10. SEDAR 71 GAG ASSESSMENT REVIEW

10.1. Documents

Attachment 19. SEDAR 71 Assessment Report
Attachment 20. SEDAR 71 Assessment Presentation

10.2. Presentation

SEDAR 71 Assessment Overview: Dr. Kevin Craig, SEFSC

10.3. Overview

The Committee was asked to review the Gag assessment prepared through SEDAR 71 (Attachment 19) and provide fishing level recommendations. Gag was last assessed during the 2014 Update to SEDAR 10, where the stock was found to be not overfished nor undergoing overfishing. However, overfishing had been occurring since 1980 and had just dipped below F_{MSY} in the terminal year. The SSB had been below MSST for the previous 5 years of the assessment but had risen above MSST in the last 2 years of the assessment.

10.4. Public Comment

Public comment was provided. See meeting minutes.

10.6. Action

- Review assessment
  - Does the assessment address the ToRs to the SSCs satisfaction?
  - ❖ *Yes*

  - Does the assessment represent Best Scientific Information Available?
  - ❖ *Yes. Stock status is robust to all sensitivities that were explored.*

  - Does the assessment provide an adequate basis for determining stock status and supporting fishing level recommendations?
  - ❖ *Yes. This assessment approach continues to be BSIA. The SSC would like to highlight several assessment strengths and improvements made with SEDAR 71, including (but not limited to):*
    - *Updated growth, natural mortality, and maturity information are improvements over SEDAR 41*
    - *Population and fishery growth curves separated*
    - *Incorporation of the SERFS video index*
    - *Incorporation of the Dirichlet multinomial*
    - *Thorough exploration of model sensitivity to model assumptions.*
- Identify, summarize, and discuss assessment uncertainties
  - Review, summarize, and discuss the factors of this assessment that affect the reliability of estimates of stock status and fishing level recommendations.
    - Qualitatively characterize these factors in terms of their influence on assessment uncertainty and fishing level recommendations.
  - ❖ *The status of the stock is robust to estimates of natural mortality and methods used to estimate natural mortality. Alternative natural mortality sensitivity runs in which steepness was re-estimated did not result in biomass/F ratios that bound the base run ratios as is typically expected.*
  - ❖ *Recruitment in the last 10 years of the assessment was low and retrospective analysis indicated recruitment may be overestimated. If this recruitment pattern continues, the stock may not be able to rebuild in 10 years. The SSC recommends an additional model run be completed which sets recruitment levels at those observed during the previous 10 years to evaluate if recovery is possible with this higher level of recruitment. See below.*
  - ❖ *A sharp drop was observed in the estimated number of discards from the private recreational and headboat sectors that may be the result of recruitment levels having been low for a longer period of time (i.e., fewer undersized fish to be released). See research recommendation below.*
  - ❖ *The SSC highlighted the fact that modelling protogynous species is very difficult. Although the assessment incorporated several aspects of gag life history well (e.g., SSB = sum of male and female mature biomass), there is the potential for sperm limitation, temporal variation in age at sexual transition,*

and time-varying maturity, etc. that may not be well characterized given the lack of appropriate data.

- List the risks and describe potential consequences of assessment uncertainties with regard to status, fishing level recommendations, and future yield predictions.

❖ *Considering sensitivity run results, assessment uncertainties are unlikely to affect the status of the stock, but could potentially play a role in fishing level recommendations and future yield predictions.*
❖ *The amount of uncertainty in recruitment is unknown. Thus, the SSC has requested projections using both the average recruitment of the last 10 years and recruitment based on the previous assessment.*
❖ *The model responded in an atypical fashion to changing natural mortality assumptions (i.e., when natural mortality was increased, the model estimated a much higher F/F_{MSY} ratio) likely due to the estimation of steepness. The SSC recommended examining recruitment estimated in sensitivity runs to see if the range of values was similar to that of the base model.*

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

❖ *Yes, the methods of addressing uncertainty are consistent with SSC expectations and the available information.*
❖ *Standard MCBE practices were used to characterize uncertainty.*

- Provide fishing level recommendations
  - The last assessment indicated the stock was close to management thresholds. Has the stock condition improved? Comment on potential reasons for a change in stock status, if needed.

❖ *No, the stock condition has worsened.*
❖ *Continued low recruitment during the last decade has contributed to poor stock condition*
❖ *Downward stock trends indicated by continued declines in indices of abundance (headboat and video indices)*
❖ *Discard mortality has peaked in the past twenty years*

- Discuss the appropriate recruitment scenario to project future fishing level recommendations. Should fishing level recommendations and management be based on the recent low recruitment?

❖ *Yes, consistent low recruitment estimates have been observed for the last 10 consecutive years. This period of low recruitment is the lowest in the time series and there is no indication that high recruitment pulses have occurred.*
❖ *As mentioned above, the SSC requests formation of a working group to explore this topic across species, including gag grouper.*

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

- ❖ *The SSC recommends an OFL based on $F=F_{MSY}$.*
- ❖ *To set the ABC, the SSC recommends a total adjustment to the OFL of 20% resulting in a P* of 30% (50-20) and recommended $P_{Rebuild}$ of 70% (50+20).*
  - *Assessment Tier – 1 (0% adjustment) given that MSY was estimated*
  - *Uncertainty Tier – 2 (2.5% adjustment) given that environmental conditions were not explicitly included*
  - *Stock Status Tier – 4 (7.5% adjustment) given that stock is overfished and overfishing is occurring*
  - *PSA Tier – 3 (10% adjustment) given that the stock has low productivity, high vulnerability, and high susceptibility (see MRAG and SEDAR 10 Update)*
- ❖ *Projections should assume management starting in 2023.*
- ❖ *Alternate rebuilding projections should consider both average recruitment from the stock recruitment relationship and a low recruitment scenario assuming a fixed recent 10-year average spanning 2010 to 2019 projected out 10 years.*

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

- ❖ *The SSC discussed overall uncertainty in recruitment, both natural variability and the apparent recent time period of low recruitment. As mentioned above in the red snapper section of this report, the SSC recommends a working group be formed to developed best practices for making recruitment assumptions in projections.*

- Provide advice on monitoring the stock until the next assessment
  - What indicators or metrics should be used to monitor the stock until the next assessment?
  - ❖ *Current sources of data should be updated regularly (landings, discards, indices of abundance from SERFS video and headboat, length and age composition) and examined for evidence of good recruitment.*
  - ❖ *Discard mortality and the use of descending devices should be monitored.*

- Provide research recommendations and guidance on the next assessment
  - Review the included research recommendations and indicate those most likely to reduce risk and uncertainty in the next assessment.
  - ❖ *As indicated in the report, "This assessment highlighted the need for continued and increased age sampling."*
  - ❖ *Monitoring recruitment through non-traditional datasets such as bridge net surveys and channel net sampling*
  - ❖ *As indicated in the report, "The utility of the SERFS video index for future assessment could be improved if length information of observed fish were available to inform the selectivity of the index."*
  - ❖ *"Better characterize the reproductive dynamics of gag including sex ratio [age at sexual transition], maturity schedule, batch fecundity, spawning seasonality and spawning frequency, as well as the potential for sperm limitation" and incorporate, if possible, into future assessments.*

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

❖ *Protogynous reproductive strategy should be incorporated into the model with time varying maturity, if necessary.*
❖ *Characterize changes in discard mortality associated with descending devices and compliance rates.*
❖ *The SSC recommends exploring the sharp drop in MRIP estimated number of discards from the private recreational and headboat sectors to determine if this drop is genuine and not an artifact of the survey.*
❖ *Consider examining trends in live releases for inland waters as an indicator of recruitment.*
❖ *Investigate the apparent decline in estuarine and coastal water live releases of gag. Look for bottlenecks in the population such as loss of submerged aquatic vegetation beds, oyster reefs, and essential fish habitat as has been documented in some states. Consider use of estuarine habitat traps (oyster shell traps), Witham collectors, and oyster culture trays to develop a recruitment index.*
❖ *Consider Chevron trap catches of ages 1-3 as a possible recruitment index*
❖ *Conduct retrospective review of projection performance using trends in empirical data from years following the terminal year of the assessment*
❖ *Conduct genetic analysis of gut contents of gag and its predators to examine potential causes of low recruitment*
❖ *Characterize egg viability with age.*

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

❖ *The SSC recommends the next assessment be operational and conducted in 5 years.*

SSC RECOMMENDATION:

Table 2. Gag Recommendations

Criteria	Deterministic	Probabilistic
Overfished evaluation ($SSB/SSB_{MSY)}$	0.15	0.14
Overfishing evaluation	2.15	2.27
MFMT (F_{MSY})	0.37	0.35
SSB_{MSY} (mt whole wt)	1563.9	1659.4
MSST (mt whole wt)	1172.9	1244.5
MSY (1000 lbs. gw)	1455.1	1453.5
Y at 75% F_{MSY} (1000 lbs.)		
ABC Control Rule Adjustment	20%	
P-Star	30%	
P rebuild	70%	
M	0.15	

OFL RECOMMENDATIONS				
Year	Landed LBS (GW, 1,000 lb)	Discard LBS	Landed Number (1,000)	Discard Number
2023	367		36	
2024	494		45	
2025	605		53	
2026	706		60	
2027	808		68	

ABC RECOMMENDATIONS				
Year	Landed LBS (GW, 1,000 lb)	Discard LBS	Landed Number (1,000)	Discard Number
2023	*see below		*see below	
2024				
2025				
2026				
2027				

***** *The SSC can recommend the catch level associated with $P_{Rebuild}$ based on the rebuilding scheduled selected by the Council.*