SEDAR 90 South Atlantic Red Snapper
DRAFT Benchmark Terms of Reference
March 2024

Data Workshop Terms of Reference

Definition of assessment unit stock was determined by the Red Snapper planning team. The northern threshold is the default boundary between South Atlantic and Mid-Atlantic council jurisdictions, and the southern threshold is default boundary between the South Atlantic and the Gulf of Mexico council jurisdictions.

1. Review, discuss, and tabulate available life history information that is appropriate for use in a stock assessment model.
    - Evaluate age, growth, natural mortality, and reproductive characteristics.
        - Explore the validity of age data and methodology across fish age readers and facilities.
        - Explore emerging technologies (e.g., Near IR spectroscopy).
        - Explore evidence of changes in life history characteristics over time.
    - Explore differences in growth parameters, spawning fractions, and fecundity data.
    - Provide appropriate models to describe population and stock specific (if warranted) growth, maturation, and fecundity by age, sex, or length as applicable.
    - Evaluate and discuss the sources of uncertainty and error, and data limitations (such as temporal and spatial coverage) for each data source. Provide estimates or ranges of uncertainty for all life history information.
    - Recommend the best measure of stock productivity (e.g. SSB vs total egg production) for use in the assessment stage.

2. Provide measures of population abundance that are appropriate for this stock assessment.
    - Consider all available and relevant fishery-dependent and -independent data sources, including:
        - State of Florida Data Surveys
        - SCDNR Juvenile Survey
        - South Atlantic Deepwater Longline (SADL) Survey
    - Document all programs evaluated: address program objectives, methods, coverage, sampling intensity, and other relevant characteristics.
    - Provide maps of fishery and independent survey coverage.
    - Develop fishery and survey CPUE indices by appropriate strata (e.g., age, size, area, and fishery).
    - Provide appropriate measures of uncertainty for the abundance indices to be used in stock assessment models.
    - Document pros and cons of available indices regarding their ability to represent abundance.
    - Categorize the available indices into one of three tiers: Suitable and Recommended, Suitable and Not Recommended, or Not Suitable.
    - For recommended indices, document any known or suspected temporal patterns in catchability not accounted for by standardization.

3. Provide commercial catch statistics including both landings and discards in both pounds and number.

- Evaluate and discuss the adequacy of available data for accurately characterizing landings and discards by fishery sector or gear.
- Provide length and age distributions for both landings and discards if feasible.
- Provide estimates of uncertainty around each set of landings and discard estimates.

4. Provide recreational catch statistics including both landings and discards in both pounds and number.
   - Evaluate and discuss the adequacy of available data for accurately characterizing landings and discards by fishery sector or gear.
   - Provide length and age distributions for both landings and discards if feasible.
   - Provide estimates of uncertainty around each set of landings and discard estimates.
   - Evaluate the utility of mini-season landings estimates, Florida State Reef Fish Survey, FISHStory and SEFHIER.

5. Recommend discard mortality rates for the fleets recommended by the panel.
   - Review available research and published literature (e.g., RELEASE, NMFS Observer Program).
   - Provide estimates of discard mortality rate by fleet, depth, and other feasible or appropriate strata.
   - Provide estimates of uncertainty around recommended discard mortality rates.
   - Document the rationale for recommended rates and uncertainties.

6. Consider social and economic information for inclusion into the stock assessment as practicable.

7. Consider any known evidence regarding ecosystem, climate, species interactions (e.g., predation studies), habitat considerations, species range modifications (expansions or contractions), regime shifts, larval movement between stock boundaries, and/or episodic events (for example: upwelling events*)* that would reasonably be expected to affect Red Snapper population dynamics and are appropriate for inclusion in the stock assessment (e.g., Larval Transport Modeling (*Karnauskas et al.*)).

8. Consider the life history and spatial abundance data from the South Atlantic Red Snapper Research Project (SARSRP). Provide recommendations for use in the assessment process.

9. Provide recommendations for future research that will improve the stock assessment model.

10. Prepare a Data Workshop report providing complete documentation of workshop actions and decisions in accordance with project schedule deadlines.

Assessment Terms of Reference

1. Review any changes in data or analyses following the Data Workshop. Summarize data as used in each assessment model. Provide justification for any deviations from Data Workshop recommendations.

2. Develop population assessment model(s) that are appropriate for the available data.
   - Consider and incorporate as appropriate the information derived from the South Atlantic Red Snapper Research Program (SARSRP) and other independent studies.
   - Evaluate selectivity and retention functions for all directed, discard, and bycatch fleets as appropriate.
   - Evaluate alternate stock recruitment functions.
   - Consider the appropriate fleet structure.
   - Consider simulation testing for incorporation of the SARSRP data into the stock assessment.

3. Provide estimates of stock population parameters, if feasible:
   - Include fishing mortality, abundance, biomass, selectivity, stock-recruitment relationship (if applicable), and other parameters as necessary to describe the population.
   - Include appropriate and representative measures of precision for parameter estimates.

4. Determine the best method for incorporating the SARSRP into the model.
   - Consider the findings from the SARSRP final peer review report.

5. Consider an alternative metric for estimating spawning potential (e.g. SSB vs total egg production).

6. Characterize uncertainty in the assessment and estimated values.
   - Consider uncertainty in input data, modeling approach, and model configuration.
   - Provide appropriate measures of model performance, reliability, and 'goodness of fit'.
   - Provide measures of uncertainty for estimated parameters and derived quantities such as biological reference points and stock status.

7. Provide estimates of yield and productivity.
   - Include yield-per-recruit, spawner-per-recruit, and stock-recruitment models

8. Provide estimates of population benchmarks or management criteria consistent with available data, applicable FMPs, proposed FMPs and Amendments, other ongoing or proposed management programs, and National Standards. Include values for fishing mortality (including assumed discard mortality if appropriate), spawning stock biomass, fishery yield, SPR and recruitment for potential population benchmarks.
   - Recommend proxy values (e.g. MSY) when necessary and provide appropriate justification.
     - If recommending changes from the previous assessment, document the rationale.
   - Define recent fishing mortality rates ($F_{Current}$) and recent spawning stock biomass ($SSB_{Current}$) that will be compared to management benchmarks to determine management benchmarks as the geometric mean of the most recent three years and the terminal data year, respectively.

9. Provide declarations of stock status relative to management benchmarks or alternative data poor approaches if necessary.

10. Provide uncertainty distributions of proposed reference points, stock status, and yield.
    - Provide the probability of overfishing at various harvest or exploitation levels.
    - Provide a probability density function for biological reference point estimates.
    - If the stock is overfished, provide the probability of rebuilding within mandated time periods as described in the management summary or applicable federal regulations.

11. Project future stock conditions (biomass, abundance, and exploitation) and develop rebuilding schedules if warranted; include estimated generation time.
    - Recommend levels of recruitment to be used in the projections.
        - Address recommendations of the Catch Level Projections Workgroup in the assessment report.
    - Stock projections (including yields) shall be developed in accordance with the following ($F_{Current}$ is the geometric mean of the most recent three years of data):
        A) If stock is overfished
        $F=0$, $F_{Current}$, $F=F_{MSY\ or\ proxy}$, F at 75% of F_{MSY} or proxy, $F=F_{Rebuild}$ (max exploitation that rebuild in greatest allowed time)
        B) If overfishing is occurring:
        $F=F_{Current}$, $F=F_{MSY\ or\ proxy}$, F at 75% of $F_{MSY\ or}$ proxy
        C) If stock is neither overfished nor undergoing overfishing:
        $F=F_{Current}$, $F=F_{MSY\ or\ proxy}$, F at 75% of $F_{MSY\ or\ proxy}$
        D) If data limitations preclude classic projections (i.e. A, B, C above), explore alternative models to provide management advice

12. Provide recommendations for future research and data collection. Emphasize items that will improve future assessment capabilities and reliability. Consider data, monitoring, and assessment needs.

13. Complete an Assessment Workshop Report in accordance with project schedule deadlines.

Review Workshop Terms of Reference

1. Evaluate the data used in the assessment, including a discussion of the strengths and weaknesses of data sources and decisions. Consider the following:
   a) Are data decisions made by the Data and Assessment processes justified?
   b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
   c) Is the appropriate model properly applied to the available data?
   d) Are input data series sufficient to support the assessment approach?

2. Evaluate and discuss the strengths and weaknesses of the methods used to assess the stock, taking into account the available data. Consider the following:
   a) Are methods scientifically sound and robust?
   b) Are priority modeling issues clearly stated and addressed?
   c) Are the methods appropriate for the available data?
   d) Are assessment models configured properly and used in a manner consistent with standard practices?

3. Evaluate the assessment findings and consider the following:
   a) Are population estimates (model output – e.g. abundance, exploitation, biomass) reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
   b) Is the stock overfished? What information helps you reach this conclusion?
   c) Is the stock undergoing overfishing? What information helps you reach this conclusion?
   d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
   e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?

4. Evaluate the stock projections, including discussing strengths and weaknesses, and consider the following:
   a) Are the methods consistent with accepted practices and available data?
   b) Are the methods appropriate for the assessment model and outputs?
   c) Are the results informative and robust, and useful to support inferences of probable future conditions?
   d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?

5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
   - Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods.
   - Comment on the likely relationship of this variability with possible ecosystem or climate factors and possible mechanisms for encompassing this into management reference points.

6. Provide, or comment on, recommendations to improve the assessment.
   - Consider the research recommendations provided by the Data and Assessment processes in the context of overall improvement to the assessment and make any

additional research recommendations warranted.

- If applicable, provide recommendations for improvement or for addressing any inadequacies identified in the data or assessment modeling. These recommendations should be described in sufficient detail for application and should be practical for short- term implementation (e.g., achievable within ~6 months). Longer-term recommendations should instead be listed as research recommendations above to be applied to future stock assessments.

7. Provide recommendations on possible ways to improve the assessment process.

8. Prepare a Review Workshop Summary Report describing the Panel's evaluation of the stock assessment and addressing each Terms of Reference.