

**Standing, Reef Fish, Ecosystem,
and Socioeconomic SSC
Meeting Summary
March 8 – 10, 2022**

The meeting of the Gulf of Mexico (Gulf) Fishery Management Council's (Council) Standing, Reef Fish, Ecosystem, and Socioeconomic Scientific and Statistical Committees (SSC) was convened at 9:00 AM EDT on March 8, 2022. The agenda for this meeting, and the minutes from the January 2022 SSC meeting, were approved as written. [Verbatim minutes from past SSC meetings can be reviewed here.](#)

Drs. Jim Nance and Luiz Barbieri will represent the SSC at the Council's April 4 – 7, 2022 meeting.

Review: Estimating Absolute Abundance of Red Snapper off Louisiana

Dr. Scott Raborn (LGL Ecological Research Associates, Inc.) presented completed research on LGL's work to generate an estimate of absolute abundance of red snapper off Louisiana (LGL study). Dr. Raborn stated that the study was designed for model-based inference of red snapper abundance through field surveys for two separate responses: total fish density (TFD) from hydroacoustic surveys and the proportion of TFD that were red snapper (PropRS) using submerged rotating video cameras (SRVs). The primary objective of the site selection process was to choose samples representative of the population while reducing costs to within budgetary constraints. As such, the site selection process sacrificed randomness for some habitat types. Site selection was non-informative, in that it was not influenced by *a priori* assumptions of red snapper density. However, some sites were purposefully selected to ensure representation of certain habitat types. To address the reduced randomness of site selection inherent in the sampling design, and account for any autocorrelation associated with sampling a platform site using two survey methodologies, a model-based inference approach was implemented. This approach requires incorporation of all important explanatory variables and their interactions in the model. A mixed generalized additive model (GAMM) was used to account for the stratification of the sampling units (depth) and sampling site was included as a random effect to address any correlation within site samples. Five habitat types (artificial reefs, natural banks, uncharacterized bottom [UCB], pipeline crossings, and oil platforms) were evaluated within depth strata across the Gulf (west, central, and east).

Sampling of pipeline crossings was not ultimately used due to their proximity to other habitats, and some sites of similar habitat type were pooled if they were less than 400m from one another. Site was used as a random effect to account for the non-independence for multiple observations recorded at a single site. Modeled estimates of TFD and PropRS were multiplied after being conditioned for pertinent variables. Dr. Raborn suggested that due to variations in hook size used in age and length composition sample collection, those samples may be biased high for standing platforms. He questioned the low proportion of age-2 red snapper collected by that hook-and-line gear, and posited that there may be a habitat and or competition effect that resulted in a length and age distribution for that habitat type that was skewed to larger, older fish.

An SSC member asked whether the largest discrepancy between the LGL study and the Great Red Snapper Count (GRSC) was on the estimated abundance over natural banks. Dr. Raborn replied that was true, but noted the difference between the GRSC and LGL study for standing platforms and artificial reefs (GRSC 4.7 times greater than LGL), and also that estimates between the studies for UCB were comparable. The SSC member then asked whether the estimated variances changed with the modifications made to the estimate in response to peer-review comments. Dr. Raborn replied that the pooled variance remained at approximately 14%, which he suggested was likely a lower bound for the true variance of the estimate of absolute abundance. An SSC member asked for clarification about the meters-from-bottom (MFB) variable, as opposed to depth at a given site. Dr. Raborn said that treating the MFB as a continuous variable solved factor expansion issues with having multiple depths sampled at the same site with the hydroacoustic and SRV gear. A discrete characterization of depth would have created multiple duplicative variables that would not have been standardized across platforms sites at varying water depths.

The SSC discussed the differences in the LGL and GRSC estimates for absolute abundance recorded for Louisiana, noting the limitations of the sampling design in the LGL study and the imputation of some Louisiana data from Texas in the GRSC. The comparability of the studies, due to these differences, remains difficult. However, an SSC member thought that in general, the difference between the surveys highlights the uncertainty in both estimates, which is likely underestimated. Dr. Raborn added that he thought the density of red snapper on natural banks explained much of the difference between the surveys, in that the natural banks sampled by LGL occurred in deeper water than those sampled in Texas in the GRSC and imputed for Louisiana. Dr. Raborn showed the locations of natural banks off Louisiana, demonstrating that those banks largely occurred in deeper waters (approximately 100m and deeper). Density of red snapper in the GRSC appeared greatest between 30m and 90m; as such, densities of red snapper in waters deeper than 90m may be comparably less.

An SSC member noted the LGL study was designed to focus on the present habitats off Louisiana, and likely represented a better estimate for that area compared to the same for the GRSC (empirically collected versus partially imputed, respectively). Another SSC member asked about the information content available to inform the model-based inference approach used in the LGL study, noting that the estimate derived from the comparatively sparse sampling over the UCB was still driving the estimate. Dr. Raborn added that there are more standing platforms than artificial reefs off Louisiana, and through previous work, LGL had data from some standing platforms. Dr. Raborn noted that both the LGL and GRSC studies generated commensurate estimates for the UCB. Since harvest rates over the UCB are substantially lower than those over natural or artificial habitat types, the faster-than-expected recovery of the fishery from a depleted condition might be explained by the approximately 89% of the red snapper stock that may exist over the UCB.

An SSC member asked whether seasonal differences of when sampling was conducted may have had an effect on catchability and catch-per-unit-effort (CPUE) over natural banks. Dr. Raborn replied that sampling occurrence as it relates to the fishing seasons for red snapper was not treated as a factor in the LGL study. Dr. Benny Gallaway (LGL, SSC member) added that some banks were in close enough proximity to angler access points to be subject to regular fishing pressure; however, other banks were at such distances that regular fishing pressure was not assumed.

An SSC member commented on the differences between design- and model-based inference methods, noting that both rely on unbiased sampling, adding that it was still unclear as to how the 106 sites were actually selected. Dr. Benny Gallaway explained that initial sites were chosen by the Louisiana Department of Wildlife and Fisheries and additional sites were included from a previous LGL study contracted by the Bureau of Energy Management (BOEM); however, it was unclear whether the expectation was that a discreet 106 sites were expected to be sampled, or whether that many sites were thought possible to be sampled given funding limitations. Dr. Raborn replied that UCB sites were purposefully selected opportunistically due to their proximity to pipeline sites; the latter were not ultimately used. An SSC member asked about the stratification of standing platform sampling based on the total pool of platforms in east strata (region, depth). Dr. Raborn replied that a random number generator was used to select for the number of platforms, which were then allocated by strata considerate of budgetary constraints. The SSC member thought that this would mean that the sampling was not in fact stratified random for platforms. Dr. Gallaway added that some sites represented a grouping of platforms that were close together, and thus did not represent a single platform at a single sampling location.

The SSC discussed the use of the LGL estimate in place of the same for Louisiana from the GRSC study. An SSC member thought it worthwhile to review a catch analysis using the LGL estimate, to be able to compare the effect of the incorporation of this estimate with the remainder of the estimate from the GRSC. The Southeast Fisheries Science Center (SEFSC) asked that the SSC clarify if it wanted to see the runs with and without the LGL estimate included. The SSC indicated it was inclined to see both; however, it may be able to reduce the number of runs necessary by first deciding whether to use the post-stratification analysis.

Discussion of Results of Post-stratification Analysis by SEFSC, FWC, and GRSC Teams for Florida Absolute Abundance Data

Dr. Katie Siegfried (SEFSC) presented the results from the post-stratification analysis of the estimates of red snapper absolute abundance in the west Florida shelf. This effort was driven by concerns of higher than expected numbers of fish in the shallow water stratum estimate off Florida. The data were post-stratified from 10 – 40 m to 10 – 25 m and 25 – 40 m. This was done for each Gulf state. In Florida, the analysis still estimated larger relative abundance in the Big Bend region, as well as a larger number of fish in the deeper depth bin rather than at 10 – 25 m.

The SSC questioned reporting zero observations in the shallower depth bin, given that LGL and GRSC reported different results. Dr. Siegfried responded that the results could be explained by the partition of the 10 – 40 m depth bin into two separate bins, as previously recommended by the SSC during their January 2022 meeting. Dr. Siegfried also mentioned that the apparent increase in red snapper in the 25 – 40 m depth bin is more in line with observations from monitoring efforts.

As additional analyses were scheduled to be presented during the rest of the meeting, the SSC debated whether to provide recommendations as the analyses were being presented, or wait until the end of the meeting. They discussed the purpose of providing recommendations based on these new analyses and how it would affect the results from the GRSC. Some members were not comfortable in providing catch advise recommendations earlier in the meeting before reviewing

the results from the other analyses scheduled to be discussed during the following days. To make sure that conversations remain focused on the topic being presented, the SSC decided to proceed with providing recommendations as the results were being presented, thus also revisiting the discussion from the LGL study.

Motion: The SSC agrees that the post-stratification analysis for the state of Florida is appropriate and should be included in the overall estimate of age 2+ red snapper in the Gulf of Mexico informed by the finalized GRSC data and random forest design.

Motion carried without opposition.

The SSC discussed if the same would apply to the post-stratification analysis for Texas data. Members expressed concerns in the accuracy of making this decision given the limitations associated with poor visibility in Texas waters versus Florida. The SSC agreed that the LGL red snapper abundance study for Louisiana would be an improvement in comparison to the data utilized in the GRSC, which was extrapolated from nearby Texas waters.

Motion: The SSC decided the LGL red snapper abundance study for Louisiana would be an improvement over using the Louisiana data in the GRSC study for conducting subsequent catch analyses.

Motion carried with 6 abstentions and 1 absent.

Review: Gulf of Mexico Red Grouper Interim Analysis: Health Check

Dr. Katie Siegfried (SEFSC) presented the 2022 Gulf red grouper interim analysis, using data through 2021. The catch limits for red grouper were reduced following the SEDAR 61 stock assessment in response to projections about substantial episodic mortality from the 2018 red tide in the eastern Gulf. This interim analysis is provided as a “health check” of the stock, since the recently updated catch limits for red grouper that were modified via framework action by the Council in 2021 (ABC = 4.96 mp gutted weight) have not yet been implemented. Dr. Siegfried noted the reduced spatial area NMFS Bottom Longline index (NMFS BLL) was used due to reduced survey coverage in 2020 as a result of community-level COVID-19 restrictions. In addition to the NMFS BLL index, the SEFSC also evaluated the index using the NMFS Summer Groundfish Survey to examine juveniles and young adults in the red grouper population. Both indices show relatively higher abundance in 2021 compared to other recent years, which matches observations by fishermen on the water; however, neither survey fully accounts for the 2021 red tide event, which persisted until December 2021.

Review: Terms of Reference for SEDAR 64: Southeastern U.S. Yellowtail Snapper Update Assessment

Mr. Ryan Rindone (Council Staff) reviewed the terms of reference (TORs) for the SEDAR 64 update run for southeastern U.S. yellowtail snapper. The TORs specify special evaluation of the

2017 recreational landings data, which are approximately six times larger than the surrounding years, and the 2020 data, which may have been affected by the COVID-19 pandemic. An SSC member added that the SEDAR 79 stock assessment of mutton snapper has been delayed specifically to address this issue at the request of the Councils. Staff was asked to note that the South Atlantic Council's P* method would be used for setting the acceptable biological catch (ABC). The SSC had no other edits to the TORs.

Review: Terms of Reference for SEDAR 85: Gulf of Mexico Yellowedge Grouper Operational Assessment

Mr. Rindone reviewed the TORs for the SEDAR 85 operational assessment of Gulf yellowedge grouper. The SSC discussed the probability of there being a red tide interaction with yellowedge grouper, which may not yet be documented in the contemporary literature. An SSC member noted that the current ecosystem model for simulating red tide effects does not presently include juvenile yellowedge grouper. Another SSC member asked whether the previous version of Stock Synthesis (SS) will be used or whether the model will be updated to the latest version. The SEFSC replied that the previous model will be used to create a continuity run, with a step-wise progression demonstrating the effect of transitioning to the most recent version of SS. The SSC member also asked about the use of the NMFS Bottom Longline data for 2020, due to the limited sampling coverage in that survey during the COVID-19 pandemic. The SEFSC said that the effect of the reduced sampling area would be evaluated against the standardized index to determine the effect of that year, similar to what was done for red grouper. An SSC member noted the increased recreational effort on yellowedge grouper since the last time the species was assessed (2011), and thought examining the targeted species associated with recreational landings for the stock would be useful to include. The SEFSC replied that intercept and effort data would be provided in a working paper which would be evaluated as part of the assessment, which would facilitate the exploration of "outlier" values in recreational landings data. The SEFSC added that this evaluation would be conducted at the intercept level.

An SSC member added that the proxy for maximum sustainable yield (MSY), presently defined as the yield at 30% spawning potential ratio, be noted under TOR #4. The SEFSC recommended adding a bullet under TOR #3 to consider the effects of the *Deepwater Horizon* oil spill from April 2010 on the yellowedge grouper stock. The SEFSC has been conducting continued research on this topic which could be reported out and considered for this stock assessment. The SSC agreed to consider this topic. Council staff also modified the OY definition to "OY = 90% of MSY or its proxy", considerate of Reef Fish Amendment 48 which is currently in rulemaking.

Review: Characterizing Fleet Behavior Using Analysis of Vessel Monitoring Service Data

Dr. Larry Perruso (SEFSC) and Dr. Shay O'Farrell (Ocean Analytics) presented on applying movement analytics to the Gulf commercial reef fish fishery. Dr. O'Farrell discussed recent work to map fishing behaviors, demonstrating worldwide hot spots for fishing activity. Within the Gulf, technologies like vessel monitoring system units (VMS) can be used to determine spatial variations

in fishing effort at a point in time, and over time. Behaviors can be further understood by asking additional questions which record the decisions made by fishermen along the way, which affect where and when they fish. By working at the individual vessel level, consistent spatial behaviors can be detected, including responses to external stimuli (e.g., weather, fuel expenses).

To assess fishing behavior, VMS data were linked with Reef Fish Observer Program (RFOP) records (approximately 2% of commercial trips), with pings relating to fishing activity (and not transit) spatially marked. Dr. O'Farrell noted that movement patterns vary by fishing gear (e.g., bandit gear is fished differently than longline gear). Other variables can then be considered, such as time of day, distance from port, depth, weather, fuel price, remote sensing (e.g., chlorophyll), and other data as available. A machine learning algorithm is then applied to learn, based on the variables measured, to detect when fishing behavior is and is not happening. The algorithm is then applied to the remainder of the VMS data not paired with RFOP records (approximately 98% of the remaining VMS data) to determine fishing behavior from those recorded tracks. The model uses a random forest approach to select portions of trips to withhold and use to self-validate, based on RFOP records. Dr. O'Farrell warned about the issue of overfitting by examining too many variables in a classical regression approach; however, when using the machine-learning algorithm, the addition of other independent variables tends to improve its predictive capabilities.

Dr. Perruso continued by describing the “explore-exploit tradeoff (EETO), whereby exploring provides new information but an uncertain payoff, while exploiting provides a more certain payoff but may result in foregoing a better payoff elsewhere. Dr. Perruso added that since fishermen tend to vary in how much they invest in exploration, the degree to which payoffs are achieved or foregone can vary. “Low entropy” exploiters are easy to predict over time, while “high entropy” explorers demonstrate movements and behaviors that are harder to predict. The investigators then identified fisher behavioral types using VMS data, looking at 8 variables to create a cluster routine to show the main drivers influencing the behaviors of each vessel. Further, the effects of disturbances (e.g., the *Deepwater Horizon* MC252 oil spill) can be measured to observe the response of vessels to those disturbances. An SSC member asked about the consideration of the experience level of the vessel captains and its effect on the strategies predicted for each vessel. Dr. O'Farrell replied that experience levels between captains have not been measured or included.

Dr. Perruso continued by discussing the effects on fishing communities when fishing grounds are closed, resulting in a displacement of effort. An example used was the effect of an oil spill and the measurement of the resultant economic effects on Gulf counties. This model used spatial closure data, VMS and logbook data, and a social vulnerability analysis to estimate spatially-explicit economic impacts from an oil spill. These data estimate the vulnerability of coastal Gulf counties and reveals those which would be most vulnerable to the effects of fishery closures based on the spatial extent of the closure and its proximity to a county and its fishery resources. Another example, though not shown to result in a co-occurring regulatory closure, is red tide. Dr. Perruso used the 2018 red tide event to demonstrate decreases in bandit fishing effort in the eastern Gulf; however, he also noted the co-occurrence of a hypoxic event in the northern Gulf and the effects of the landfall of Hurricane Michael in the Florida Panhandle in the same year.

An SSC member thought the information presented could help inform the work of the Council's Ecosystem Technical Committee to develop a Fishery Ecosystem Plan. They also noted that the

lack of patterns observed in the MODIS remote sensing data for detecting red tide may not be at an appropriate resolution to effectively inform changes in fishing behavior; however, work done by the University of Florida and others exists that may be appropriate for this purpose. Another SSC member asked about the motivation for doing this research. Dr. Perruso recalled work done by others in the northern Pacific that was similar in nature, and the beneficial inferences that were drawn from that work. SSC members commented on the utility of these sorts of analyses for augmenting management alternatives proposed for fishery management plan amendments, and encouraged the continued development of such research and its review by the SSC in the future. An SSC member mentioned a concern regarding the level of detail used in some of the presentations with regard to location and fishery-dependent confidentiality, and encouraged the investigators to be mindful of the resolution of the data presented. SSC members also encouraged the investigators to get involved in the SEDAR process, especially at the data workshops and webinars, to contribute their work towards stock assessment efforts.

Motion: The SSC supports and recommends further developing and expanding the use of spatial fishery modeling and complementary analyses along the lines of that presented by Drs. Perruso and O'Farrell to understand the social and economic implications of fisheries disruptions and other abrupt changes. The SSC also recommends further exploring direct pathways to integrate these models and similar types of social and economic data into stock assessments and management processes.

Motion carried with one abstention.

Motion: The SSC requests that in instances when these spatial fishery modeling analyses are used to inform management alternatives in fishery management plan amendments, that these analyses be reviewed by the SSC prior to Council consideration.

Motion carried without opposition.

Review and Discussion: National Academies of Report on the Impacts of Limited Access Privilege Programs in Mixed-use Fisheries

Dr. Ava Lasseter (Council Staff) provided the recommendations from the report on *The Use of Limited Access Privilege Programs in Mixed-Use Fisheries*, which was presented by Dr. Anderson at the January 2022 SSC meeting. SSC members discussed whether or not they supported all the recommendations equally and whether some recommendations should be prioritized over others. The lack of data available for evaluating the impacts of LAPPs in existing commercial programs was noted, as well as the greater lack of data available for the potential establishment of a recreational sector LAPP, which the Council is not considering at this time.

Motion: The SSC agrees with the recommendations from the National Academies of Science report on the use of Limited Access Privileges Programs (LAPP) in mixed-use fisheries.

Motion carried 17 to 6 with 2 abstentions.

Evaluation: Updated SEFSC Catch Analysis for Gulf of Mexico Red Snapper using the Great Red Snapper Count

Mr. Matt Smith (SEFSC) and Dr. LaTree Denson (SEFSC) presented revised catch advice for red snapper based on the estimates of absolute abundance from the GRSC for Florida, Alabama, Mississippi, Texas, and the LGL study for Louisiana. The fishing mortality rate is input through projections to estimate F-at-age by region, using numbers-at-age, F-at-age, and mean landed weight-at-age to estimate catch. This catch analysis uses the post-stratified re-analysis of the GRSC for Florida. Uncertainty in the catch advice was quantified using deterministic projections at 75% of the fishing mortality rate corresponding to 26% SPR ($F_{26\%SPR}$), and also from Monte Carlo simulations incorporating uncertainty for the number of age-2+ red snapper, recruitment, fishing mortality rates, and initial depletion. Mr. Smith clarified that the terminal year of data for the analysis is 2019, with future yields projected forward from that point. After accounting for the inclusion of the LGL estimate, and the post-stratification of the Florida estimate from the GRSC-derived estimate using the random forest approach, the revised combined estimate of absolute abundance of age-2+ red snapper is approximately 85.6 million fish. Catch yields were generated annually, for both a three-year and a five-year average.

Three scenarios for considering the abundance over the UCB were generated: assuming all structure (e.g., all natural and artificial habitats), all structure plus 10% of the UCB, and all structure plus 15% of the UCB. Age and length composition data were informed by SEDAR 52, using data through 2016. The frequency of age-2+ fish were randomly selected assuming normal distribution with mean and standard deviation (SD) determined by the last 10 years of available data (2007-2016). An estimate of virgin spawning stock biomass (SSB) was derived from the fraction of SSB in 2019 divided by the projected SPR for 2019 from SEDAR 52 (20.7% based on the projected pace of rebuilding from SEDAR 52).

An SSC member was concerned about the uncertainty in the difference between the overfishing limit (OFL) and ABC projections. Mr. Smith commented that the catch analysis is still considered to be data rich by some metrics (e.g., Ralston et al. 2011¹). Council staff replied that the SSC has consistently expressed concern about the application of the P* method, due to narrow buffers generated by that method. Mr. Smith presented an additional option, which was an ensemble (all artificial and natural structures, plus ~8% UCB fished) approach that estimates a grand mean and variance for the catch advice and provides a broader estimate of uncertainty across the three UCB scenarios. Another SSC member asked how this new catch analysis changes the perception of biomass in the eastern versus western Gulf. Mr. Smith replied that the difference in biomass is less. However, the fishing mortality rates and age and length composition data are still informed by SEDAR 52, and a full stock assessment model would be needed to properly quantify that difference.

Dr. John Walter (SEFSC) presented spatial analyses (“Gardner analysis”) of commercial and recreational catch compared to biomass derived from the GRSC. The two objectives of this work were to assign spatial recreational and commercial catch and effort, using estimates of biomass

¹ <https://media.fisheries.noaa.gov/dam-migration/ns1-ralston-et-al-2011.pdf>

derived from the GRSC; and, to calculate exploitation rates for scenarios to inform potential fishery yields based on those rates. The analysis relies on the spatial distribution of the Karnauskas et al. 2017² study, which derives spatial abundance from data from 2010 and 2011, whereas the GRSC abundance by depth strata and zone are derived from data from 2018 – 2019. Spatially-explicit commercial landings are used to inform CPUE in space. Recreational catch is spatially allocated by state using state-specific available data. The spatial analysis was updated to account for the SSC's determination to use the LGL estimate for Louisiana, and to post-stratify the shallowest depth stratum in Florida. The majority of the stock (greater than 50%) experiences very low exploitation (less than 1%) by the directed fleets. When partitioned by region (Texas, Louisiana, Alabama and Mississippi, Northwest Florida, Florida mid-region, and South Florida), the greatest mean exploitation rates are observed in Alabama, Mississippi, and Northwest Florida.

Biomass was estimated from the GRSC using composition data and mean weights for red snapper from SEDAR 52, along with the regional abundance estimates from the GRSC-derived data to estimate biomass in weight. An SSC member asked about the relative fleet-specific fishing mortality rates between SEDAR 52 and this analysis, noting that the new analysis showed a decrease in those fleet-specific fishing mortality rates. Dr. Walter verified that the fishing mortality rates were proportionally lower, because of the increased biomass predicted to be present in the Gulf relative to the estimated fleet-specific fishing mortality rates. An SSC member thought there appeared to be a mismatch in the spatial distribution of the biomass and where the natural bottom habitat was known to be, and that the exploitation was also estimated to be higher in areas where exploitation was commonly thought to be lower. The SEFSC replied that inaccuracies in abundance estimation and/or exploitation rates could be causing those mismatches, specifically south of Mississippi. An SSC member from Mississippi remarked that there are substantial landings predicted to be from offshore of that state, and that data collected by the state do not support the exploitation rates estimated therein by the Marine Recreational Information Program. The SSC member also recommended looking into recent angler surveys querying, among other things, the depths at which those anglers fished. The SEFSC noted that the scaling of abundance from the GRSC and LGL estimates to the Karnauskas study may explain the difference in exploitation rates along the Texas/Louisiana border.

The SSC noted that other aspects of population dynamics, like recruitment, reproduction, updates to age and length compositions, and other information have not been updated with current information, as is customary from a stock assessment. Further, an SSC member stated that the SSC could not conclusively determine the current SPR level of the stock, or the stock biomass relative to the SSB target in the red snapper rebuilding plan. Another SSC member also expressed reticence to recommend catch advice in this manner, without knowing the effect of that catch advice on the rebuilding plan.

Dr. Walter noted that the Gardner analysis used a mean weight in the eastern Gulf of 3.2 pounds whole weight (lbs ww), and 4.8 lbs ww in the western Gulf. SSC members acknowledged that the stock is in fact larger than previously estimated by SEDAR 52, and that exploitation rates are likely lower than estimated by that previous assessment. An SSC member thought the issue of localized depletion should be considered by the Council, as evidenced by spatial effort estimation and mark-recapture studies, including those conducted as part of the GRSC. Another SSC member

² <https://afspubs.onlinelibrary.wiley.com/doi/pdfdirect/10.1080/19425120.2016.1255684>

contended that their primary concern was exploitation in the eastern Gulf, which experiences substantial exploitation by comparison. Further, the SSC member thought the average size of red snapper in the eastern Gulf was decreasing. This observation was corroborated by another SSC member, who detailed GRSC observations of mean weight in the eastern Gulf that were closer to two lbs ww. That SSC member commented that the P^* approach was not mandated to be used to set the buffer between the OFL and the ABC.

An SSC member thought it prudent to continually evaluate the condition of the red snapper stock, to the extent practicable, if a decision is made to recommend revised catch advice based on the analyses presented. Another SSC member thought that the previously unaccounted biomass of red snapper recently identified by the GRSC and LGL surveys may explain why a stock-recruit relationship was not able to be discerned, and why the stock appeared as resilient as it was to fishing pressure. The SEFSC remarked that it was comfortable retaining the MSY proxy of $F_{26\%SPR}$, since that value is largely based on the portion of the stock which experiences directed fishing mortality. However, as a greater percentage of the UCB is considered for catch advice, the greater the proxy for MSY should ultimately be, based on empirical evidence and modeling.

SSC members remarked that the SSC's last OFL recommendation used the GRSC, and the ABC used the NMFS BLL survey; however, the ABC is typically derived from the OFL, and not usually set using a different set of data from the OFL. Those SSC members thought this difference in the information used for catch advice was inappropriate, and that the same information should be used to inform both catch levels.

Motion: The SSC finds that the catch analysis developed by the SEFSC and informed by age-2+ red snapper abundance from the GRSC for Texas, Alabama, Mississippi, and the post-stratified abundance data for Florida, and from the LGL red snapper abundance study for Louisiana, is the BSIA for abundance information and useful for development of OFL and ABC recommendations.

Motion carried 14 – 7, with three abstentions and one absent.

An SSC member asked why the P^* values in the ensemble projections decreased and then increased for $P^* = 40\%$, and decreased for $P^* = 30\%$. Mr. Smith replied that these trajectories have to do with the existing age composition information from SEDAR 52, and that as the age composition data are smoothed over time (to equilibrium) results in some variation in the annual potential yields. An SSC member asked about the justification for decreasing the OFL from the SSC's last recommendation (25.6 million pounds whole weight [mp ww]), noting that some surveys have indicated increasing positive sentiment from anglers about the health of the stock. Council staff added that the Council's Fisherman Feedback tool, which collects input from fishermen ahead of stock assessments, has several comments on the abundance of red snapper, expressing both positive and negative sentiments, ahead of the SEDAR 74 research track assessment. An SSC member recalled that some fishermen have noticed decreasing trends, and acknowledged that variations in observations across the Gulf are to be expected, based on several recent publications. The directed fleets for red snapper are known to operate over UCB; the question at this point was to determine the proportion of UCB biomass to consider as part of the catch advice.

An SSC member asked about the current catch limits, and Council staff noted the current OFL as 15.5 mp ww, and the ABC as 15.1 mp ww. The SSC's most recent catch recommendations for OFL were 25.6 mp ww (based on the GRSC), and 15.4 mp ww for the ABC (based on the NMFS BLL survey); these catch limits have not yet been implemented. The SSC member thought the discrepancy in surveys used may be of concern to the Department of Commerce. Another SSC member expressed concern about the standard deviation for the OFL estimate, and thought there was some risk of exceeding the ABC and encroaching on the OFL. Other SSC members thought that the ensemble approach did not account for an appropriate amount of biomass from the UCB, given the biomass and fishing effort identified over that habitat. An SSC member questioned whether depletion over natural and artificial habitats would attract fish from the UCB biomass, or rely on production from the remaining biomass on those habitats.

Motion: The SSC accepts the SEFSC catch analysis and establishes an OFL based on the ensemble analysis using the 5-year average of 18.91 mp ww.

Motion carried 12 – 9, with three abstentions and one absent.

The SSC discussed an appropriate catch recommendation for the ABC, acknowledging the uncertainties it has discussed with respect to the data used in the catch analysis, and the catch analysis itself. The SSC used a P* of 40% when setting catch advice from SEDAR 52. An SSC member mentioned the decreasing trend in the NMFS BLL survey in the eastern Gulf and the issue of possible localized depletion, and reiterated the need to have regular periodic updates about the health of the stock. An SSC member noted that although the eastern and western Gulf NMFS BLL survey data appear scaled in the same manner, the catches in the western Gulf are much greater than in the eastern Gulf, and the western Gulf age and length compositions show older, larger fish; thus, the eastern and western Gulf data were not comparable as presented. Council staff described the selectivity of the sampling gears, noting that the NMFS BLL survey tends to select for larger, older fish, while the SEAMAP and FWC video surveys select for different age and length compositions dependent on their depth deployments (deeper water = larger, older fish, and vice versa). The combined Gulf-wide NMFS BLL index of relative abundance shows an increasing trend through the mid-2010s, and a leveling off thereafter. Council staff noted that the NMFS BLL survey was not the best for catching red snapper, as evidenced by its exclusion from the exploitation analysis in the Gardner analysis. Further, that survey selects for larger and older fish using 15/0 circle hooks³, and thus would not be expected to catch the younger, smaller red snapper estimated to occur in the eastern Gulf. An SSC member thought the majority of the depletion issues are coming from the eastern Gulf; however, the stock catch limit recommendations are provided for the Gulf as a whole.

Motion: The SSC approves an ABC of 16.31 mp ww for red snapper, based on the 5-year average using the ensemble approach, and based on a P* value of 0.3.

Motion carried 11 – 9 with two abstentions and three absent.

³ <https://seamap.gsmfc.org/documents/SEAMAP%20Bottom%20Longline%20Operations%20Manual%201-2016.pdf>

Review: An Update on the Development of Brown and White Shrimp Empirical Dynamic Models (EDM)

Dr. Michelle Masi (SERO) presented on the progress of developing brown and white shrimp empirical dynamic models (EDMs). She provided a timeline of the SEFSC's research since June 2019 into models for shrimp, beginning with a review of age-structured models. She stated that the SEAMAP Working Group from the NMFS Shrimp Working Groups, had determined SEAMAP to be a representative index of penaeid stock abundance. Dr. Masi then noted that penaeids are considered annual crops and that NMFS lacks age-structured data. In addition, data lags in NMFS receiving landings data proves problematic for timely stock status information. Dr. Masi reviewed how Shrimp Amendment 15 used stock synthesis models for developing annual status determination criteria (SDC) for penaeids. Dr. Masi asked the SSC to consider if an age-structured model is needed to provide relative SDC.

Dr. Stephan Munch (Southwest Fisheries Science Center) then provided background information on EDMs and noted that they implicitly account for unobserved variables using lags of the observed variables. Two highlights of using EDMs are that (1) they don't need data on all variables to make accurate predictions and (2) they don't need equations if enough data are available. When comparing prediction error across 185 fish stocks through use of an EDM compared with traditional models, an EDM forecasts better for roughly 90% of the populations. Dr. Munch next reviewed how hierarchical EDMs were used to predict abundance for brown and white shrimp in each SEAMAP statistical zone. When models included lags of abundances as well as current temperature, salinity, and dissolved oxygen, only temperature and abundance were found to be relevant. For brown shrimp, overall correlation was found to be 0.86; for white shrimp, overall correlation was found to be 0.75. The next steps in research would be to use EDMs to determine stock status.

Dr. Masi stated that preliminary findings show that data limitations for penaeids suggest that age-structured models are neither appropriate nor responsive enough for an annual crop. They plan to derive SDC for brown and white shrimp and provide an update to the SSC in late 2022. A peer-review of brown and white shrimp models as part of the SEDAR research track will commence in 2023. Dr. Masi requested SSC input on their interpretation of EDM as being an appropriate consideration for brown and white shrimp assessment models.

An SSC member inquired if fall or summer SEAMAP was used in predicting abundance for brown shrimp and for white shrimp with EDMs. Dr. Munch stated that he couldn't recall, but that they used the recommendation from the NMFS working group. The SSC member then asked if there would be involvement of the SSC in the EDM development. Dr. Masi replied that SSC involvement would be in the form of input during this SSC meeting and again in a fall 2022 SSC meeting, and Dr. Siegfried (SEFSC) stated that additional SSC involvement would occur during the shrimp SEDAR research track. Another SSC member asked about the potential use of state inshore surveys for recruitment. Dr. Masi replied that these are Gulf-wide models; still, state recruitment indexes were considered for inclusion but have not been developed. One SSC member stated that a shift from age-structured models for shrimp is needed, but he would encourage running simple biomass models for comparison with EDMs. Another SSC member stated that EDM is an exciting approach and inquired about the plan to use EDMs for status determination

criteria. Dr. Munch replied that the use would be same as if equations were used and stated that conceptually there is no difference. An SSC member inquired if giving the stock assessment presentations later in the year would be a solution for the lag in NMFS receiving landings data. Dr. Masi replied that, even if presentations are given later in the year, there is still a lag from real-time data. Another SSC member inquired as to models for royal red shrimp and pink shrimp. Dr. Masi stated that royal red shrimp is currently only tracked for its ACL and landings and that, at this time, there are not enough points from SEAMAP for EDM to be used with pink shrimp.

One SSC member commented that there are members of the SSC such as Dr. Nance that should be directly involved in the transition from current to proposed models, instead of the SSC only reviewing these models at the end. Ms. Leann Bosarge (Council member) asked about the involvement of SSC members in not just the shrimp SEDAR research track in 2023 but also in deriving SDC for brown and white shrimp from EDMs. Dr. Siegfried responded that the SSC will review results of the research and that the SEFSC can share updates with SSC members between meetings.

Public Comment

Eric Schmidt, a charter captain in Ft. Myers, FL, reiterated what other stakeholders have been commenting about the red grouper fishery in the last two years: it has been exceptional. From Boca Grande to Naples, he has seen the age-two year class moving through the fishery. He has been catching copious amounts of juveniles daily which leads him to believe there will be a solid fishery in a few years. He's heard there is a possibility the fishery may close again this year; he implored NOAA Fisheries not to predetermine a closure date, or to make any knee-jerk decisions, especially when there are extensive data lags, during this time of economic uncertainty and increasing gas prices.

He was asked by SSC members to remark on his observations of businesses during the 2008 recession. Mr. Schmidt remarked he has noticed similarities such as an increase in shore fishing and expects to see decreased effort, especially in offshore fishing. Mr. Rindone noted that 2008, and current, shore mode landings should be followed closely for discussion in upcoming topical working groups. He added that the recent reallocation of red grouper will exacerbate the reduction in commercial effort. Lease prices increased from \$0.70 last year to \$3.25 this year. This is unsustainable for businesses considering they must also account for rising fuel, grocery and bait costs.

He also provided testimony on data privacy in relation to new VMS regulations. He opposed VMS installation 23 years ago because he thought it would lead to the use of the collected data against the fishermen in management decisions to close areas to fishing. He gave the example of restrictive Pulley Ridge management decisions. He also commented on the presentation (XI.a) regarding publicizing maps with fishing effort by location. Some fishermen are savvy enough to use what is provided to fish competitors' locations. This information should remain confidential. Mr. Bob Zales, a charter captain in Panama City, FL, concurred with Mr. Schmidt. Amendment 53 is already impacting the commercial sector; increasing fuel costs exacerbate the issue. Recently, he had the best red snapper season in 57 years, but he has noticed people are wary of traveling now

with the economic uncertainty. These impacts are significant when determining the prosecution of fisheries. Florida is known for its excellent fishing, but this reputation may be in jeopardy. Even local restaurants are hurting because of rising costs to purchase fish. They don't want to pass the costs to the consumer. Managers need to be careful with the use of location-tracking data. He remarked that charter fishermen fish differently than commercial, so the VMS data aren't comparable. Mr. Zales also noted the disconnect between the current management decisions and the public's perception of the Great Red Snapper Count results. He cautioned managers to think carefully about the quota because anglers will catch whatever is allowed. He thanked the SSC for discussing socio-economic outcomes as they impact regulations and should be considered in the decision-making process.

Eric Brazer, Deputy Director of the GOM Reef Fish Shareholders Alliance, stated he was glad to see the positive results of the red grouper health check and hopes that additional work will be done to tease out implications beyond those from fishery observations, such as CPUE, and trip tickets to validate on-the-water observations. He suggested a closer look at the IFQ portal, as it is proximal real-time data, and following the economic impacts of Amendment 53 on red grouper and similarly, gag. If there were mechanisms available to track data in real-time, they may show that some anglers are less opposed to certain quota cuts.

An SSC member asked for Mr. Brazer's industry observation of red snapper. He is hearing reports of increased commercial effort relative to landings, especially after the recreational season closes. Commercial fishermen have to go further offshore and fish longer.

Dr. Mike Drexler, of the Ocean Conservancy, commended the Science Center and SSC for distilling the current body of work provided into management advice; however, he stated that there is still work to be done to integrate and reconcile standing data. The best way to do this is through the SEDAR process. He counseled the SSC against inevitably categorizing all the recently presented data as BSIA. Historically, the amount of red snapper caught has never exceeded 16 million pounds as estimated in SEDAR 52. This should be revisited as it impacted the SPR and called into question stock health, especially when considering fishing levels of 25 million pounds or higher. He also requested that any changes to the ABC account for the rebuilding plan schedule and to avoid potential overfishing. He also noted several unresolved issues, including the discussion of common currencies, when making these decisions. He cautioned the committee on making decisions that could lead to catch advice estimates for 2024, especially with assessment timing that will unlikely lead to any realized changes until 2025.

Mr. Jim Zurbrick, a commercial fisherman in north Florida, commented on the potential increase in red snapper and resulting catch advice. He agrees that more restrictive management allowed the fishery to get to its current status but cautions an increase, even of 10%, because of the resulting increase in discards overall in the fishery. A quota increase is not a detriment to the fishery per se, unless it leads to increased waste. He also commented on the use of onboard cameras on fishing trips as rather accurate and likely a good alternative to fisheries observers who may miss collecting valuable data for various reasons. He looks forward to an analysis comparing the utility of cameras to human observers.

Mr. Randy Boggs, a charter captain in Orange Beach, AL, commented on the red snapper fishery in his area stating that he has been seeing many smaller fish; commercial fishermen are doing well because they can keep the smaller fish. He has heard that the western Gulf has retained a biomass of larger fish despite the recent hurricanes, but he believes that increasing catch limits is premature. He hasn't seen the number of fish that he saw in previous years, especially with the constant increase in fishing pressure.

Mr. Troy Frady, a charter fisherman in Alabama, provided comment on the red snapper fishery in his area. He stated that he has been charter fishing for twenty years out of Orange Beach and has spent more time on the water than any scientist. Despite some scientific opinions, he thinks the red snapper fishery is in trouble because the rate of removal far exceeds the ability of the fishery to replenish itself. He also suspects that recruitment may not be as good as it's believed; he has noticed a depletion of larger red snapper. Hurricane Sally destroyed or covered many artificial reefs and potentially moved large amounts of fish out of the western Gulf.

Other Business

No other business was brought before the SSC.

The meeting was adjourned at 3:00 pm eastern time on March 10, 2022.

Meeting Participants

Standing SSC

Jim Nance, *Chair*
Luiz Barbieri, *Vice Chair*
Lee Anderson
Harry Blanchet
Dave Chagaris
Roy Crabtree
Benny Gallaway
Doug Gregory
David Griffith
Paul Mickle
Trevor Moncrief
Will Patterson
Sean Powers
Steven Scyphers
Jim Tolan
Richard Woodward

Special Reef Fish SSC

Jason Adriance
Mike Allen
John Mareska

Special Ecosystem SSC

Mandy Karnauskas
Josh Kilborn
Steve Saul

Special Socioeconomic SSC

Luke Fairbanks
Cindy Grace-McCaskey
Jack Isaacs

Council Representative

Tom Frazer