NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
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Crab and Scallop Plan Team

REPORT

November 5, 2026

Virtual

Committee Members in attendance:

Katie Palof, **Co-Chair** (ADF&G-Juneau)
Anita Kroska, **Coordinator** (NPFMC)
André Punt (Univ. of Washington)
Andrew Olson (NMFS-Juneau)
Ben Daly (ADF&G-Kodiak)
Brian Garber-Yonts (AFSC-Portland)
Caitlin Stern (ADF&G-Juneau)
Erin Fedewa (AFSC-Kodiak)
Ginny Eckert (UAF/CFOS-Juneau)
Lee Cronin-Fine (AFSC-Seattle)
Tyler Jackson (ADF&G-Kodiak)
William Bechtol (UAF-Homer)
William Stockhausen (AFSC-Seattle)

Vacant, **Co-Chair**
Vacant, quantitative expert
Vacant (ADF&G-Dutch Harbor)

All documents and presentations are available on the November CPT eAgenda, including final SAFE documents for Norton Sound red king crab (NSRKC).

NSRKC Final SAFE

Caitlin Stern (ADF&G-Juneau) presented the 2026 final assessment for Norton Sound red king crab (NSRKC). The NSRKC assessment is conducted as a Tier 4 assessment implemented within the GMACS modeling framework. Data sources used in the assessment include the commercial fisheries during the summer and winter seasons, as well as a year-round subsistence fishery, ADF&G bottom trawl surveys, and NMFS bottom trawl surveys (which includes the current Northern Bering Sea (NBS) survey). Growth is informed by tagging data. The commercial fisheries are not rationalized but have been super-exclusive since 1994, so commercial fishers registered for Norton Sound Red King Crab cannot register for other Bering Sea king crab fisheries during the same year.

Caitlin noted that large males comprised an historically-high proportion of the retained catch during the 2026 summer fishery. The average weight during the 2026 summer commercial fishery was the highest in the time series and the percentage (34%) of retained males in the largest model size class was also the highest in the time series. Similar proportions for large males have not been seen since 1981 and 1982. No survey data were collected during 2026 and potential causes for the high proportion of large males are unknown. Potential hypotheses include: reduced natural mortality for the largest crabs, changes in growth, or movement trends that might make large males more vulnerable to capture.

Overfishing did not occur during 2026 (total catch mortality was less than the OFL), but the ABC was exceeded after the summer commercial fishery closure was announced by State fishery managers, following higher than projected catches in the final days of the fishery. For reference, and to facilitate discussion, Anita Kroska (NPFMC) posted a document with excerpts from the crab FMP that pertain to accountability measures if an overage should occur. The excerpt document noted a distinction between Federal and State roles and responsibilities. The stock author included the total catch estimate in the stock assessment, including any harvest that exceeded the ABC, which is in accordance with an accountability measure listed in the crab FMP (Section 3.2.1). The stock author indicated that there was no further concern for the subsequent year based on the overage since the assessment model assumes the entire OFL is removed when estimating the OFL for the upcoming season. The CSPT discussed its potential role in addressing this overage and determined that no CSPT action was necessary. Because the OFL was not exceeded, the overage was not related to scientific uncertainty in the OFL, so an adjustment of the ABC buffer is not needed. Under the FMP, when an overage of the ABC occurs, the State "has some discretion to determine the most appropriate method to account for any catch above the [ABC] in setting the TAC [or GHL] for the subsequent fishing season" (Response to Comments, FMP Amendment 38/39). Any accountability measures would be delegated to the State under their in-season management purview.

Caitlin presented results from five alternative models to the CSPT:

1. 26.0 updated: the base model updated from the 2025 assessment model 25.0a2
2. 26.1.d: 26.0 but fit to a spatiotemporal (ST) model-based abundance index fit to the NOAA NBS survey and the ADFG trawl survey with a "smooth" on depth as a covariate
3. 26.1.nd: 26.0 but fit to a ST model-based abundance index fit to the NOAA NBS survey and the ADFG trawl survey with only year and survey identity factors as covariates
4. 26.2.d: 26.1.d except that catchability for the model-based abundance index was estimated
5. 26.2.nd: 26.1.nd except that catchability for the model-based abundance index was estimated

Fishery-independent survey time series in Norton Sound display pronounced spatiotemporal variation in station coverage. Historical ADF&G trawl surveys (1996–2024) covered extended offshore stations near St. Lawrence Island during 2006 and 2008, but have been restricted to inner stations in Norton Sound in subsequent years. The NOAA NBS surveys (2010–2025) sample a wider geographic area but at broader spatial grid resolutions. Over the past year, Caitlin has been exploring the utility for the assessment to better capture temporal patterns in stock abundance using spatio-temporal (ST) generalized linear mixed models (GLMMs) implemented using sdmTMB to integrate the spatially-explicit survey information from the ADF&G and NOAA surveys. The two ST model-based indices fit in the alternative models addressed requests from the CSPT (CPT at the time) and SSC to determine whether incorporating depth as a covariate

would improve ST model fits to the survey data, and whether there was evidence for an interaction between depth and survey type. Caitlin explored several models with fixed effects for year and survey type, with depth either excluded, as a simple covariate, as a linear interaction with survey type, or as a smooth, nonlinear interaction by survey type. She also explored the use of three error distribution assumptions, namely, the delta-gamma, delta-lognormal, and Tweedie distributions. Based on cross-validation, the delta-gamma model with the smoothed depth interaction term exhibited the best combination of out-of-sample negative log-likelihood, smallest root mean square error (RMSE), and smallest mean absolute error (MAE). Caitlin thus selected the indices from this model to use in models 26.1.d and 26.2.d. As an alternative model-based index, she also selected the indices from the delta-gamma model that did not include depth as a covariate to use in models 26.1.nd and 26.2.nd. The CSPT discussed potential mechanisms for the depth-survey type interaction. Potential candidates for such an effect included differences between the surveys in vessel operations and gear types. The CPST also noted that the difference in the marginal effect of survey type on the depth effect was almost negligible within the depth range sampled by the ADF&G survey.

The base model for harvest recommendations, 26.0, used a version of GMACS (2.20.44) updated from the version used for the 2025 assessment (2.20.20) and the version used for the May 2026 proposed model runs (2.20.34). Caitlin presented a bridging analysis for this change and several inconsequential changes to bounds on model parameters and noted that there was very little difference in results between the two models and certainly nothing that raised any red flags requiring further investigation.

All five alternative assessment models exhibited satisfactory parameter jittering results and convergence to the MLE. Retrospective analyses were conducted and the Mohn's Rho scores for all five were improvements over the 2025 model. One concern Caitlin and the CSPT shared was related to the values for estimated survey catchability from the two 26.2 models. For the 26.1 models, catchability was fixed at 1, essentially implying that the combined surveys were catching all crab within the area swept by the trawl gear. For the 26.2 models, the estimated value for catchability was substantially larger than 1 (i.e., > 1.5), with the implication that the surveys were catching a greater abundance of crab than were actually present in the area swept. Caitlin suggested, and the CSPT agreed, that including the model-based indices in the assessment was an improvement over including the NMFS NBS and ADF&G surveys separately, but that estimating catchability for the model-based indices needed further investigation to determine whether the large catchability estimates were reasonable. The CSPT discussion noted that the scaling issue was critical to the assessment and that the assumption that catchability was 1 for the ADF&G survey on its reduced spatial scale inside the Sound had been a somewhat arbitrary decision to fix the scale. Given the larger spatial scale across which the model-based indices were derived, however, the larger estimate might be warranted.

Caitlin recommended that the assessment go forward with Model 26.1d (which fixed catchability to 1) because the model-based index with the interaction between the smooth on depth and

survey type had the better diagnostics. The CSPT agreed with her reasoning and thus recommended using Model 26.1.d to determine management quantities and set overfishing levels.

NSRKC is managed under Tier 4, with the B_{MSY} proxy determined by average MMB over a pre-agreed time frame. The CSPT noted that there might be some confusion on the public's part because the recommended OFL for 2027 is smaller than the 2026 OFL even though the assessment indicates increasing MMB alongside strong catch rates and record proportions of mature males. This apparent disconnect arose from the overall change in scale associated with the inclusion of the model-based index in the recommended assessment model. Although terminal MMB increased, B_{MSY} increased proportionally more and associated stock status (B/B_{MSY}) decreased. The value for F_{OFL}/F_{MSY} is proportionately smaller resulting in a smaller OFL for 2027 under Model 26.1.d because $B/B_{MSY} < 1$,. In other words, stock abundance is now estimated to have been higher over the time series than previously estimated, and even though abundance for 2027 is projected to be higher than for the base model, that abundance is a smaller proportion of the historical average abundance estimated by the recommended model, leading to a smaller OFL.

In reviewing the risk table for NSRKC, Caitlin highlighted that using the model-based indices of abundance reduces concern regarding potential mismatches between the stock and surveyed areas. Retrospective patterns, previously flagged as poor, improved this year. However, other concerns regarding the assessment and uncertainty over population dynamics remained, and no new fishery-independent survey information was available this year. The CSPT noted that improved retrospective patterns reflected better model stability, not necessarily that the model better captured the stock dynamics. With respect to ecosystem considerations, Caitlin presented information that modeled pH in Norton Sound continued to decline and that recent measurements within the Sound indicated pH levels were at concerning levels given lab studies using red king crab from other stocks, although the relationship between pH (and other environmental factors) and juvenile NSRKC growth and survival in Norton Sound is not well understood. Fishery performance indicators continued to be consistent with a stable stock, although the CSPT noted that CPUE trends are included in the assessment model so model results are not independent of the performance indicators. Overall, Caitlin suggested there was no cause to change risk levels across the four categories. She recommended continuing to use the 30% ABC buffer the SSC adopted for this stock last year given the large uncertainties associated with biological characteristics and environmental processes for this stock, as well as the lack of surveys during 2026.

For future work, the CSPT recommended

1. Explore development of spatiotemporal model-based estimates for size compositions, as previously requested by the SSC
2. Document and update (as necessary) the summer commercial fishery CPUE standardization

3. More fully explore reasons why estimates for catchability using the model-based indices are greater than 1.0 (e.g., what other assumptions about scaling do these estimates reflect)?
4. Consider the utility of including time-varying weight-at-age in the assessment and evaluate the amount of data available to inform it
5. Prioritize research studies that address the relationship between pH and juvenile red king crab survival
6. Report biomass primarily in metric units, other than the two standard tables in the Executive Summary
7. Whether to re-run ST model comparisons is left to the authors' discretion; however, it is preferred that any new explorations for model-based indices should be presented in the proposed models document rather than the final SAFE document moving forward.

SAFE Guidelines - Off-cycle & Proposed Model Documents

Off-cycle Reports

Buck Stockhausen (AFSC-Seattle) presented proposed guidelines for off-cycle reports for BSAI crab stocks assessed on multi-year cycles, including Pribilof Islands blue, red, and golden king crabs, St. Matthew Island blue king crab, and Western Aleutian Island red king crab. The purpose of the proposed guidance is to establish consistency among authors and clarify the information the CSPT expects in off-cycle reports, as previous submissions varied in content. Because these stocks do not receive a full annual assessment, the primary purpose of an off-cycle report is to determine whether overfishing has occurred while minimizing workload associated with multi-year assessment cycles. The CSPT recommended that off-cycle reports be simplified to include only an updated Executive Summary, rather than a full SAFE report, and that this distinction be made clear to the SSC and public.

The Executive Summary should include the stock name, assessment frequency, catches, stock biomass, recruitment, management performance, basis for the overfishing limit (OFL), a summary of any rebuilding analyses, and a summary of relevant survey information. The catch information should summarize the most recent five years and include retained catch, total catch mortality in crab fisheries, and total catch mortality in groundfish fisheries. The CSPT discussed whether additional historical catch information was necessary, noting that much of the information is already available in the introductory tables of previous SAFE reports. Members emphasized keeping off-cycle reports as simple as possible and deferring to the most recent full assessment for additional information. Survey information should summarize biomass trends and survey size compositions when available. However, because this information is already presented in the NMFS Eastern Bering Sea (EBS) bottom-trawl survey technical memorandum published annually, the CSPT suggested referencing the technical memorandum rather than reproducing redundant figures and analyses. For stocks without survey information, such as Western Aleutian Islands red king crab, the report would be correspondingly simpler.

The CSPT also discussed circumstances that might warrant conducting a full assessment rather than submitting an off-cycle report. An unexpected change in survey biomass or other substantial indication of a change in stock status could trigger a full assessment, such as the survey biomass estimate trigger for Pribilof Island red king crab established by the CPT in Sept 2025. The CSPT looks to the author to recommend a change to the assessment cycle but would not expect the author to produce a full assessment that same year due to timing constraints. Regarding prohibited species catch (PSC) limits, members noted that PSC limits apply to Bristol Bay red king crab, Bering Sea Tanner crab, and Bering Sea snow crab, which are assessed annually using information from the NMFS Eastern Bering Sea bottom-trawl survey. The remaining crab stocks do not have PSC limits for groundfish management; therefore, PSC catch information does not need to be included in off-cycle reports. Overall, the CSPT recommended removing all sections below the Executive Summary as provided in the off-cycle report guidance and requiring only an updated Executive Summary for off-cycle reports. The goal is to provide clear, consistent, and concise documentation sufficient to support an overfishing determination while minimizing unnecessary analyses, figures, and reporting workload.

Proposed Model Documents

Buck Stockhausen (AFSC-Seattle) presented proposed guidelines for BSAI crab stock assessment proposed model reports, which are provided by assessment authors to the CSPT at the meeting preceding the presentation of a full assessment. The purpose of the document is to provide a starting point for developing consistent reporting guidelines because formal guidance for the content of these reports has not previously been established. Members emphasized that proposed model reports should be distinct from SAFE reports and may reference the most recent SAFE report rather than repeat previously presented information.

The CSPT discussed the proposed report structure, emphasizing a concise Introduction that identifies responses to recent CSPT and SSC comments, other analyses conducted, changes to data since the previous assessment and their potential impacts, corrections to GMACS and their impacts on the assessment, and potential or proposed models for consideration in the next assessment. Members recommended presenting other analyses before the list of proposed models because these analyses help inform decisions about which models should be brought forward for the full assessment. Recent examples of other analyses include exploration of survey effort reduction, and evaluation of the potential impacts of hybrid Tanner/snow crab on the assessment.

The CSPT also discussed the inclusion of convergence diagnostics and agreed that detailed diagnostics are unnecessary unless they are being used to evaluate and eliminate models from further consideration. However, authors should indicate whether models converged, to provide relevant information for evaluating proposed models. Members emphasized keeping this requirement simple and avoiding unnecessary diagnostic results that do not inform model recommendations. The reports should also include a comparison of model results, followed by a summary and recommendations in which the assessment author clearly identifies which models should be brought forward for the full assessment. Overall, the CSPT supported the proposed

report structure and recommended keeping the documents focused on relevant updates, analyses, model comparisons, and author recommendations to guide model selection for the upcoming full assessment.

AIGKC Proposed Models

Tyler Jackson (ADFG-Kodiak) presented the proposed model scenarios for the 2027 Aleutian Islands golden king crab (AIGKC) assessment (final SAFE in April 2027). All of the models were implemented using version 2.20.34b of GMACS. Tyler will update GMACS to the latest version for the April 2027 assessment. He summarized progress on recent SSC and CPT (now CSPT) recommendations. The two general areas where progress was made were to develop a combined area model and to explore the source of the convergence failure for the WAG (Western Aleutian goldens, west of 174◦ W longitude) evident at the May 2026 CPT meeting.

Tyler presented model runs 26.0a2 and 26.0a3 for the WAG to understand how the high groundfish mortality estimated for 1996 related to a large recruitment pulse estimated for 1993-1995 evident in many of the model runs presented to the May 2026 CPT meeting. These model configurations differed from the May 2026 base model (26.0a) by increasing the weight on the groundfish fishery bycatch (model 26.0a2) and estimating natural mortality for 1996 (model 26.0a3). Increasing the weight on the groundfish bycatch data involved reducing the standard error of the log for the bycatch data from 1 to 0.5 (CV from 1.31 to 0.53). This was sufficient to resolve the issue identified during May 2026. The estimate of natural mortality for the WAG for 1996 from model 26.0a3 was very high ($0.98 yr^{-1}$). However, there is no evidence for a large-scale mortality event during 1996, and this model is not recommended for April 2027. The fit to the 1995 to 2004 CPUE index was poorer when the weight to the groundfish bycatch was increased, but was considered acceptable. Model 26.0a2 for WAG was more reliable in terms of jitter analysis than Model 26.0.

A second set of model runs involved assessing the EAG and the WAG within a single model run. The combined model had separate fleets for the directed fishery and groundfish bycatch, and additional seasons compared to the area-specific models. An advantage of a combined model is that there is then no need for a post-assessment calculation of F_{OFL}. The first combined model (model 27.0) estimated parameters separately for each area. Models 27.0a and 27.0b differed from model 27.0 because model 27.0a assumes that growth for the EAG and WAG are the same (five fewer estimated parameters) while model 27.0b is a variant of model 27.0a in which between-area variability in recruitment is estimated.

The difference between outcomes of single area models and 27.0b were primarily how the size composition data were re-weighted. The fits and estimates of MMB over time are similar between the models, although the estimates of catchability between single area and 27.0b differ.

Tyler initially recommended models EAG 26.0a, WAG 26.0a2, and 27.0b for the 2027 final assessment. The first two models are the 2026 base models except that the weight on the fit to the groundfish fishery bycatch for the WAG is larger. The CSPT noted that $F_{35\%}$ in the combined

model is calculated by scaling fully-selected fishing mortality for the two directed fisheries simultaneously until the total area-combined MMB is 35% of unfished area-combined MMB, which means that MMB is not depleted to 35% by area. GMACS will need to be updated so that the scalar on fully-selected fishing mortality is adjusted by area to match how $F_{35\%}$ is calculated for the area-specific models. The CSPT recommends not taking the combined model forward for April 2027 but agreed that it could be used to re-evaluate the pre-specified value for *M* which was based on an area-combined analysis. The CSPT recommends that the model runs for April 2027 are therefore model 26.0a2 for WAG and a modified version of model 26.0a for EAG but with the higher weight on the groundfish bycatch data (similar to 26.0a2) if this does not lead to unrealistic outcomes.

Tyler noted that jittering will be finalized for all models for the April 2027 CSPT meeting and that the catch for the small state-based fishery will be included in the catch series for the EAG (there are no size-composition data for the state-based fishery).

The CSPT emphasized the value of research to consider covariates for time blocks in selectivity, although some previous work on this issue previously occurred. The CSPT also reiterated its support for work to update the maturity ogive.

New Business

In new business, Anita Kroska (NPFMC) and Katie Palof (ADF&G) reviewed tentative topics and meeting dates for the January Modelling Workshop and the April 2027 CSPT meeting, membership changes, and the meeting schedule for 2027. Caitlin Stern will help refine the topics and agenda for the January Modelling Workshop, and she also volunteered to help with post-CSPT meeting tasks after the April 2027 CSPT meeting. Katie briefly discussed potential hybrid crab topics that could be included on the April 2027 CSPT agenda, including new and ongoing research, clarifying hybrid inclusion in data streams and assessments (per SSC request), and a potential debrief of snow and Tanner seasons from ADF&G and industry.

The CSPT thanked Dr. Cody Szuwalski for his contributions as he recently stepped down after many years of service to the Plan Team. Dr. Lee Cronin-Fine's nomination was approved by the Council, and the CSPT welcomed him to his first meeting. Katie noted the continued CSPT vacancies (including a co-chair) will limit future meeting capacity. Therefore, CSPT capacity constraints will be accounted for when finalizing the April 2027 CSPT agenda.

Tentative January Modelling Workshop topics

- GMACS updates
    - Adjustments to other assessments based on new updates? Best practices for GMACS use
    - Incorporate MSE capability?
    - Resampling protocols, crab growth and molt timing/probability in GMACS
    - Runtime optimization for users, base TPL, modular functionality

    - Check on jittering issues and clean up
    - Progress on next gen RTMB GMACS prototype
        - allow for density-dependent M, multi-area models, multi-stock models
    - Differences between snow and Tanner use of maturity ogives in GMACS
    - GMACS updates from combined area AIGKC model
- GMACS updates - Tanner specific
    - Retrospective analysis failure
    - Projections scaling issues
    - Implement estimated nonparametric curve for male terminal molt
    - Potential additional alignment with bespoke Tanner model if needed
        - implement alternative M parameterization to match TCSAM02
        - finish aligning priors and penalties with TCSAM02
- Snow crab
    - Convergence with male-only model, simplification process
    - Likelihood profiles if model stable
    - Match survey data processing to Tanner?
    - Growth data audit, actual composition sample sizes, and discard mortality handed inside GMACS
    - Yield per recruit (SSC request)
- AIGKC
    - Combined area M profile
- Model-based size compositions
- Hybrid research updates
- Tier 4 model practices, BMSY basis years static vs add terminal year (snow vs SMBKC vs PIRKC etc) vs a range of years based on logic (e.g., years with fishery)
    - Exploration of exploitation rates related to basis years
    - Discuss whether to present scenarios of different basis years in SAFE doc for tier 4 (e.g., only years w/ fishery)

Tentative April 2027 meeting topics

- Council and GMACS updates
- Final SAFEs
    - AIGKC
    - WAIRKC
- Proposed models
    - NSRKC
    - Snow crab
    - Tanner crab
    - BBRKC
- January Modelling Workshop Report
- ESP Updates
- Skipper survey updates
- Risk table debrief
- Hybrid crab research & updates (specific topics will be determined by mid-Feb)
- Scallop status - off-cycle update
- Crab Economic SAFE and socioeconomic reporting update (T)
- Research Updates (T)
- Survey modernization update (T)
- Harvest Control Rules updates (T)
- SAFE Guidelines (T)

- Research priorities (T)

Upcoming CPT meeting dates and locations:

- January 11 - 14, 2027: January Modelling Workshop, Anchorage
- April 19 - 23, 2027: Virtual
- Sept. 13 - 17, 2027: In-person, Seattle

Others in attendance: **indicates presenter, **indicates in person*

Jenefer Bell
Carlton Burnside
Kevin Clark
Adam Eno
Mark Henkel
Luke Henslee
John Hilsinger
Ray Hunter
Cory Lescher
Heather Mann
Steve Minor
Harrison Moore
Peggy Parker
Landry Price
Nicole Schmidt
Chris Siddon
Ali Whitman