Statements of Work for 2027 SEDAR Stock Assessments

SEDAR Committee
March 2025
Develop by Council Staff

Statements of work (SoW) are developed by Council staff and used by the Southeast Fishery Science Center (SEFSC) to estimate workload associated with assessments projects. Staff are proposing to continue to use SoWs to develop SEDAR projects. The SoWs will be sent to the SEFSC for negotiations and reviewed by the Scientific and Statistical Committee (SSC) in April. If no significant changes are recommended in the statements of work, staff will develop terms of reference from the SoWs for the stock assessments, as needed. The SSC and council will review terms of reference before they are finalized.

Draft SoWs are provided for 2027 SEDAR assessments for Red Grouper, Snowy Grouper, and Vermilion Snapper. Staff developed this document to consolidate research recommendations from the latest stock assessment and SSC review as well as major uncertainties. The Committee is asked to discuss and modify the draft SoW for 2027 assessments.

Three projects are proposed for consideration:

- Red Grouper with a Data Workshop and Stock Identification Workshop,
- Snowy Grouper with a Topical Working Group, and
- Vermilion Snapper Update Assessment

Species:
Red Grouper

Model and Additional Data Years:

- Prior Assessment: South Atlantic Red Grouper SEDAR 53 (2017)
- Prior Terminal Year: 2015
- Data providers should provide all new and recent available data sufficient for use in the stock assessment through 2026. Data providers may decide to include preliminary or partial data for more recent years that could be used in stock assessment models or projection analyses. Data inclusion for the stock assessment models and projection analyses will be determined by the lead analyst based on quantity and quality of the most recent data.
- Model Type: Update SEDAR 53 with current BAM configuration and develop two stock model as recommended by SEFSC.

Requested Data Updates (Please be as specific as possible):

- Review any new and updated information to determine if it warrants consideration for modifying existing assumptions to life history, discard mortality, and steepness.
- Following NMFS Procedure 01-101-11, provide a model run using the SEDAR 53 configuration including recent years data.
- Update recreational landings from Coastal Household Telephone Survey. Include a sensitivity to different recreational data streams.
- Consider using Florida's State Reef Fish Data for estimating recreational catch off Florida.

Requested Model Modification to previously approved assessment (Please be as specific as possible):

- Consider larval dispersal models that could inform connectivity between Gulf and South Atlantic regions.
- Indices of Abundance:
  - Update indices of abundance as needed.
- Use MRIP recommended approaches for recreational catch to reduce PSEs below 50%.
- Explore use of long-term average or recent average recruitment stanzas.
- Consider estimating commercial discards with observer program vs commercial discard logbook.
- Consider using different methods for estimating Red Grouper natural mortality including a subset of Then et al. 2015, Hammel and Cope 2022, or other research.
- Address recommendations from the Catch Level Projections Workgroup Report in the assessment report.

Is a Data Workshop Needed? Yes

Stock identification workshop will be needed to aid in the development of where to split the data. Data workshop will be needed to consider data previously not used in SEDAR 53. Data previously excluded may be useful to assess the stocks in the geographic regions identified in the stock identification workshop.

Is a Working Group Needed? Yes – Assessment Workgroup, as needed, to aid in development of two stock model

POTENTIAL SCHEDULE:

- Start early in 2027 due to length of time since completion of previous assessment.
- Target Final Report Completion: TBD due to workload

Red Grouper Research Recommendations and Uncertainties Identified in Review of SEDAR 53

Below are research recommendations included in SEDAR 53 (2017) as well as SSC comments on addressing uncertainty in the assessment and research recommendations. Staff used this information to develop the proposed SOW following the background information.

Research Recommendations from SEDAR 53 (2017)

- Further develop methods to combine SERFS chevron trap and video gears for creating indices of abundance.
- Evaluate sample size cut offs for using age and length compositions. What should be the minimum standards, and how does this interplay with the number of age and length classes modeled in the assessment?
- It appears that the sampling intensity for fish comprising age and length compositions has diminished, particularly for the commercial sector in 2015. Why?
- In stock assessment, various likelihood formulations have been used for fitting age and length composition data. The multinomial distribution and its robust versions have been the most widely applied. However, more recently the Dirichlet-multinomial and logistic-

normal have attracted attention. A simulation study could shed light on the performance of these various likelihood formulations under sampling conditions realistic in the southeast U.S.

- The assessment indicated that recruitment has been lower than expected since 2005. Why? Can environmental or ecological drivers of recruitment be identified? What are the mechanisms?
- Red grouper were modeled in this assessment as a unit stock off the southeastern U.S. For any stock, variation in exploitation and life-history characteristics might be expected at finer geographic scales. Modeling such sub-stock structure would require more data, such as information on the movements and migrations of adults and juveniles, as well as spatial patterns of larval dispersal and recruitment. Even when ne-scale spatial structure exists, incorporating it into a model may or may not lead to better assessment results (e.g., greater precision, less bias). Spatial structure in a red grouper assessment model might range from the very broad (e.g., a single Atlantic stock) to the very narrow (e.g., a connected network of meta-populations living on individual reefs). What is the optimal level of spatial structure to model in an assessment of snapper-grouper species such as red grouper? Are there well defined zoogeographic breaks (e.g., Florida keys, Cape Hatteras) that should de ne stock structure? How much connectivity exists between the Gulf of Mexico and Atlantic stocks?
- Protogynous life history: 1) Investigate possible effects of hermaphroditism on the steepness parameter; 2) Investigate the sexual transition for temporal patterns, considering possible mechanistic explanations if any patterns are identified; 3) Investigate methods for incorporating the dynamics of sexual transition in assessment models.
- In this assessment, the number of spawning events per mature female per year was implicitly assumed to be constant. The underlying assumptions are that spawning frequency and spawning season duration do not change with age or size. Research is needed to address whether these assumptions for red grouper are valid. Age or size dependence in spawning frequency and/or spawning season duration would have implications for estimating spawning potential as it relates to age structure in the stock assessment (Fitzhugh et al. 2012).

Research Recommendations from SSC Review of SEDAR 53 (2017)

- A review of stock structure and early life history is needed to account for recruitment and connectivity between the Gulf of Mexico stock and the South Atlantic stock.
- Compare age structure of Red Grouper between northern areas and southern areas in the South Atlantic.
- Explore the episodic recruitment events for Red Grouper and investigate if these events co-occur for other species in the South Atlantic. In particular, the 2003-2004 recruitment events that followed Hurricane Charlie may indicate immigration of several species from the Gulf of Mexico after such events.
- Examine annual changes in sex ratio and size/age at maturity and transition.
- Investigate other methods to estimate M.

Uncertainties identified by SSC during review of SEDAR 53

- Public comment suggested that episodic larval transport or movement of older stages from the Gulf into the South Atlantic may have caused the high recruitment levels seen in the SEDAR 53 assessment, such as the recruitment spike in 2003-2004. A 2004 genetic study found that there was no genetic difference between the Gulf of Mexico stock and the South Atlantic stock, suggesting there is enough mixing between the Gulf and South

Atlantic to cause genetic homogeneity. In other words, although the information available is incomplete and no formal analysis has been conducted, some lines of evidence seem to point to the fact that the dynamics of Red Grouper in the South Atlantic Region is not completely independent of episodic inputs from the Gulf. Although at this point the SSC considers this just as a working hypothesis, this might explain the fact that Red Grouper SSB has been under SSBMSY and F above FMSY for pretty much the entire time series used in this assessment.

- The causes and periodicity of the episodic high recruitment events are unknown, and a source of uncertainty in this assessment and the projections. Sensitivities were run removing the highest recruitment spikes, showing little effect to stock status and model estimates. Multiple recruitment scenarios were presented, attempting to address this recruitment uncertainty in the projections.
- Uncertainties in parameters such as M and h are well characterized within the MCB analysis.
- Although uncertainty in landings is characterized in the MCB analysis, a CV was used that is smaller than the actual CV of the data. This resulted in an overly narrow range of uncertainty.
- There is uncertainty due to unmeasured effects of lionfish.
- Although the level of exploitation during the earlier part of the time series do not match the trajectory of the SSB, the value of FMSY in this assessment was computed from the terminal years of the assessment. This value will be different in different periods of selectivity back in time.
- The selectivity of the Chevron Trap survey was changed from dome-shaped to flat-topped based on analyses that had not been conducted during the previous assessment. This changed the magnitude of the peaks and valleys in the index.

Species:
Snowy Grouper

Model and Additional Data Years:

- Prior Assessment: South Atlantic Snowy Grouper SEDAR 36 Update (2021)
- Prior Terminal Year: 2018
- Data providers should provide all new and recent available data sufficient for use in the stock assessment through 2026. Data providers may decide to include preliminary or partial data for more recent years that could be used in stock assessment models or projection analyses. Data inclusion for the stock assessment models and projection analyses will be determined by the lead analyst based on quantity and quality of the most recent data.
- Model Type: Update current BAM configuration with Topical Working Group.

Requested Data Updates (Please be as specific as possible):

- Review any new and updated information to determine if it warrants consideration for modifying existing assumptions to life history, discard mortality, and steepness.
- Following NMFS Procedure 01-101-11, provide a model run using the SEDAR 36 Update configuration including recent years data.
- Update recreational landings from Coastal Household Telephone Survey. Include a sensitivity to different recreational data streams.

Requested Model Modification to previously approved assessment (Please be as specific as possible):

- Separate landings and discards into different data streams due to potential change in discard mortality (current research at NCSU), which may result in a selectivity change due to the seasonal recreational fishery, low bag limit, and survivorship of some released fish when descending devices are used.
- Indices of Abundance:
    - Develop an index of abundance for Snowy Grouper using the South Atlantic Deepwater Longline Survey.
    - Investigate other techniques to develop indices of abundance for Snowy Grouper for current indices of abundance (Chevron Trap and Short Bottom Longline Surveys). Consider adding the video component into the Chevron Trap survey.
- Use MRIP recommended approaches for recreational catch to reduce PSEs below 50%.
- Explore use of long-term average or recent average recruitment stanzas.
- Consider estimating commercial discards with observer program vs commercial discard logbook.
- Consider using different methods for estimating Snowy Grouper natural mortality including a subset of Then et al. 2015, Hammel and Cope 2022, or other research.
- Address recommendations of the Catch Level Projections Workgroup Report in the assessment report.

Is a Working Group Needed? Yes – Assessment Workgroup
Work with an assessment workgroup to aid in the incorporation of the SADL Survey

POTENTIAL SCHEDULE:

- Begin the assessment process so that the model can include index data for the most recent year (typically available mid-year)
- Target Final Report Completion: presented to SSC in October 2027

Snowy Grouper

Below are research recommendations included in SEDAR 36 Update (2021) as well as SSC comments on addressing uncertainty in the assessment and research recommendations. Staff used this information to develop the proposed SoW following the background information.

Research Recommendations from SEDAR 36 Update (2021)

- Increased fishery independent information, particularly for developing reliable indices of abundance, would greatly improve the assessments of deepwater species.
- More age samples should be collected from the general recreational sector and with more complete spatial coverage.
- Snowy grouper were modeled in this assessment as a unit stock off the southeastern U.S. For any stock, variation in exploitation and life-history characteristics might be expected at finer geographic scales. Modeling such sub- stock structure would require more data, such as information on the movements and migrations of adults and juveniles, as well as spatial patterns of larval dispersal and recruitment. Even when fine-scale spatial structure exists, incorporating it into a model may or may not lead to better assessment results (e.g., greater precision, less bias). Spatial structure in a snowy grouper assessment model might range from the very broad (e.g., a single Atlantic stock) to the very narrow (e.g., a connected network of meta-populations living on individual reefs). What is the optimal level of spatial structure to model in an assessment of snapper-grouper species such as snowy grouper? Are there well defined zoogeographic breaks (e.g., Cape Hatteras) that should define stock structure? Research into these questions could help inform future stock assessments.
- Protogynous life history: 1) Investigate possible effects of hermaphroditism on the steepness parameter; 2) Investigate the sexual transition for temporal patterns, considering possible mechanistic explanations if any patterns are identified; 3) Investigate methods for incorporating the dynamics of sexual transition in assessment models.
- In this assessment, the number of spawning events per mature female per year was implicitly assumed to be constant. The underlying assumptions are that spawning frequency and spawning season duration do not change with age or size. Research is needed to address whether these assumptions for snowy grouper are valid. Age or size dependence in spawning frequency and/or spawning season duration would have implications for estimating spawning potential as it relates to age structure in the stock assessment (Fitzhugh et al. 2012).

Research Recommendations from SSC (Jan 2021 Meeting) provided during review of SEDAR 36 Update

Research to reduce risk and uncertainty

- Increased collection of fishery independent data, particularly age samples.
- An evaluation of methods for estimating Snowy Grouper natural mortality.
- An evaluation of the utility of selectivity blocks chosen.

Major research recommendations

- Reduce uncertainty in natural mortality assumptions:
    - Subset species used in Then et al. analysis to include only grouper, snapper, or species with similar life histories.

    - Use empirical studies (tagging etc.) to come up with field-based natural mortality estimates at age.
    - Conduct a simulation study to examine which factors may reduce uncertainty in the choice of natural mortality in the BAM.
- Consider not specifying the stock recruitment relationship and model recruitment as an average value with random residuals. Rather than calculating MSY and BSY from the SR curve, consider alternative proxies.

Minor research recommendations

- Abundance indices:
    - Explore the effect of different methods used to develop indices of abundance (delta lognormal versus zero-inflated negative binomial). Determine why they generate different trends and peaks/valleys and how best to treat these data.
    - Overall low catches of Snowy Grouper in fishery independent surveys used to generate indices of abundance. A deep water survey is highly desirable.
    - Evaluate the use of inverse sampling methods for analysis for generating indices of abundance.
- Explore MRIP data in greater detail to a) understand what causes outliers (e.g., 2012), b) determine potential for bias in discard estimates, and c) determine how best to treat these data in the assessment.
- Examine temporal autocorrelation in both abundance index residuals and recruitment estimates and explore ways to account for that within the model.
- Investigate shore mode captures of Snowy Groupers in MRIP.
- Explore the effect of plus group definition up to a max age of 80.
- Explore alternative methods for addressing recruitment assumptions in projections.
- Evaluate the efficacy of recruitment estimation by subdividing the dataset and projecting forward using a shorter time series. Compare with recruitment estimates generated using the complete time series.
- Explore the prevalence of use of descending devices in the Snowy Grouper fishery.
- Consider the use of the South Atlantic Fishery Management Council EwE model to explore hypotheses regarding Snowy Grouper and its ecological relationships with other species (e.g., exploration of why recruitment has been low, predator-prey relationships, dietary overlap, etc.).

Uncertainties identified by SSC during review of SEDAR 36 Update

Major

- Uncertainties regarding maximum age assumptions and resulting estimation of natural mortality.
- Estimation of a Beverton-Holt stock recruitment curve with fixed steepness.

Minor

- Abundance indices:
    - Abundance indices were not well fit in the current model configuration.
    - Abundance index residuals appear temporally autocorrelated and that autocorrelation was not accounted for in the current model configuration.
    - Large uncertainty in estimated annual values for abundance indices, including unexplained shift in the peak year of the Chevron Trap Index (now 2000).
- Estimate of 2012 recreational landings is a potential outlier.

- The stock may be in a different productivity regime than implied by current biological reference points given it has been stable but well below biological reference points since 1984.
- Stock dynamics may be more controlled by natural processes than fishery processes given low recent fishing mortality relative to natural mortality.

Species:
Vermilion Snapper

Model and Additional Data Years:
- Prior Assessment: South Atlantic Vermilion Snapper SEDAR 55 (2018)
- Prior Terminal Year: 2016
- Data providers should provide all new and recent available data sufficient for use in the stock assessment through 2026. Data providers may decide to include preliminary or partial data for more recent years that could be used in the stock assessment models or projection analyses. Data inclusion for the stock assessment models and projection analyses will be determined by the lead analyst based on quantity and quality of the most recent data.
- Model Type: Update SEDAR 55 with current BAM configuration.

Requested Data Updates (Please be as specific as possible):
- Review any new and updated information to determine if it warrants consideration for modifying existing assumptions to life history, discard mortality, and steepness.
- Following NMFS Procedure 01-101-11, provide a model run using the SEDAR 53 configuration including recent years data.
- Update recreational landings from Coastal Household Telephone Survey. Include a sensitivity to different recreational data streams.
- Consider using Florida's State Reef Fish Data for estimating recreational catch off Florida.

Requested Model Modification to previously approved assessment (Please be as specific as possible):
- Indices of Abundance:
    - Update indices of abundance as needed.
- Use MRIP recommended approaches for recreational catch to reduce PSEs below 50%.
- Explore use of long-term average or recent average recruitment stanzas.Consider estimating commercial discards with observer program vs commercial discard logbook.
- Consider using different methods for estimating Red Grouper natural mortality including a subset of Then et al. 2015, Hammel and Cope 2022, or other research.
- Address recommendations of the Catch Level Projections Workgroup Report in the assessment report.

Is a Data Workshop Needed? No

Is a Working Group Needed? No

POTENTIAL SCHEDULE:

- Start early in 2027 due to length of time since completion of previous assessment.
- Target Final Report Completion: TBD due to workload

Vermilion Snapper

Research Recommendations from SEDAR 55 (2018)

- Further investigate discrepancies between age composition data and indices of abundance
- Further develop methods to standardize and combine SERFS chevron trap and video gears for creating indices of abundance
- Evaluate sample size cut offs and weighting procedures for age and length compositions. What should be the minimum standards, and how does this interplay with the number of age and length classes modeled in the assessment?
- In stock assessment, various likelihood formulations have been used for fitting age and length composition data. The multinomial distribution and its robust versions have been the most widely applied. However, more recently the Dirichlet-multinomial and logistic-normal have attracted attention. A simulation study could shed light on the performance of these various likelihood formulations under sampling conditions realistic in the southeast U.S.
- Vermilion snapper were modeled in this assessment as a unit stock o the southeastern U.S. For any stock, variation in exploitation and life-history characteristics might be expected at finer geographic scales. Modeling such sub-stock structure would require more data, such as information on the movements and migrations of adults and juveniles, as well as spatial patterns of larval dispersal and recruitment. Even when ne-scale spatial structure exists, incorporating it into a model may or may not lead to better assessment results (e.g., greater precision, less bias). Spatial structure in a vermilion snapper assessment model might range from the very broad (e.g., a single Atlantic stock) to the very narrow (e.g., a connected network of meta-populations living on individual reefs). What is the optimal level of spatial structure to model in an assessment of snapper grouper species such as vermilion snapper? Are there well defined zoogeographic breaks (e.g., Florida keys, Cape Hatteras) that should de ne stock structure? How much connectivity exists between the Gulf of Mexico and Atlantic stocks?

Research Recommendations from SSC (Jan 2021 Meeting) provided during review of SEDAR 36 Update

- Because Vermillion Snapper is a schooling species that swims above the bottom, a sonar index could provide valuable information.
- Try using video and trap data to look at changes in catchability. For instance, if Vermilion Snapper is seen on video, but not caught in the traps, are there environmental variables that may drive that process?
- Consider dropping the HB index or truncating it at 1992 when the index changes suddenly in response to management changes.
- Investigate the apparent disconnect between the CVID index and the chevron trap age compositions.
- Investigate the feasibility of a juvenile index.
- Examine reasons for the large disconnect between the signal coming from the age comps vs. the length comps.

- Examine whether the size at age variability is a population phenomenon (high level of among individual variation in growth) or is being driven by spatial differences in size at age.

Uncertainties Identified in Review of SEDAR 55 (2018)

- The steepness profile was flat, so steepness was fixed in the base run at 0.69. This is nearly equal to the steepness value used in the prior assessment (steepness = 0.71).
- Using the geometric mean fishing mortality estimate of the last 3 years may bias the results or remove the actual trend in fishing mortality.
- However, this is a convention that has been adopted by the SSC and is assumed to be more appropriate than the arithmetic mean, or the terminal year value given the reduced reliability in that terminal F value.
- The headboat index drops dramatically in 1992, when there is a management change, and most likely does not track the population abundance as it did prior to that time.
- There was an issue fitting the CVID index, especially at the end of the time series. However, it was determined this was most likely due to differing signals in the age comps vs. the index. As such, no upweighting of the CVID index was done, to make sure that recruitment signals captured by the age comps remained in the model. The SSC agreed that this was an appropriate approach