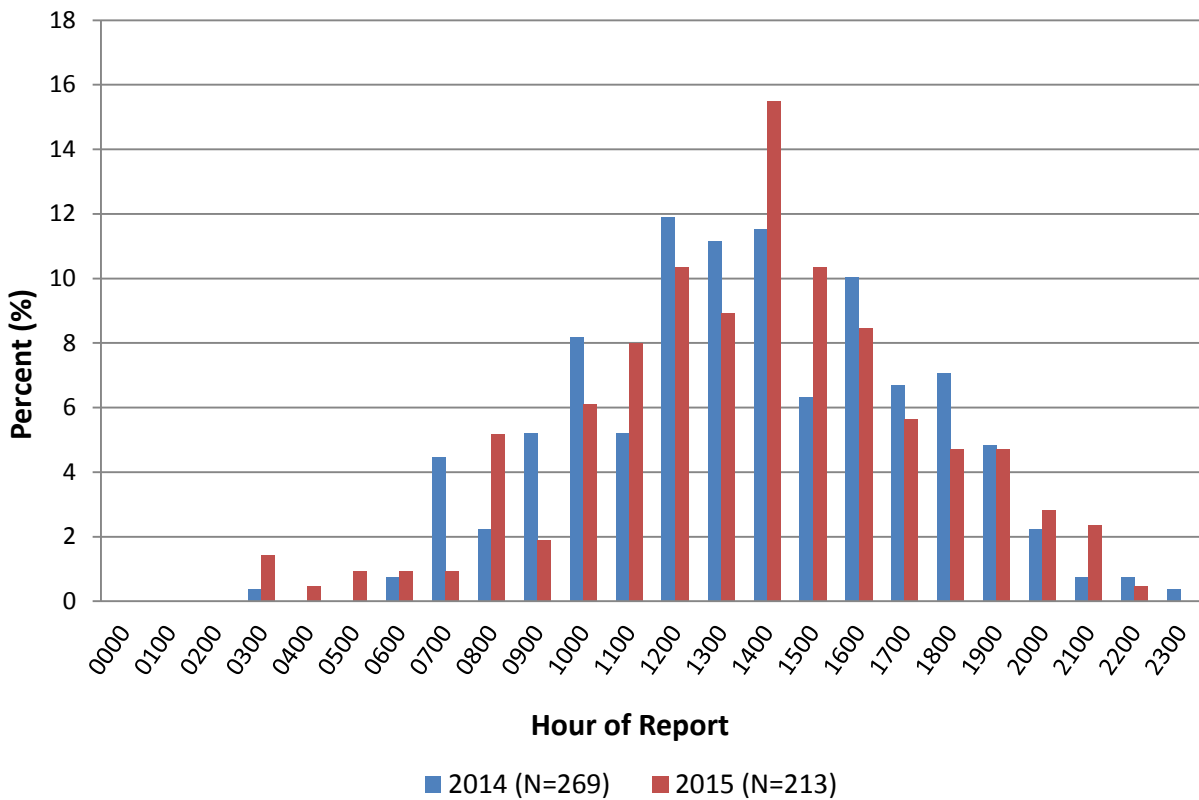


Figure 2.4.2. Percent frequency distribution of time of submission for private vessel landing reports during the 2014 and 2015 **state** seasons.

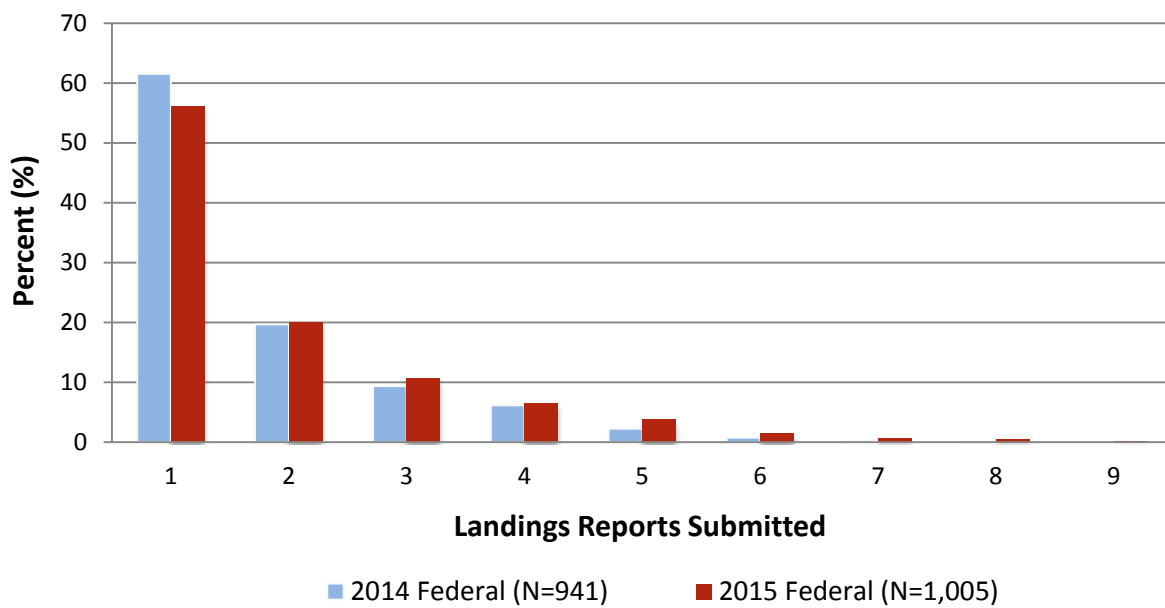


Figure 2.4.3. Percent-frequency distribution of unique vessels by number of reports submitted during the 2014-2015 **federal** seasons.

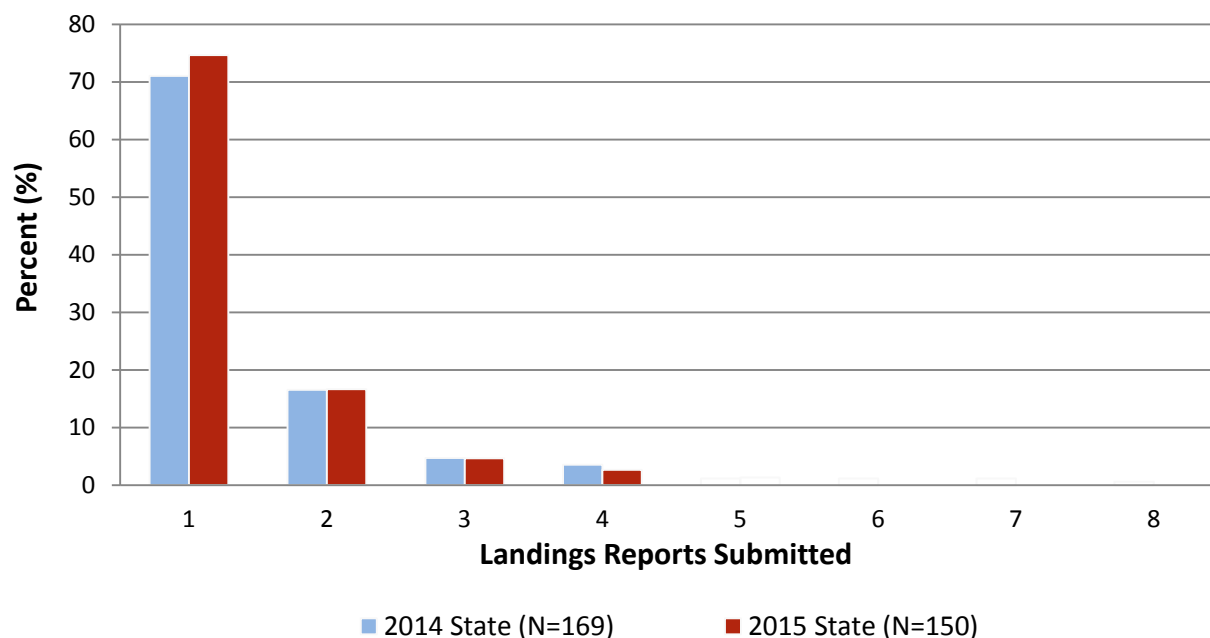


Figure 2.4.4. Percent-frequency distribution of submitted landing reports by unique vessel during the 2014-2015 **state** seasons.

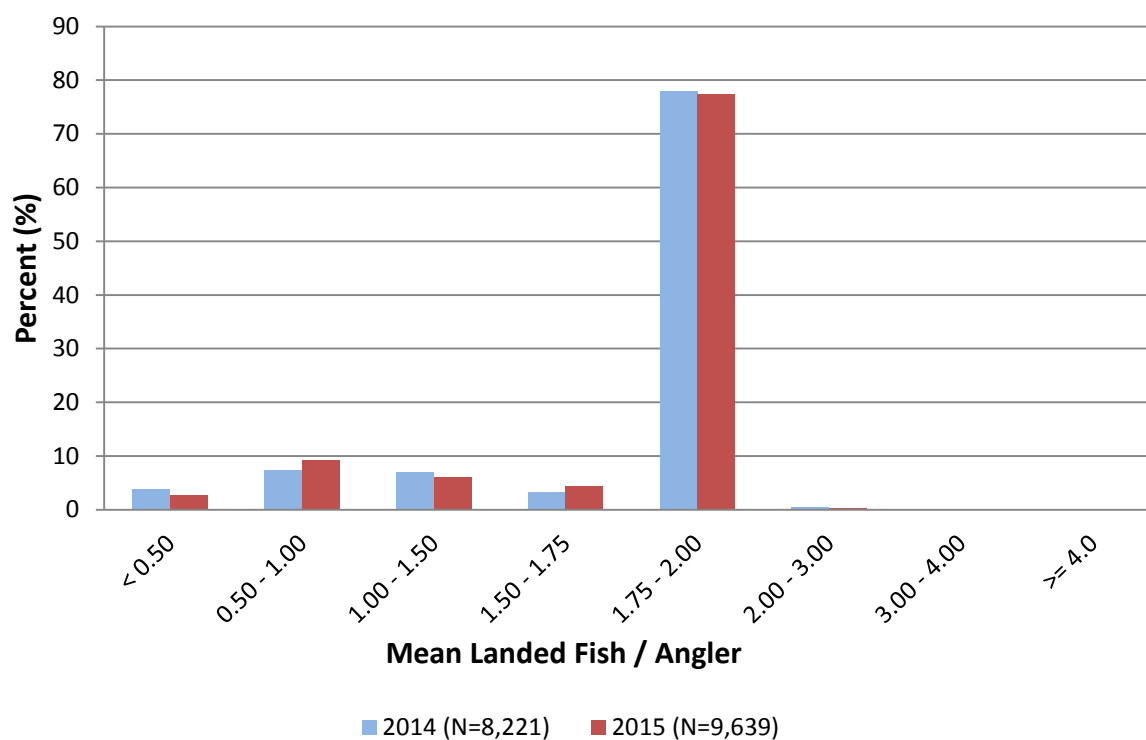


Figure 2.4.5. Percent frequency distribution of mean Red Snapper landed per private angler from Snapper Check reports submitted during the 2014 and 2015 **federal** seasons.

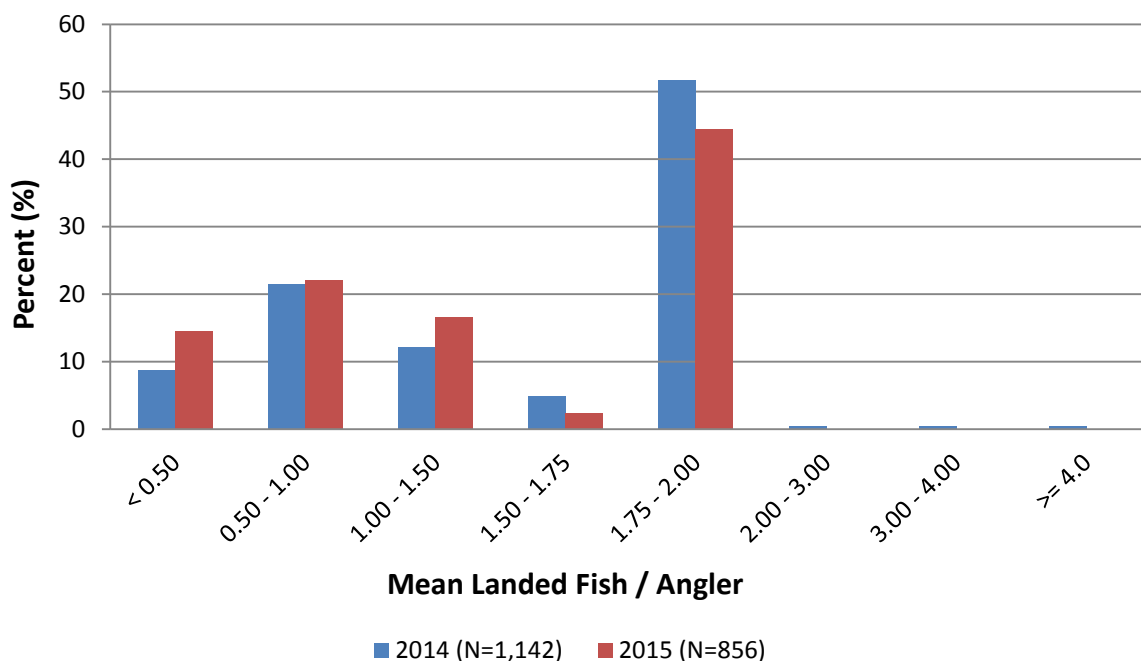


Figure 2.4.6. Percent frequency distribution of mean Red Snapper landed per private angler from Snapper Check reports submitted during the 2014 and 2015 **state** seasons.

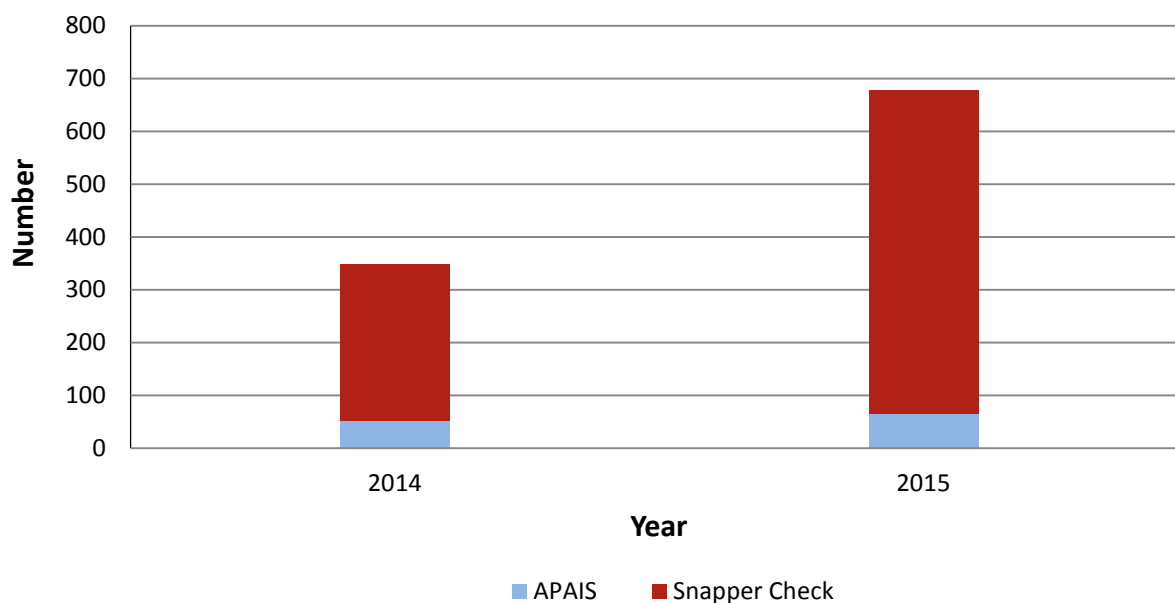


Figure 3.6.1. Number of private vessel validations collected during Snapper Check and APAIS surveys in 2014 and 2015.

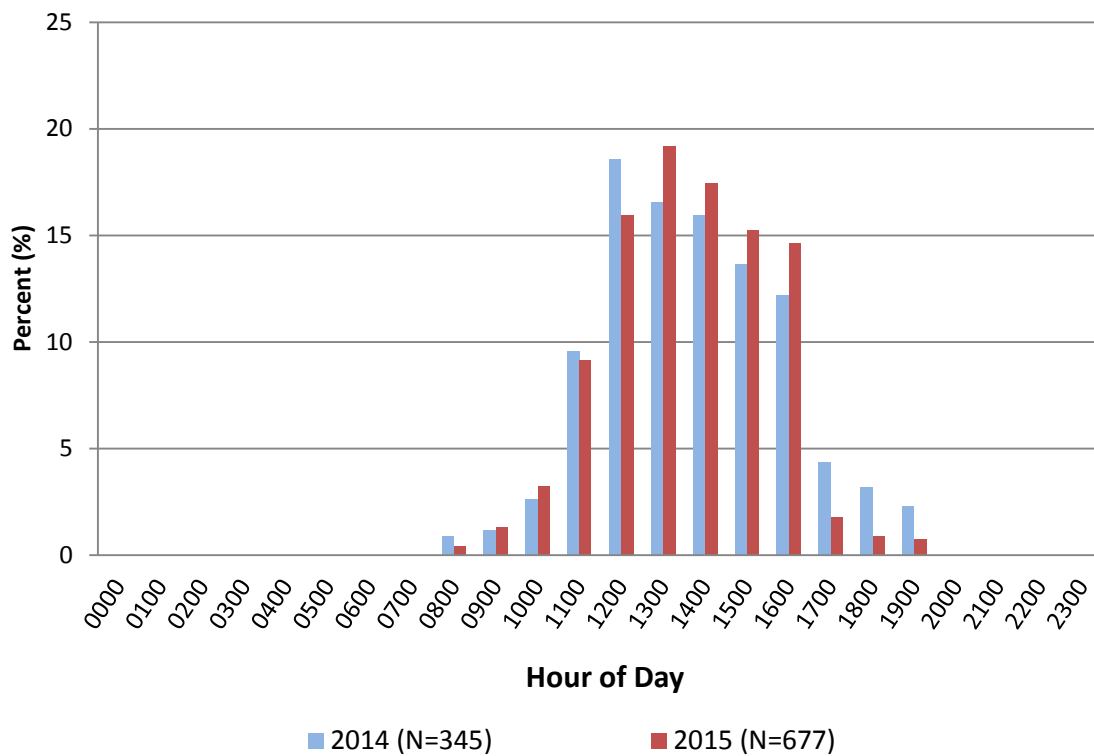


Figure 3.6.2. Percent-frequency distributions of private vessel validations by hour of day during 2014 and 2015.

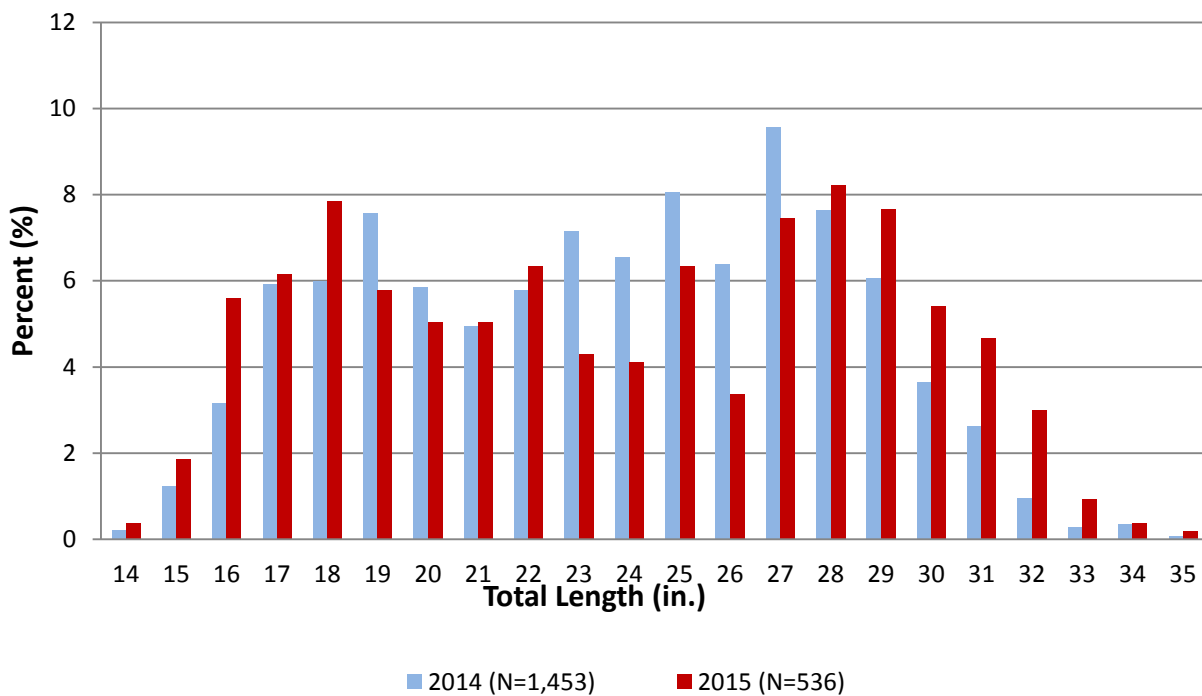


Figure 3.6.3. Percent-frequency distribution of Red Snapper measured (inch groups) from private vessels during the 2014 and 2015 **federal** seasons.

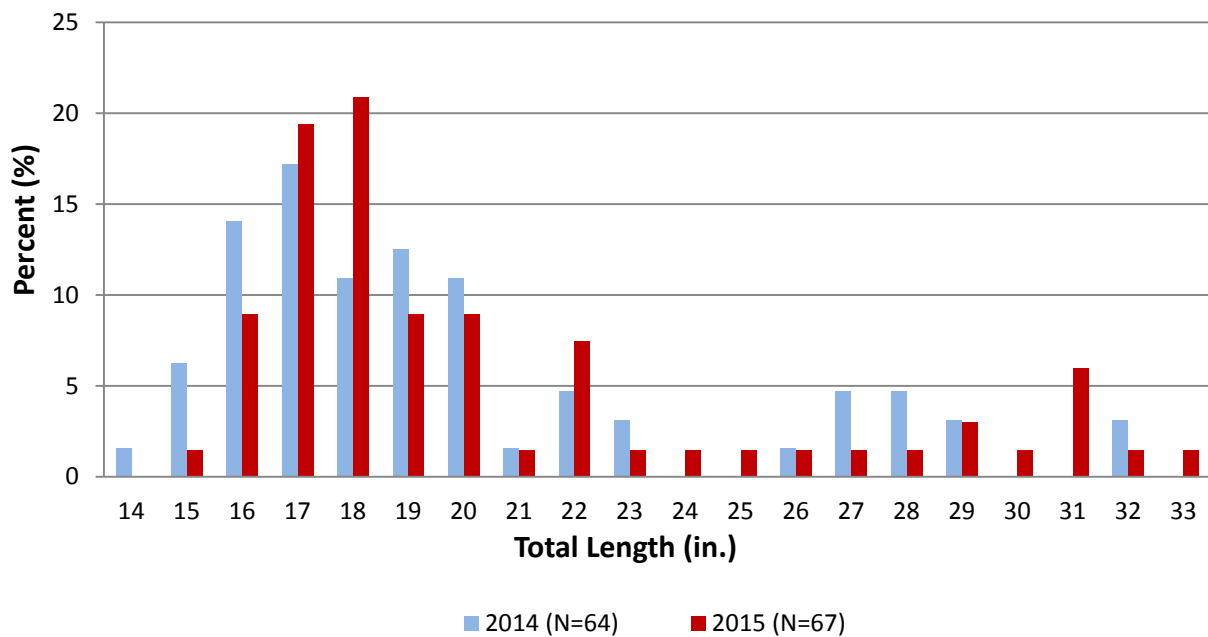


Figure 3.6.4. Percent frequency distribution of Red Snapper measured (inch groups) from private vessels during the 2014 and 2015 **state** seasons.

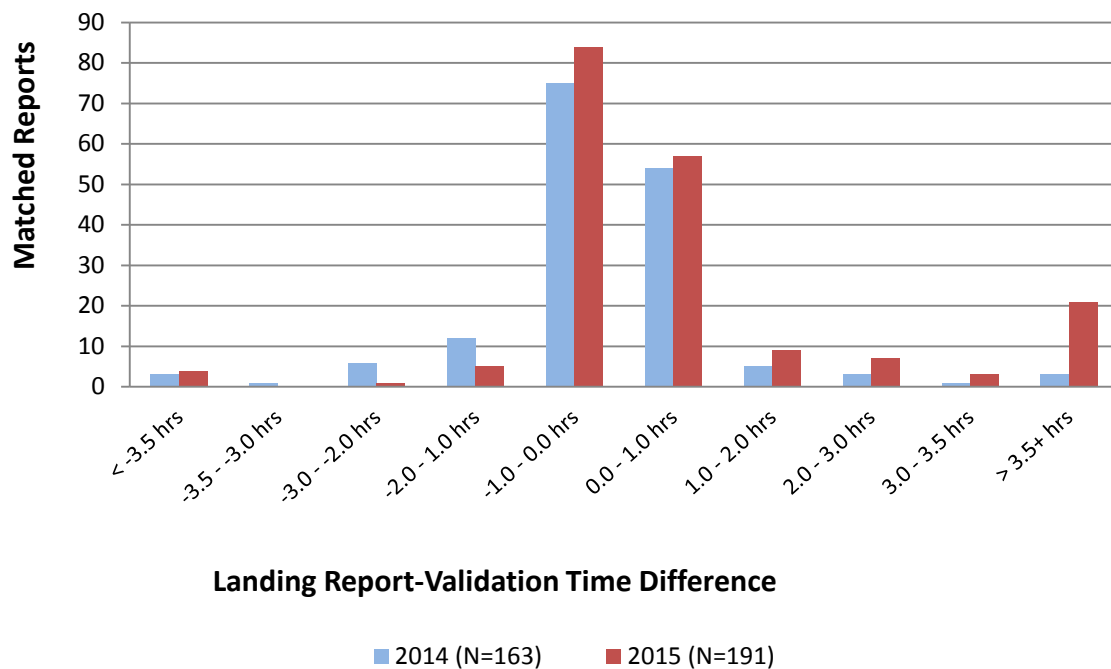


Figure 4.1.1 Distribution of time difference between time of landing report and validation for matched vessel reports for private vessels in 2014 and 2015. A negative number within the report to validation time difference indicates the vessel report was submitted prior to the validation encounter.

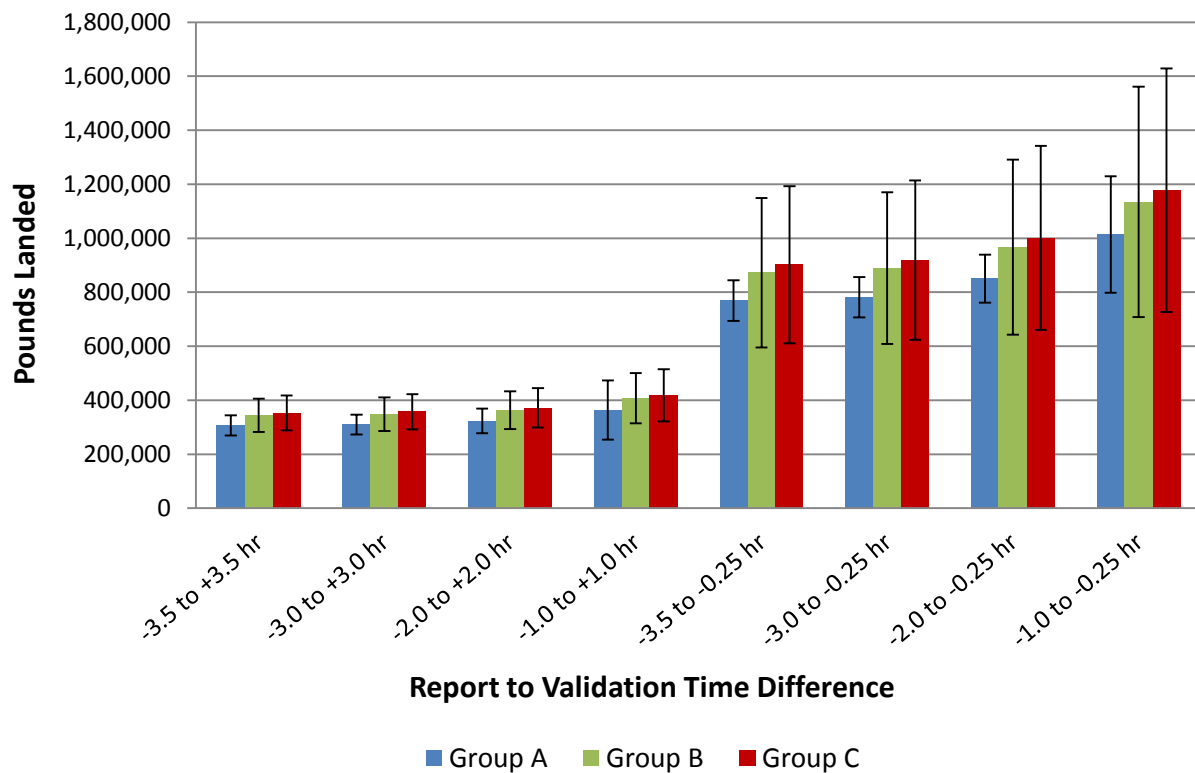


Figure 4.3.1. Point estimates and 95% Confidence Intervals ($p < 0.05$) for 2014 private vessel landings using three methods of matching reports to validations within various times of reporting relative to time of validation. Group “A”- match occurred when the combined total of number of anglers + landed fish between a trip report and validation were the same, Group “B”- match occurred when the combined total number of anglers + landed fish between a trip report and validation were the same and the reported dead discards was within ± 1 of the dead discards recorded on the validation, and Group “C”- match occurred when the combined total number of anglers + landed fish + dead discards between vessel report and validation were the same.

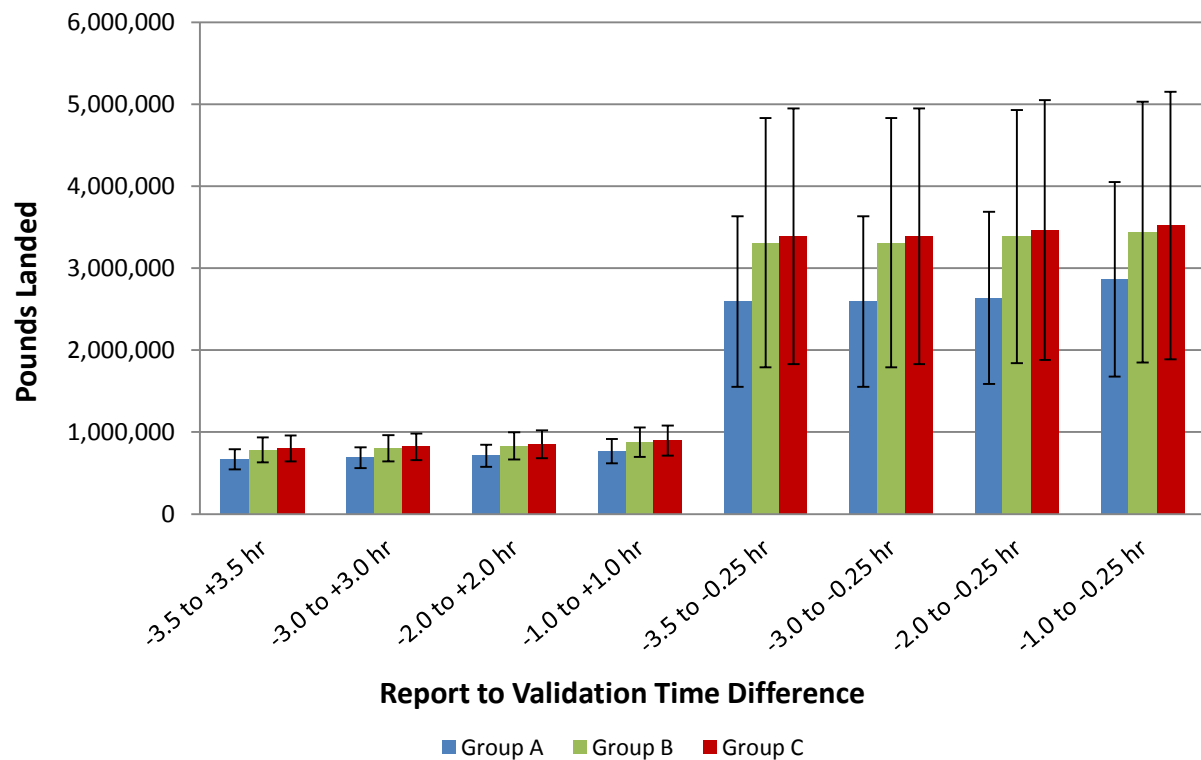


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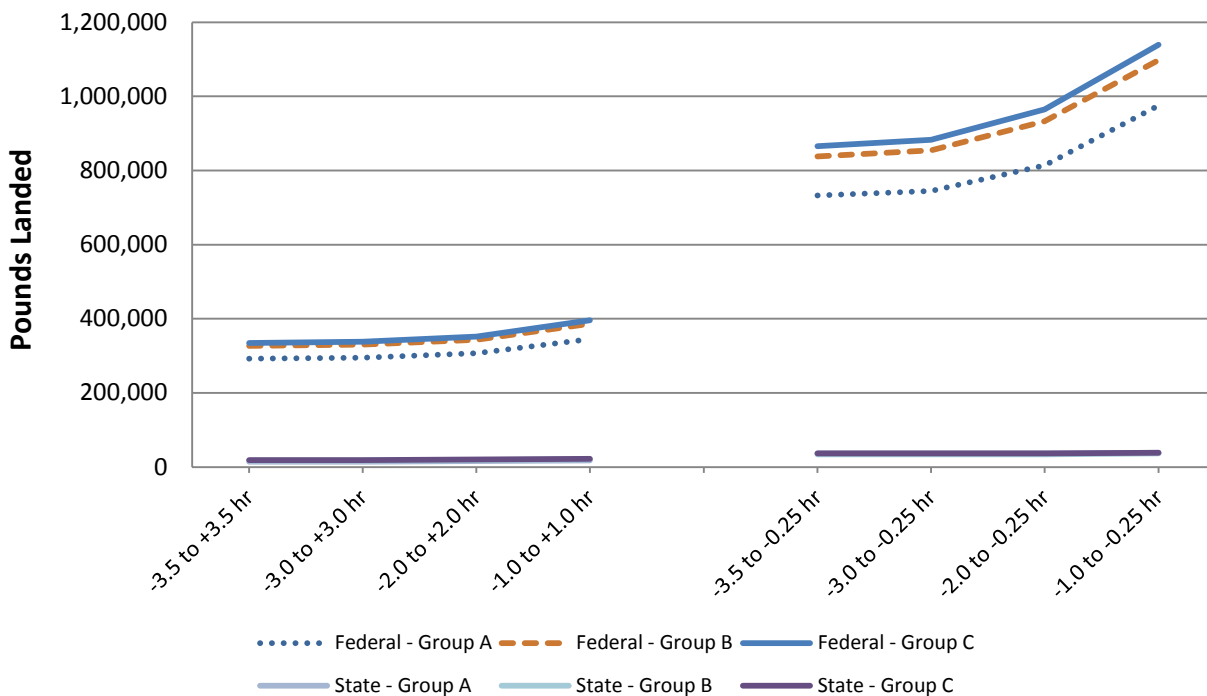


Figure 4.3.3. 2014 landings estimates for private vessels calculated using three methods of matching reports to validations within various times of reporting relative to time of validation. Group “A”- match occurred when the number comprising anglers + landed fish of a landing report was equal to the same number of a validation for the same vessel registration and date, Group “B”- match occurred when the number comprising anglers + landed fish of a landing report was equal to the same number of a validation for the same vessel registration and date and the reported dead discards was within +/- 1 of the dead discards on the validation, and Group “C”- match occurred when the number comprising anglers + landed fish + dead discards of a landing report was equal to the same number of a validation for the same vessel registration and date.

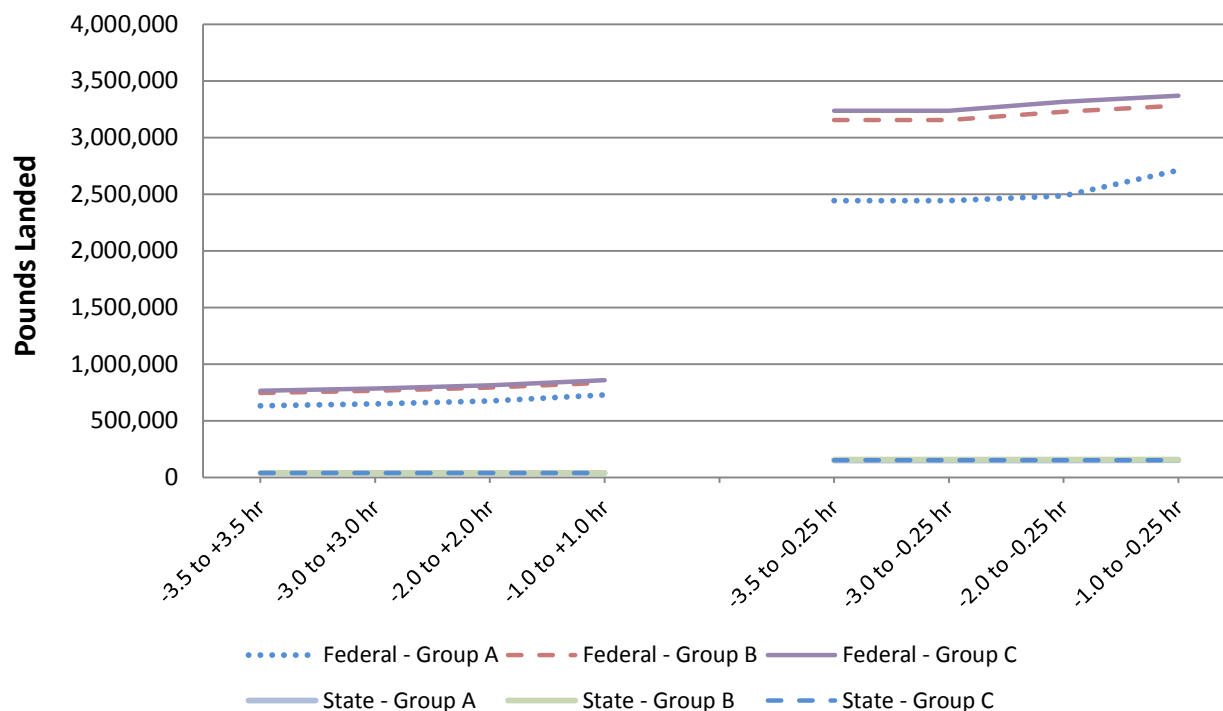


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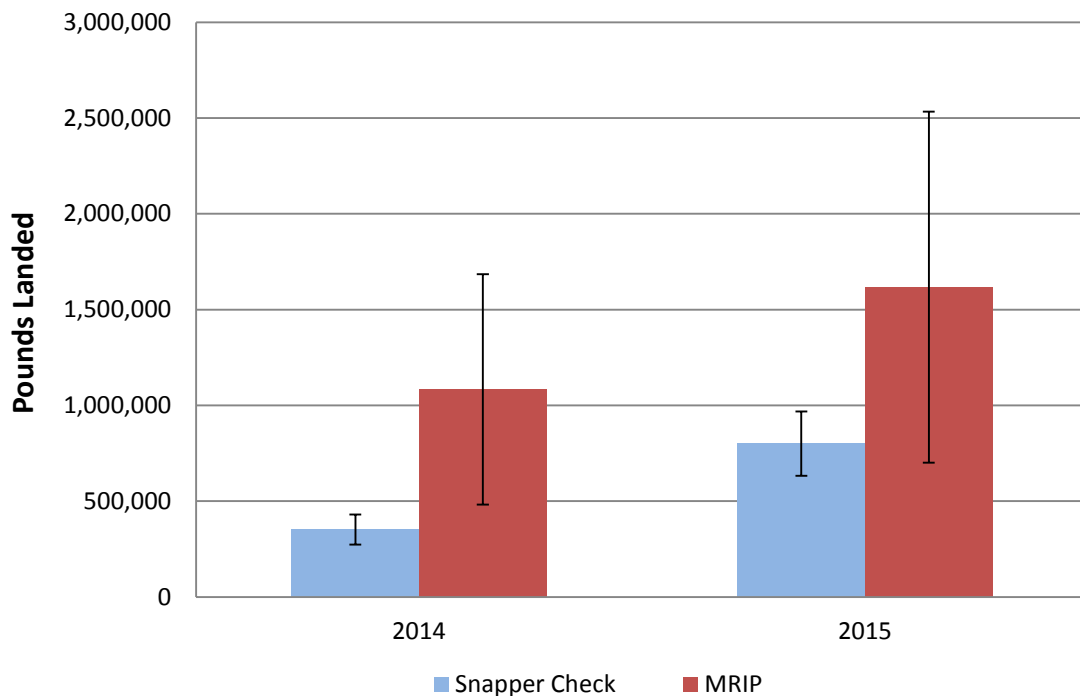


Figure 4.4.1. Snapper Check and MRIP total private landings point estimates and 95% Confidence Intervals ($p < 0.05$).

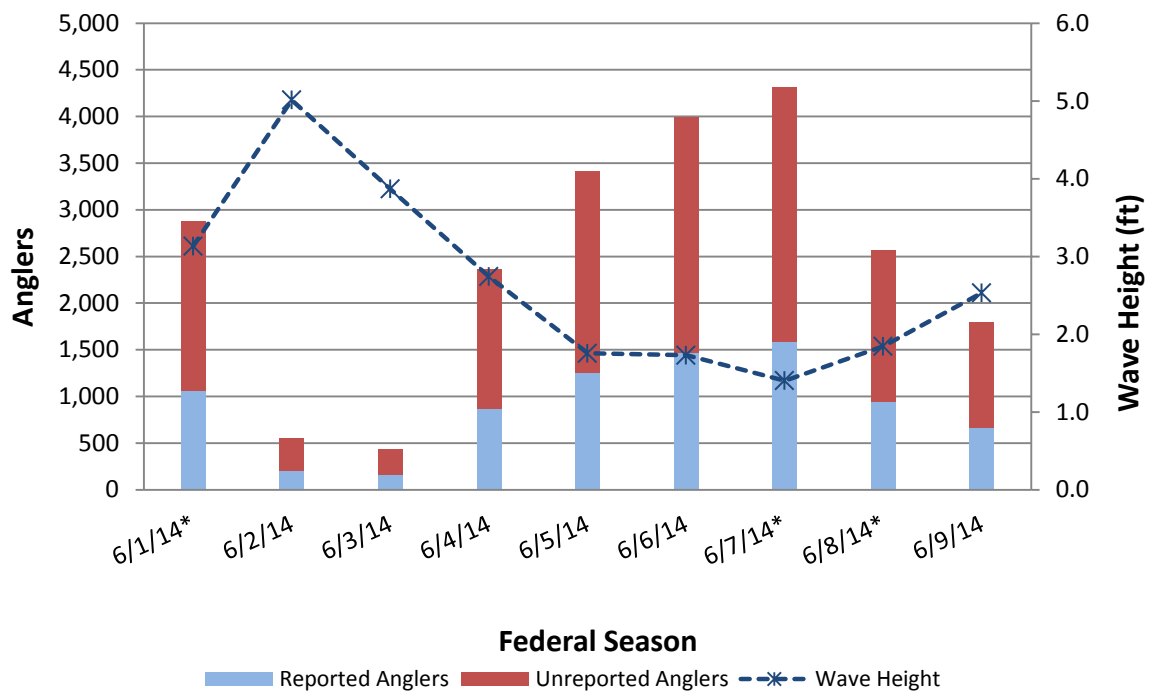


Figure 4.4.2. Daily reported and estimated unreported private vessel angler trips and mean daily wave height (0600-1800 hours) during the 2014 **federal** Red Snapper season. An '*' next to the date indicates a weekend day.

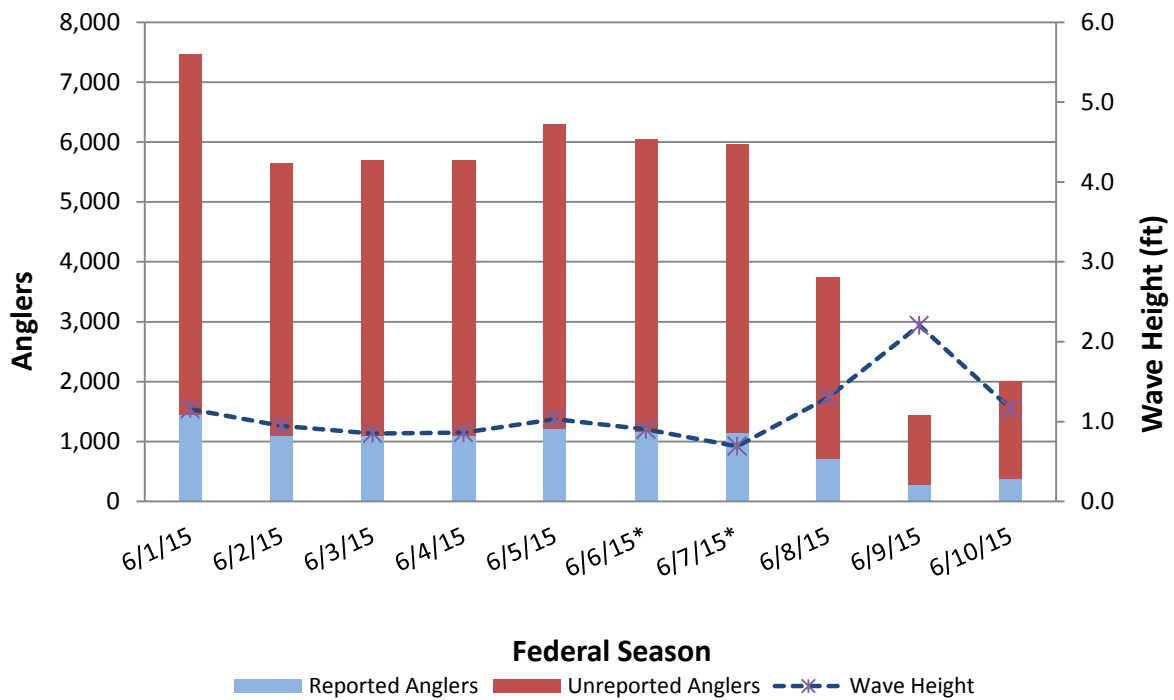


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For-Hire Electronic Census Reporting of Red Snapper Catch in Alabama: 2014-2015

FINAL REPORT

Submitted by:

Kevin Anson

Alabama Department of Conservation and Natural Resources/Marine Resources Division

Acknowledgements:

The author would like to thank the many Department of Conservation and Natural Resources/Marine Resources Division staff who conducted the field sampling activities, entered and checked data. Appreciation is extended to D. Huff for development of the database and reporting data portal and app. A special thanks to all for-hire captains and vessel representatives who reported trip information and to all deckhands for their patience while samplers collected biological information for the survey.

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1.0 Introduction

1.1 Background

Red Snapper, *Lutjanus campechanus*, is a very popular species among Alabama's recreational anglers and is an important fish to Alabama's for-hire fleet. The majority of Red Snapper landed in Alabama by the for-hire fishery are caught in federal waters. Although quotas were gradually increasing in the late 2000's, the federal recreational Red Snapper season length began to decrease during the same time period. Reductions in fishing days were caused primarily by an increasing average weight of fish landed, increasing numbers of fish caught per angler trip, and inconsistent state seasons (SERO-LAPP-2014-04, 2014). In 2013, the 28-day federal water fishing season was the shortest on record, yet, according to federal landings estimates, total recreational (for-hire and private) landings estimates for that year were nearly 200% higher than landings in 2012 which comprised of 42% more federal season days than 2013. Additional federal management measures were implemented in time for the 2014 Red Snapper federal fishing season. These measures included use of a buffer which reduced the amount of quota used to calculate season length and a payback provision which reduced available quota in the subsequent fishing season if quotas were exceeded. The buffer was established to minimize the potential for landings overages in the recreational sector and to reduce the chance for payback penalties being imposed in subsequent years if quotas were exceeded. The recreational data collection system used by federal fisheries managers to monitor landings of red snapper could not provide landings estimates which could be used for in-season monitoring. The two management options and their impact on access to the Red Snapper resource by Alabama's anglers underscored the need for more timely estimates of harvest to prevent quota overages and maximize access to the resource by reducing the size of the buffer.

Alabama anglers voiced their concerns and frustration with federal management of Red Snapper prior to 2013 but the prospect of further reductions in season days, due in part to the dramatic increase in harvest estimates in 2013 and the new management measures, caused their dissatisfaction to reach a new high. Staff with the Alabama Department of Conservation and Natural Resources (ADCNR) were also concerned about management of the recreational fishery and the limited prospect for improving access for Alabama anglers. Therefore, ADCNR managers investigated the use of a mandatory reporting requirement for all anglers landing Red Snapper in Alabama. A complimentary dockside survey of anglers and their catch using a random-stratified sampling design was also considered to account for the average weight of fish being landed and to estimate rates of non-reporting and misreporting. Prior to the 2014 fishing season, the Commissioner of the Alabama Department of Conservation and Natural Resources promulgated a regulation requiring captains of all recreational vessels, for-hire and private, to report all Red

Snapper landed in Alabama prior to landing. Anglers were provided electronic and paper options to submit trip information. The dockside survey results were applied to angler reports to calculate estimates of harvest and discards. This report provides a summary of the results of the reporting program from the 2014 and 2015 fishing seasons. In addition, a brief discussion on the practical use of this reporting program for monitoring in-season landings is provided.

1.2 Fishing Seasons

Table 1.2.1 lists the dates of the federal, Alabama, and Florida for-hire seasons, and the total number of fishing days available to for-hire anglers during 2014 and 2015. Prior to the 2015 season, federal management action separated the recreational quota between the private and for-hire components of the fishery and the result was an increase in season length from 9 days in 2014 to 44 days in 2015. During the same period state season lengths also increased. Florida's season is included in the table as a small number of Alabama state-licensed for-hire captains typically purchase the Florida for-hire license and target Red Snapper during the Florida state season. Currently, validly licensed anglers are allowed to harvest fish from another state's jurisdictional waters and return to an Alabama port as long as the harvested fish meet the size and bag limits for the state of harvest for each licensed angler and the vessel does not stop in Alabama waters. For-hire vessels are restricted from certain jurisdictional areas depending upon the license/permit the vessel is assigned. Only federally-permitted vessels are allowed to fish in federal waters when open and they can only fish in state waters when both state and federal waters are concurrently open.

2.0 Landing Reporting

2.1 Reporting Requirements

On May 13th 2014, the Commissioner of the ADCNR promulgated a regulation requiring captains of vessels; both for-hire and private, to report harvested Red Snapper prior to landing in Alabama. The reporting program was called Snapper Check. Although there was a short time period between the promulgation of the regulation and the beginning of the 2014 federal fishing season (June 1st), the ADCNR utilized various media prior to and after the promulgation of the regulation to inform for-hire captains of the new reporting requirement including; radio advertisements during a popular outdoor show, ADCNR press releases, articles and public service announcements in multiple news publications and fishing magazines, a mailing to for-hire licensees within the ADCNR license database, placing posters at marinas, emails to saltwater license holders and ADCNR staff visiting a local for-hire fishing association meeting. A fine for non-reporting was included with this regulation; however, as this was the first reporting regulation of its kind used by ADCNR no citations were issued during the first two years of the regulation in order to give the

Public enough time to become aware of the need to report. Citations for non-reporting have been issued in subsequent years.

The reporting regulation identified several items which were required to be completed on all submitted reports. These items included; date and time of report, vessel registration number (U.S. Coast Guard documentation or state registration number), fishing status of vessel trip (for-hire or private fishing trip), county of landing, and numbers of anglers, Red Snapper retained, and discarded dead during the fishing trip. In 2015, in order to assist with confirmation of reported data, an additional question regarding the for-hire trip length (single day or multi-day) was added to the list of required data to be reported. The additional question assisted ADCNR staff during QA/QC procedures to confirm reported harvested fish information as anglers on trips lasting more than 24 hours are allowed two daily bag limits per angler (up to 4 fish/angler).

There were approximately six headboats operating in Alabama during 2014 and 2015 and the landings from these vessels were significant. However, owner/operators of these headboats were participating in NOAA Fisheries' Southeast Region Headboat Survey (SERHS). Operators SERHS headboats were required to report numbers of fish harvested for each fishing trip from which harvest estimates were derived. Therefore, the requirement for headboat operators to report information through Snapper Check was waived by ADCNR fisheries managers as it was deemed to be duplicative and represented an excessive reporting burden to operators of these vessels. Headboat operators may be required to report landings through Snapper Check in the future so that real-time estimates of harvest can be calculated for this segment of the for-hire sector and used for in-season monitoring.

2.2 Reporting Options

Anglers were provided multiple means to report trip information including; a toll-free telephone number, online through the ADCNR website, a smartphone app, and paper forms provided at six coastal public boat launches (Baldwin County - Boggy Point, Cotton Bayou and Ft. Morgan; Mobile County - Bayou La Batre Public Docks, Billy goat Hole, and Little Billy goat Hole). Trip information submitted via the toll-free telephone number, online, or app was automatically stamped with the date/time when the report was submitted. In order to successfully complete an electronic report all requested information required a response. For the vessel registration data field, the reporting vessel representative was queried as to the origin of the vessel registration number; U.S. Coast Guard vessel documentation or state vessel registration. If the vessel representative selected U.S. Coast Guard documentation number they were required to submit a minimum of six numbers to complete the field and continue to the next field. For those anglers who indicated landing Red Snapper with a vessel issued a state registration number (XX-0000-XX format) they were prompted

to complete three individual questions – one question for each segment of the registration number. Anglers could not proceed to the next question unless information was provided for each question. There were no restrictions for number of anglers, fish harvested, or dead discards other than the field required a response.

Paper reports (Figure 2.2.1) provided at popular coastal public boat launches frequented by Red Snapper anglers consisted of an original and a carbonless copy and each pair were uniquely numbered. Anglers were instructed to place the original completed copy in secure drop boxes provided on-site and to keep the carbonless copy for law enforcement purposes. ADCNR staff periodically checked drop boxes throughout the fishing season with more frequent visits (once every two days) during the federal portion of the fishing season and less frequent visits during the state water portion of the fishing season. Generally, landings information from paper reports was entered into the database within two business days after collection. For each landing reports (electronic or paper) a unique confirmation number was issued that would allow identification as to which reporting option was used to submit information and assist QA/QC procedures.

2.3 Landing reports QA/QC

Data entry errors were expected for electronically submitted data and during the data entry process for paper reports. Date and time data fields on electronically submitted reports were automatically filled in at time of successful report submission. Data provided for the number of anglers and fish harvested were checked for outliers. Any reports which contained angler harvest rates which exceeded two fish per angler or were less than one fish per angler were scrutinized. During 2014 and 2015, the daily bag limit for each for-hire angler during the federal and state fishing seasons was two Red Snapper. Instances where it appeared the reported data included an error were adjusted. For example, if a report indicated six anglers and 122 harvested fish, the report was changed to reflect a harvest of 12 fish and the value for number of anglers was not changed. Another example where reported data could have been changed would be for a report which indicated 44 anglers and eight fish harvested. In this example, the value for anglers was changed to reflect four anglers were on the trip and the value for harvested fish was not changed. A relatively few number of reports were submitted with “0” harvested fish. As most of the reports with “0” harvested fish contained a value greater than “0” for dead discards it was assumed the person provided the report to report dead discards and the report was not retained in the database. Dead discard information was accepted as submitted as there was no reliable method to correct for data entry errors.

A small number of paper reports were submitted with missing or incomplete vessel registration numbers. For these reports, the reported data was entered; however, an invalid vessel

registration number was recorded in place of the missing or incomplete registration number. Data from paper reports were checked against the original copy and edited as needed. Data were reviewed for outliers and modified as described for electronically submitted reports.

Prior to each fishing season, a list of active for-hire vessels was created for the purpose of comparing to the reported fishing status. In 2015, the list was updated at least once with new permit information. The vessel list was comprised of the following groups; vessels with a valid federal permit, vessels with an Alabama for-hire license, vessels associated with a for-hire permit or license in the previous year but not the current year, and headboats participating in the SERHS. Information for federally permitted vessels was downloaded from NOAA Fisheries' Gulf of Mexico Charter/Headboat for Reef Fish and Historical Captain Gulf of Mexico Charter/Headboat for Reef Fish permits database found in NOAA Fisheries' Southeast Regional Office's Frequent FOIA Requests Regarding Permits, Vessels, and IFQ webpage. Data for Alabama licensed for-hire vessels were obtained from ADCNR's license database. Information for SERHS headboats was acquired from NOAA Fisheries staff administering the program and was included in the vessel list for the purpose of identifying Snapper Check reports. As previously mentioned, headboats were not required to report via Snapper Check but some reports were received which matched registration numbers of vessels in the SERHS. These reports were removed prior to estimate calculations. The final source of for-hire vessels included in the for-hire vessel list was the Alabama vessel directory used for the Marine Recreational Information Program's For-Hire Telephone Survey (FHTS). The FHTS vessel directory is used by the MRIP program to identify the universe of active for-hire vessels in states where the FHTS is conducted from which weekly telephone calls are made to determine estimates of fishing effort. New for-hire vessels are regularly added to the FHTS vessel directory when the identified vessel either is associated with a valid federal permit and Alabama license or the vessel is determined by ADCNR staff to be operating a for-hire business. Many of the vessels found in the federal permit and Alabama license databases were also found in the FHTS directory; however, a small number of vessels in the FHTS directory were not associated with a current permit/license. Unless otherwise noted, all vessel compilations, data preparation, analysis, and final estimate calculations associated with this project were performed using SAS® software (v. 9.3).

Registration numbers from vessels in the for-hire vessel list were matched to registration numbers provided on all landing reports; both private and for-hire. If the registration number on a report with 'for-hire' fishing status matched a registration number of a vessel in the for-hire vessel list the fishing status was not changed. However, if the registration number on a landing reports with 'for-hire' fishing status did not match any registration number in the for-hire vessel list the fishing status was changed to 'private'. The number of reports where trip status was changed from

‘private’ to ‘for-hire’ fishing status was 77 (9.4% of for-hire reports) and 89 (4.0% of for-hire reports) in 2014 and 2015, respectively.

2.4 Summary of Landing Reports

A summary of the landing reports submitted through Snapper Check by year, license group (federal and state), and reporting option is provided in Table 2.4.1. ADCNR received 819 for-hire reports in 2014 and 2,243 reports in 2015. In both years, the majority of reports were submitted through the smartphone app. As a percentage of the annual total, use of the app increased by 11% from 2014 to 2015 while reports submitted by paper decreased by 6% from 2014 to 2015. Table 2.4.2 provides the number of vessels submitting at least one report by license group. Nearly a third of reporting vessels in each year were Alabama licensed vessels or vessels with no license previously identified as for-hire vessels and participating in the FHTS. Nearly 76% of the reports received by ADCNR in 2014 were submitted by federally-permitted vessels and nearly 92% of submitted reports were received from federally-permitted vessels in 2015. The mean number of reports by license group were comparable to one another between the two years with the exception of federally-permitted vessels where the mean number of trips increased 237% (7.7 trips/reporting vessel in 2014 to 26 trips in 2015). A total of 197 reports were submitted by vessels with only an Alabama for-hire license in 2014 while 190 reports were submitted by the same group in 2015.

Percent frequency distributions of submitted reports by hour of the day for the 2014 and 2015 fishing seasons are provided in Figure 2.4.1. In both years, reports were submitted in nearly every hour of the 24-hour period and over 70% of submitted reports indicated a reporting time between 10:00am and 7:00pm. A bi-modal distribution of reports during both years was observed which may confirm at least two trips per day were completed by a large number of vessels during each season.

The number of reported trips during 2014 from vessels within the federal and state license groups is provided in Figures 2.4.2. In 2014, 62 of the 81 (76.5%) federally-permitted reporting vessels reported 10 or less trips while 34 of the 37 (91.9%) state-licensed reporting vessels reported 10 or less trips. The longer federal season in 2015 provided additional fishing opportunities for owner/operators of federally-permitted vessels (Figure 2.4.3). At least 6% of all reporting vessels in this group were represented in each of the reported trip categories. Nine out of the 79 vessels (11.4%) submitting at least one landing report reported 51 or more trips with Red Snapper during the season. Reporting by state-licensed vessels in 2015 was similar to that in 2014 with 93.3% of vessels submitting 10 or fewer trips with Red Snapper.

Reported data were summarized by year, two-month periods, and license group (federal and state). The two-month sampling period or 'wave' is based on a calendar year such that there are six waves in a year; Wave 1 comprising the months of January and February, Wave 2 comprising March and April, etc.. The two-month designation follows the design used in the MRIP Angler Point Angler Intercept Survey (APAIS) and will allow for comparisons of harvest estimates from this study to APAIS estimates. Summary statistics of reported data from 2014 and 2015 are provided in Table 2.4.3. All reported metrics increased compared to 2014 which can be attributed to the increase in federal season days. The means and standard errors for reported anglers, harvested fish, harvest/angler, and dead discards is provided in Table 2.4.4. The mean number of anglers per report varied from 4.17 - 7.72 with the lowest means calculated for state-licensed vessels. Likewise, the mean number of Red Snapper harvested per report varied depending upon the license group with the lowest numbers of fish reported for the state group and the highest means calculated for vessels in the federal group (Figure 2.4.4 and Figure 2.4.5). Mean fish harvested per angler (two fish daily bag limit) followed a similar pattern; however, the difference in means between federal and state seasons was not as large. The mean reported dead discards were much higher in 2014 compared to 2015. The higher number of dead discards per report in 2014 may have been a result of heightened awareness of discards due to the introduction of mandatory reporting or related to higher incidence of depredation due to sharks or dolphins. Regardless, the higher standard errors for dead discards compared to standard errors calculated for the number of anglers and fish reported reflected the higher variability associated with this value. In each year, approximately two-thirds of the landing reports had zero reported dead discards (2014-66.7% and 2015-68.7%) while approximately 31% of landing reports had between one and ten reported dead discards. The maximum number of reported dead discards was 36 and 20 in 2014 and 2015, respectively.

3.0 Validation of Landing Reports

3.1 Validation Procedures

A dockside survey of vessels was developed to gather the same information required on the landing reports from vessels with Red Snapper and collect lengths and weights from harvested fish. The data would be used to determine the level of reporting compliance, accuracy of filed reports, and calculate mean weight of landed fish throughout the fishing season. The two sources of data (landing reports and validations) were considered to be similar to a typical capture-recapture experiment whereby the reports were the capture sample and the validations were the recapture sample. ADCNR staff previously developed a simple ratio estimator to adjust for under-reporting using the ratio of unmatched reported and validated trip data to matched reported and validated data. Staff sought guidance from MRIP survey consultants reviewing the preliminary

results of the Snapper Check program for recommendations on appropriate estimators which could provide measures of precision for derived estimates. A ratio estimator that could be applied to the Snapper Check data which took into account the issue of precision was offered by a group of MRIP consultants after an initial review of the Snapper Check program (Breidt et. al. 2016). Estimators proposed by this group do not require the reports to be representative of the entire population of fishing trips with Red Snapper harvest. In addition, the estimator outlined in the consultant report does not require the reports to be accurate. The samples collected for validation; however, are assumed to be collected based on a probability sample where the validation sample may occur regardless of whether or not a report is submitted. More information about the ratio estimator is provided in Section 4.2.

3.2 Description of Sampling Sites

Sites considered for sampling included active locations with for-hire fishing activity listed in the APAIS Site Register. Sites in the Site Register and used for assignment selection must possess saltwater recreational fishing activity and must be accessible to samplers (GSMFC, 2016). Generally, sites listed in the Site Register are open to the public and favorable towards APAIS samplers conducting the survey. Potential Snapper Check sampling sites were reviewed to determine the level of for-hire Red Snapper fishing activity. Nearly all of the APAIS sites with for-hire fishing activity were identified as sampling sites for this study. The sampling sites consisted of eight commercial marinas (Baldwin County-7, Mobile County-1) where for-hire vessels targeting Red Snapper are moored during the fishing season and from which for-hire fishing trips terminate. A small number of for-hire vessels were also known to use coastal public boat launches to conduct Red Snapper fishing trips but the number of trips was believed to be very low at these locations and they were not included in the sample for assignment draws. However, sampling assignments were issued for these locations to conduct sampling of private vessel fishing trips and some for-hire validations were collected during those assignments.

3.3 Site Selection Procedures

Sampling assignments were selected using a random, stratified sampling procedure with replacement. In order to efficiently utilize available staff sites were first stratified by county. Next, sites were stratified by day type - weekends (Saturday, Sunday and federal holidays occurring during the sampling period) and weekdays (Monday-Friday), and similar to the APAIS survey, each site/day type combination was divided into six-hour time blocks; 0200-0800, 0800-1400, 1400-2000, and 2000-0200 hours. A time block of 1100-1700 was added to ensure coverage during the time of day when most for-hire activity (returning anglers) occurred at the site. For each site/day type/time block sampling unit within each county a value was assigned corresponding to a defined

range of Red Snapper fishermen expected during the designated sampling unit. The higher the number of anticipated anglers the higher the value assigned to the sampling unit.

The number of assignments selected varied throughout the season depending upon personnel availability and anticipated fishing activity. For example, during the 2014 federal fishing season for-hire fishing activity was expected to be very high and the number of assignments and staff was increased compared to the state-only fishing seasons. The assignment draw process for Snapper Check sampling assignment selection was performed using Excel® software. Red Snapper fishing activity values for all sites within each site/day type/time block were tallied for each county. A range of numbers corresponding to the combined fishing activity values was created using the product of the combined time-block values and 100. The beginning value for each site's range is the product produced in the prior site added to the previous site's combined time-block value. The random number generator function in Excel® was used to generate a series of random numbers which were used to match the corresponding pressure range for each site. Sites were selected using replacement.

The second stage of site selection was to determine which day of the month to assign selected site/day type/time block assignments selected during the first stage of sample selection. Fishing pressure values were developed in the same manner as the site selection process described above. Random numbers were generated and matched to the appropriate fishing value range.

In order to maximize data collection during the study period, validation data was also collected during MRIP APAIS assignments. If a time block was selected twice for the same site and calendar day, or if a time block overlapped a previously selected time block for the same day (MRIP selected sites included) another random date was selected for the second time block. Validation samples may be collected independently from APAIS assignments in subsequent years.

3.4 Dockside Sampling Procedures

Samplers were trained on how to screen vessels to identify trips with Red Snapper and how to conduct the survey prior to conducting sampling assignments. Snapper Check validations were also collected by biological staff during APAIS assignments after receiving permission from MRIP staff. Required Snapper Check information not captured during the APAIS interview (e.g. total discards) was asked of the captain or deckhand. In 2014, ADCNR biological staff were instructed to observe, with angler's permission, all of the harvested Red Snapper in order for the validation to be accepted. If samplers could not visually inspect all of the harvested Red Snapper the sampler was instructed to terminate the interview. Upon comparing the 2014 reported trip data including number of anglers, fish harvested, and dead discards to 100% sampler observed harvest and angler-supplied number of anglers and dead discards for matched trips (by date and vessel

registration) the under- and over-reporting error rates for these data were found to be insignificant. Therefore, in 2015, samplers were instructed to observe at least one Red Snapper on a vessel to confirm the vessel was required to submit a landing reports. The sampler could obtain the harvested total by counting the entire catch or receiving the information from the captain or deckhand. This protocol change resulted in increased vessel validations with minimal impact to estimates.

Samplers were instructed to collect fish lengths and weighs as time and fish cleaning table space permitted. Fish were weighed in kilograms on certified digital scales or hand-held Chatillon® spring scales. Fish were measured fork length (millimeters) and total lengths were estimated using the regression formula provided by Schirippa and Legault (1999).

Conservation Enforcement Officers were also tasked with collecting information from Red Snapper anglers on for-hire and private vessels as part of their routine patrols; both dockside and at-sea. Officers were assigned this task because at-sea contacts, particularly with anglers on private vessels, could be helpful to ascertain reporting compliance for vessels using private access sites. A total of 68 for-hire vessel validations (at-sea and dockside) were collected by enforcement staff during 2014 and 2015 and this number was considered too small for comparing responses and calculating estimates of harvest.

3.5 Validation Data QA/QC

Validation data were entered into a database within a few days of collection via an online data entry tool. Entered data was compared to the original copy and edits were made as required, usually within a week. Individual fish weights were compared to the regression of fish lengths collected within each year. Individual length and weight data outside the 99% confidence interval were excluded from calculations.

Vessel registration numbers from validation samples were compared to the for-hire vessel list. Instances where the trip status was recorded as a 'private' fishing trip were changed to for-hire status when the vessel registration number was found in the for-hire list. Likewise, validations recorded with 'for-hire' trip status where the vessel registration number was not found in the for-hire vessel list were changed to private trip status. A total of 27 validations, 8.6% of all for-hire validations collected during 2014 and 2015 combined, were changed from private to for-hire status.

3.6 Summary of Validations

A total of 93 and 222 for-hire vessel validations were collected by biological staff in 2014 and 2015, respectively (Table 3.6.1). Approximately 22% of the annual biological validations completed in

2014 and 2015 were collected during APAIS assignments (Figure 3.6.1). In addition to validations collected at public marinas, a small number of validations (<8% each year) were collected during sampling assignments at public boat launches where private vessels were the primary sampling target (Figure 3.6.2). A percent frequency distribution of validations by time of day is provided in Figure 3.6.3. All of the validations occurred between 1000-2000 hours. The annual bi-modal distribution was similar to the distributions of landing reports with peaks of collections occurring from 1100-1200 hours and 1500-1600 hours.

Summary statistics for validations collected by ADCNR biological staff in 2014 and 2015 are provided in Table 3.6.2. Trip metrics from validation data were similar to those derived from reported data with the highest number of validations and largest means occurring when the federal season was open to harvest. Standard errors increased with decreasing sample size but were generally low except for dead discards. The highest mean dead discards per vessel trip (3.0 fish/trip) was calculated for the federal license group during Wave 4 2014. This number was calculated from a small number of reports.

The number of Red Snapper measured and weighed and the mean weights and standard errors from validation data are provided in Table 3.6.3. The highest mean weight in each year was calculated for the federal license group and was significantly higher compared to the mean weight calculated for state-licensed vessels. The percent frequency distribution of fish measured from the federal license group is provided in Figure 3.6.4. Nearly 56% of the fish measured in 2014 were 27 inches total length or greater. In 2015, fish were more uniformly distributed among all observed size groups. The larger number of larger fish observed in 2014 compared to 2015 may be due to a large year class of older fish or for-hire captains retaining larger fish during the short federal season to satisfy customers. Fish measured during the state season comprised of smaller sizes with most of the fish 23 inches total length or less (Figure 3.6.5).

4.0 Estimate Calculations

4.1 Matching Landing Reports to Validation Reports

Critical to the capture-recapture survey design was the identification of unique reported trips and validation events and the method used to match the two events correctly as appropriate. The state vessel registration or the U.S. Coast Guard vessel documentation number were used to match validation contacts with reported trips as each vessel is assigned a unique number. Samplers were instructed to pay special attention to vessel registration numbers and in the case of U.S. Coast Guard documented vessels vessel names were also collected from the vessel (names were used to query NOAA Fisheries' documented vessel directory to determine documentation number). Accuracy of vessel identification numbers provided by vessel representatives was

equally important for the matching process but data was accepted as provided as there was no way to determine when a report was submitted with incorrect information. A comparison of registration numbers on landing reports to the for-hire vessel list to confirm vessel status (Section 2.3) indicated less than 9% of the reports received in 2014 and 5% of the reports received in 2015 required the trip status to be changed from for-hire to private. This number; however, may have also included incorrect trip status entries by private anglers.

Records from each database were initially merged by vessel registration number and date. A cursory review of the matched data indicated a significant number of these records had reporting time after the validation time. Calculating precise harvest estimates using “late” reports could be problematic. The validation encounter could bias the reporting response of vessel representatives. Representatives may be influenced to report as a result of the encounter whereas they may not have reported if there was no validation encounter. If this scenario were widespread, estimated landings would be much less than actual landings. A validation encounter also may have caused some vessel representatives to refrain from reporting. This was the case with several private vessel representatives who indicated to ADCNR staff they did not file a Snapper Check report for trips conducted the same day of a validation interview by ADCNR staff because they believed they satisfied the reporting requirement by completing the validation. Non-reporting of trips corresponding to completed validations that would otherwise have been reported could result in over-estimation of harvest. The non-response ratio estimator would increase and it would be applied to the reported trips. This study did not perform follow-up or complimentary surveys to estimate the bias associated with validation sampling activities. However, the impact of non-response due to the validation encounter in calculating for-hire ratio estimators was minimal as 5.6% of all for-hire validations in 2014 and 13.2% of all for-hire validations in 2015 did not have a matching report at this stage of the matching process.

Although the Snapper Check program was promulgated as a mandatory reporting program, ADCNR managers decided not to enforce the reporting requirement during the first two years of the program. This decision was made to allow ample time for vessel operators to become familiar with the new requirement. As previously described, a significant number of landing reports were submitted after the validation. Upon review of reports submitted by each vessel it was apparent many reports were being submitted after the trip occurred (e.g. report times for two trips were within two or three minutes of one another). To minimize incorrectly matching validations to reported trips while providing an opportunity to match reports submitted after a validation a time range around the validation time was needed. The characteristics of the Alabama for-hire fishery were reviewed to determine a reasonable time period which could be used to refine the matching procedure. Alabama for-hire vessel operators (federal and state-licensed) are allowed to make multiple trips per day with unique passengers on each trip. Generally, three trips per day (4 hours

each trip) is the maximum number of trips taken by Alabama for-hire vessels during the Red Snapper season. Therefore, the maximum report to validation time difference considered for assigning a match status was 3.5 hours before validation and 3.5 hours after validation. If the time of a report with a vessel registration number matching the vessel registration number from a validation record on the same date was more than 3.5 hours before the time of validation or after the validation it was excluded from matching to the validation. Additional time periods were evaluated to assess the impact of incorrectly matching of reports to validations including; -3.0 - +3.0 hours, -2.0 - +2.0 hours, and -1.0 - +1.0 hours. To estimate the influence of a validation encounter on response rates further time periods where the report was submitted prior to validation were evaluated including; -3.5 - -0.25 hours, -3.0 - -0.25 hours, -2.0 - -0.25 hours and -1.0 - -0.25 hours.

There were many instances after matching the reports to validation records where two or three landing reports were matched to a single validation. These reports may have been submitted for multiple trips completed during a single day or for a trip completed prior to the day of validation but submitted electronically where the date and time could not be modified to the original date of the trip. In an effort to further refine the trip identifier (vessel registration and date) various combinations of trip metrics from the report and validation were compared to one another. The trip metrics included; the number of anglers, harvested fish, and dead discards. Several combinations of the three metrics were used to determine matched status for submitted landing reports and validations; 1) the total of anglers and landed fish from reports compared to totals of same metrics from validations, 2) the total of anglers, landed fish, and dead discards from reports compared to validations, and 3) the totals of anglers and landed fish and the total for dead discards within one fish of the dead discard total for either the report or validation. Trip metric combination 1 provided the best opportunity to match reports with validations as it required the least amount of data to match records and the number of anglers and fish harvested is easily recalled during reporting and validation. A significant number of incorrectly matched records could occur using just the number of anglers and number of harvested fish as many of the trips were reported with the same passenger capacities and harvested fish totals would be similar due to the relatively small bag limit. For example, many trips could have a total combined value of 15 (5 anglers and 10 landed fish) or 18 (6 anglers and 12 landed fish). Trip metric combination 2 required the dead discards to be added to the total of anglers and landed fish for both records and compared to one another. Use of dead discards further refined the trip identifier to increase the chances of correctly matching a reported trip to a validation within the designated time periods. However; the number of dead discards provided on a report could be misreported during a validation. For example, two different people could provide the information for the two records (e.g. a captain reporting the trip but the mate being questioned for validation data) or the elapsed

time between submitting a landing report and completing a validation would provide extra time for additional fish to be recalled. Trip metric combination 3 was used to estimate the impact of misreporting. The last step of the matching process attempted to match the report to the validation by searching for the best ‘fit’ within the specific time period and trip metric groups by ordering landings report chronologically by vessel and date. The report (if multiple validations existed) closest to the time of validation within each trip metric combination group was considered a match with a validation record when all other conditions for time period and trip metric combination were considered. The number of for-hire reports matched to a validation by registration number and date within the -3.5 – +3.5 hour report/validation time period meeting trip combination 2 conditions for 2014 and 2015 are provided in Figure 4.1.1. In 2014, 10% of the matched validation records included reports submitted after the time of validation and, in 2015, 17% of the matched validation records included reports submitted after the time of validation.

4.2 Ratio Estimator Description

Once the matching process was completed, data were available for use in calculating the ratio estimator. Breit et al. (2016) provided details of a ratio estimator which was derived from the standard estimator of population size used in capture–recapture studies:

$$\hat{N} = \frac{n_1 n_2}{m},$$

where n_1 and n_2 are the capture and recapture samples and m is the number of units in the recaptured sample that were previously captured (matched records). The authors proposed that the standard estimator can be considered a ratio estimator where $t_y = N$, $n_1 = \sum_{i=1}^N r_i$, $n_2 = \sum_{i=1}^{n_2} y_i$, and $m = \sum_{i=1}^{n_2} r_i$; $r_i = 1$ if the i^{th} unit in the population represents a matched report and validation and $r_i = 0$ if the report does not occur in the sample, and $y_i = 1$ for every validation. The ratio estimator with auxiliary variable r was proposed:

$$\hat{N} = \sum_{i=1}^N r_i \frac{\sum_{i=1}^{n_2} y_i}{\sum_{i=1}^{n_2} r_i}.$$

The authors believed expressing \hat{N} as the ratio estimator was a method whereby an estimate of its standard error (SE) could be derived. The SURVEYMEANS procedure in SAS® software (v. 9.3) was recommended for this study by the MRIP consultants and subsequently used to calculate the ratio estimators.

The authors proposed applying the ratio estimator to report metrics such as total reported harvest and dead discards in order to calculate an estimate representing the total population. To estimate these metrics they proposed:

$$\hat{t}_y = \sum_{i=1}^N r_i y_i^* \frac{\sum_{i=1}^{n_2} y_i}{\sum_{i=1}^{n_2} r_i y_i^*},$$

where y_i is the Red Snapper harvested or discarded for validated trip i , and where $r_i y_i^*$ is the number of fish harvested or discarded on the i^{th} trip. If no report matched the validated trip then $r_i y_i^* = 0$. Breit et al. stressed \hat{t}_y is an appropriate estimator of total harvest and discards as long as the reports and validations are matched accurately, the validation sample is a probability sample, and reporting by anglers is not influenced by field staff conducting the validation surveys. The first two requirements have been addressed and the influence of samplers on reporting rates is addressed in Section 4.3.

4.3 Estimates Using Various Matching Procedures

Landings estimates and 95% Confidence Intervals using the three trip metric combinations for each of the selected time periods are found in Figures 4.3.1 and 4.3.2 for 2014 and 2015, respectively. The trip metric combination using the combined totals for anglers and fish landed had the largest number of matched records and consequently the lowest estimate totals of the three combinations evaluated for all time periods. The procedure which required the total number of anglers, landed fish, and dead discards from the report to match the validation was the most conservative matching method (least number of matched records) and resulted in the highest landings estimates within each of the same time period compared to the other two methods. The highest landings estimates for each trip metric combination were in the -1.0 - -0.25 hour time block. Sample sizes for the 2014 -1.0 - -0.25 hour time block for all three trip metric combinations were under 30 contributing to very large (imprecise) estimates. Estimates for all time period / trip metric group combinations were not significantly different ($p < 0.05$) except for the matching angler and landed fish and angler and landed fish and dead discard difference of +/- 1 groups within the -3.5 – +3.5 hour time period were significantly different from the angler and landed fish and matching dead discard group within the -1.0 – 1.0 time period group.

Selecting the most appropriate time period and trip metrics combination to estimate Alabama for-hire angler harvests was needed. The differences between the lowest and highest point estimates were large, nearly 400,000 pounds in 2014 and nearly 1,000,000 pounds in 2015. The -3.5 – +3.5 hour time period was selected for final Snapper Check landings as it compared favorably to the smaller time periods except where sample sizes were significantly reduced and precision was compromised. The 2014 and 2015 point estimates for federal and state license groups using the three trip metrics combinations within the -3.5 - +3.5 hour time group are depicted in Figures 4.3.3 and 4.3.4, respectively. Although the differences among the three trip metric combinations were small the combination using the matching totals for anglers, landed fish, and dead discards

between the report and validation was selected to represent final Snapper Check landings estimates. This was the most conservative trip metric combination and estimates were closest to the estimates produced by the time period groups where the report was submitted prior to the validation.

The ratio estimators provided in Table 4.1.1 were applied to the summarized reported data as previously described to determine the estimates for total anglers, harvested fish, dead discards, and landings (Table 4.3.1). As expected, federally permitted vessels were responsible for the majority of angler trips, fish harvested, dead discards, and landings. The extended season in 2015 resulted in an increase of anglers and fish harvest from federally permitted vessels. Proportional Standard Errors (PSE) for most of the estimates were relatively low.

4.4 MRIP and Snapper Check Estimates Comparison

Annual landings estimates and 95% Confidence Intervals of harvested pounds of Red Snapper from the MRIP and Snapper Check are provided in Figure 4.4.1. Confidence intervals of survey estimates in each year overlapped one another which suggest the means were not statistically different; however, analysis of the differences between the estimates and statistical tests to determine levels of significance were beyond the scope of this project. MRIP and Snapper Check landings estimates by wave and area of harvest from 2014 and 2015 are provided in Table 4.4.1. For comparison of Snapper Check to MRIP landings the license status in Snapper Check was used to assign trips to state waters or federal waters in order to approximate MRIP area fished designations; landing reports submitted by federally-permitted vessels were assigned area fished status to federal waters and reports submitted by state-licensed only vessels were assigned to state waters. Annual Snapper Check landings estimates were 63% higher and 17% lower than MRIP estimates in 2014 and 2015, respectively. State water harvests were generally higher in the Snapper Check program. There were substantial differences between the two surveys for federal water harvests for most waves yet no pattern was found.

Significant portions of the annual MRIP harvest were attributed to federal waters during waves when federal waters were closed to recreational fishing - 37.9% of the 2014 annual estimate and 9.0% of the 2015 estimate. This may be the result of a small number of samples being collected from state-licensed vessels harvesting Red Snapper from Florida waters. Florida's territorial seas boundary in the Gulf of Mexico is 9 nautical miles from shore. Eligible 'Distance from Shore' question responses on APAIS survey forms used in Alabama correspond to its 3 nautical mile territorial seas boundary. Catch from an APAIS angler intercepted in Alabama who indicates they fished in the Gulf of Mexico and provides a response to the distance fished question that is greater than 3 miles will be assigned to federal waters. Smaller amounts of Red Snapper landings were estimated by Snapper Check to have been harvested by federally-permitted vessels in Wave 4

2014 and Wave 5 2015. The reporting vessels during these waves could have submitted electronic reports where the date of the original trip could not have been updated to reflect the actual trip date, the reported trips were from vessels where the federal permit was removed from the vessel after the fishing season and the for-hire vessel list wasn't updated to capture the new vessel status, or they were reported out of season harvests.

Landings trends within each survey over the time period were reviewed. Harvest estimates from each survey were also compared to fishing season lengths. The 2015 federal Red Snapper season was 388% longer than the 2014 season. MRIP landings over the same time increased by 349% and Snapper Check landings increased by 158%. MRIP landings appear to track well against the number of available days but 61% of the 2014 federal estimates were harvested during a time of the year when federal waters were closed. When the MRIP landings estimated outside the federal season were removed landings increased by 1,061% from 2014 to 2015.

Mean daily federal season landings were calculated for each survey and compared to one another. Mean MRIP daily landings were 6,081 pounds/day and 14,371 pounds/day in 2014 and 2015, respectively, and mean Snapper Check daily landings during the federal season were 23,319 pounds/day and 12,491 pounds/day, respectively. The Snapper Check daily average in 2014 was 1.8 times higher than the daily average calculated for 2015. The unequal rates of increase for federal Snapper Check landings and season length combined with 2015 mean daily landings estimated at nearly half of the 2014 estimate may indicate a derby fishery existed in 2014. Fishing derbies are created when anglers or owner/operators of fishing vessels feel pressure to make as many trips as possible during the short season. Anglers and vessel owners typically respond to derby management by making more trips and completing trips during weather conditions they may not otherwise have fished if the season was longer. Powers and Anson (2016) described a survey methodology used to estimate Alabama Red Snapper effort and harvest from private vessels using public boat launches during 2012-2015. The authors noted changes in fishing behavior such as increasing numbers of daily vessel trips and anglers per vessel which coincided with decreasing number of fishing days during the federal season. The results of this study indicate an increase in the federal season length within the for-hire sector increased effort and harvest but at rates that were less than the increase in season length.

State water harvest estimates within each survey comprised a small percentage of overall annual harvest. Snapper Check estimates were higher than MRIP estimates in nearly every wave where state water landings were estimated. Snapper Check estimates increased in 2015 just as the state season lengths were increased. As was offered to explain the comparatively lower MRIP federal estimates for 2014, lower MRIP estimates of state water harvest may be the result of low sample sizes of catch and/or effort.

4.5 Alternative Estimate Calculations

Although the Snapper Check data time series is very short compared to other recreational data collection programs it constitutes the most comprehensive data representing the recent Alabama recreational Red Snapper fishery. The data afforded an opportunity to estimate various levels of federal for-hire fishing effort including a maximum level of effort for the entire active for-hire fleet. The total number of federally-permitted vessels and the number of federally-permitted vessels with an Alabama for-hire license participating in Snapper Check are provided in Table 4.5.1. Vessels with a federal permit and an Alabama for-hire license were considered the universe of active federal for-hire vessels operating in Alabama as a for-hire license is required to conduct for-hire fishing trips in Alabama. The maximum daily vessel trips that for-hire captains were assumed to complete throughout the fishing season was 3 trips/d (4 hrs/trip). The maximum effort (vessel trips) was calculated as the maximum number of vessels in the universe of active vessels multiplied by the product of total daily effort for the fleet (3 trips/d multiplied by the number of days in the federal fishing season). In addition, two levels of fishing effort were calculated based on the maximum number of vessels in the universe of active vessels multiplied by the product of total daily effort for the top 5th and 10th percentiles of reporting vessels (mean trips/d multiplied by the number of days in the season). In 2014, the mean number of reported trips was 2.31 trips/d and 1.97 trips/d for the 5th and 10th percentiles, respectively. In 2015, the mean number of reported trips was 1.42 trips/d and 1.33 trips/d for the 5th and 10th percentiles, respectively. The three hypothetical estimates and the number of vessel trips estimated from Snapper Check reports and validations using the matched reports and validations within the multiple time periods and selected trip metric combination are provided in Figures 4.5.1 and 4.5.2 for 2014 and 2015, respectively. The estimated number of Snapper Check vessel trips using the -3.5 - +3.5 matching time period and equal trip metric was 52.3% of the maximum number of hypothetical trips estimated for the entire Alabama active federal fleet. In 2015, the estimated number of Snapper Check vessel trips for the same period was 40.8% of the estimated hypothetical effort. Estimated Snapper Check vessel trips derived from ratio estimators using reports matched to validations before the time of validation were much closer to the hypothetical effort estimates. In 2014, Snapper Check estimates from these time periods were closest to the estimates for the 10th percentile reporting vessels with estimates of Snapper Check trips within the -1.0 - -0.25 time period exceeding all three hypothetical maximum trips. In 2015, all Snapper Check estimates for the same time periods and matching groups exceeded the hypothetical maximum trips calculated for the 5th and 10th percentile groups of vessels but were less than the hypothetical maximum number of trips for all federally-permitted vessels participating in Snapper Check that year. These results suggest that the procedures used to match reports and validations within the -3.5 – +3.5 matching time period are appropriate.

5.0 Discussion

5.1 Snapper Check Review and Use for Monitoring In-Season Landings

The Snapper Check program provided estimates of for-hire landings during time periods when harvest was anticipated and at levels correlating to season length. The estimated reporting rate for all for-hire vessel trips was 49% and 48% in 2014 and 2015, respectively. Timeliness of reporting was a concern during the first year of the program as late reporting could be influenced by dockside validation of vessels. The use of a conservative method to match reported trips to vessel validations ensured reported trips, regardless of time of reporting, were matched appropriately. In order to improve reporting rates in the future captains will be reminded of the reporting requirement and timeliness of reporting will be stressed. In addition, enforcement staff will increase patrols and issue citations for non-reporting.

Timeliness of trip reporting is essential to real-time quota monitoring. During the first two years of Snapper Check, over 80% of the submitted for-hire reports were received via electronic methods which may be sufficient for in-season monitoring. Season length projections could be made prior to a fishing season based on average estimated daily trips in prior years. Variables such as weather, average weight of harvested fish, and reporting under-coverage are the areas of largest uncertainty and can cause in-season harvest estimates to be significantly different from projected harvest estimates. Currently, a lag time of approximately 7 days exists between collection and processing of data (both reported data from paper reports and validation data) before data can be used. This is significantly shorter than the time for estimates of catch using the MRIP program. Short seasons with reporting rates significantly less than those used in landings projections could cause in-season landings estimates to be underestimated leading to a quota overage. Also, projection of landings is problematic as the mean weight of harvested fish may change as a result of fishing behavior or year class strength. Monitoring of landings for in season closures using Snapper Check would be most effective during season lengths of 14 days or longer to allow time to collect and process data to determine actual reporting rates and mean fish weight.

AMRD believes that working diligently with NOAA MRIP staff and NOAA MRIP consultants during this process that the Alabama Snapper Check Red Snapper Reporting Program has proven to be a valid alternative to MRIP for more accurately capturing the landings in Alabama during a short season fishery such as red snapper.

6.0 Literature Cited

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Unless otherwise noted, MRIP data was gathered from the National Marine Fisheries Service, Fisheries Statistics Division's recreational data webpage, <http://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index>.

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7.0 Tables

Table 1.2.1. Red Snapper federal and state for-hire season dates and total fishing days during 2014 and 2015. Overlapping days were counted as one day.

Year	Fishing Season Dates			Total Season Days
	Federal	Alabama	Florida	
2014	June 1 - 9	July 4-6, 11-13, 18-20, 25-27	May 24 - July 14	58
2015	June 1 – July 14	July 1 - July 31	May 23 - July 12, Sept. 5-7, 12, 13, 19, 20, 26, 27, Oct. 3, 4, 10, 11, 17, 18, 24, 25, 31 and Nov. 1	70

Table 2.4.1. Number of for-hire vessel reports submitted through Snapper Check by year, license group, and method of reporting.

Year	License Group	Reporting Method				Totals
		App	Online	Phone	Paper	
2014	Federal	360	14	134	114	622
	State	102	3	56	36	197
	Totals	462	17	190	150	819
	% of Total	56.4	2.1	23.2	18.3	100.0
2015	Federal	1,355	32	497	169	2,053
	State	154	5	16	15	190
	Totals	1,509	37	513	184	2,243
	% of Total	67.3	1.6	22.9	8.2	100.0

Table 2.4.2. Number and percentage of vessels submitting at least one Snapper Check report, number and percentage of reports submitted, and mean number of reports submitted per reporting vessel by year, and license group (includes vessels in FHTS without a valid license/permit).

Year	License Group	No. of Vessels With \geq One Report	% of Vessels With \geq One Report	No. of Submitted Reports	% of Submitted Reports	Mean Number of Reports / Vessel
2014	Federal	81	68.6	622	75.9	7.68
	State	30	25.4	178	21.7	5.93
	FHTS	7	5.9	19	2.3	2.71
	Totals	118	100.0	819	100.0	6.94
2015	Federal	79	63.7	2,053	91.5	25.99
	State	30	24.2	148	6.6	4.93
	FHTS	15	12.1	42	1.9	2.8
	Totals	124	100.0	2,243	100	18.09

Table 2.4.3. Number of for-hire reports, anglers, Red Snapper harvested and discarded dead from Snapper Check landing reports during 2014 and 2015 by wave and license group.

Year	Wave	License Group	No. of Reports Submitted	No. of Anglers Reported	No. of RSN Harvested	No. of Dead Discards
2014	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	608	4,888	9,742	653
		State	172	871	1,647	166
	4	Federal	14	117	228	33
		State	25	117	196	43
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
	Totals		819	5,993	11,813	895
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	1,379	10,730	21,345	985
		State	148	852	1,585	126
	4	Federal	672	4,982	9,471	354
		State	37	170	261	4
	5	Federal	2	19	38	0
		State	5	17	23	1
	6	Federal	.	.	.	.
		State	.	.	.	.
	Totals		2,243	16,770	32,723	1,470

Table 2.4.4. Means and standard errors for reported number of for-hire anglers, Red Snapper harvested per vessel trip, Red Snapper harvested per angler, and dead Red Snapper discards during 2014 and 2015 by wave and license group.

Year	Wave	License Group	Mean Anglers /Report (SE)	Mean RS Harvested /Report (SE)	Mean RS Harvested /Angler (SE)	Mean Dead RS Discards /Report (SE)
2014	1	Federal				
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	8.04 (0.18)	16.02 (0.37)	1.94 (0.01)	1.07 (0.13)
		State	5.06 (0.21)	9.58 (0.44)	1.87 (0.03)	0.97 (0.16)
	4	Federal	8.36 (1.22)	16.29 (2.57)	1.91 (0.09)	2.36 (0.52)
		State	4.68 (0.22)	7.84 (0.69)	1.67 (0.11)	1.72 (0.79)
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	7.78 (0.11)	15.48 (0.25)	1.93 (0.01)	0.71 (0.04)
		State	5.76 (0.23)	10.71 (0.49)	1.84 (0.03)	0.85 (0.23)
	4	Federal	7.41 (0.15)	14.09 (0.32)	1.85 (0.01)	0.32 (0.04)
		State	4.59 (0.34)	7.05 (0.69)	1.53 (0.11)	0.11 (0.05)
	5	Federal	9.50 (0.50)	19.00 (1.00)	2.00 (0.00)	0.00 (0.00)
		State	3.40 (0.40)	4.60 (0.98)	1.38 (0.27)	0.20 (0.00)
	6	Federal	.	.	.	.
		State	.	.	.	.

Table 3.6.1. Number of for-hire validations, anglers, Red Snapper harvested and discarded dead from Snapper Check validations by year, wave, and fishing season for 2014 and 2015.

Year	Wave	License Group	No. of Validations	No. of Anglers	No. of RSN Harvested	No. of Dead Discards
2014	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	76	620	1,273	104
		State	12	50	89	1
	4	Federal	1	4	2	3
		State	4	24	38	4
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
Totals			93	698	1,402	112
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	153	1,240	2,529	118
		State	20	109	155	11
	4	Federal	40	286	595	40
		State	8	31	43	3
	5	Federal	1	8	16	0
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
Totals			222	1,674	3,338	172

Table 3.6.2. Mean and standard error ($p < 0.05$) for mean number of for-hire anglers, Red Snapper harvested per vessel trip, Red Snapper harvested per angler, and dead discards by year, wave, and fishing season from validations collected during 2014 and 2015.

Year	Wave	License Group	Mean Anglers /Validation (SE)	Mean RS Harvested /Validation (SE)	Mean RS Harvested /Angler (SE)	Mean Dead Discards /Validation (SE)
2014	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	8.16 (0.47)	16.75 (1.12)	2.02 (0.04)	1.37 (0.38)
		State	4.17 (0.63)	7.42 (1.31)	1.77 (0.13)	0.08 (0.08)
	4	Federal	4.00 (.)	8.00 (.)	2.00 (.)	3.00 (.)
		State	6.00 (0.82)	9.50 (1.50)	1.63 (0.24)	1.00 (1.00)
	5	Federal	.	.	.	.
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.
2015	1	Federal	.	.	.	.
		State	.	.	.	.
	2	Federal	.	.	.	.
		State	.	.	.	.
	3	Federal	8.10 (0.36)	16.53 (0.80)	2.02 (0.03)	0.77 (0.20)
		State	5.45 (0.59)	7.75 (1.18)	1.44 (0.16)	0.55 (0.50)
	4	Federal	7.15 (0.50)	14.88 (1.45)	2.01 (0.10)	1.00 (0.32)
		State	3.88 (0.44)	5.38 (1.16)	1.41 (0.27)	0.38 (0.18)
	5	Federal	8.00 (.)	16.00(.)	2.00 (.)	0.00 (.)
		State	.	.	.	.
	6	Federal	.	.	.	.
		State	.	.	.	.

Table 3.6.3. Number of Red Snapper measured and weighed during for-hire validations and mean weight with standard error ($p < 0.05$) by year, wave and fishing season.

Year	Wave	License Group	No.RS Measured	No. RS Weighed	Mean Weight-LBS (SE)
2014	1	Federal	.	.	.
		State	.	.	.
	2	Federal	.	.	.
		State	.	.	.
	3	Federal	838	836	10.91 (0.41)
		State	41	41	5.06 (0.51)
	4	Federal	8	8	9.11 (0.89)
		State	30	30	5.55 (1.24)
	5	Federal	.	.	.
		State	.	.	.
	6	Federal	.	.	.
		State	.	.	.
2015	1	Federal	.	.	.
		State	.	.	.
	2	Federal	.	.	.
		State	.	.	.
	3	Federal	765	763	8.21 (0.16)
		State	58	58	6.94 (0.73)
	4	Federal	209	190	8.52 (0.33)
		State	22	21	5.15 (1.17)
	5	Federal	10	10	4.96 (0.77)
		State			
	6	Federal	.	.	.
		State	.	.	.

Table 4.1.1. Number of validations, validations with matching report and ratio estimators with standard errors ($p < 0.05$) for anglers, harvested Red Snapper, and dead discards by year, wave and license group. Time period used for matching reports was within +/- 3.5 hours of the time of validation.

Year	Wave	License Group	No. Validations	No. Validations w/ Matching Report	Angler Ratio Estimator (SE)	Harvested RS Ratio Estimator (SE)	Dead Discard Ratio Estimator (SE)
2014	1	Federal	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
		State	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
	2	Federal	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
		State	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
	3	Federal	76	40	1.97 (0.25)	2.03 (0.27)	3.25 (1.24)
		State	12	6	1.79 (0.52)	1.85 (0.59)	1.00 (0.00)
	4	Federal	1	0	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
		State	4	2	2.00 (1.19)	1.58 (0.68)	1.00 (0.00)
	5	Federal	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
		State	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
	6	Federal	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
		State	.	.	1.97 (0.23)	2.01 (0.25)	3.03 (1.05)
2015	1	Federal	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
		State	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
	2	Federal	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
		State	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
	3	Federal	153	77	2.22 (0.22)	2.18 (0.22)	2.74 (0.89)
		State	20	5	3.03 (1.36)	3.23 (1.38)	2.87 (0.75)
	4	Federal	40	22	1.98 (0.34)	1.90 (0.34)	2.50 (1.13)
		State	8	3	2.81 (1.49)	2.87 (1.74)	3.00 (2.62)
	5	Federal	1	0	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
		State	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
	6	Federal	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)
		State	.	.	2.24 (0.19)	2.17 (0.19)	2.87 (0.76)

Table 4.3.1. Estimates and proportional standard errors (PSE) of anglers, landed Red Snapper, dead discards, and landings estimates from the Snapper Check Program using the ratio estimators calculated for the -3.5 – +3.5 time period and trip metric combination for anglers, landed fish and dead discards.

Year	Wave	License Group	Estimated Anglers	Estimated Anglers PSE	Estimated RS Harvested	Estimated RS Harvested PSE	Estimated Dead Discards	Estimated Dead Discards PSE	Estimated RS Landings (LBS)	Estimated RS Landings PSE
2014	1	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
	2	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
	3	Federal	9,651	12.8	19,236	13.8	1,289	62.9	209,872	13.9
		State	1,829	36.9	3,459	44.7	502	34.7	17,516	45.8
	4	Federal	233	11.9	464	12.6	100	34.8	4,231	15.9
		State	234	59.3	392	33.9	45	34.8	2,176	40.5
	5	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
	6	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
Totals			11,948	17.3	23,550	18.7	2,022	52.7	233,794	16.6
2015	1	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
	2	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
	3	Federal	23,844	10.1	47,433	9.9	2,189	39.9	389,280	10.1
		State	2,814	41.2	5,235	41.8	361	26.5	36,323	43.1
	4	Federal	9,895	17.4	18,810	17.1	703	56.7	160,173	18.0
		State	479	52.8	736	61.8	11	92.9	3,790	65.8
	5	Federal	43	8.8	82	9.0	0	.	409	18.0
		State	38	8.8	50	9.6	3	33.2	323	13.6
	6	Federal	0	.	0	.	0	.	0	.
		State	0	.	0	.	0	.	0	.
Totals			37,113	14.9	72,347	14.6	3,267	42.2	590,297	14.5


Table 4.4.1. Comparison of landings estimates from the MRIP and Snapper Check. Snapper Check license groups were aligned with MRIP water jurisdictions.

Year	Wave	Water Body Jurisdiction /License Group	MRIP Landings	MRIP Landings PSE	Snapper Check Landings (LBS)	Snapper Check Landings PSE	Change from MRIP (LBS)	Percent Change from MRIP LBS
2014	1	Federal	0	.	0	.		.
		State	0	.	0	.		.
	2	Federal	0	.	0	.		.
		State	0	.	0	.		.
	3	Federal	86,364	43	209,872	13.9	123,508	143
		State	3,038	109	17,516	45.8	14,478	477
	4	Federal	54,451	87	2,909	15.9	-51,542	-95
		State	0	.	881	40.5	881	.
	5	Federal	0	.	0	.		.
		State	0	.	0	.		.
	6	Federal	0	.	0	.		.
		State	0	.	0	.		.
	Totals		143,852	42	233,794	16.6	89,942	63
2015	1	Federal	0	.	0	.		.
		State	0	.	0	.		.
	2	Federal	64,457	65	0	.	-64,457	.
		State	243	123	0	.	-243	.
	3	Federal	503,248	23	389,280	10	-113,968	-23
		State	13,034	84	36,323	43.1	23,289	179
	4	Federal	129,102	57	160,173	18	31,071	24
		State	0	.	3,790	65.8	3,790	.
	5	Federal	0	.	409	18	409	.
		State	0	.	323	13.6	323	.
	6	Federal	0	.	0	.		.
		State	0	.	0	.		.
	Totals		710,084	20	590,297	14.5	-119,787	-17

Table 4.5.1. Alabama for-hire license status for federally permitted vessels with an Alabama mailing address, number of Alabama state for-hire licensed vessels with a federal permit possessing an out-of-state mailing address and the number of dual permitted vessels identified in the Snapper Check program during 2014-2015. Federal permit mailing address established prior to the federal Red Snapper season.

Year	Federally-permitted vessels with AL mailing address without AL for-hire license	Federally-permitted vessels with AL mailing address and AL for-hire license	Federally-permitted vessels with out-of-state mailing address and AL for-hire license.	Dual- permitted vessels	Dual-permitted vessels submitting at least one Red Snapper landing report or having at least one validation
2014	48	74	13	87	84
2015	45	72	14	86	83

8.0 Figures



Alabama Marine Resources Division
Red Snapper Reporting Program

Nº 20001

Please fill in all information for this vessel trip. Upon trip completion, place the white copy in the drop box and keep the yellow copy with you for Enforcement verification.

If you have already reported this trip electronically or by phone and have a confirmation number, it is not necessary to report using this form.

Date: _____ **Time:** _____ AM PM (circle one)

No. of Anglers: _____

Vessel Registration #: _____
No. of Red Snapper Harvested: _____ (this trip)
No. of Red Snapper Discarded Dead: _____ (floating, eaten by predators, etc.)

CHARTER TRIPS ONLY:
 This trip was a (circle one):
 SINGLE DAY TRIP
 MULTI-DAY TRIP

County You are Landing Fish (circle one): **BALDWIN** **MOBILE**
(Baldwin County=Orange Beach/Gulf Shores/Ft. Morgan; Mobile County=Dauphin Island/Bayou La Batre)

You are landing red snapper at (circle one): **PUBLIC ACCESS** **PRIVATE ACCESS**
(Public access= public launch, public marinas; Private access= private residence, condo/hotel dock, private landing)

Figure 2.2.1. Example of Snapper Check paper report provided at select coastal public boat launches. The charter trip information contained in the box was added in 2015. Information for county of landing and landing access (added in 2015) were to be completed by private vessel representatives only.

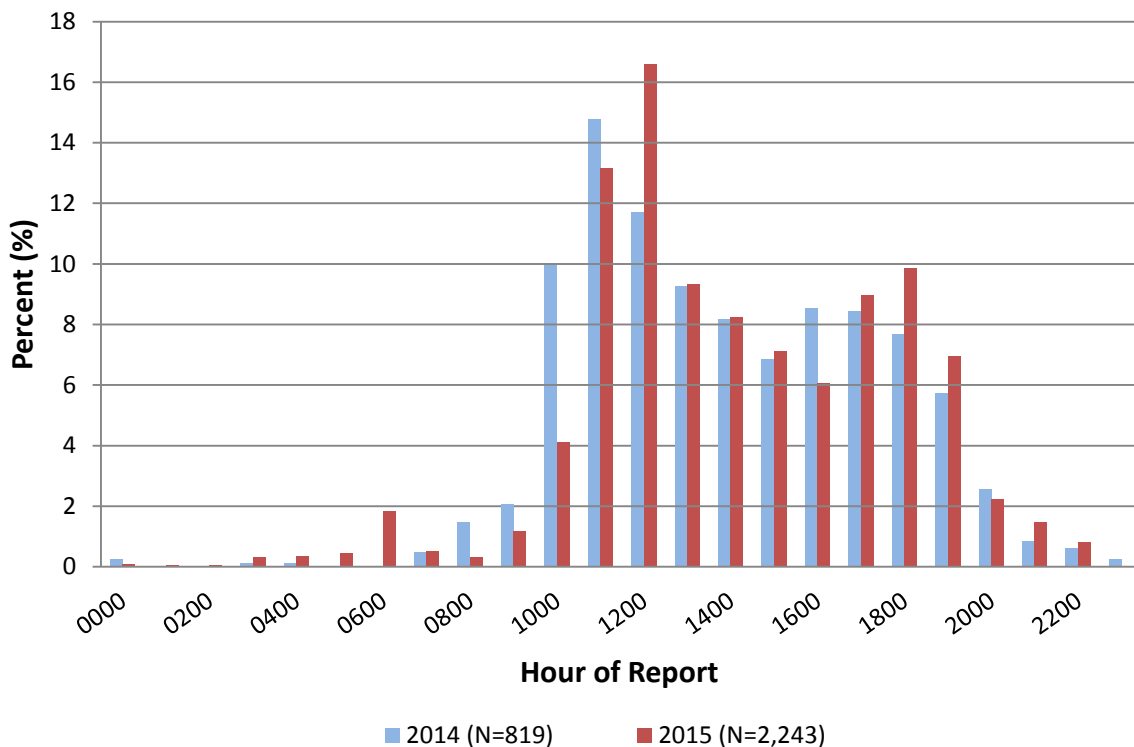


Figure 2.4.1. Percent-frequency distribution of all for-hire reports submitted via Snapper Check by time of report during the 2014 and 2015 fishing seasons.

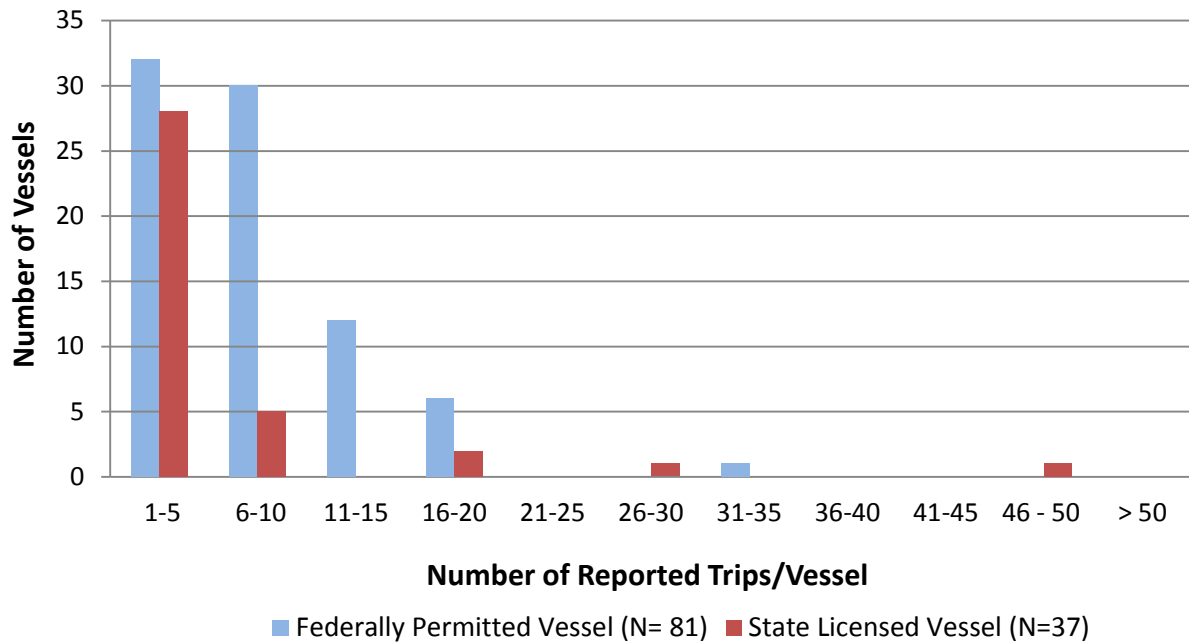


Figure 2.4.2. Frequency distribution of Snapper Check reports by federally-permitted and state-licensed for-hire vessels in 2014.

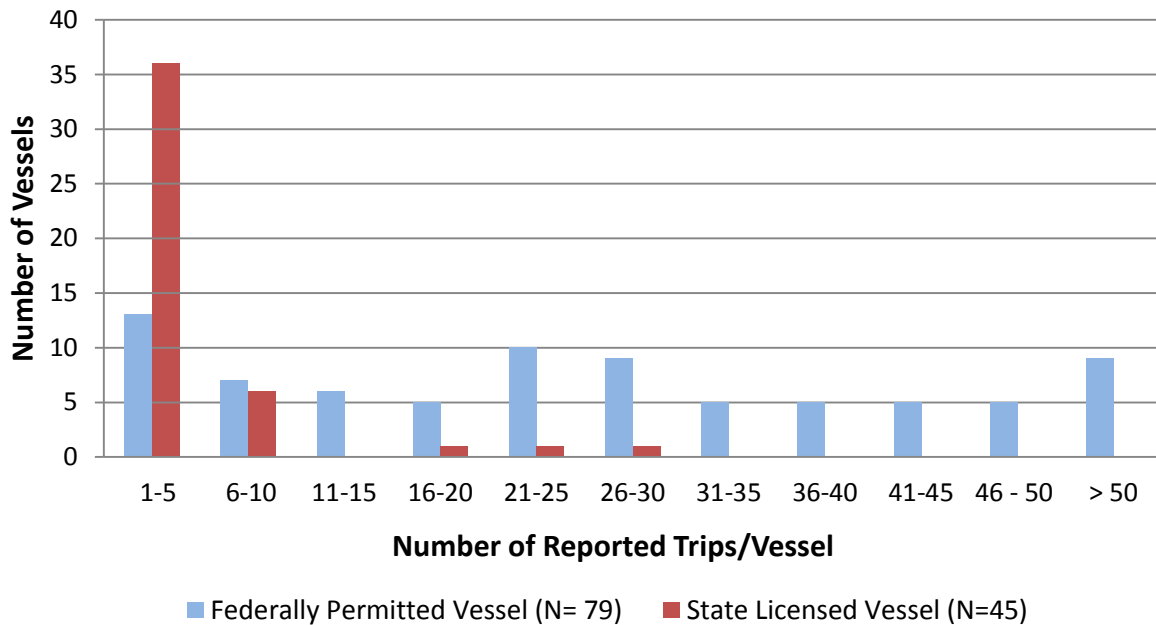


Figure 2.4.3. Frequency distribution of Snapper Check reports by federally-permitted and state-licensed for-hire vessels in 2015.

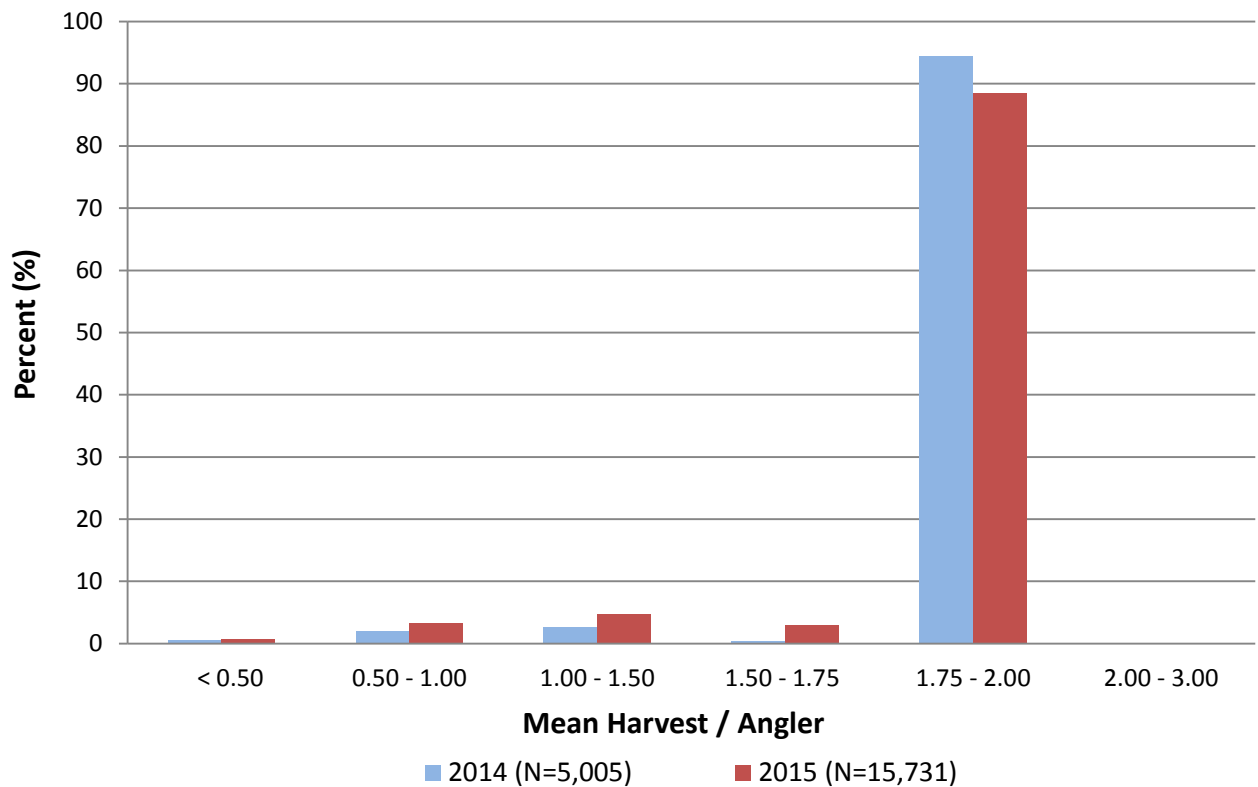


Figure 2.4.4. Percent-frequency distribution of mean Red Snapper harvested per angler from Snapper Check reports submitted for **federally-permitted vessels** during 2014 and 2015.

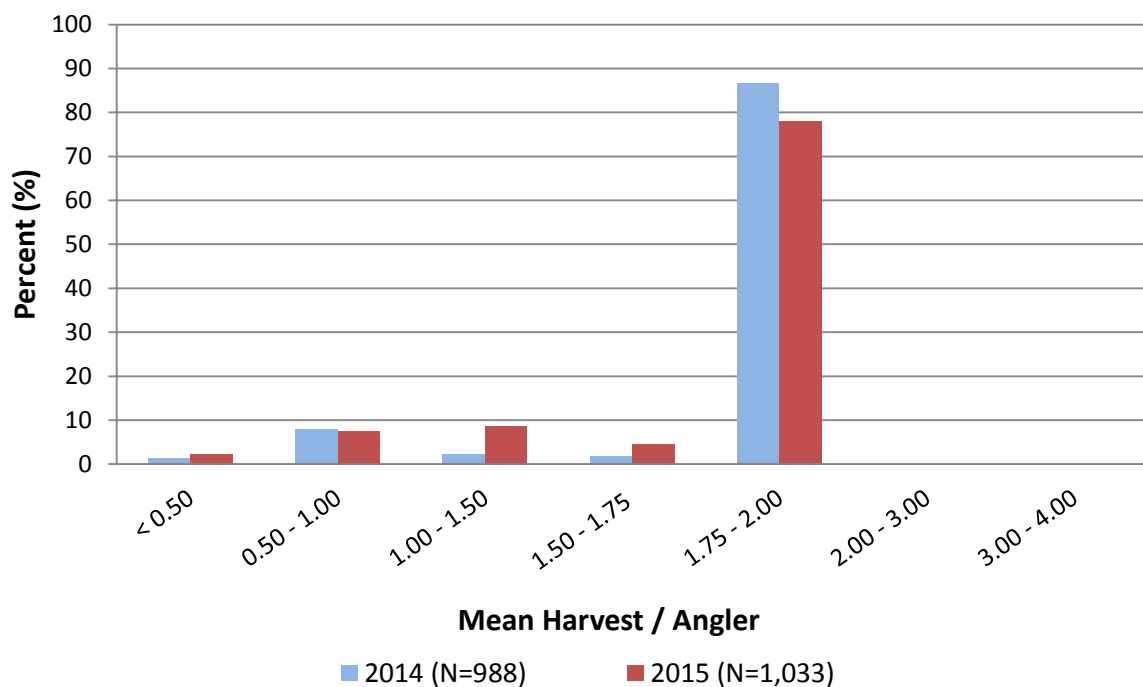


Figure 2.4.5. Percent-frequency distribution of mean Red Snapper harvested per angler from Snapper Check reports submitted for **state-licensed vessels** during 2014 and 2015.

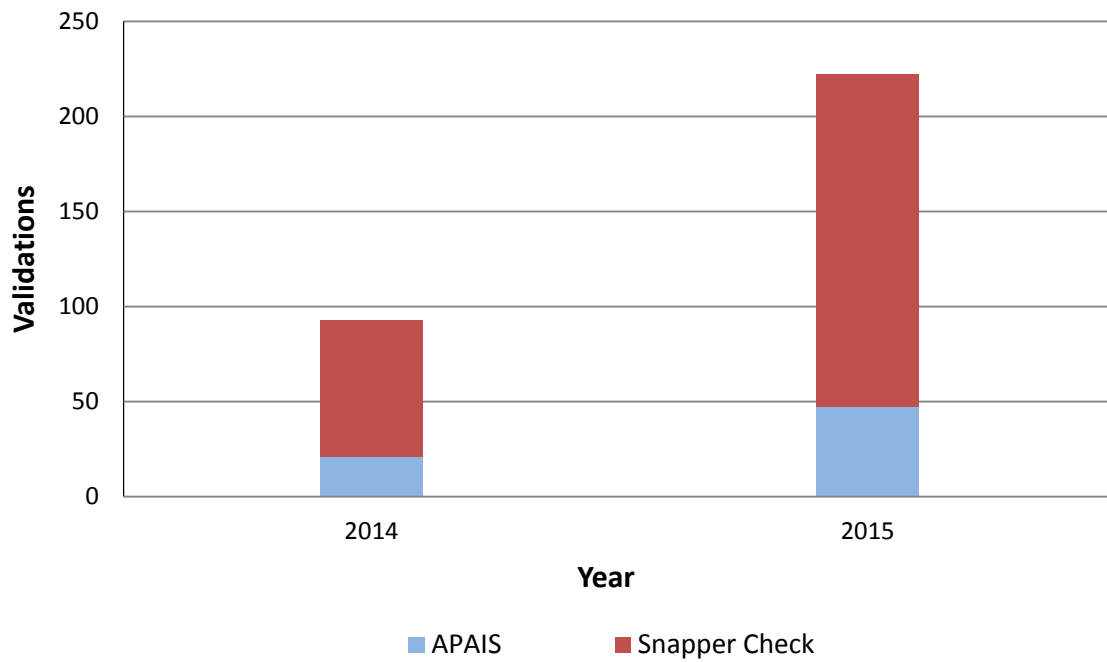


Figure 3.6.1. Number of for-hire vessel validations collected during 2014 and 2015 Snapper Check and APAIS surveys.

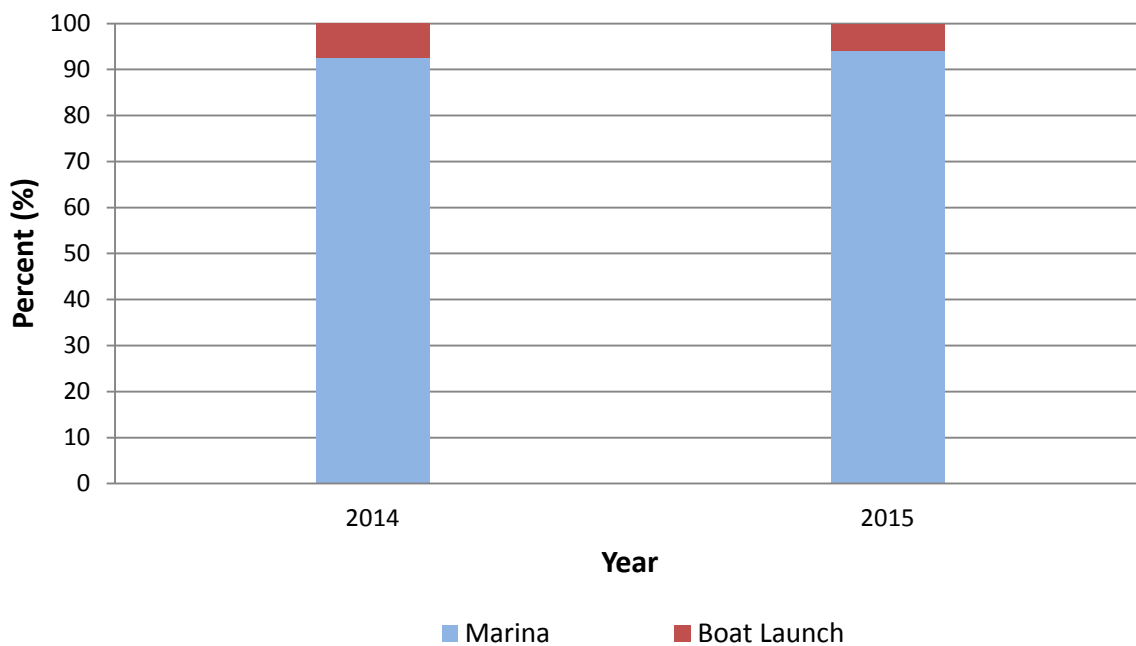


Figure 3.6.2. Percentage of for-hire vessel validations collected at public marinas and boat launches during 2014 and 2015.

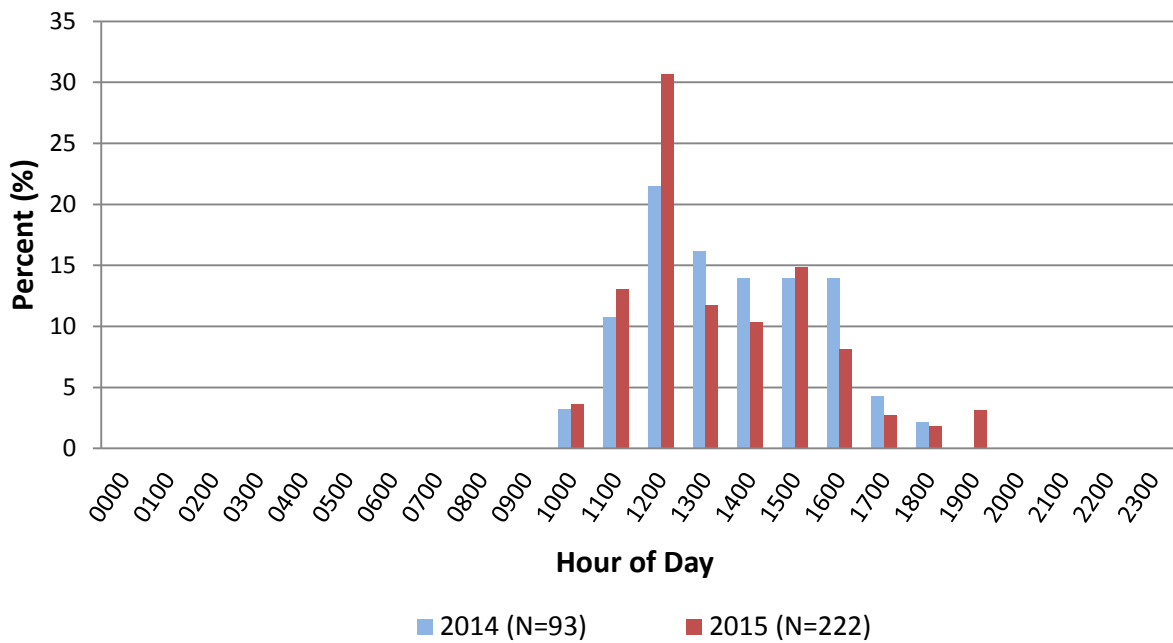


Figure 3.6.3. Percent-frequency distribution of for-hire vessel validations by hour of day during 2014 and 2015.

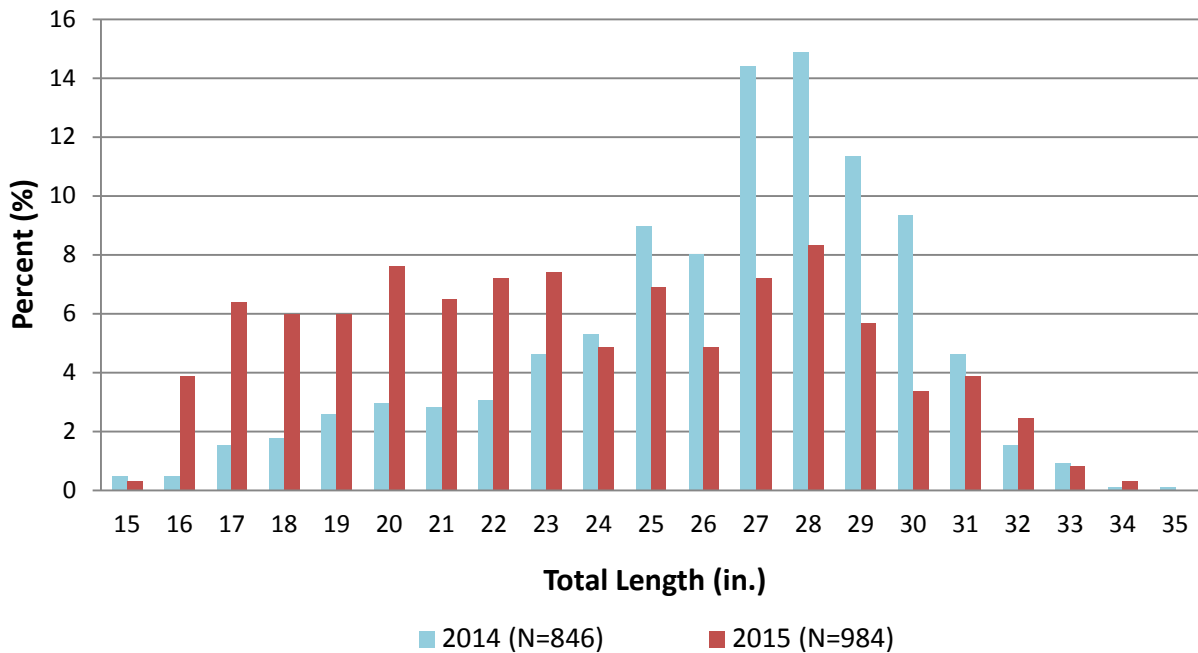


Figure 3.6.4. Percent-frequency distribution of Red Snapper measured (inch groups) from **federally permitted** for-hire vessels during 2014 and 2015.

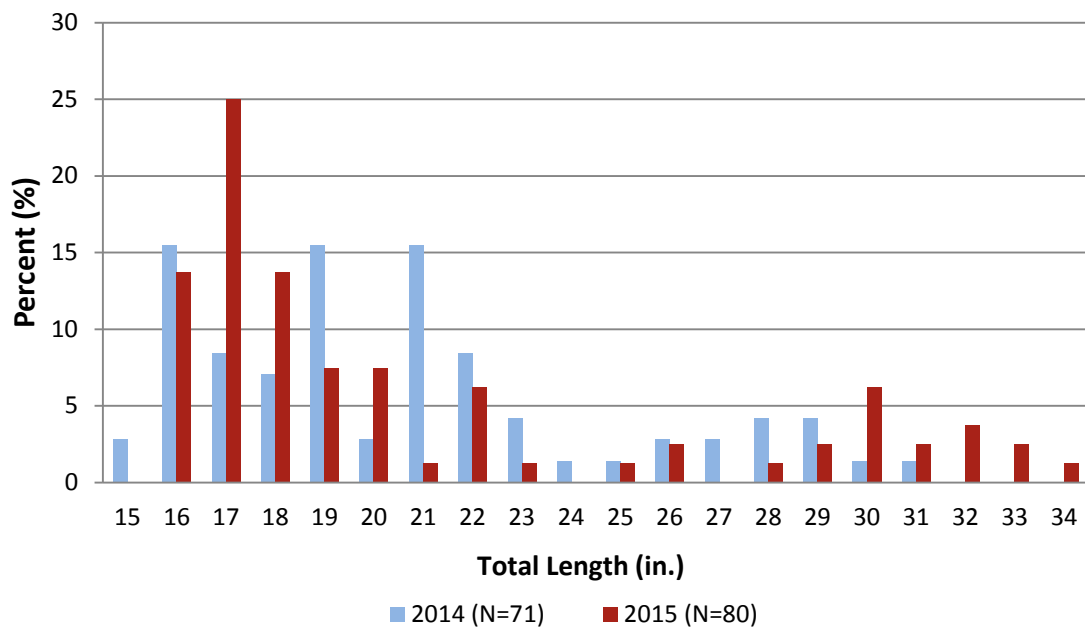


Figure 3.6.5. Percent frequency distribution of Red Snapper measured (inch groups) from **state-licensed** for-hire vessels during 2014 and 2015.

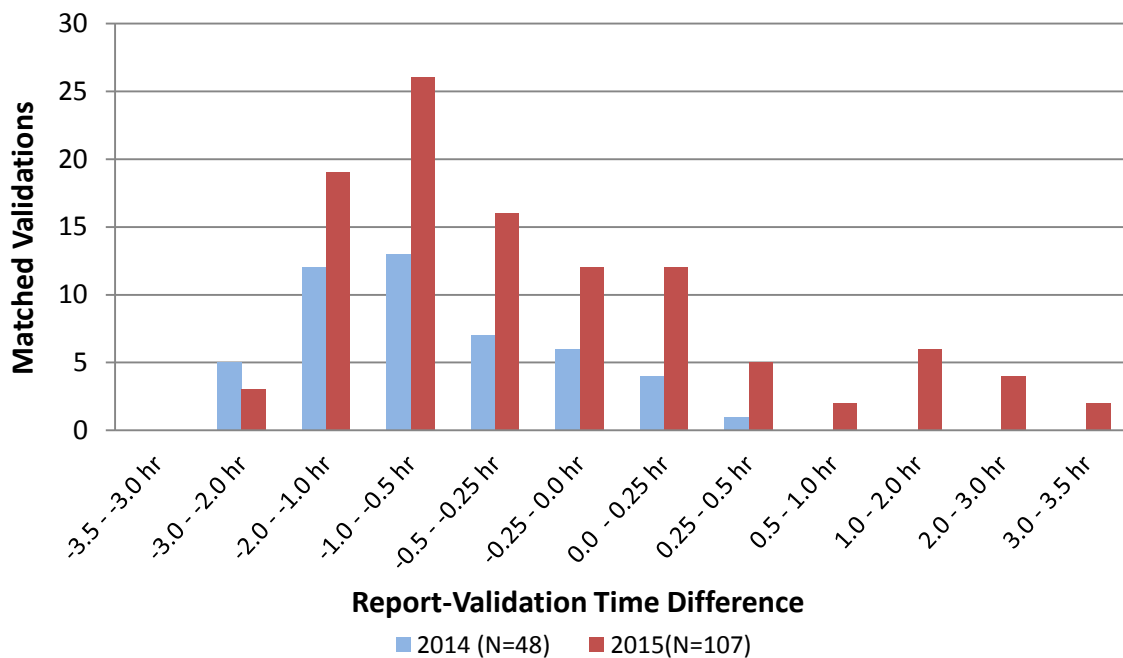


Figure 4.1.1. Distribution of matched vessel reports to validations occurring within various periods of time when the report was submitted before and after the time of validation and periods of time when the report was submitted before the time of validation for federal and state vessels in 2014 and 2015. A negative number within a time difference range indicates the vessel report was submitted prior to the validation encounter.

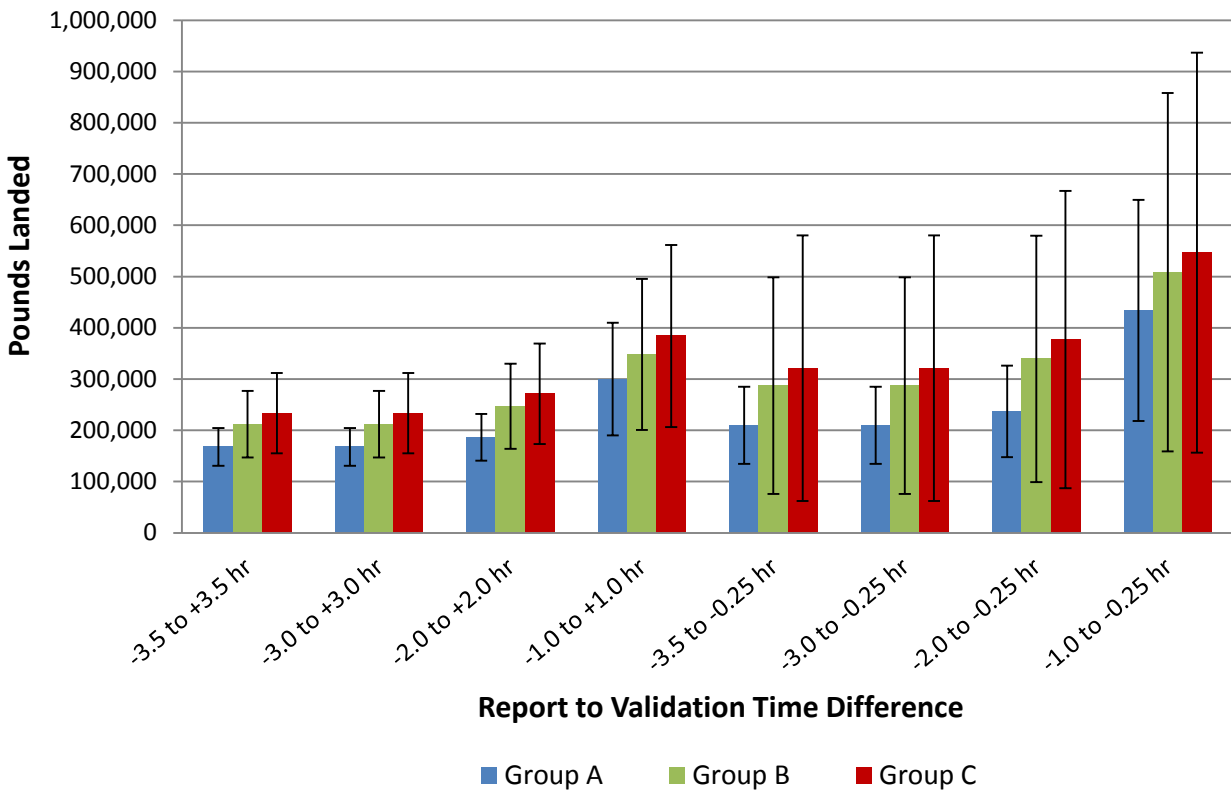


Figure 4.3.1. Point estimates and 95% Confidence Intervals ($p < 0.05$) for 2014 for-hire landings (federal and state-licensed vessel groups combined) using three methods of matching reports to validations within various times of reporting relative to time of validation. Group “A”- match occurred when the combined total of number of anglers + landed fish between a trip report and validation were the same, Group “B”- match occurred when the combined total number of anglers + landed fish between a trip report and validation were the same and the reported dead discards was within ± 1 of the dead discards recorded on the validation, and Group “C”- match occurred when the combined total number of anglers + landed fish + dead discards between vessel report and validation were equal to one another.

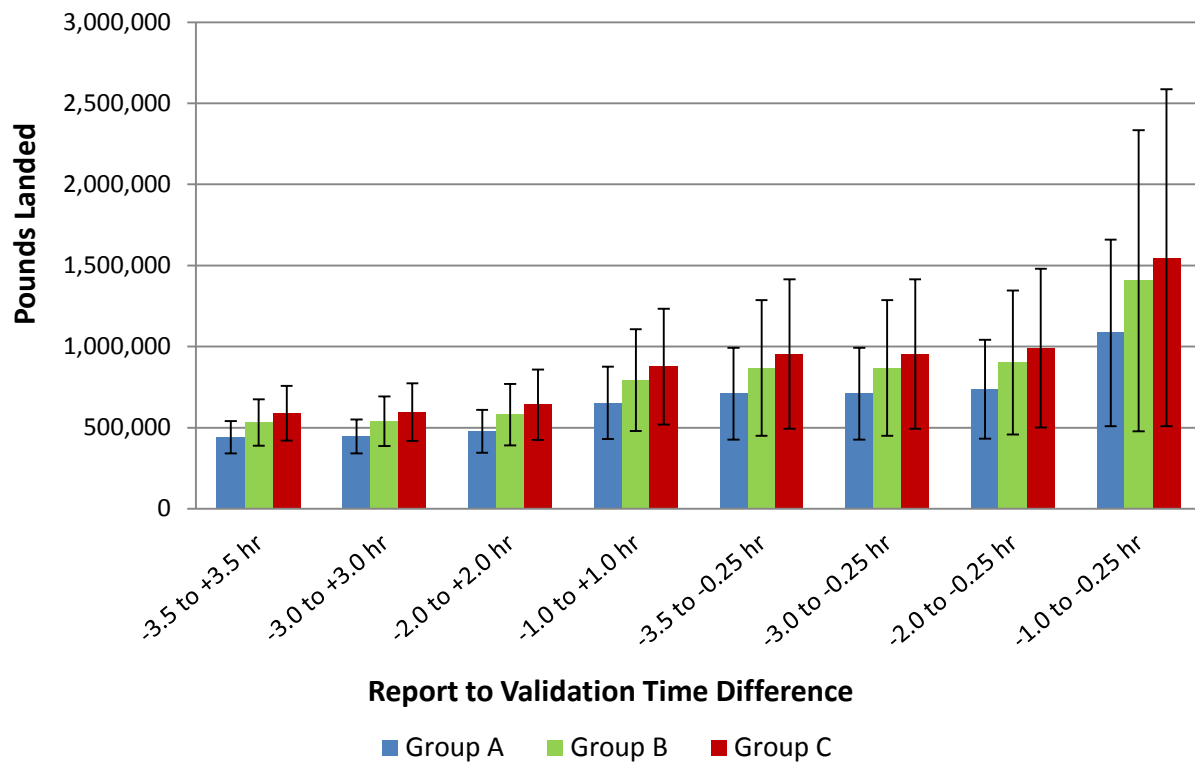


Figure 4.3.2. Point estimates and 95% Confidence Intervals ($p < 0.05$) for 2015 for-hire landings (federal and state-licensed vessel groups combined) using three methods of matching reports to validations within various times of reporting relative to time of validation. Group “A”- match occurred when the combined total of number of anglers + landed fish between a trip report and validation were the same, Group “B”- match occurred when the combined total number of anglers + landed fish between a trip report and validation were the same and the reported dead discards was within ± 1 of the dead discards recorded on the validation, and Group “C”- match occurred when the combined total number of anglers + landed fish + dead discards between vessel report and validation were equal to one another.

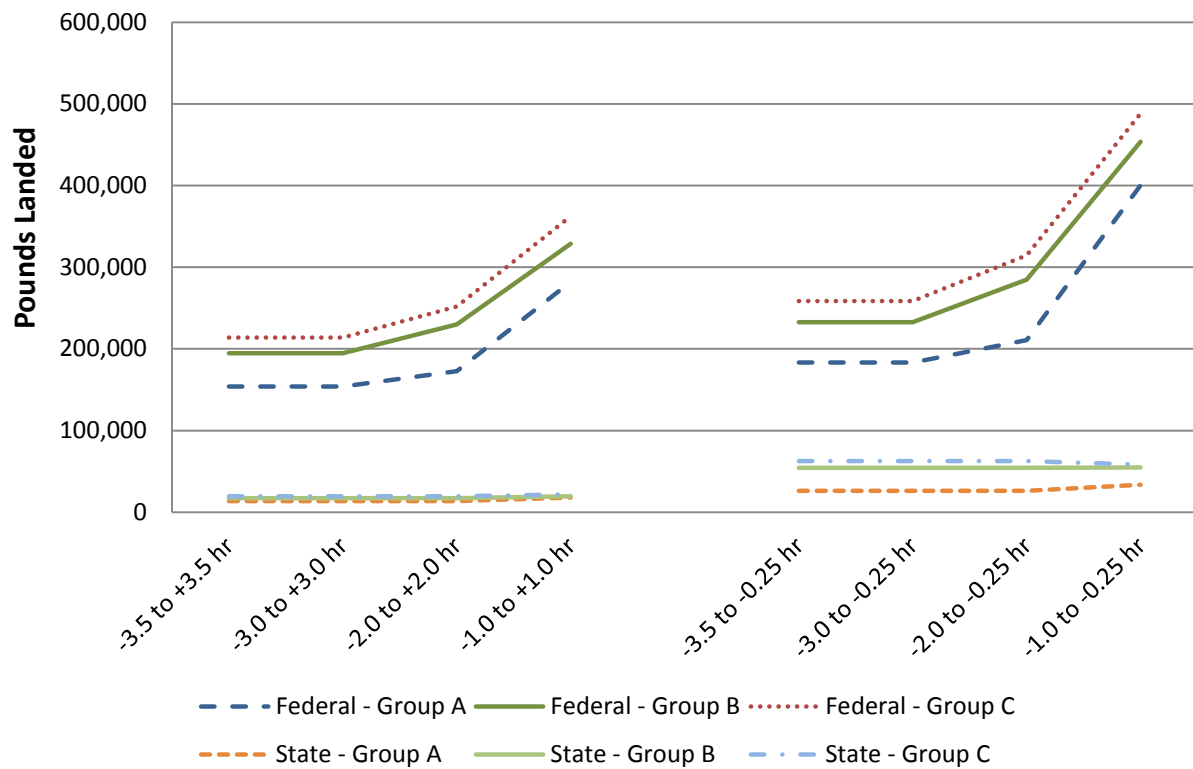


Figure 4.3.3. 2014 for-hire landings estimates for federal and state-licensed vessels calculated using three methods of matching reports to validations within various times of reporting relative to time of validation. Group “A”- match occurred when the number comprising anglers + landed fish of a vessel report was equal to the same number of a validation for the same vessel registration and date, Group “B”- match occurred when the number comprising anglers + landed fish of a vessel report was equal to the same number of a validation for the same vessel registration and date and the reported dead discards was within +/- 1 of the dead discards on the validation, and Group “C”- match occurred when the number comprising anglers + landed fish + dead discards of a vessel report was equal to the same number of a validation for the same vessel registration and date.

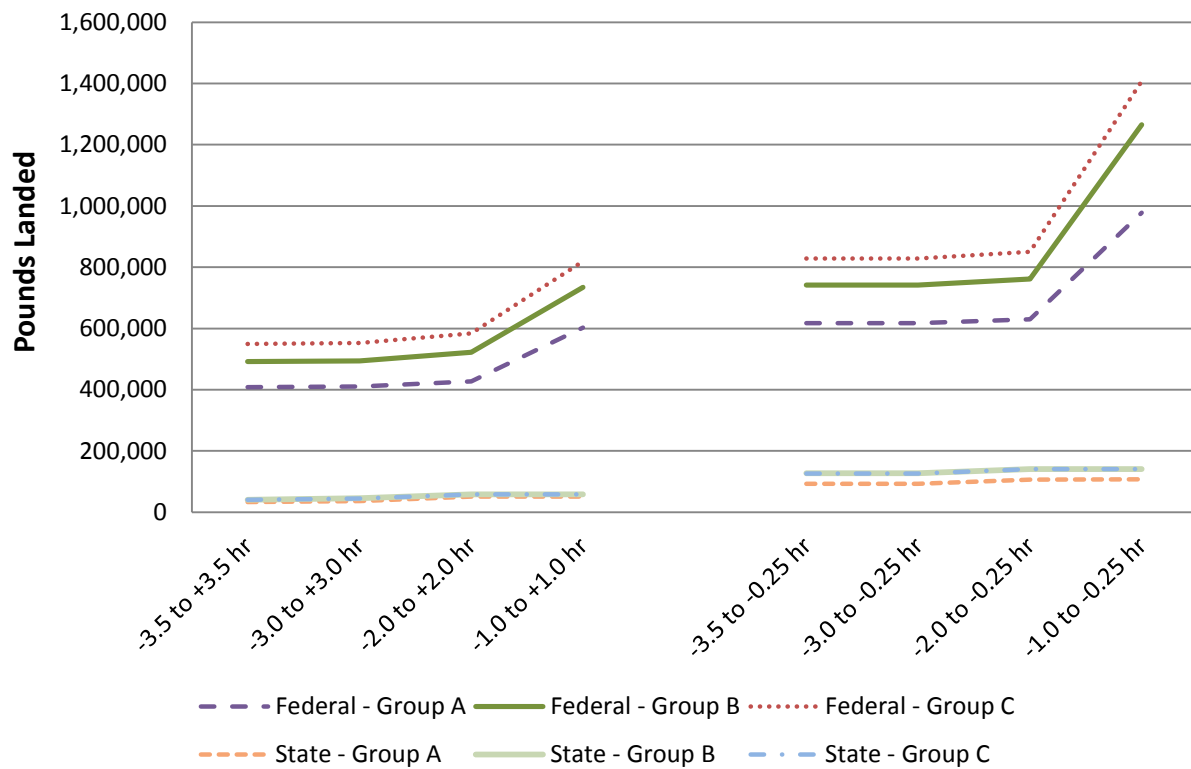


Figure 4.3.4. 2015 for-hire landings estimates for federal and state-licensed vessels calculated using three methods of matching reports to validations within various times of reporting relative to time of validation. Group “A”- match occurred when the number comprising anglers + landed fish of a vessel report was equal to the same number of a validation for the same vessel registration and date, Group “B”- match occurred when the number comprising anglers + landed fish of a vessel report was equal to the same number of a validation for the same vessel registration and date and the reported dead discards was within +/- 1 of the dead discards on the validation, and Group “C”- match occurred when the number comprising anglers + landed fish + dead discards of a vessel report was equal to the same number of a validation for the same vessel registration and date.

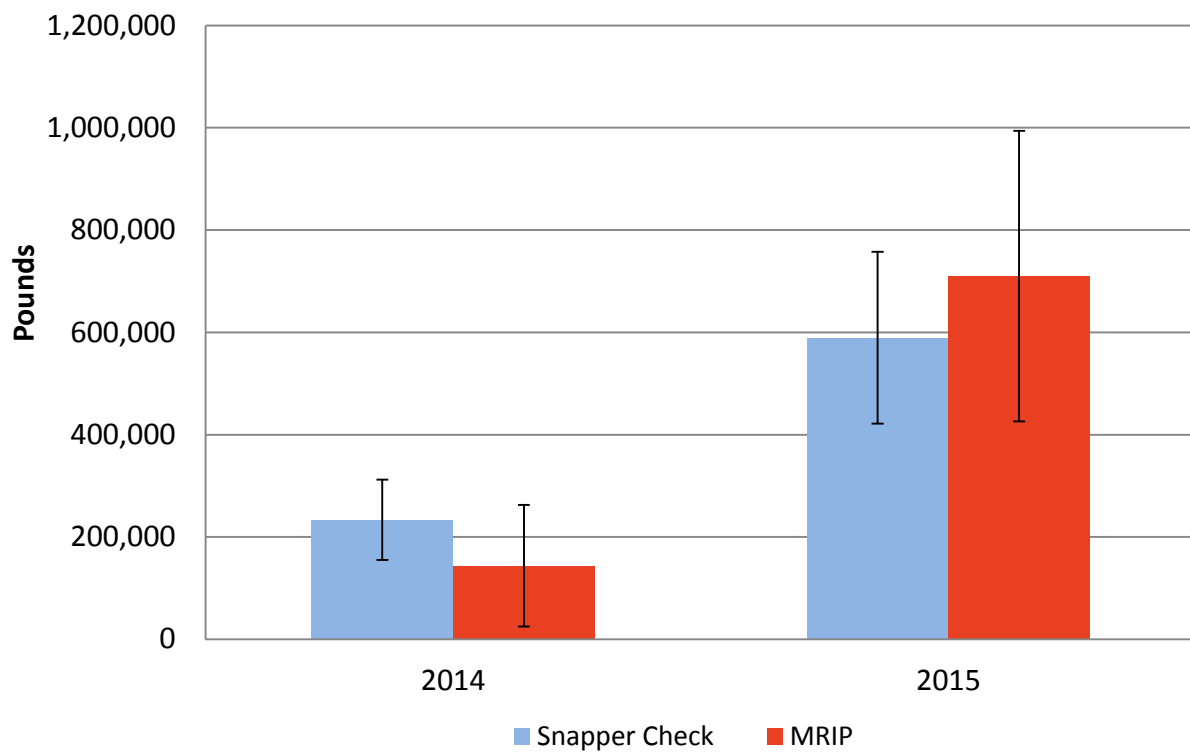


Figure 4.4.1. Snapper Check and MRIP total for-hire landings point estimates and 95% Confidence Intervals ($p < 0.05$).

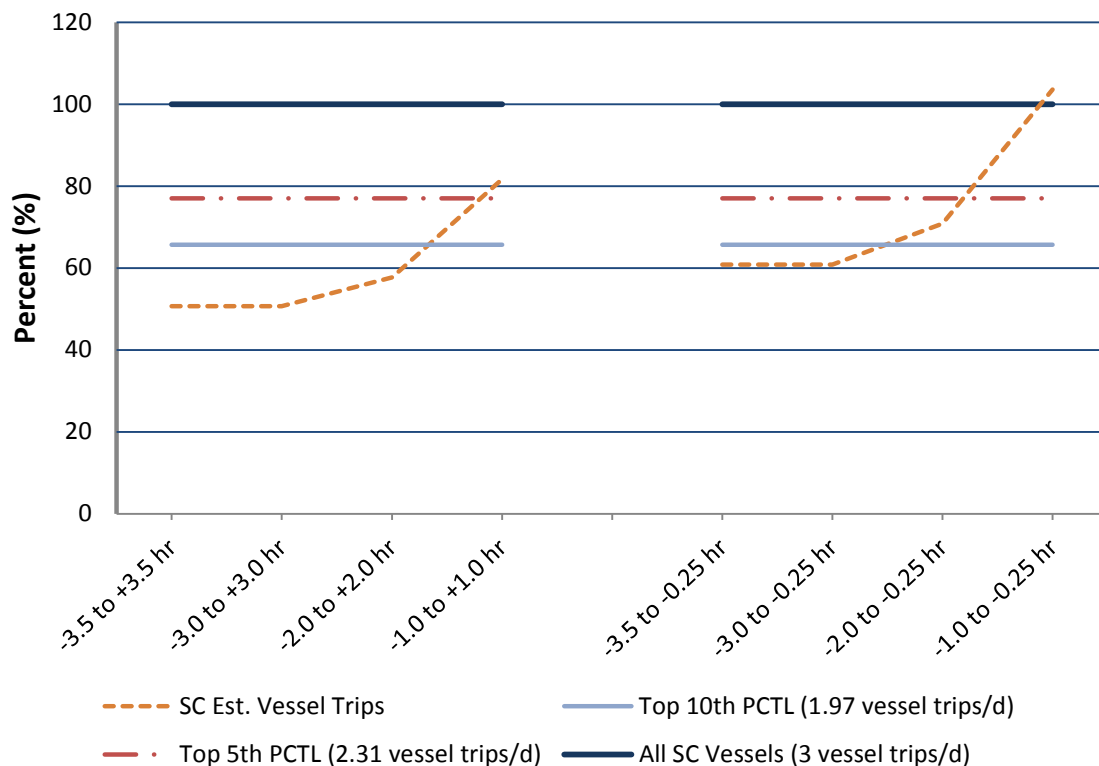


Figure 4.5.1. Estimated percentages of for-hire vessel trips completed by federally permitted vessels during 2014 using various Snapper Check data relative to a hypothetical maximum number of trips estimated for the entire fleet of federally permitted vessels which were associated with a report or validation. Snapper Check (SC) estimates were calculated as the product of the trip ratio estimator (derived from the matching reports and validations within various times of reporting relative to time of validation and equal totals of anglers, landed fish, and dead discards for the matched report and validation) and the number of submitted landing reports. Estimates were also calculated for the top 10th and 5th percentiles of vessels submitting Snapper Check landing reports. Estimated vessel trips for the two groups were calculated as the product of the mean daily reporting rates, number of days in the fishing season and total number of vessels which submitted at least one report or were validated at least once. The estimated maximum number of vessels trips was calculated as the product of the total number of vessels submitting at least one landing reports or associated with a validation, total number of season days, and 3 trips/d mean daily trip value.

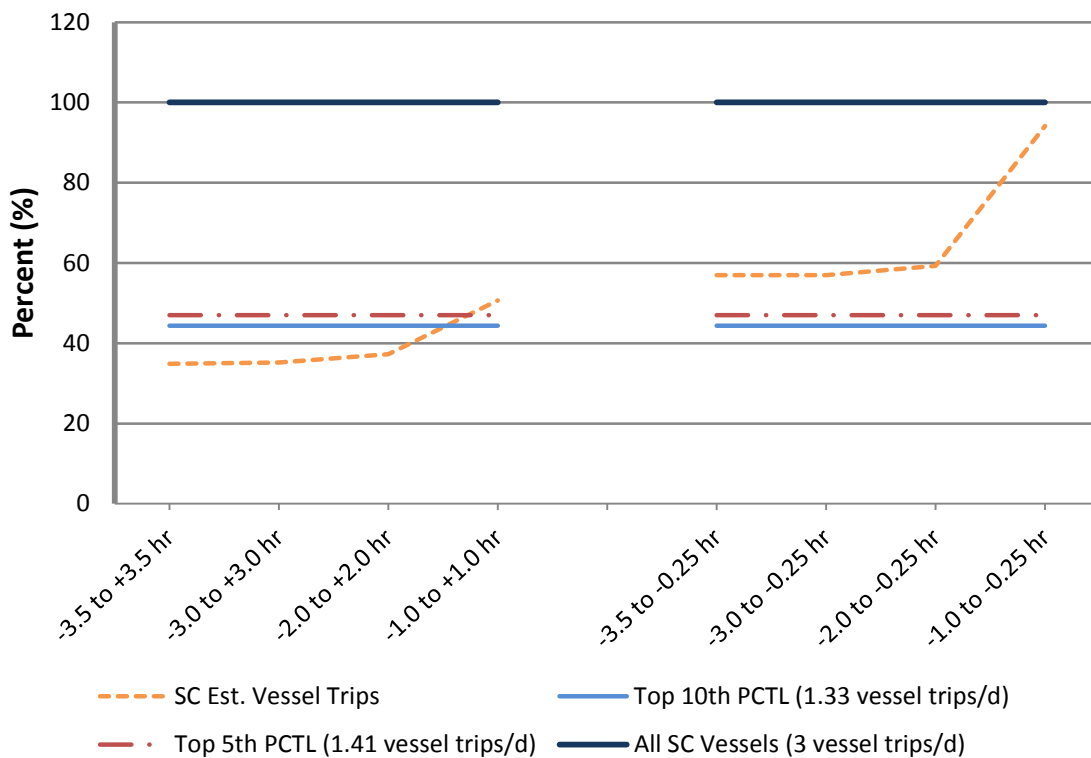


Figure 4.5.2. Estimated percentages of for-hire vessel trips completed by federally permitted vessels during 2015 using various Snapper Check data relative to a hypothetical maximum number of trips estimated for the entire fleet of federally permitted vessels which were associated with a report or validation. Snapper Check (SC) estimates were calculated as the product of the trip ratio estimator (derived from the matching reports and validations within various times of reporting relative to time of validation and equal totals of anglers, landed fish, and dead discards for the matched report and validation) and the number of submitted landing reports. Estimates were also calculated for the top 10th and 5th percentiles of vessels submitting Snapper Check landing reports. Estimated vessel trips for the two groups were calculated as the product of the mean daily reporting rates, number of days in the fishing season and total number of vessels which submitted at least one report or were validated at least once. The estimated maximum number of vessels trips was calculated as the product of the total number of vessels submitting at least one landing reports or associated with a validation, total number of season days, and 3 trips/d mean daily trip value.