# 3. SEDAR 36 SNOWY GROUPER UPDATE ASSESSMENT REVIEW

## 3.1. Documents

Attachment 1. SEDAR 36U Assessment Report
Attachment 2. SEDAR 36U Assessment Presentation

## 3.2. Presentation

SEDAR 36U Assessment Overview: Mr. Rob Cheshire and Dr. Katie Siegfried, SEFSC

## 3.3. Overview

The Committee was asked to review the Snowy Grouper Update assessment prepared through SEDAR 36U and provide fishing level recommendations (Attachment 1). Snowy Grouper was last assessed in 2013 during SEDAR 36, where the stock was found to have been overfished but not undergoing overfishing. The major reason for performing an Update assessment was due to the fact that there were no new indices or major data sources for this species.

## 3.4. Public Comment

*There was no public comment.*

## 3.5. Action

1. Review assessment

    a) Does the assessment address the ToRs to the SSCs satisfaction?

    - *The assessment addresses the ToRs to the SSCs satisfaction.*

b) Does the assessment represent Best Scientific Information Available?

- *The SSC was in agreement that the assessment represents Best Scientific Information Available.*

c) Does the assessment provide an adequate basis for determining stock status and supporting fishing level recommendations?

- *The SSC was in agreement that the assessment provides an adequate basis for determining stock status and supporting fishing level recommendations.*

2. Identify, summarize, and discuss assessment uncertainties.

a) Review, summarize, and discuss the factors of this assessment that affect the reliability of estimates of stock status and fishing level recommendations.

- *The SSC identified several factors that likely affect the reliability of estimates of stock status and fishing level recommendations, including:*
  - *Uncertainty in natural mortality. This is of particular concern in light of recent changes in our understanding of the maximum age for this species.*
  - *Estimation of a Beverton-Holt stock recruitment curve with fixed steepness.*
  - *The 2012 estimate of recreational landings was identified as a potential outlier. Although a sensitivity run replacing the 2012 estimate with a smoothed value (4-year average of landings from 2010, 2011, 2013, and 2014) suggested little impact on assessment results, this value remains a source of uncertainty that should be examined in more detail in the future.*
  - *Changes in indices of abundance with the application of different standardization techniques, including a shift in the location of the peak of the Chevron Trap Index (now 2000) between SEDAR 36 and this update.*
  - *Abundance indices were not fit well in the current model configuration. Abundance index residuals appear autocorrelated and that autocorrelation was not accounted for in the current model configuration.*
  - *The stock has been stable well below the biological reference points since 1984, suggesting the stock may be in a different productivity regime than implied by the current reference points.*
  - *Stock dynamics may be controlled more by natural processes than fishery processes given fishing mortality values are lower than natural mortality in recent years.*

b) Describe the risks and consequences of the assessment uncertainties with regard to status and fishing level recommendations.

- *The SSC highlighted several potential risks and consequences of assessment uncertainties, including:*
  - *Natural mortality could be underestimated or overestimated which would affect stock status and fishing level recommendations as shown in the sensitivity analyses provided.*
  - *2018 and 2019 recruitment estimates, generated from the stock-recruitment curve, were higher than the recent low average recruitment and are a source of uncertainty.*
  - *Projections for this stock will be particularly sensitive to changes in natural mortality for fish at the youngest ages (those observed recently in the fishery) given fishing mortality is lower than natural mortality for ages frequently caught.*
  - *Assumed steepness in the Beverton-Holt curve has a direct impact on the accuracy of biological reference points and therefore affects both the status determination and fishing level recommendations.*
  - *Although the rebuilding timeframe is long (2039), assessment and projection information can only inform management in the much shorter term of approximately 5 years. See the SSC's recommendation for timing of next assessment below (Action Item 5c).*

c) Are methods of addressing uncertainty consistent with SSC expectations and the available information?

- *The SSC had no concerns with how uncertainty was addressed and agreed that the methods were consistent with what is typically produced given the expectations and constraints of an update assessment. The SSC had several suggestions for future assessments as outlined below (Action Item 5).*

d) List (in order of the greatest contribution to risk and overall assessment uncertainty) and comment on the effects of those assessment factors that most contribute to risk and impact status determinations and future yield predictions.

- *The SSC has organized assessment uncertainties into major and minor categories based on the expected impact on status determinations and future yield predictions. Within the Minor category, there is no particular order of importance.*

- *<u>Major Uncertainties:</u>*
  - *Uncertainties regarding maximum age assumptions and resulting estimation of natural mortality.*
  - *Estimation of a Beverton-Holt stock recruitment curve with fixed steepness.*

- *Minor Uncertainties:*
  - *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.*

3. Provide fishing level recommendations.

   a) Apply the ABC control rule and complete the fishing level recommendations table.

   - *The SSC applied the ABC Control Rule and placed the Snowy Group update assessment and stock in the following Tiers:*
     - *Tier I: 2 (2.5%) because steepness was specified, not estimated.*
     - *Tier II: 2 (2.5%) because uncertainty was carried forward in the projections, but environmental conditions were not included.*
     - *Tier III: 4 (7.5%) because the stock is both overfished and overfishing.*
     - *Tier IV: 3 (10%) because the stock has low productivity, high vulnerability, and high susceptibility.*
   - *The total adjustment score of 22.5% resulted in a P*=27.5% and a recommended $P_{rebuild}$ of 72.5%.*
   - *The SSC recommended using the P* value of 27.5% with average recruitment estimates from 2011-2017 to determine the ABC over a 5-year period with management beginning in 2023. The SSC recommends the same assumptions be made when calculating the OFL using P*=50%. Note these projections are being used to calculate the ABC and are not rebuilding projections; the stock will not rebuild in this scenario within the current rebuilding time frame.*

   b) Comment on any difficulties encountered in applying the Control Rule, including any required information that is not available.

   - *The SSC experienced no difficulties in applying the CR. However, the SSC discussed the need to revisit the ABC Control Rule wording for Dimension*

*1 (Assessment Information) and revise the associated Tier descriptions to account for situations in which steepness is specified when estimating MSY-based reference points.*

c) Is adequate rebuilding progress being made? Comment on reasons why progress differs from projections.

*Although spawning stock biomass is far below the reference points, it has doubled in size since 1994 and has been on a positive trajectory since. Spawning stock biomass and recreational catches have increased, but total biomass and abundance have not.*

*Rebuilding progress may be affected by the following factors:*

- *Natural mortality may have changed over time.*
- *Given younger ages are assumed to experience higher natural mortality than older ages and young fish now compose a larger portion of stock biomass, the impact of natural mortality may exceed that of fishing mortality which may lessen the impact of management measures.*
- *Management measures have reduced fishing mortality over the period in which spawning stock biomass has increased. However, recreational catches have increased and the discard rate for the recreational sector is unknown. The one fish per vessel bag limit may be causing significant recreational discards. If there are significant unreported discards, our estimate of fishing mortality may be biased low.*
- *If recruitment remains low, rebuilding progress will be impacted as indicated in the projections provided in the assessment.*

4. Provide advice on monitoring the stock until the next assessment.

a) What indicators or metrics should the Council request to help inform the rebuilding progress prior to the next assessment?

- *The SSC recommended the following indicators/metrics:*
  - *Continuing to refine methodology for generating a fishery independent abundance index from the deep water longline survey (started in 2020).*
  - *Evaluating age/size selectivity for Snowy Grouper in the short-bottom longline survey and Chevron trap survey to assess the potential for either survey to serve as a recruitment index.*
  - *Development of a Citizen Science project to obtain information on numbers and size distribution (and possibly other information) on Snowy Grouper releases.*

b) Is there a recommended trigger level for these metrics? Triggers should be used for an indication of improvement. If no improvement is being made the Council may want to consider additional management actions.

- *The SSC recommended the following potential triggers:*
  - *Frequency of occurrence of individuals captured in fishery independent surveys that exceed age/size thresholds (i.e., max age/size) as an indicator of stock recovery.*
  - *Monitoring the body size at sex transition as an indicator of the availability of large individuals in the population.*

5. Provide research recommendations and guidance on the next assessment.

a) Review the included research recommendations and indicate those most likely to reduce risk and uncertainty in the next assessment.

- *Research most likely to reduce risk and uncertainty includes:*
  - *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.*

b) Provide any additional research recommendations the SSC believes will improve future stock assessments.

- *The following research recommendations are organized into Major and Minor categories to match the uncertainties they are designed to help address (see 2d above).*

- *<u>Major</u>*
  - *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.*

- *<u>Minor</u>*
  - *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.).*

c) Provide guidance on the next assessment, addressing its timing and type.

- *The SSC recommends an Operational Assessment be conducted in 5 years.*

Table 1. Snowy Grouper Recommendations

| **Criteria** | **Deterministic** | **Probabilistic** |
|---|---|---|
| Overfished evaluation (SSB/MSST) | 0.48 | 0.50 |
| Overfishing evaluation ($F_{Current}/F_{MSY}$) | 1.24 | 1.08 |
| MFMT ($F_{MSY}$) | 0.10 | 0.10 |
| $SSB_{MSY}$ (Total Biomass, mt) | 1,908.0 | 1,930.9 |
| MSST (Total Biomass, mt) | 1,430.8 | 1,448.2 |
| MSY (1000 lbs.) | 532.0 | 533.6 |
| Y at 75% $F_{MSY}$ (1000 lbs.) | 518.5 | 519.3 |
| ABC Control Rule Adjustment | 22.5% | |
| P-Star | 27.5% | |
| M (Point estimate used to scale Charnov) | 0.08 | |

| **OFL RECOMMENDATIONS** | | |
|---|---|---|
| Year | Landed LBS | Landed Number |
| 2023 | 194,000 | 21,000 |
| 2024 | 193,000 | 20,000 |
| 2025 | 192,000 | 20,000 |
| 2026 | 188,000 | 20,000 |

| **ABC RECOMMENDATIONS** | | |
|---|---|---|
| Year | Landed LBS | Landed Number |
| 2023 | 148,000 | 16,000 |
| 2024 | 150,000 | 16,000 |
| 2025 | 152,000 | 16,000 |
| 2026 | 152,000 | 16,000 |