

Original vs Revised Draft Example OFL CV Decision Criteria Table and Summary Statement Using Proposed Criteria Evaluation Process

OFL CV matrix for Scup:

Final 2023 OFL CV Decision Criteria Table for Scup - July 2023 **(ORIGINAL)**

Decision Criteria	Summary of Decision Criteria Considerations	Assigned OFL CV Bin (60/100/150)
Data quality	<p>Surveys</p> <ul style="list-style-type: none"> ● Synoptic surveys over the stock area include the NEFSC spring and autumn bottom trawl surveys, but these surveys show large interannual fluctuations that reflect availability rather than abundance in any single year. ● Surveys generally rarely catch fish age three and older, although older ages are present in commercial and recreational catch at ages. Other surveys do not cover the entire stock area, and most catch few fish over age 2. The inclusion of multiple state surveys, which by themselves are geographically restricted, enable broader coverage of the stock area in aggregate. ● Covid-related issues limited coverage of state and federal surveys in recent years (2020-2022). <p>Landings and discards</p> <ul style="list-style-type: none"> ● Commercial landings have been well sampled for length and age since 1995. Some concern about declining commercial port sampling in 2022 should this continue because older age groups are caught in the commercial fishery.. ● Commercial discards have been fairly well sampled since 2000, although discard observations are highly variable and skewed. ● New MRIP data are now being used to estimate recreational landings and discards. ● About 53% of the estimated total catch and discards in weight in 2022 was from the recreational fishery. ● Length sampling of recreational landings has generally been adequate since 1988. ● Recreational discard is low. ● Covid-related issues introduced uncertainty into catch estimates, requiring imputation methods for 2020-2022 estimates. 	60%
Model appropriateness	<ul style="list-style-type: none"> ● The assessment model is based on a complex statistical catch-at-age model (ASAP SCAA). 	

and identification process	<ul style="list-style-type: none"> ● Catch is modelled as four fleets (commercial and recreational landings and discards). ● Life history does not require special modelling adjustments. ● Addition of new selectivity block improved the model diagnostics for the 2021 and 2023 management track assessments. ● A significant portion of the stock biomass is represented by the plus group, which is assumed to be lightly exploited because of the selectivity pattern applied. ● About 25 different configurations were explored in the 2015 benchmark. ● The effect of new MRIP estimates on continued validity of prior sensitivity analyses depends on the magnitude of the change. Because the proportion of landings attributable to new MRIP estimates is relatively low, we could expect sensitivity analyses to remain valid. ● Biological reference points were updated in the 2023 management track assessment. 	100%
Retrospective analysis	<ul style="list-style-type: none"> ● Retrospective patterns were not degraded from earlier assessment results following the addition of the 2013-present selectivity block. ● Adjusted 2022 SSB estimates were outside the model-estimated 90% confidence intervals, thus a retrospective adjustment was made for both for the determination of stock status and for projections of catch and biomass in 2024 and 2025. ● General trends in retrospective patterns for SSB, R, and F have been consistent for the past five assessments. ● Retrospective adjustment application at 90% CI threshold results in a discontinuity 	100%
Comparison with empirical measures or simpler analyses	<ul style="list-style-type: none"> ● Age structure in fishery and survey catches has been expanding since the 1990s. ● Aggregate survey indices remain near time series highs. ● Several large recruitment events likely gave rise to survey index highs. ● Given the potential effects of availability in any given year, swept area estimates of biomass are less reliable than for some other stocks. ● No empirical estimates of scale are available. 	100%
Ecosystem factors accounted	<ul style="list-style-type: none"> ● No ecosystem factors were considered in the assessment, but mean weights at age and maturity at ages 2 and 3 continue to decline. ● Previous assessments examined thermal habitat models to evaluate factors affecting availability, but no strong signals were observed. ● Scup are considered moderately vulnerable to climate effects in the Hare et al. (2016) report. 	100%
Trend in recruitment	<ul style="list-style-type: none"> ● Recruitment has been consistent with no apparent trend; although the year classes in 2014 and (especially) 2015 were above average, the 2016 – 2021 year classes were below average. 	60%

	<ul style="list-style-type: none"> ● R/SSB has declined over the time series and has remained low, as would be expected as a result of the large stock size. ● OFL projections were sampled from estimated recruitment for 1984-2022; the SSC found this to be appropriate. 	
Prediction error	<ul style="list-style-type: none"> ● Comparisons of previous and current model predictions of SSB, F, and recruitment were presented. Updated MRIP data led to relatively little change in estimates of F and SSB of Scup. ● The retrospective pattern has become more pronounced over time leading to underestimation of SSB and overestimation of F. This has been adjusted for in the current assessment. ● Difficult to obtain prediction error estimates with high uncertainty in management of recreational removals 	100%
Assessment accuracy under different fishing pressures	<ul style="list-style-type: none"> ● The assessment is responsive to changes in fishing pressure. Fishing mortality declined by more than four-fold over the assessment series, while SSB increased more than ten-fold. ● In the most recent years, fishing mortality rates have been moderate and at levels expected for management targets. ● Fishing mortality in the past 19 years has been low, but increases in SSB, R, C, and survey indices are consistent. 	60%
Simulation analysis/MSE	<ul style="list-style-type: none"> ● No formal MSE-type analyses have been conducted for this stock. 	NA

Summary Statement (**ORIGINAL**)

The SSC recommends using an OFL coefficient of variation (CV) level of 100% for the following reasons (see Attachment 5 for the additional information and basis of this recommendation): There is high data quality; there are consistent signals, from surveys, catch-at-age, and model results, and the data agree with theory throughout. There is also a relatively low effect of revised MRIP estimates. Several surveys show declines or low abundance in early years to record lows in the mid-1990s and increases in abundance thereafter. Age structure in surveys shows a decline or low abundance of older ages in survey catches in early years and increases in abundance of older ages in recent years. Age structure in commercial landings-at-age and recreational landings-at-age show similar trends of increasing abundance of older ages in the stock. Several large recruitment events have been indicated by survey indices. In combination, these trends are consistent with lower fishing mortality rates in recent years, and increasing stock abundance as indicated by model results. Although 53% of the catch weight in 2022 is attributable to the recreational fishery, the increase in recreational catch related to the new MRIP estimation methodology is relatively low in comparison to other stocks. There has been no obvious or clear trend in recent recruitment over the past decade, although a declining trend in recruitment may be emerging. Adjustment of projected recruitment currently appears unwarranted. There is no discernable impact of thermal habitat on interannual variation in

availability, so adjustment of survey indices to account for thermal habitat effects also appears unwarranted.

In 2021, the SSC recommended an OFL CV of 60% for Scup. Although many aspects of the stock assessment have not changed from the previous MTA, the principal reason for raising the CV to 100% in 2023 is because the rating for retrospective pattern has changed from 60% to 100%. In the 2021 assessment, the Mohn's Rho was approaching, but not over, the 90% CI threshold; the value for SSB in the 2021 assessment was -14% and is now -21%, and the value for F in 2021 was +20% and has now increased to +42%. Since the adjusted 2022 SSB estimates based on the retrospective patterns were outside the model-estimated 90% confidence intervals, a retrospective adjustment (correction) was made for both the determination of stock status and for projections of catch and biomass in 2024 and 2025. The addition of the retrospective correction is a new discontinuity factor affecting overall uncertainty in the OFL. The need for correction is indicative of lack of model fit and/or inconsistent data, and should be monitored in future assessments.

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**DRAFT EXAMPLE UNDER PROPOSED OFL CV CRITERIA
EVALUATION PROCESS**

Final 2023 OFL CV Decision Criteria Table for Scup - July 2023 **(REVISED)**

Decision Criteria	Summary of Decision Criteria Considerations	Assigned OFL CV Bin (60/100/150)
Data quality {Tier 1}	<p>Surveys</p> <ul style="list-style-type: none"> ● Synoptic surveys over the stock area include the NEFSC spring and autumn bottom trawl surveys, but these surveys show large interannual fluctuations that reflect availability rather than abundance in any single year. ● Surveys generally rarely catch fish age three and older, although older ages are present in commercial and recreational catch at ages. Other surveys do not cover the entire stock area, and most catch few fish over age 2. The inclusion of multiple state surveys, which by themselves are geographically restricted, enable broader coverage of the stock area in aggregate. ● Covid-related issues limited coverage of state and federal surveys in recent years (2020-2022). <p>Landings and discards</p> <ul style="list-style-type: none"> ● Commercial landings have been well sampled for length and age since 1995. Some concern about declining commercial port sampling in 2022 should this continue because older age groups are caught in the commercial fishery.. ● Commercial discards have been fairly well sampled since 2000, although discard observations are highly variable and skewed. ● New MRIP data are now being used to estimate recreational landings and discards. ● About 53% of the estimated total catch and discards in weight in 2022 was from the recreational fishery. ● Length sampling of recreational landings has generally been adequate since 1988. ● Recreational discard is low. ● Covid-related issues introduced uncertainty into catch estimates, requiring imputation methods for 2020-2022 estimates. 	<p>60%</p>
Model appropriateness and identification process	<ul style="list-style-type: none"> ● The assessment model is based on a complex statistical catch-at-age model (ASAP SCAA). ● Catch is modelled as four fleets (commercial and recreational landings and discards). ● Life history does not require special modelling adjustments. 	<p>100%</p>

<p>{Tier 1}</p>	<ul style="list-style-type: none"> • Addition of new selectivity block improved the model diagnostics for the 2021 and 2023 management track assessments. • A significant portion of the stock biomass is represented by the plus group, which is assumed to be lightly exploited because of the selectivity pattern applied. • About 25 different configurations were explored in the 2015 benchmark. • Model results suggest that the population has responded as expected to changes in fishing mortality. Rates declined by more than four-fold over the assessment series, while SSB increased more than ten-fold (from assessment accuracy under different fishing pressures criterion). • The effect of new MRIP estimates on continued validity of prior sensitivity analyses depends on the magnitude of the change. Because the proportion of landings attributable to new MRIP estimates is relatively low, we could expect sensitivity analyses to remain valid. • Biological reference points were updated in the 2023 management track assessment. 	
<p>Retrospective analysis {Tier 1}</p>	<ul style="list-style-type: none"> • Retrospective patterns were not degraded from earlier assessment results following the addition of the 2013-present selectivity block. • The retrospective pattern has become more pronounced over time leading to underestimation of SSB and overestimation of F (from prediction error criterion). • Adjusted 2022 SSB estimates were outside the model-estimated 90% confidence intervals, thus a retrospective adjustment was made for both for the determination of stock status and for projections of catch and biomass in 2024 and 2025. • General trends in retrospective patterns for SSB, R, and F have been consistent for the past five assessments. • Retrospective adjustment application at 90% CI threshold results in a discontinuity 	<p>100%</p>
<p>Comparison with empirical measures or simpler analyses {Tier 2}</p>	<ul style="list-style-type: none"> • Age structure in fishery and survey catches has been expanding since the 1990s. • Aggregate survey indices remain near time series highs. • Several large recruitment events likely gave rise to survey index highs. • Given the potential effects of availability in any given year, swept area estimates of biomass are less reliable than for some other stocks. • No empirical estimates of scale are available. 	<p>100%</p>
<p>Ecosystem factors accounted {Tier 2}</p>	<ul style="list-style-type: none"> • No ecosystem factors were considered in the assessment, but mean weights at age and maturity at ages 2 and 3 continue to decline. • Previous assessments examined thermal habitat models to evaluate factors affecting availability, but no strong signals were observed. 	<p>100%</p>

	<ul style="list-style-type: none"> ● Scup are considered moderately vulnerable to climate effects in the Hare et al. (2016) report. 	
Trend in recruitment {Tier 2}	<ul style="list-style-type: none"> ● Recruitment has been consistent with no apparent trend; although the year classes in 2014 and (especially) 2015 were above average, the 2016 – 2021 year classes were below average. ● R/SSB has declined over the time series and has remained low, as would be expected given the large stock size. ● OFL projections were sampled from estimated recruitment for 1984-2022; the SSC found this to be appropriate. 	60%

DRAFT EXAMPLE OF SUMMARY STATEMENT UNDER PROPOSED OFL CV CRITERIA EVALUATION PROCESS

Summary Statement (**REVISED**)

Based on a stepwise evaluation of Tier 1 and Tier 2 criteria, the SSC recommends using an OFL coefficient of variation (CV) level of 100%. Tier 1 criteria establish the minimum possible value of the CV irrespective of how well other criteria are met. Under the Tier 1 criteria (Data quality, model appropriateness, and retrospective pattern), the need to adjust biomass and fishing mortality rates for retrospective pattern led the SSC to assign a CV=100%. While the model improvements were significant and data quality is high, they were insufficient to offset a trend toward increasing Mohn’s Rho from earlier assessments. Statistically significant retrospective patterns suggest undetected changes in either data quality or process error. CVs assigned to the Tier2 criteria (empirical comparisons, ecosystem factors, and recruitment stanzas) ranged between 60 and 100% but did not alter the assignment of the overall CV. Details for these decisions are provided in Attachment 5.

The overall quality of the data supporting this assessment is high. Consistent signals from surveys and catch-at-age data agree with underlying theory. Several surveys show declines or low abundance in early years to record lows in the mid-1990s and increases in abundance thereafter. Age structure in surveys shows a decline or low abundance of older ages in survey catches in early years and increases in abundance of older ages in recent years. Age structure in commercial landings-at-age and recreational landings-at-age show similar trends of increasing abundance of older ages in the stock. Several large recruitment events have been indicated by survey indices. In combination, these trends are consistent with lower fishing mortality rates in recent years, and increasing stock abundance as indicated by model results.

Although 53% of the catch weight in 2022 is attributable to the recreational fishery, the increase in recreational catch related to the new MRIP estimation methodology is relatively low in comparison to other stocks. No clear trends in recent recruitment over the past decade are apparent but a declining trend in recruitment may be emerging. Restriction of projected

recruitment to a more recent stanza currently appears unwarranted. There is no discernable impact of thermal habitat on interannual variation in availability, so adjustment of survey indices to account for thermal habitat effects also appears unwarranted.

The increase of the overall OFL CV from 60% in 2021 to 100% in 2023 is driven by the increase in retrospective pattern (Criteria 3) in Tier 1 from 60% to 100%. In the 2021 assessment, the Mohn's Rho was approaching, but not over, the 90% CI threshold. Mohn's Rho for SSB in the 2021 assessment was -14% and is now -21%; Mohn's Rho F in 2021 was +20% and has now increased to +42%. Since the adjusted 2022 SSB estimates based on the retrospective patterns were outside the model-estimated 90% confidence intervals, a retrospective adjustment (correction) was made for both the determination of stock status and for projections of catch and biomass in 2024 and 2025. Inclusion of the retrospective correction creates a discontinuity that affects the overall uncertainty in the OFL. The need for correction is indicative of lack of model fit and/or inconsistent data, and should be monitored in future assessments.

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