
Simpler Modeling WG report

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Membership

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Objectives

- I. Explore simpler (or more ‘focused’) ‘base’ models for at least snow crab, Tanner crab, and BBRKC to better understand and support the use of Tier 3 size-structured models with greater model parsimony and stability
 - a) Identify the minimum aspects (data and parameterization) that are needed to start a model from scratch.
 - b) Identify complexity that could be reduced through different parameterizations or simpler assumptions
 - c) Identify specific features of recent models that may be causing convergence issues, such as parameters with very large variance estimates or maximum likelihood estimates occurring on or very near bounds
- II. Allow authors the opportunity to explore building new models by adding features to simpler base models rather than limiting authors to only incremental changes from legacy models
- III. Define the underlying assumptions of the Federal models/harvest control rules and the estimates/harvest strategies used by the State to establish TACs and identify where they differ.
- IV. If time allows, explore a different Tier approach that could be included in assessments to serve as a ‘fallback’ if unexpected and/or major problems in Tier 3 calculations arise due to new data.



3 main topics of Discussion

- I. Steps to create a more robust Tier 3 model for each stock
- II. State and Federal Harvest Specifications Process
- III. Proposed “Fallback” model options



Steps to create a more robust Tier 3 model

- 3 commonalities among stocks:
 1. Specify growth and maturity relationships outside of the model rather than estimating within the model.
 2. Consider using the BSFRF data to inform a prior on Q and/or selectivity instead of modeling it directly.
 3. Collapse all small sources of mortality, such as bycatch fisheries, into one 'fleet' (holding bin) and estimate or fix selectivity.
- Priority in moving models into GMACS, no need for a bridging legacy features to GMACS



Steps to create a more robust Tier 3 model

- **Snow Crab:** Issues with the Currency of management
 - Producing a model that incorporates the best available information on biological processes but establishes $F=M$ on the exploitable biomass
 - Place assessment in Tier 4 based on Tier 3 calculations being incompatible with maturity occurring largely prior to fishery selectivity and therefore generating F proxies at unreasonably high values.
- **Tanner Crab:** 3 commonalities + building a simpler (more focused) model in GMACS
- **BBRKC:** Issues with estimation of Q for the NMFS trawl survey and retrospective patterns
 - Explore 3 commonalities + the origin of the current prior on Q and prior configurations



Steps to create a more robust Tier 3 model

- Process:
 - No bridging analysis
 - Maintain CPT/SSC review to retain feedback and recommendations



State and Federal Harvest Specifications Process

- Highlighted the differences between the State and Federal processes- detailed in the report but a few key takeaways:
 - SHSs generally apply an exploitation rate of 5-22.5% (dependent on stock and stock status) to mature male biomass (or abundance).
 - generally lower than those used when calc. OFL
 - Incorporates additional uncertainty into TAC setting- incl. management uncertainty, scientific uncertainty not accounted for by the ABC and buffer
 - May be some differences between the inputs utilized in the SHS and the specs. Setting assessment model
 - Current vs. projected stock status
 - EX: 2022 snow crab assessment was below/above the FOFL control rule closure threshold. Because the State considers *current* stock status, the State harvest control rule implemented a fishery closure, whereas the assessment did not.
- Variability between ABC and TAC- ABC 60% higher than TAC in 10 yr avg.
- No formal WG recommendations, but presentations were informative



Proposed “Fallback” model options – Tier 4

- WG concluded that the most simple model to bring forward would be a **basic Tier 4 approach in which B = survey-estimated (ideally using the REMA package) vulnerable male biomass (male crabs likely to be susceptible to both directed and incidental catch fisheries), $OFL = M$ (adjusted by stock status)* B , $ABC = \text{buffer}*(OFL)$** , where the ABC buffer would be determined by guidance in the FMP and the common practice of buffering the ABC based on model uncertainties that has been documented by the CPT/SSC in meeting reports.
- The WG supported bringing forward the proposed alternative model for all three stocks (snow, Tanner, BBRKC) at the May 2023 CPT meeting during the discussion of proposed model runs.
- WG’s not preferred assessment model, and the assessment authors will continue to work on making adjustments to their assessment model, but this alternative approach would allow the reviewing bodies to have a fallback option should the more complex models not converge during the fall meetings where OFL and ABC specifications need to be set.



Proposed “Fallback” model options – More complex Tier 4?

- A slightly more complex Tier 4 model (e.g., the Tier 3.5 snow crab model last year) if they choose that captures the growth and mortality between the survey and the fishery to calculate the biomass used in the HCR.
- Some WG members expressed concerns about a more complex Tier 4 model.



Questions?

