Comments on the report, “Recommended Use of Current Gulf of Mexico Surveys of Marine Recreational Fishing in Stock Assessments”

Beverly Sauls and Luiz Barbieri, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute (FWC-FWRI), St. Petersburg, FL

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Recently, NOAA Fisheries released a report titled, “Recommended Use of Current Gulf of Mexico Surveys of Marine Recreational Fishing in Stock Assessments” for review by the SEDAR Steering Committee. The report provides an overview of several MRIP certified surveys currently conducted in the Gulf region, and points to a number of potential sources of error and bias associated with each. Among the survey designs considered was the MRIP certified Gulf Reef Fish Survey (GRFS), which was developed and tested over the past six years in the state of Florida in close consultation with NOAA Fisheries Office of Science and Technology (NOAA-OST) and their expert consultants (a complete timeline is available at https://myfwc.com/research/saltwater/fishstats/gulf-reef-fish-survey/timeline/). The GRFS was designed to work side-by-side with the existing MRIP survey in Florida and integrates data collected through both surveys to provide more-precise year-round estimates of landings and discards for a number of important federally managed and assessed stocks in the Gulf region.

In this response, we provide additional information about the MRIP certified survey in Florida that was either not included or described inaccurately in NOAA’s report. We would also like to emphasize that FWC-FWRI, along with other state agencies in the region, has worked collaboratively with NOAA Fisheries to identify data needs for stock assessment and management in the Gulf of Mexico and made significant investments to address those needs through the development of improved survey methodologies. This concerted effort started with a series of regional workshops coordinated by Gulf States Marine Fisheries Commission in 2013 and 2014 that included participants from all five state resource management agencies, NOAA-OST, the Southeast Regional Office (SERO), the Southeast Fisheries Science Center (SEFSC), and the Gulf of Mexico Fisheries Management Council. Workshop participants identified data needs for assessment and management that the general MRIP survey was not meeting for red snapper and other federally managed reef fish species (GSMFC 2013). Expert statisticians also participated during the workshops and provided guidance on survey designs (Stokes et al. 2015). Over the course of several years following the regional workshops, survey designs were developed and tested in each state, and methods were further refined in close consultation with NOAA-OST and their statistical consultants. Four of the five survey methods developed, including the GRFS, underwent a rigorous MRIP peer review and were ultimately certified by NOAA Fisheries.

The state of Florida was focused on improving estimates specifically for the private boat fishery targeting federally assessed reef fish stocks, since data from the general MRIP survey at the time were considered adequate for assessing state-managed stocks. The private boat fishery represents the majority of recreational landings and discards in Florida, and estimates produced for this segment of the fishery were the most problematic for quota monitoring. The GRFS was designed with the goal of providing estimates for important reef fish species that are more precise than the general MRIP survey and fulfill data needs for both stock assessments and fisheries management. The GRFS survey is conducted year-round, and provides monthly estimates of both landings and discards for multiple important federally assessed reef fish stocks, including red snapper, vermilion snapper, gray triggerfish,

gag, red grouper, and greater amberjack. Improved precision also facilitates management of large, open-access recreational fisheries within the framework of annual catch limits.

During development of the new supplemental survey, Florida worked closely with staff from NOAA-OST to develop an integrated estimation approach that took advantage of catch data collected through the existing MRIP Access Point Angler Intercept Survey (APAIS). The state also worked with NOAA-OST to improve stratification in the APAIS to increase sampling frequencies at sites where offshore trips return, and implement an integrated sample draw for supplemental assignments at a subset of APAIS sites where the state could develop new interview procedures aimed at increasing intercept rates for trips that target reef fishes. Because samples for both the APAIS and supplemental GRFS intercept survey are drawn by NOAA-OST using the same site pressure rating from the MRIP site register, data from the two surveys can be appropriately weighted and combined for use together in the GRFS estimation. Integrated catch data from the two intercept surveys are used in combination with the effort estimate from the complementary GRFS mail survey to produce expanded catch estimates. The result has been improved precision for both harvest and discard estimates for important federally managed species.

The NOAA report points out that FES and state surveys all have inherent bias, which we do not disagree with. However, the discussion fails to recognize progress made during the design and development of the GRFS to reduce sampling error and the number of possible sources of non-sampling error relative to the general MRIP survey. Here we outline specific examples of how the GRFS has reduced the magnitude and potential sources of error for state level private recreational reef fish landings and discards:

1. *Increased sample size* – The NOAA report noted, "In general, one can decrease sampling error and increase statistical precision by drawing a larger random sample from the population and optimize the distribution of sample across the study population." Sample sizes were not provided for any of the surveys reviewed in the report; however, the current statement of work for MRIP lists sample sizes for the FES across each wave for two broad strata in Florida (NOAA 2017). This first strata is household residences across the state that can be matched to a saltwater fishing license issued in Florida, from which 206-337 households are selected per wave. For the remaining households across the state that cannot be matched to a resident fishing license (the second strata), 641-1,034 are selected per wave. The stratification in Florida does not distinguish between coastal and non-coastal counties (as is done in other states where FES is conducted), and there is no regional stratification for Atlantic versus Gulf coast or north versus south Florida. Households within each of these two broad, statewide strata are selected using simple random sampling. Assuming a 30%-40% response rate in Florida, this equates to between 266 and 496 FES survey responses each wave. For the GRFS mail survey, a total of 7,000 individual license holders are sampled each month (14,000 per wave) distributed across 14 separate strata (described in the next bullet below). The average response rate of 18% in 2018 equates to 1,260 GRFS mail survey responses per month (2,520 per wave). Response rates have increased to >20% following recommended changes to the layout of the questionnaire in 2019.

2. *Increased stratification and better accounting for non-response bias* – The NOAA report indicates that the GRFS has no mechanisms in place to measure and account for non-response bias. In fact, the GRFS mail survey has a sophisticated stratification scheme designed to measure

known differences in avidity among different types of anglers and account for potential bias if response rates differ among those groups. Fourteen total strata account for differences among out-of-state residents who travel to Florida from adjacent states (GA and AL) and from across the country, and among state residents that live in various regions of the state (north, central, and south), in counties directly adjacent to the Gulf coast and further away, and in households with and without a registered recreational boat. Like the FES, the Neyman method is used to allocate sample across strata to minimize variance, and appropriate sample and non-response weights are calculated for each strata. Non-response bias is further accounted for through post-stratification weights that account for different response rates within strata. All of these sampling methods and estimation procedures were incorporated during the initial testing of the GRFS for the intended purpose of increasing sample size and improving sample distributions across the diverse population of resident and non-resident anglers that target reef fishes in Florida, and these methods have remained unchanged since certification was received through NOAA.

3. *More direct survey questions and context* – The NOAA report is critical of the questionnaire length for the GRFS; however, by sampling from a list of known fishing participants in the Gulf reef fish fishery, the questionnaire is more direct and asks questions specifically related to private boat fishing effort, which allows for higher quality trip-level information to be collected. The FES, by comparison, is a more general survey of all households across the state, including those not matched to a known saltwater fishing participant. In order to make the FES salient to this broader population, questions unrelated to saltwater recreational fishing also had to be included, such as how household members receive weather reports and how often they visit beaches and national seashores. Omnibus style designs that combine several surveys on different topics in the same questionnaire may have a higher magnitude of bias because of constraints on the length of the questionnaire and the lack of context provided with each question (Bellanger and Levrel 2017). In the shortened questionnaire for the FES, each respondent in the household is asked just one question pertaining to any type of saltwater fishing from a private boat in which they recall the total number of days fished over the full two month reporting period. Furthermore, the FES questionnaire only asks anglers to report saltwater fishing trips, and does not distinguish between trips targeting finfish, versus shellfish such as scallops or spiny lobster, which are also frequently targeted recreationally in Florida. The GRFS questionnaire prompts respondents to recall the week and day of each private boat trip reported over a one month period, which requires that respondents carefully consider whether reported trips actually occurred during the month in question and helps to reduce telescoping error. The GRFS questionnaire also asks respondents to report the types of finfish that were caught or targeted during each trip, which is used to identify reef fish trips versus other types of finfish or shellfish fishing.

4. *Minimizing sources of potential error in effort estimation* – Another benefit of a more detailed questionnaire is that it helps eliminate potential sources of non-sampling error in fishing effort calculations. The GRFS directly asks anglers to report the numbers of trips they take in each area fished (state versus federal jurisdictions) to target and/or catch reef fish species off the Gulf coast of Florida; whereas, the FES produces an overall estimate of total angler trips made by

state residents that target any type of saltwater fish anywhere in the state that must later be partitioned out. For example, numbers of trips taken from the Gulf versus Atlantic coast of Florida and in state versus federal jurisdictions are not reported in the FES, and intercept data collected at publicly accessible sites in the APAIS is used to partition effort among these regions and areas fished. Directed trips for reef fishes also relies upon information collected from the APAIS. Since the GRFS mail survey directly asks respondents to report numbers of trips in state and federal waters to fish for reef fishes, it is not necessary to partition effort estimates.

The NOAA report lays out four options for incorporating different sources of recreational data into regional stock assessments. The preferred short-term option, Option 1a, recommends using the calibrated FES time series in AL, MS, and FL for both assessment and management. Options 1b and 1c outline an apparent three year timeline before MRIP certified state surveys may be used in regional stock assessments (Option 1c). The timeline for achieving this began In September 2018, when the state of Florida, along with other states, participated in a fourth regional workshop to work collaboratively with NOAA OST in the development of statistically valid methods for calibrating estimates from the newer MRIP certified surveys. Several viable options were presented by MRIP consultants for methods to provide integrated estimates using information from multiple overlapping surveys. Each state provided data sets containing survey estimates to NOAA OST in early 2019 for consultants to evaluate and recommend methods for calibration and integration. Since the workshop, we have not received any documentation of results or progress made towards a proposed calibration method, and the summary of workshop proceedings has not been released. At this time, we are requesting that NOAA release the summary report and results of analyses following the 2018 workshop so that the state of Florida may begin developing short-term options, as has been done for MRIP calibrations in the past (see Boreman 2012). We acknowledge the complexity of calibrating different surveys for red snapper across states. However, for stocks where the vast majority of landings in the Gulf of Mexico come from the west coast of Florida, such as red grouper and gag, state-level data derived from a peer-reviewed and NOAA certified survey designed to directly estimate landings and discards for the fishery of interest with higher precision and fewer sources of potential error should be able to be considered for use in stock assessments under the guidelines of National Standard 2. While we agree that every survey has some amount of error and potential bias, the goal should be to calibrate the historic time series to the most accurate (least biased) time series based on the best scientific information currently available.

We recognize the necessity for moving away from a survey design that relies on landline telephones as the list frame; however, several other differences between the Coastal Household Telephone Survey (CHTS) and the FES sample design and survey instruments represent fundamental changes that could potentially impact non-sampling bias. The CHTS was stratified by county, and households were sampled each wave proportional to populations in each county. The new FES survey design has a drastically reduced level of stratification, which is especially concerning for a state as large and diverse as Florida. The FES also has much lower sample sizes compared to the CHTS. The 2010 statement of work for the CHTS included quotas in excess of 11,000 telephone contacts per wave across Florida. The shortened FES questionnaire also represents a major change to the survey instrument. The CHTS walked respondents back through time to recall specific details for each reported trip, whereas respondents in the FES are only asked to recall a total number of trips taken over a two month period. The CHTS also requested information on saltwater trips specifically for finfish, whereas the CHTS does not distinguish between different types of recreational fishing. Given the challenges for monitoring specialized fisheries

that are more difficult to reach in general surveys, such as the recreational reef fish fishery off the Gulf coast of Florida, the reduced granularity of the FES survey is cause for concern. We believe the potential impacts from design changes between the CHTS and FES should be further investigated by NOAA OST, especially for important managed species. Low sample size and reduced stratification may also be driving some of the observed differences between the FES and the GRFS. Ratios between aggregated annual MRIP estimates using the new FES method range between 2 and 3 times higher compared to GRFS. However, when estimates are disaggregated to the month or wave level, ratios between the two surveys are highly variable and indicate that FES estimates are sometimes lower than GRFS and at other times much more than 3 times higher. This has important implications for fisheries managed with short harvest seasons.

The state of Florida also has a keen interest in understanding and accounting for potential biases in the GRFS. The NOAA report pointed out that if disproportionate numbers of anglers fishing from sites not covered in the intercept survey are also not included in the mail survey (i.e. not registered for the GRFS), this could be a potential source of under-coverage bias in the GRFS. We share this concern, and have been evaluating this potential bias through a separate on-site survey. On-site methods are suitable to small-scale fisheries that are readily observable, and have been used successfully to independently validate or verify the accuracy of larger-scale off-site surveys (such as list-based mail and telephone surveys). Integrated studies using both on-site and off-site methods simultaneously have been conducted in other countries to ground-truth the accuracy of estimated fishing effort and catch, and better understand and account for unknown bias (Hartill et al. 2012, Hartill and Edwards 2015, Holdsworth et al. 2018, Ryan et al. 2015). During 2017 and again this year, FWC-FWRI conducted a separate on-site survey of fishing effort during summer months in northwest Florida, where the majority of red snapper recreational landings and discards occur. The method involved direct observation of activity at the main passes in the region where all recreational boats departing from private and public access sites must navigate through in order to enter the Gulf of Mexico. Special questions were added to the GRFS intercept interview to determine the proportion of boats exiting through the passes that participated in directed reef fish trips. Running the two surveys simultaneously allows for comparisons among estimates to verify whether the GRFS may be underestimating total effort within this region. Preliminary results from 2017 and the first month of 2019 indicate that the two methods are producing comparable estimates, and we will be sharing final results of this study and submitting for peer review early next year.

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