SEDAR 61 Assessment Workshop Webinar V
Gulf of Mexico Red Grouper
May 30, 2019 from 11:00 AM to 12:00 PM
Summary Report

Data Updates

The combined video index and length composition, recreational age composition, growth and natural mortality, and fecundity-at-age have all been updated. The FWRI Repetitive Time Drop index and length composition data have been incorporated into the model structure. The square root of the sample sizes available was used for the composition data to iteratively reweight the effective sample sizes of those data sets. The model start year is 1986, using one area (the Gulf of Mexico) and one season (the calendar year). Genders are combined, with maturity, protogyny, and fecundity all a function of age. Spawning stock biomass is measured as female reproductive output in scaled number of eggs. Natural mortality (Lorenzen) is fixed, as is steepness (at 0.99).

Model fits were improved by estimating the von Bertalanffy growth rate parameters k and length at age-1 (A_{min}). The model had previously struggled to fit to the large cohorts of fish which can move through the stock structure through time.

Five fishing fleets with both landings and discards are included in the model (commercial handline, commercial vertical line, commercial longline, commercial trap, recreational). Red tide is treated as a pseudo-fishing fleet in 2005 and 2014, selecting for age-0 and older fish. Four fishery-independent and four fishery-dependent indices of abundance are also included, including the addition of the FWRI Repetitive Time Drop index.

Another change made was to model the combined video index as asymptotic, effectively selecting for all red grouper over a certain size (approximately 60 cm FL). Modeling the fishing fleets with length-based selectivity generated more realistic selectivity patterns for the respective fishing fleets, and was more reflective of observed data. Further, retention parameters were allowed to vary with time, with the inflection point fixed at the size limit.

Model Results

Declines in biomass are observed following the 2005 and 2014 red tide events, which appear to have had substantial deleterious effects on the spawning stock biomass. Strong recruitments are intermittent and unpredictable, with strong recruitment events in 1998 and 2005. Recruitment deviations can fluctuate about the mean (>1 SD). The majority of the fishing mortality is inflicted by the recreational fleets, followed by the commercial handline and longline fleets, and then red tide; however, mortality from red tide can exceed the fishing mortality of the other individual fishing fleets.

Fleet Selectivity Curves

Commercial handline and longline selectivity curves were dome shaped, with the fleets selecting for size-limit fish, and then gradually selecting less for successively larger size classes. Recreational selectivity assumes that due to regulatory restrictions, the recreational fleets are not retaining all fish caught like the IFQ commercial fisheries. Recreational selectivity is also dome-shaped for reasons similar to the commercial fleets.

Length Composition

Fits to length composition data are improved over SEDAR 42; however, room for improvement exists for most fishery-independent indices of abundance. Fairly large residual patterns are evident in the recreational landings. Time-varying selectivity may better explain the residual patterns observed.

Age Composition

Fits to age composition data are good for the commercial handline and longline fleets, and the recreational fleets, but not for the commercial trap data. Cohorts can be seen moving through the residuals in the recreational data. These patterns may also be improved by the application of time-varying selectivity.

Fits to Abundance Indices, Discards

Fits are fair to the commercial handline and longline data. Fits to headboat data are good, except for in the mid-2000s. Fits to MRIP data are marginal, with poor fits prior to 2008, with observed and predicted values appearing to oscillate about one another. Further index development for MRIP and the SRHS may improve these fits, including more work in trip identification. Fits it fishery-independent indices are better than those to the fishery-dependent indices mentioned prior.

Fits to commercial handline and longline discards are overestimating discards in the early part of the time series, and underestimating somewhat later in the time series. Commercial trap data are fit well. Recreational discards are generally fit well, with some underestimation around 2010.

Diagnostics

The jitter analysis randomly perturbs model parameter values by 10%, for 200 runs. This analysis showed that the model is stable across key parameters.

The bootstrapping exercise runs the model 500 times to generate a histogram of the results against the model estimate of key output values. This exercise showed agreement for all key output values, with the exception of fishing mortality which (bootstrapping values were lower than the model estimate). This may be due to variability in initial fishing mortality estimates from early in the respective time series. Starting the model at a different estimate of virgin stock biomass may result in different values.

Retrospective analyses did not show a pattern as a result of removing successive years of data from the model. The jack-knife analysis removes one index at a time from the model to test for model sensitivity to a particular index. This analysis showed that the model was robust, indicating that the model was not relying too much on any one index.

Likelihood profiling supported a Σ_R value > 0.75, a R_0 (virgin recruitment) value of ~9.9, and an estimate of h (steepness) of between 0.72 – 0.74 (currently fixed at 0.99). Initial Fs for the commercial longline fleet are set at 0.08-0.09, commercial trap at 0.01-0.02, and recreational fleets at 0.23-0.26.

SEDAR 61 versus SEDAR 42

The proposed base case predicts a larger SSB compared to SEDAR 42; however, it also predicts a considerable drop in SSB since 2013, which has driven the SSB below $SSB_{30\%SPR}$. Recruitment deviations show general agreement between models. Red tide mortality in 2005 is reflected in both models, with red tide mortality from 2014 added to the SEDAR 61 model. Virgin recruitment and virgin SSB are both predicted to be larger in SEDAR 61.

Sensitivity Analyses

<u>Red Tide in 2005 only; in 2005, 2014, 2015; and in 2005 and 2015</u>

The model can recognize a red tide event occurring around 2014; however, it cannot distinguish the effects of a red tide between 2014 and 2015. Workshops indicated that a red tide event occurred in 2014, and that event is thought to have been severe.

Remove Fishery-Independent Indices

Overall, removing any of the fishery-dependent indices did not result in a marked difference in the model results, with all analyses indicating the stock to be below $SSB_{30\%SPR}$.

Projections

The lack of a stock-recruitment relationship has led the Assessment Panel to fix steepness at 0.99. However, the diagnostics indicated that steepness may be estimable, and in past assessments, steepness for red grouper has been estimated ~0.8. Assessment Panelists indicated that the Scientific and Statistical Committee would likely want to see a run where steepness is estimated within the range shown in the likelihood profiling (0.72-0.74). Subsequent diagnostics would likely not be necessary at that time.

Projections will assume constant recruitment for 2010 – 2017, with selectivity, retention, and discard mortality taken from that same time block. Allocations are capped at 76% commercial and 24% recreational. 2018 preliminary landings will be used, and 2019 landings will be presumed to be equal to the ACL, which was adjusted through an emergency rule. The first year of forecasting will be in 2020. A rebuilding timeline will only be necessary if SSB drops below 50% of $SSB_{30\%SPR}$ (MSST; Amendment 44).

The Stock Assessment Report is due to the Gulf Council by July 26, 2019

Participants:

Julie Neer	Kevin Thompson	Will Patterson
Ryan Rindone	Linda Lombardi	Vivian Matter
Skyler Sagarese	Mandy Karnauskas	Jeff Isely
Adyan Rios	Mary Christman	Kelly Fitzpatrick
Beth Wrege	Matt Smith	Martin Fisher
Dave Chagaris	Mike Colby	Nick Ruland
Jeff Pulver	Mike Drexler	
John Walter	Michelle Masi	