

Scopes of work (SoW) are developed by Council staff and used by the Southeast Fishery Science Center to evaluate the workload associated with operational assessments. The SAFMC process includes review of the SoWs by the SSC and then approved by the Council at their September Council meeting prior to submission by November 1.

Draft SoWs are provided for Snowy Grouper, Spanish Mackerel, and Dolphin. Spanish Mackerel has been added into this document because the SEDAR Steering Committee stated that benchmark assessments would be a valuable addition to the assessment portfolio (May 2023) and previously staff could not fit another research track assessment into the SEDAR planning grid. The Dolphin Management Strategy Evaluation has been on the SEDAR planning grid but a discussion on the type of review the SSC would like to have for this type of analysis to set catch level recommendations has not occurred.

Based on comments from the SSC, staff developed this document to consolidate research recommendations from the latest stock assessment and SSC review as well as major uncertainties. The SSC is asked to discuss and modify the draft SoW for potential 2026 assessments and comment on the type of review they feel is appropriate for the Spanish Mackerel Benchmark Assessment and Dolphin MSE.

Three projects are proposed for consideration:

- Snowy Grouper Operational Model,
- Spanish Mackerel Benchmark, and
- Dolphin MSE Review

## 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 scope of work 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.

### Proposed Scope of Work

#### **Species:**

Snowy Grouper

#### **Model and Additional Data Years:**

- Prior Assessment: South Atlantic Snowy Grouper SEDAR 36U (2021)
- Prior Terminal Year: 2018
- OA Terminal Year: 2024, include all or partial data from the most recent year. (Additional 6 years of data minimum)
- Apply the current BAM configuration.

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

- Include any new and updated information on life history, discard mortality, and steepness.

#### **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 video component into the Chevron Trap survey.

- Use MRIP recommended approaches for recreational landings to reduce PSEs below 50%.
- Explore use of average recruitment instead of relying of Beverton-Holt stock recruitment curve.
- 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., Hammel and Cope, or MARFIN funded research project.
- Address recommendations of the Catch Level Projections Workgroup in the assessment report.

**Is a Topical Working Group Needed?** (Yes/No)

**If Yes, Topical Working Group Topics:**

Topical Working Group 1:

Topical Working Group 2:

**Suggested Topical Working Group Process (Webinar or In-Person):**

**APPROVED TIMING:**

- Assessment Species are approved at Spring SEDAR Steering Committee Meeting (ex. May 2023)
- Cooperators use their process to develop SoWs
- Initial Cooperator-approved SoWs submitted to SEFSC by November 1<sup>st</sup>, 2023
- SEFSC provides feedback to Cooperators via memo no later than February 1<sup>st</sup>, 2024
- Cooperators/Technical review bodies review feedback and negotiate final SoWs with SEFSC
- Final SoWs provided to SEDAR Program Manager by May 1<sup>st</sup>, 2024

## Spanish Mackerel

During the review of SEDAR 78 Spanish Mackerel Operational Assessment, the SSC had several concerns with the data inputs in the model which were requested to be investigated more thoroughly. The SSC set up a workgroup to identify specific recommendations to improve upon the assessment to describe stock status and catch level recommendations. Recreational catch estimates were revised; however, other issues identified by the SSC could not be addressed by the SEFSC.

### Research and Sampling Recommendations from SEDAR 78 (2022)

- Development of a fishery-independent survey for pelagic species would decrease reliance on a fishery-dependent index of abundance that has unexplained trends in residual values in recent years.
- Examine how schooling or migratory dynamics may influence the catchability of the species. In particular, research the assumption of the hyperstability of indices that sample the schooling portion of the stock.
- Age-dependent natural mortality was estimated by indirect methods (Lorenzen) for this assessment. Telemetry and conventional-tagging programs can provide alternative estimates of natural mortality. Investigate new methods for determining point estimates for natural mortality.
- Limited information is available for shrimp bycatch in the Atlantic. Comprehensive observer coverage across space and time are needed to adequately capture the scale and size distribution of bycatch for Spanish mackerel and other species.
- The general recreational discards have increased dramatically in the last 2 years of this assessment. A better understanding of the size composition and mortality of discarded fish would improve the assessment, especially if discards continue to increase due to effort or future management changes.
- Implement systematic age sampling for the general recreational and commercial sectors. Age samples were important for this assessment for determining key parameters but sample sizes were limited, particularly for the general recreational sector, commercial handline and commercial cast net sectors, which account for the majority of the recent landings.

### Research Recommendations from SSC (Jan 2021 Meeting) provided during review of SEDAR 78

#### Research to reduce risk and uncertainty

- Parameters describing the SR curve were not updated from the 2012 assessment.
- The SR data do not show a clear pattern (a cluster of points in the NE quadrant of graph) and estimates of steepness from these data were unreliable. Steepness estimates from similar species are not available.
- As is common in many assessments, steepness and natural mortality are uncertain:
  - Steepness not estimable, and was fixed from previous assessment – SEDAR 28. There was no signal from data to inform steepness. This would apply to the ABC control Tier I.
  - Natural mortality was fixed from previous assessment – SEDAR 28. Natural mortality was found to have a significant impact on stock status. Likelihood profiles showed that natural mortality could be much higher (>0.5), which, if true, would indicate stock size is higher than currently estimated.
- Lack of adequate representation of length and age samples from each fishery (most fleets) to inform fishing mortality.
- Uncertainty of the shrimp bycatch estimates was high. The observer coverage is extremely sparse and effort data are questionable.
- Lack of a pelagic fishery independent index of adult abundance

- Commercial Handline index fits were poor (severe underfitting/overfitting)
- Model ignored initial year of MRIP CPUE index (which was a relatively extreme value)

Projection and Interim year assumptions for projections.

- Commercial age sampling possibly inadequate
- MRIP – high PSEs, uncertainty in terminal year data point
- Influence of bad fit to initial year REC index (high value GR) on SSB
- Uncertainty in steepness
- Model likelihood profiling points to potentially higher natural mortality
- YOY index missing terminal year data
- Effect of removing early years with higher landings

Major research recommendations

- Investigate steepness
- Revise estimates of natural mortality
- Age samples
- Investigate changes in stock distribution
- Improve characterization of recreational discards

SSC Spanish Mackerel Workgroup Recommendations Dec 2022

- Use a more contemporary M estimation method (e.g. Hamel and Cope 2022) to obtain a point estimate. Alternatively, take the average M estimated for congeners within other regions worldwide.
- Consider applying a uniform distribution (non-truncated?) on M with a range of values corresponding to a maximum age +/- 2 with the mean equal to the chosen point estimate when conducting the MCB ensemble uncertainty analysis Monte Carlo draws
- Consider a sensitivity run with the most recent 3-year (2018-2020) (geometric) average representing 2020 data point. Alternatively, consider a sensitivity run with the most recent 3-year (2018-2020) (geometric) average weighted by reverse-CV representing 2020 data point. Evaluate and note in the report any particular concerns or problems with the MRIP data collected in 2020.
- Use a recent average recruitment instead of model-derived recruitment from the stock-recruit relationship. Determine an appropriate MSY proxy and timeseries for average recruitment.
- Do sensitivity run or model run with asymptotic cast net selectivity (However, I do not think this will change the outcome as much as changes in M and h)
- Since the S78 K and Linf values are considerably different from S28, perhaps sensitivity runs can be done with S28 values.

Proposed Scope of Work

**Species:**

Spanish Mackerel

**Assessment Type:**

Benchmark

**Model and Additional Data Years:**

- Prior Assessment: South Atlantic Spanish Mackerel 78 (2022)
- Prior Terminal Year: 2020
- OA Terminal Year: 2024, include all or partial data from the most recent year. (Additional 4 years of data minimum)
- Apply the current BAM configuration.

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

- Include any new and updated information on life history, discard mortality, and steepness.

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

- Indices of Abundance:
  - Re-investigate recreational index methods.
  - Investigate other sources for index of abundance including NEAMAP and state surveys.
- Compile and consider all observer data collected on Spanish Mackerel
- Consider using different methods for estimating Spanish Mackerel natural mortality including a subset of Then et al. 2015 or Hammel and Cope 2022.
- Investigate changes in distribution
  - Impact on current commercial
  - Impact on biomass and stock abundance
- Address recommendations of the Catch Level Projections Workgroup in the assessment report.

**Suggested Process:**

Data Workshop: In-Person. Include federal, state, and stakeholder participants north of North Carolina. Work with ASMFC to get representation.

Assessment Workshop: Webinars

Review: 1) CIE In-Person 2) CIE Desk 3) SSC only

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## Dolphin

A management strategy evaluation is being conducted to aid in determining sustainable harvest for Dolphin. The background model will use an operating model to aid in developing catch level recommendations. This type of approach has not been used in the South Atlantic region. A review of the operating model to used to determine biomass or sustainable harvest is needed.

### Proposed Scope of Work

**Species:**

Atlantic Dolphin

**Assessment Type:**

Management Strategy Evaluation – Operating Model

**Model and Additional Data Years:**

- Prior Assessment: none
- Prior Terminal Year: NA
- OA Terminal Year: Developed during MSE

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

- NA

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

- NA

**Suggested Process:**

Data Workshop: Not needed given workshops were held to gather input.

Assessment Workshop: Not needed since a model team was used to develop the model

Review: 1) CIE In-Person 2) CIE Desk 3) SSC only

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