

Draft SSC Report June 2023



C1 BSAI Crab

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Simpler Modeling Workshop

- Originated from SSC 2022 recommendation to form a joint SSC/CPT/stock author workgroup to explore assumptions and model structure in BBRKC, Snow Crab, and Tanner models to develop more stable Tier 3 models
- Working group met in March 2023 (Seattle, Wa), formulated objectives (in workgroup report), and recommended pathways for model investigation:
 - Re-specifying growth and maturity from analyses outside of the model.
 - Consider using BSFRF data to inform a prior on Q and/or survey selectivity rather than treating the BSFRF data as separate survey to be fit by the model;
 - Combining all mortality sources other than the directed fishery into a single “fleet” to avoid estimating multiple time-series of fishing mortality rates for bycatch fisheries.

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- In addition, workgroup recommended a Tier 4 survey biomass approach ('fallback') as an option to address potential model specification and fit issues that may arise with more complicated models

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- The SSC supports the workgroup recommendations with the following additions
 - Provide information on the tradeoffs related to model parsimony (i.e., simple versus complex formulations)- e.g., retrospective analysis, comparison of fit statistics, and descriptions about the ability of the model to capture biological processes and output realistic management quantities.
 - Highlight data/information issues- e.g., the relative confidence in available data and how these data may relate to data weighting schemes and the estimation of parameters inside or outside of the models.
 - Investigate alternative methods that improve modeling of both female and male processes (e.g., to reduce tension between model fitting of both female and male crabs).

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- The SSC supports the workgroup recommendations with the following additions (cont)
 - Consideration of the impacts on the state and federal harvest specification processes - e.g., considerations for exploitation rates that differ between the processes
 - Retrospective plots that compare the OFLs predicted by the existing status quo Tier 3 models plotted against the Tier 4 models.
- SSC supports the workgroup recommended a Tier 4 survey biomass approach ('fallback') as an option to address potential model specification and fit issues that may arise with more complicated models

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Simpler Modeling Workshop

- The SSC recommends that the CPT identify specific simulations and/or analysis to identify tradeoffs between model performance vs shifting to a lower tier.
- Continue work as part of the Crab Modeling Workshop process.

C1 - General BSAI Crab Comments

- The SSC **highlights** that several crab assessments result in unrealistic fishing mortality estimates that result in catch advice to remove virtually all legal-size crab
 - The SSC **recommends** that identifying the root causes of this issue be a high priority for the planned Jan 2024 workshop
- The SSC had additional recommendations for assessment authors regarding Tier 4 'fallback' models

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Aleutian Island Golden King Crab

- AIGKC is managed as a Tier 3 stock with a single OFL and ABC. ADF&G manages the fishery in two areas (east and west of 174°, EAG & WAG).
- The SSC supports the CPT's recommendation to use Model 22.1e2 for both the EAG and the WAG as the basis for harvest specifications and status determination.
- SSC supports the CPT recommended OFL, ABC and 25% buffer
- AIGKC is not overfished. Overfishing will be evaluated at the October 2023 meeting after the fishery is complete.

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Aleutian Island Golden King Crab

- 25% ABC buffer
 - Fishery-dependent CPUE, uncertain natural mortality, few data, retrospective pattern, recent changes in length frequencies
 - The buffer is the same as PT and is the same as last year.

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Aleutian Island Golden King Crab

- The SSC places a high priority on incorporating information from the cooperative survey into the assessment.
- Suggested a number of model/research suggestions for the future

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Pribilof Islands Golden King Crab

- Full assessment (triennial)
- SSC **recommends** a Tier 4/5 assessment differing with CPT Tier 5 recommendation because it substitutes survey area swept estimates of mature male biomass (MMB) from a more recent time period (2002 - 2016) for older (1993-1998) fishery total catch.
- Approach used in 2010 Gulf of Alaska spiny dogfish assessment
- Overfishing did not occur in 2020, 2021, or 2022
- No assessment of stock biomass (no overfished determination)
- SSC **supports** the 25% ABC buffer

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Western Aleutian Islands Red King Crab

- Full assessment (triennial)
- Overfishing did not occur in 2020/21, 2021/22, 2022/23
- No current information on stock biomass (no overfished determination)
- The SSC **recommends** Tier 5 assessment using status quo methods
 - Agreement with author and CPT
- The SSC **recommends** Fishing Effects Model analysis of gear-specific and seasonal fishing disturbance trends to support further consideration of the CPT-proposed habitat protections

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Bristol Bay Red King Crab Model Runs

- Nine models were considered that included updated GMACS code, changes to the start date of the model, multiple methods for fixing or estimating M, considerations for NMFS survey Q, and an assessment of how influential the NMFS survey retow data are.
- The SSC *recommends* bringing Model 21.1b, 22.0, 23.0a, and a simple Tier 4 calculation for the October meeting.
- The SSC *supports* the CPT recommendations for author focus on the following:
 - considering NMFS survey catchability relative to the BSFRF survey
 - continued work on the model initial conditions, sensitivity to growth, and retrospective patterns
 - revisit blocking on molting probability from tagging data

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Tanner Crab Model Runs

- The SSC appreciates the efforts of the author to explore a range of Tier 3 model alternatives, and variant of the “fallback” Tier 4 alternative defined during the March 2023 Simpler Modeling Workshop
- The SSC *recommends* the following models be brought forward for consideration in September 2023
 - Model 22.03b - base model with minor changes
 - Tier 4 “fallback” model consistent with the guidelines identified during the March 2023 workshop

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Tanner Crab Model Runs

- The SSC *supports* transitioning this model, or a simplified version thereof, into the standardized GMACS platform
 - The SSC feels this is a higher priority than continued exploration of model alternatives based on the current platform (e.g. 23.02, 23.05)
- The SSC supports continued evaluation of time-varying natural mortality within a GMACS model
 - Concurs with CPT that complexity added by time-varying M may be balanced by external growth estimation and use of BSFRF data to inform survey selectivity

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Pribilof Island Blue King Crab Model Runs

- SSC **supports** continuing to use Tier 4 assessment and update model software (ADMB to TMB)
 - TMB used in groundfish Tier 5 assessments
 - No changes to underlying model structure and negligible differences in model results
- The SSC **recommends** that the single model (Tier 4 model in TMB) be brought forward for determining stock status and setting specifications for this stock in the fall

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Snow Crab Model Runs

- Last year, snow crab assessment transitioned to the GMACS modeling platform
- Considerable modeling issues still needed to be addressed:
 - Convergence problems
 - Bimodality in management quantities
 - Large retrospective patterns
- Exploratory modeling work this year was motivated by the recommendations of the Simpler Modeling workshop for more robust approaches

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Snow Crab Model Runs

- The SSC reviewed proposed models and model runs for the 2023 snow crab assessment.
- The SSC *agrees* with the CPT to bring forward the status quo model and a Tier 4 “fallback” random effects model.
- Any other model brought forward at the discretion of the author should show adequate convergence properties

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Snow Crab Model Runs

- F35% fishing mortality rate no longer results in a meaningful conservation constraint on the snow crab fishery.
- To evaluate a potential alternative, the SSC *recommends* that OFL and ABC estimates be provided for a modified Tier 3 approach:
 - Reference levels and status determination would be calculated using mature male biomass as usual.
 - The OFL is calculated by replacing F35% in the Tier 3 harvest control rule by the model estimate of natural mortality.
 - The SSC requests evaluation of this approach by the assessment author and the CPT in September.

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Snow Crab Model Runs

- Stock assessment author has initiated a process of rethinking the fundamental assumptions that led to the current status quo model.
- The SSC **supports** this effort and offered recommendations on
 - Time-varying natural mortality
 - Pre-specified model parameters
 - Modeling males and females
 - Modeling bycatch fisheries

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Catch Accounting / BSFRF Research

- Catch accounting update on EM and crab (informational)
 - The SSC **looks forward to** updates on incorporation of stock-area component into prohibited species estimates and developing methodology for identifying crab species on EM video as progress is made.
- BSFRF research update (informational).
 - The SSC **suggests** as these research efforts move forward that survey methods and timing of surveys relative to the EBS trawl survey are considered to better understand the effectiveness of crab protections.

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Unobserved Mortality Working Group - Next Steps

- The CPT provided recommendations to the SSC on the SSC recommended and Council approved formation of a working group. Council staff requested feedback on objectives and timeline of working group.
- The SSC **recommends** working group goal is to develop a framework for how to estimate the magnitude and extent of unobserved fishing mortality for crab stocks along with guidance for explicitly incorporating these estimates in BSAI crab stock assessments and to inform other council documents related to conservation and management of crab stocks.
- The SSC **supports** holding workshop(s) in addition to inter-agency working group.

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Unobserved Mortality Working Group - Next Steps

- The SSC *suggests* objectives of working group are:
 - Identify data sources, major data gaps, and assumptions to estimate unobserved mortality for stock assessments and to better understand temporal/spatial extent across fisheries and gear types.
 - Organize workshop with stakeholder, stock assessment scientist and external expert for broad perspective and refine research needs
 - Provide research priority recommendations and/or needed research projects.

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Unobserved Mortality Working Group - Next Steps

- The SSC *discussed* that all potential gear types should be considered, recognizing that the Council may prioritize specific gear types
- The SSC *envisions* final products include:
 - Framework for estimating unobserved fishing mortality and explicitly incorporating into stock assessments.
 - Report on specific research priorities and data needs.
 - Recommendations for approaches to investigate spatial/temporal extent of unobserved mortality over fisheries and gear types to the extent practicable.
- The SSC *recommends* establishing the working group and convening first meeting no later than early 2024.

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Stock Structure Template for Red King Crab

- The SSC received a report on draft stock structure template for red king crab, focusing on stocks in the eastern Bering Sea (EBS).
- The template synthesizes available information concerning stock structure, including genetic studies, biological characteristics, distribution, retention areas, and any other relevant information.
- The SSC *recommends* that the draft be completed and included as an appendix to the Bristol Bay red king crab SAFE document.

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Stock Structure Template for Red King Crab

- Information provided in the draft template suggests that there is continuity between the Bristol Bay stock and red king crab in the Northern District.
- This grouping was distinct from the Pribilof Island and Norton Sound red king crab stocks.
- The biomass in the Northern District is small relative to the Bristol Bay stock.
- There is some evidence of a slight increasing trend of abundance in the Northern District.

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Stock Structure Template for Red King Crab

- The SSC *recommends* completing the document with the following:
 - Provide a more thorough summary of recent tagging data.
 - Include distribution maps for the EBS using the bottom trawl survey data.
 - Provide biomass trends by stock to compare relative magnitude of the different stocks.
 - Include EFH species distribution maps for red king crab.
 - If time allows, include maps of bycatch in the groundfish fishery using observer data.
 - Summarize research on larval drift patterns for Bristol Bay red king crab.

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Stock Structure Template for Red King Crab

- The SSC identified a research need for a genetic study focusing on EBS red king crab stocks.
- The SSC recommends that any future tagging work consider deploying tags in the Northern District to evaluate exchange between the Northern District and Bristol Bay.