New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
Eric Reid, Chair | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: August 2, 2022

TO: Scientific and Statistical Committee

FROM: Groundfish Plan Development Team

CC: Groundfish Committee

SUBJECT: **Rebuilding Strategies for Gulf of Maine Cod**

The Groundfish Plan Development Team (PDT) met by webinar on July 11 and July 25, 2022, to discuss developing rebuilding plan options for Gulf of Maine cod. Documents the PDT discussed included the 2021 stock assessment, peer review report, PDT report and Scientific and Statistical Committee (SSC) report.

Background

In an August 13, 2021, letter from GARFO to NEFMC, Gulf of Maine cod was identified as making inadequate progress toward rebuilding following the 2019 stock assessment. The letter explains that the Council must implement a new rebuilding plan within 2 years of the date of notice (i.e., by August 13, 2023). Furthermore, the cod rebuilding plans may need to be modified after the 2023 research track for Atlantic cod is completed.

The most recent assessment of Gulf of Maine cod was a management track assessment in September 2021. The stock is overfished, and overfishing is occurring.

The Groundfish Committee met on June 14, 2022, and passed the following motion:

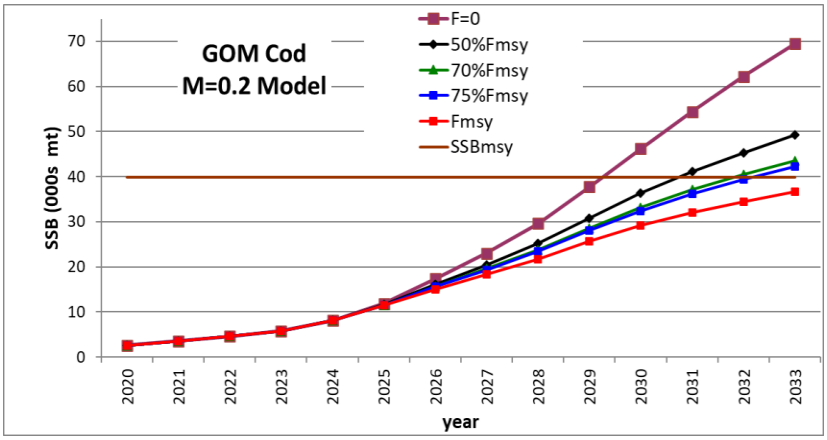
> *Task the Plan Development Team with analyzing F-rebuild options for Gulf of Maine (GOM) cod which consider 50%/60%/70% rebuilding probabilities associated with a 10-year rebuilding timeline. Also determine if fishing at 75% of F(MSY) is projected to rebuild the GOM cod stock in 10 years.*

Progress Report

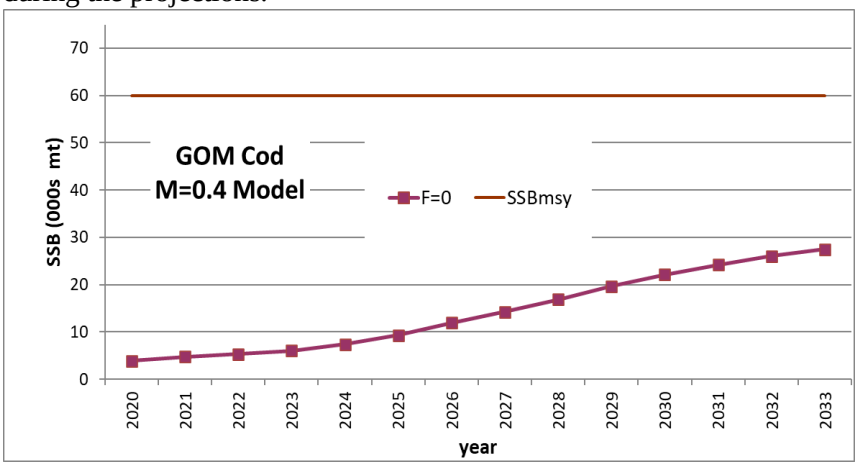
The PDT conducted several rebuilding projections and assumed a fixed rate for fishing mortality (F), consistent with recent groundfish rebuilding plans. Calendar year catch in 2021 is assumed to be the annual catch limit of 523 mt. Summarized results are based on the median values from the projections. Projections that rebuild (cross the horizontal line in the figures) result in at least a 50% probability of

achieving the rebuilding target spawning stock biomass (SSB). These projections are preliminary and subject to change.

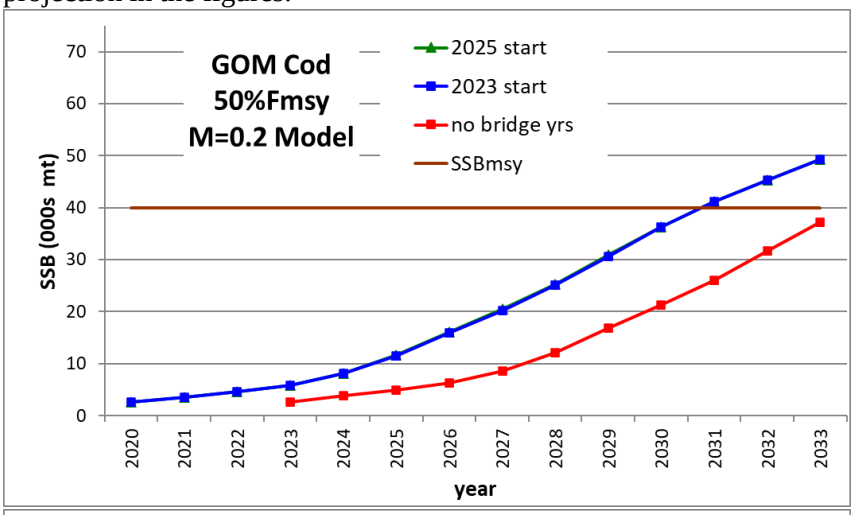
1) **M=0.2 model standard projections** with the same assumptions used in the 2021 stock assessment using the M=0.2 model at F=0, 50%FMSY, 70%FMSY, 75%FMSY, and FMSY.

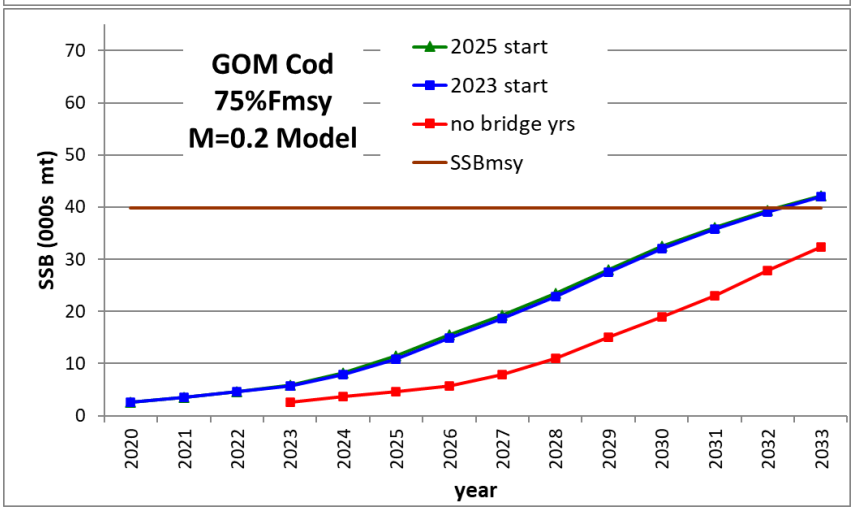


2) **M-ramp, M=0.4 model standard projections** with the same assumptions used in the 2021 stock assessment using Mramp, M=0.4 model at F=0. This assumes natural mortality remains high during the projections.

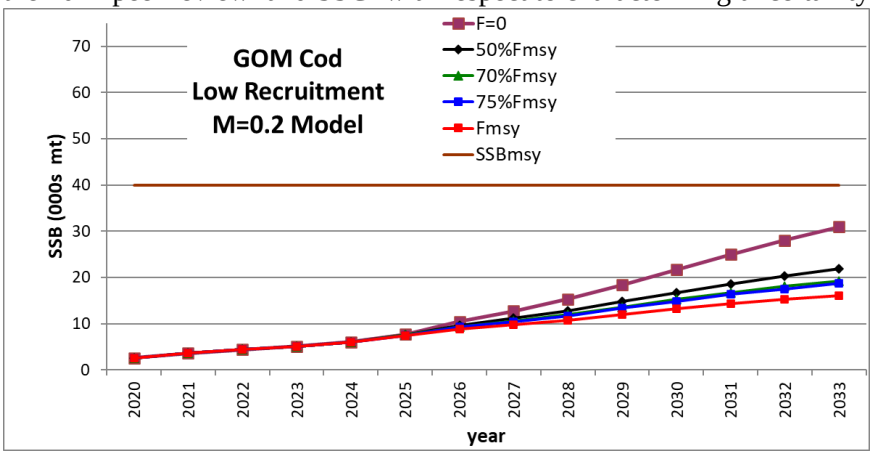


3) **Varying the starting date** the new F would be applied with the same assumptions used in the 2021 stock assessment using the M=0.2 model at 50%FMSY and 75%FMSY: 2023 start , 2025 start (keeping the current ABCs for 2022-2024), and without bridge year catch assumptions. The no bridge years projects off the terminal year of the assessment and has the effect of slowing SSB rebuilding in the projections. Note: the 2025 start projection is obscured by the 2023 start projection in the figures.

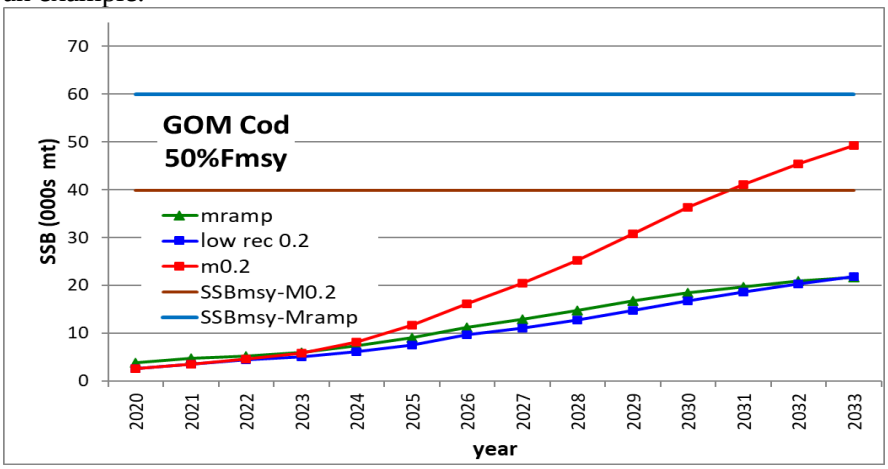




4) **Sensitivity projections with M=0.2 model** changing the recruitment in the projections to draw from the last 15 years of recruitment using the M=0.2 model at F=0, 50%FMSY, 70%FMSY, 75%FMSY, and FMSY. This assumes continued poor recruitment and based on feedback from the 2021 peer review[1] and SSC[2] with respect to characterizing uncertainty and future research.



5) **Comparing the various projections** and low recruitment sensitivity projection at 50%FMSY as an example.



[1] **2021 Peer Review report:** *The Panel was concerned with the large increases and increasing trend of short-term projected catches (in this assessment as well as in the previous assessments). Further, model results from this assessment appeared to be less than those projected in the last management track assessment, suggesting a misspecification in the projections. After discussion with the assessor, it seemed that this was a result of the projection model sampling from the CDF of recruitment estimates from 1982 – 2017. Recruitment since ca.2005 appears to be much lower than the years prior and below the longer time series median value, and thus using the CDF of recruitment from 1982 – 2017 may not be representative of current recruitment dynamics than more recent years recruitment data only. The Panel requested that the assessor conduct a brief analysis of the affect that truncating the recruitment time series to the past 15 years would have on the projections. Initial results from this analysis suggest catches will still increase but by smaller amounts. While we did not ask for the new projections to be carried forward as options, they are important context for understanding the scientific uncertainty involved in setting catch levels.*

[2] **2021 SSC report:** *ADDITIONAL COMMENTS AND RESEARCH RECOMMENDATIONS*
The SSC remains concerned about the impact of retrospective patterns on the determination of Gulf of Maine cod catch advice. The SSC recommends additional consideration of whether both the M = 0.2 and M-ramp models are useful, as the retrospective pattern is increasing for both models. In addition, selection of an appropriate recruitment stanza to inform projections deserves additional research. The impact of changing ocean conditions on aspects of stock productivity (e.g., natural mortality and recruitment) and on the projections underlie the SSC's rejection of the ABC projections using two bridge years and will need to be considered in future assessments. In addition, the SSC recommends that the findings of the Atlantic Cod Stock Structure Working Group be integrated into the stock assessment process. The SSC recommends that all of these comments should be considered in the Atlantic cod research track stock assessment process. The SSC requests that the Groundfish PDT continue to explore development of a more robust estimate of incidental bycatch to support application of Option C of the ABC control rule. The PDT presented estimates of discards, but these values do not represent all bycatch, which would be required to apply Option C.

Preliminary PDT Summary and Questions for the SSC

1) The PDT recommends using the current ABCs for 2022-2024 (551 mt, held constant) in the rebuilding plan. The PDT would fix the catches at the ACLs (522 mt) in those years for the projections. The PDT would like feedback from the SSC on this decision. Or should the PDT consider developing revised ABC options for 2023 or 2024 that increase with the projections?

2) The standard projections under the M=0.2 model indicate the stock can rebuild within 10 years or less. However, projections at F=0 under the M-ramp, M=0.4 model and the sensitivity on the M=0.2 model with assumed low recruitment do not rebuild the stock. Should the PDT consider developing rebuilding strategies for 10 years, given these uncertainties in natural mortality and recruitment?

3) To date, the PDT has not developed an approach to model Atlantic cod stock structure uncertainty in the projections. Does the SSC have any ideas?