South Atlantic and Gulf of Mexico
Scientific and Statistical Committees
Joint Meeting via Webinar
August 4, 2022

SEDAR 64 Interim Analysis for Southeastern U.S. Yellowtail Snapper

Dr. Shanae Allen and Mr. Chris Swanson of the Florida Fish and Wildlife Conservation Commission (FWC) presented an interim analysis which updates the landings and discards data for southeastern U.S. yellowtail snapper through 2020, using the base model approved by the Gulf of Mexico (Gulf) and South Atlantic Scientific and Statistical Committees (SSCs) following their review of the SEDAR 64 (2020) stock assessment. Because this analytical work was completed as an interim analysis, there were no updates made from SEDAR 64 to other model features like age and length composition, reproduction, and fishery-independent indices of relative abundance. SEDAR 64 used the Marine Recreational Information Program's (MRIP) Fishing Effort Survey (FES)-calibrated private recreational catch and effort statistics.

Mr. Swanson reviewed the assessment history for yellowtail snapper, which has been assessed four times since 2003. Generally speaking, the ratio of the spawning stock biomass (SSB) compared to the SSB at the proxy for fishing mortality at maximum sustainable yield (F_{MSY}), currently defined at $F_{30\%SPR}$ (spawning potential ratio), has remained consistent or increased with time across stock assessments, indicating a healthy stock.

Mr. Swanson reviewed the landings history, showing that the commercial landings come primarily from the Florida Keys and southeastern portion of Florida. A decrease in commercial landings was observed in 2020, possibly attributable to economic effects from COVID-19. Recreational landings use MRIP-FES for private vessel and shore landings, and make up the majority of recreational landings. Discards come primarily from the recreational private vessel fleet, with total discards for all directed fleets oscillating around 2 million fish per year.

Mr. Swanson examined the 2017 MRIP-FES landings off southwestern Florida, which were anomalously higher than landings of the same in surrounding years. A combination of high catch rates and weights resulted in an increased estimate of total MRIP-FES landings for 2017; a sensitivity run examining the effect of using a geometric mean of the surrounding years was performed to examine the effect of the2017 point estimate and will be reviewed later. For 2020 MRIP-FES data, imputations of intercept data were necessary due to decreased sampling during COVID-19; the results of these imputations were not observed to affect the 2020 data compared to previous years with respect to landings and weight estimates from intercepts in those years.

The base model configuration was reviewed, with updated recruitment deviations through 2020 and updated bias adjustments. A total of 88 out of 120 model parameters are estimated in the base model. Model convergence criteria and error structure remain unchanged from SEDAR 64. Model fits to landings and discards were observed to be reasonable and within the model error estimation. Model estimates od recruitment were shown to be consistent in recent years; however, recruitment is internally estimated since 2016, begetting larger estimated variance

around those point estimates. In the last three years (2018 – 2020), total biomass and SSB are estimated to have decreased somewhat. As expected in a directly targeted fishery, the majority of the age composition is skewed towards younger ages. MRIP-FES landings are estimated to be comprised of mostly younger fish, especially compared to the commercial fleet; recreational discards are far greater than commercial discards.

Model diagnostics were completed to evaluate model stability and rugosity. No model parameters were observed to hit bounds, and no jitter runs (deviations of base parameter estimates of 10%) contained a likelihood value that was less than the interim base model. Jackknife analyses, which remove a single index to observe model dependency on that index, showed sensitivity to the removal of the commercial catch-per-unit-effort (CPUE) index in a runs test, and to the headboat index when examining mean lengths. Overall, goodness of fit increased over time in the model towards present-day data. A retrospective analysis, removing a single year of data at a time to evaluate model sensitivity to recent data, did not demonstrate any model sensitivity, with one-year forecasting from the retrospective terminal years falling within the 95% confidence intervals. Predictive skill using the Mase scoring system is designed to evaluate the model's predictive ability compared to a random walk, with a score less than 1 indicating superior predictive ability compared to a random walk. The MRIP-FES index in the interim analysis (base model through 2020) showed a strong predictive ability, along with fishery-independent indices.

Dr. Allen reviewed the sensitivity analyses conducted for the interim analysis. The first was to evaluate the impact of elevated MRIP-FES estimated landings in the southwestern region of Florida in 2017. These landings in 2017 deviated more than two standard deviations from the mean compared to landings from 2014 – 2016, and 2018 – 2020. Using a geometric mean of the surrounding years in place of the reported 2017 landings decreases the total estimated stock landings for 2017. No discernible differences were observed in model performance in the sensitivity run. Another sensitivity run evaluated a misspecification for the MRIP-FES CPUE index of abundance, which had originally characterized as catch per angler instead of catch per trip. The effect of this correction shows a decrease compared to the base model in terms of SSB and recruitment, and an increase in fishing mortality. However, reference points remained unchanged, and results were found to still be within uncertainty bounds. Applying the MRIP-FES CPUE correction indicates that the stock may be approaching the target SSB and the maximum fishing mortality threshold (MFMT). An SSC member asked how effort was being estimated at the trip level compared to the previous angler-level method. Dr. Allen replied that factors such as the total number of anglers and average hours fished were incorporated to generate the trip-level estimate of CPUE.

Dr. Allen reviewed Markov chain Monte-Carlo simulations to generate posterior distributions of model parameters and their derived quantities. Some differences between the MCMC run and the model observed maximum likelihood are observed for MFMT; however, this is exaggerated by narrow scaling on the x-axis. Generally speaking, uncertainty in the model is shown to be appropriately characterized. To evaluate stock status, the geometric mean of SSB for 2018 – 2020 is compared to the minimum stock size threshold, which indicates that yellowtail snapper is not overfished. Further, the geometric mean of the fishing mortality rate for 2018 – 2020 is compared to the MFMT, which indicates that yellowtail snapper is not experiencing overfishing.

Dr. Allen reviewed yield projections, limited to 2021 – 2030, and including constant catch and constant F scenarios. Recruitment is based on the stock-recruit relationship, and is similar to the average recruitment for the stock over the recruitment time series. An iterative method specifying the fleet-specific fishing mortality rates by year is applied, as were the current jurisdictional allocation and sector allocation regulations. Using the South Atlantic SSC's acceptable biological catch (ABC) control rule, a P* of 0.375 is applied to the projections, as was done following SEDAR 64. Projections are constrained to fish the stock down towards $SSB_{30\%SPR}$ through higher allowable catches in early projection years. This is possible because the $SSB_{Current}$ is greater than $SSB_{30\%SPR}$. Projections for a three-year and five-year average constant catch, and equilibrium catch, are provided.

An SSC member asked whether the change in MRIP-FES CPUE specification from catch per angler to catch per trip was included in the interim analysis. Mr. Swanson replied that the interim analysis did not update this misspecification, since it was what was performed in the SEDAR 64 base model. Another SSC member asked why the fishery-independent indices were not also updated. Council staff replied that due to time constraints, and to get operable management advice in a timely fashion, an interim analysis approach was adopted, in which all of the indices are not typically updated. An SSC member asked about the projections under the constant catch scenarios, noting that they appeared to lead to overfishing over time if left in place. Dr. Allen replied that this was due to these values being fixed, and that these deterministic projections were set to achieve $SSB_{30\%SPR}$ and MFMT. An SSC member asked about the proportion of landings possibly coming from private access points. Another SSC member, and a resident of Key West, replied that private access point landings could constitute a substantial proportion of private angling landings. The SSC member also asked about the projections exceeding MFMT under the constant catch scenarios, and asked if constant catch could be used until the projections reach MFMT. Another SSC member replied that the annual yield projections would be expected to achieve MFMT on an annual basis.

Council staff reviewed the SSCs' previous decisions regarding yellowtail snapper. Previous meetings of the Joint SSCs in July and October 2020 deemed SEDAR 64 to be consistent with the best scientific information available and useful for management advice. The SSCs recommended using the calculated P* value of 0.375 to produce ABCs using the South Atlantic Council's ABC Control Rule, and also recommended that the Councils consider adjusting the annual catch limit (ACL) or annual catch target (ACT) for management uncertainty (e.g., 0.75 * $F_{30\%SPR}$). Due to the length of time elapsed between the terminal year for SEDAR 64 (2017) and beginning management action (2020), this interim analysis was conducted using updated data streams to re-inform projections.

> **Consensus Statement**: The SSCs determine that the 2022 SEDAR 64 interim analysis satisfies the prescribed terms of reference.
>
> **Consensus Statement**: The SSCs did not find any outstanding issues with the analysis that would prevent it from being used to inform catch level recommendations.
>
> **Consensus Statement**: The SSCs finds the 2022 interim analysis using the SEDAR 64 base model as being consistent with the best scientific information available.

The SSCs discussed the definition of an interim analysis, with the Gulf SSC remarking that this analysis bore some differences to past interim analyses reviewed by that SSC (e.g., gray triggerfish and red grouper). The SSCs thought exploration into the approach taken here should be considered by the SEFSC for future interim analyses, whereby necessary data streams are updated, and explore differences in performance with the current interim analysis approach. An SSC member thought the uncertainty surrounding the P* method was narrow, which has been a perennial issue for ABC control rules in the southeastern U.S. The SSC member added that they thought the uncertainty characterized in this interim analysis was greater than previously characterized, and likely more appropriate. An SSC member asked how to balance the health of the stock and uncertainty in future recruitment against setting catch limits that would fish the stock right at MFMT. SSC members considered revisiting the South Atlantic SSC's ABC Control Rule, and recommending that the Councils address some of this uncertainty in the buffers between the Council's apportioned ACL and its sector/stock ACL(s) and ACT(s). SSC members also thought it prudent to make recommendations about what to consider in the next stock assessment of yellowtail snapper, and when that assessment should occur.

> **Consensus Statement**: The SSCs recommend that the next stock assessment of southeastern U.S. yellowtail snapper be performed in the next 3 – 5 years, and include updating all indices of relative abundance. The next assessment should also further explore uncertainty in natural and discard mortality, and in the projections, and also MRIP-FES CPUE interpretation as catch-per-trip instead of catch-per-angler. Research recommendations from SEDAR 64 should also be considered.

> **Consensus Statement**: The SSCs recommend catch levels commensurate with $F_{30\%SPR}$ for the overfishing limit (OFL), a P* of 0.375 for the ABC, using annual yields as outlined in the table below:

Year	$F_{30\%SPR}$ (OFL)	P* = 0.375 (ABC)	90% of $F_{30\%SPR}$	75% of $F_{30\%SPR}$
2023	3.922	3.887	3.733	3.432
2024	3.774	3.749	3.635	3.401
2025	3.684	3.665	3.576	3.385
2026	3.625	3.610	3.537	3.375
2027	3.584	3.572	3.510	3.367

Other Joint Committee Business

The Councils have established a Joint Committee of the SSCs to address unassessed stocks. The members of this Joint Committee have been selected, and Dr. Kai Lorenzen (South Atlantic SSC) will serve as the chair. The Joint Committee will be convened in the fall of 2022. An SSC member asked why the effort to examine unassessed stocks in the South Atlantic had become a joint effort. Council staff replied that the Councils share some species, like goliath grouper, that could benefit from collaboration. South Atlantic SSC members stated that the original intent was to evaluate unassessed stocks, not necessarily those with an ABC of zero. The SSCs agreed that special consideration of a Council's specific needs, and application of ABC Control Rules, should be made where possible.