C2 BSAI CRAB STOCKS

KATIE PALOF & MIKE LITZOW (CPT CO-CHAIRS)

JUNE 2026 NPFMC MEETING

CPT MEETING MINUTES – MAY 11TH – 15TH VIRTUAL

BSAI CRAB STOCKS MANAGEMENT TIMING

Aleutian Islands golden king crab
Pribilof Islands golden king crab *
Western Aleutian Islands(Adak) red king crab *

→ Assessed in May/June

→ Triennial cycle, 2026

→ Triennial cycle, postponed to 2027

EBS snow crab
Bristol Bay red king crab
EBS Tanner crab
Pribilof Islands blue king crab *
Pribilof Islands red king crab *
St. Matthew blue king crab *

→ Quadrennial cycle, next assessment in 2029

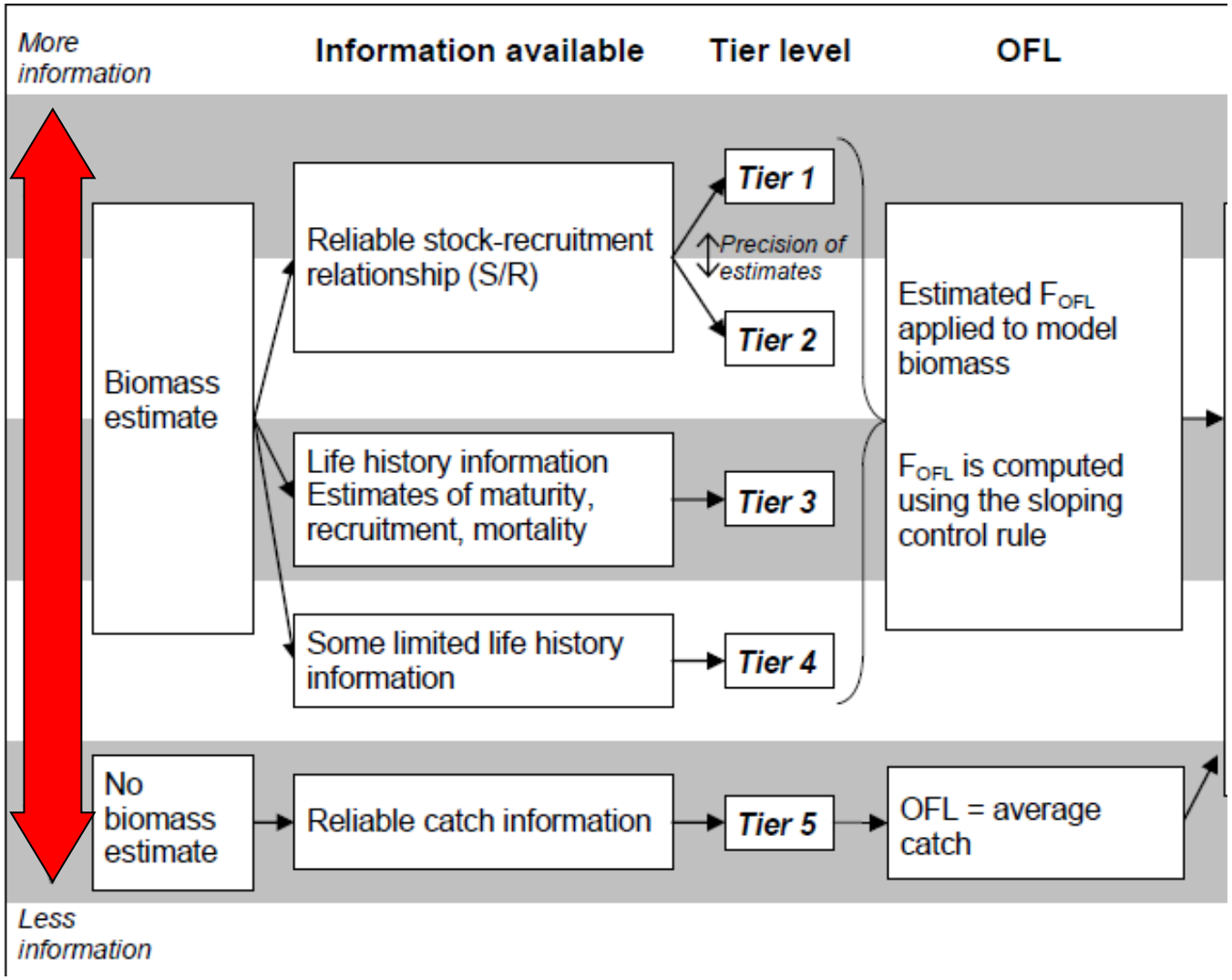
→ Assessed in September/ October

→ Triennial cycle, next assessment in 2028

→ Biennial cycle, next assessment in 2026

Norton Sound red king crab

→ Nov (virtual) / Dec council



ABC buffer:

Determined based on stock information available and uncertainties not incorporated in the assessment model.

MAY 2026 AGENDA

- ✓ **AIGKC final assessment, OFL and ABC**
- ✓ **PIGKC final assessment, OFL and ABC**
- ✓ Hybrid discussion
- ✓ Proposed model runs: Tanner crab, Snow crab, BBRKC, NSRKC, SMBKC
- ✓ Balance of CPT report:
  - ✓ Risk table progress
  - ✓ Jan modeling workshop report, GMACS updates
  - ✓ SAFE guideline updates
  - ✓ General ESP updates
  - ✓ Maturity workflow – Chionoecetes crab
  - ✓ Research updates: skipper survey, BSFRF, and others

ALEUTIAN ISLAND GOLDEN KING CRAB (AIGKC)

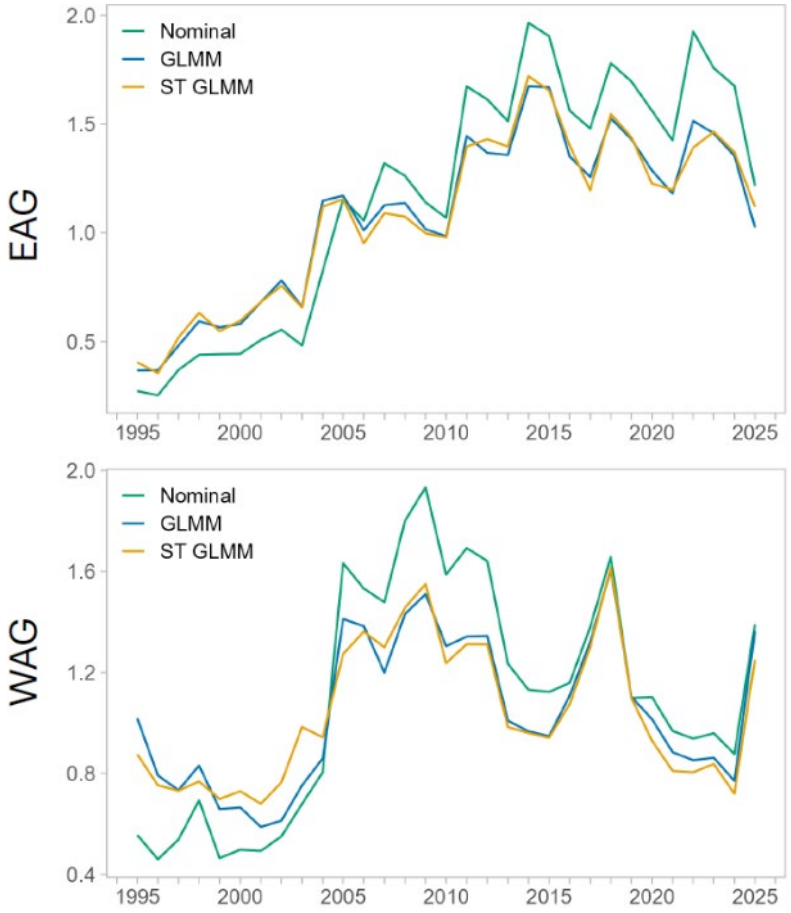
FINAL SAFE, OFL / ABC 2026

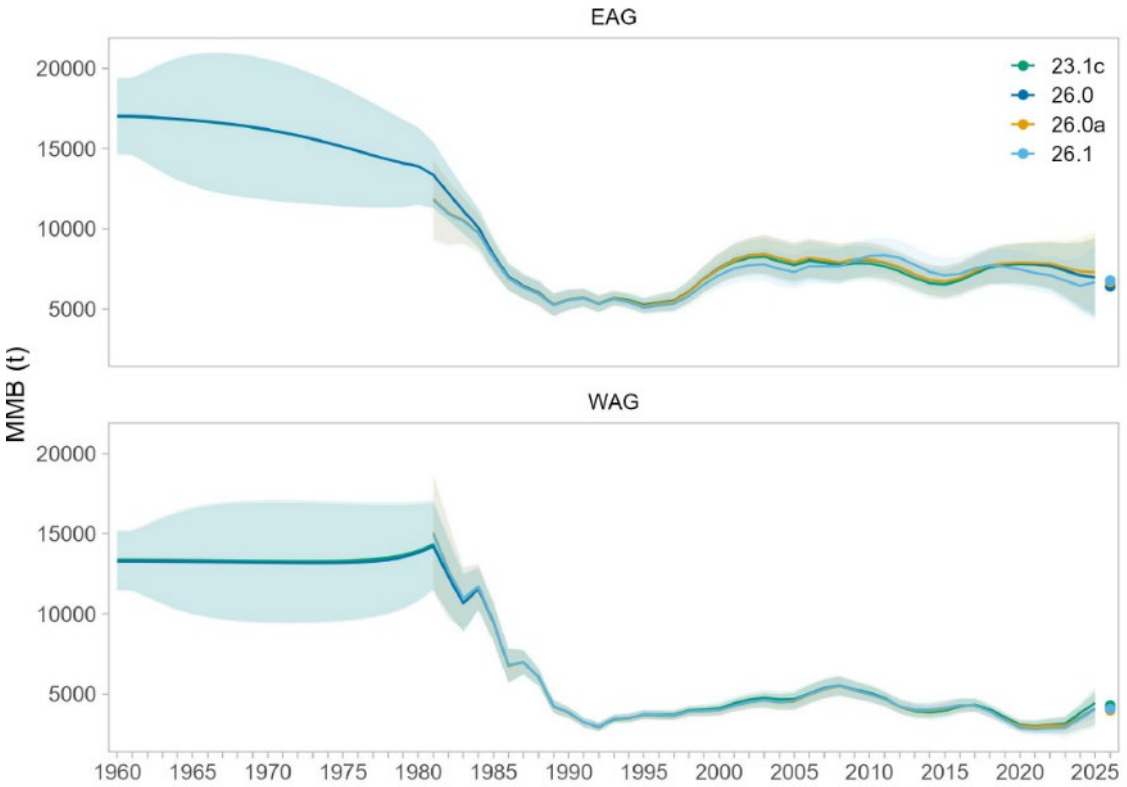
AIGKC EXPLORATIONS

- Data updates from 2025 final assessment
  - 2025/26 Retained / Total Catch ; retained and total catch size composition
  - 2024/25, 2025/26 Groundfish Bycatch
  - Post Rationalization Std CPUE (23.1c)
  - Full Std CUPE Time Series using spatio-temporal methods (26.0, 26.0a, 26.1)
- CPUE standardization – legacy vs. spatiotemporal
  - Detailed in Appendix A; model 23.1c – legacy standardization, other models sdmTMB standardization
- Model options:
  - 23.1c (base model from 2024, 2025)
  - 26.0 (spatiotemporal CPUT Std)
    - 26.0a (26.0 + initial conditions, catch weighting)
      - 26.1 (26.0a + selectivity time blocks)

MODEL FIT

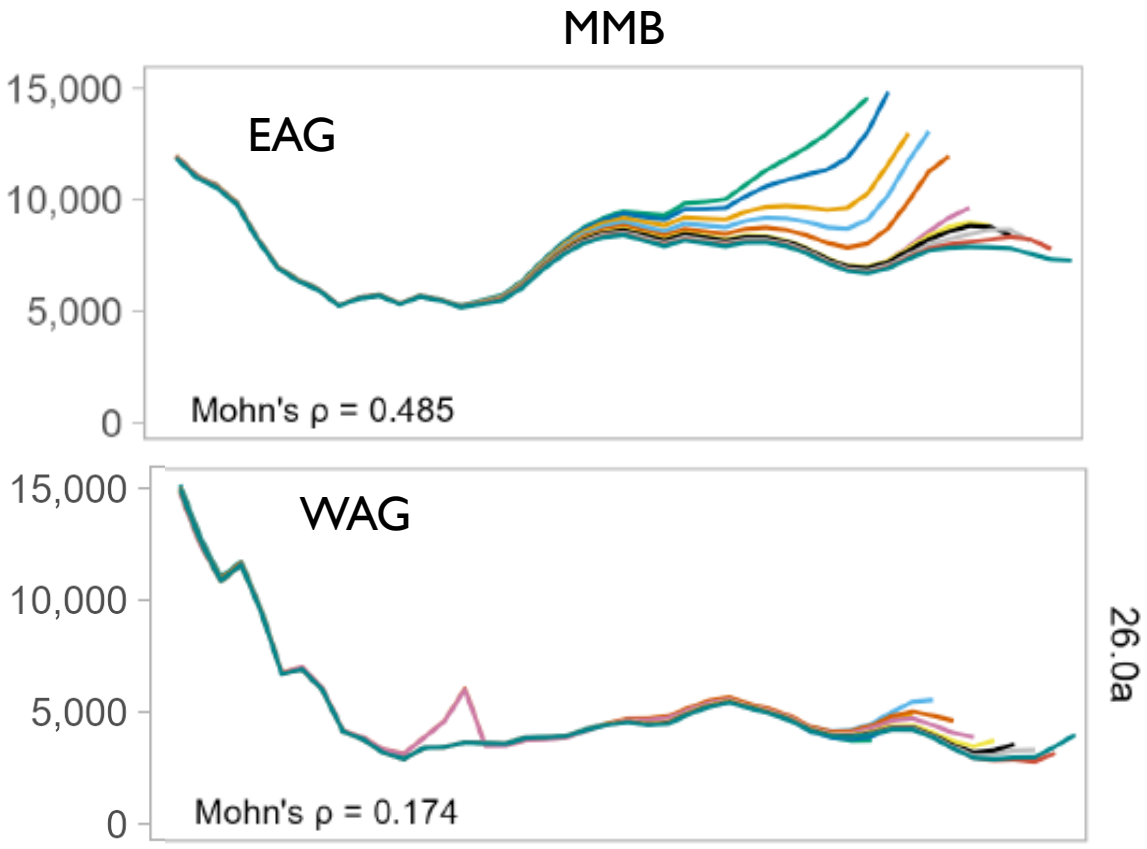
- ST GLMM more suitable
- Decline in CPUE and biomass in EAG; increase in WAG





STOCK CONCERNS

- Concern over retrospective pattern in EAG (not a new concern)
- WAG – issues with bycatch F value moving into unrealistic region for some jitter and retrospective runs
  - Needs to be addresses in model parameterization
- WAG CPUE and biomass increase – does it reflect stock status or hyperstability in fishing?



FINAL SPECIFICATIONS

Table 17: Comparison of biological reference points for models 23.1c, 26.0, 26.0a, and 26.1. Stock status, F_{OFL}, and OFL are computed using the combined approach detailed in Section F above.

Subdistrict	Model	MMB (t)	$B_{35\%}$ (t)	Status	$\bar{R}_{1987-2022}$	$F_{35\%}$	F_{OFL}	OFL (t)	Total OFL (t)
EAG	23.1c	6,406	6,630	0.96	2,648	0.522	0.501	2,146	3,534
WAG		4,279	4,488		1,799	0.516	0.496	1,388	
EAG	26.0	6,412	6,659	0.94	2,662	0.518	0.484	2,104	3,355
WAG		4,035	4,477		1,793	0.523	0.489	1,251	
EAG	26.0a	6,680	6,687	0.96	2,669	0.516	0.492	2,232	3,493
WAG		3,990	4,470		1,790	0.523	0.500	1,261	
EAG	26.1	6,774	6,590	0.98	2,631	0.481	0.472	2,044	3,343
WAG		4,075	4,462		1,787	0.512	0.504	1,299	

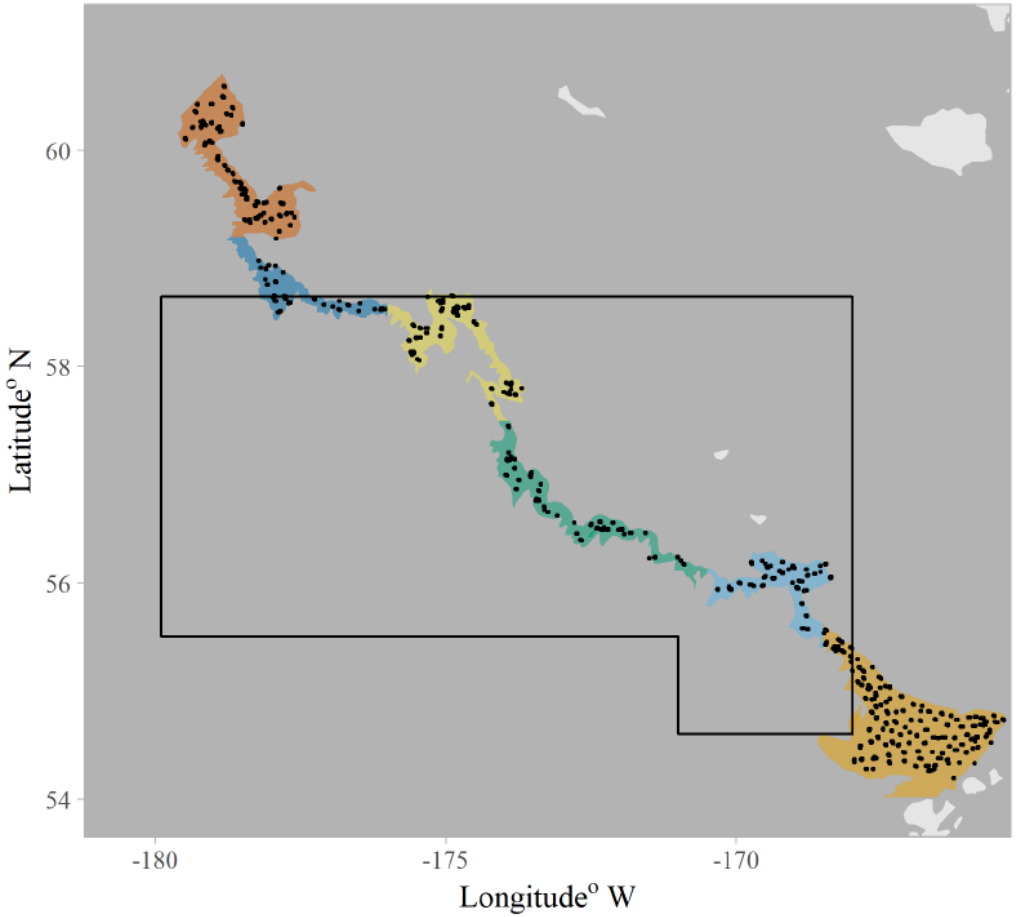
- 2017 OFL method: recompute FOFL control rule using area specific F35%, but combined stock status
- Use combined-status FOFL to computer OFL by area
- Sum OFLs.
- Recommendation: OFL = 3,493 t, ABC = 2,620 t

CPT RECOMMENDATIONS

- Model 26.0a for both areas
  - Makes use of spatiotemporal model approach to CPUE Std, starts in 1981, which is closer to when index and size-composition data first become available
- 25% ABC buffer consistent with previous assessments
  - Draft risk table draft provided (Appendix B); but not utilized for buffer setting at this meeting
  - Level of uncertainty similar
    - No fishery independent data
    - OFL for the entire stock but the assessments are by subdistrict
    - Retrospective patterns still prevalent in EAG
- Future work:
  - Development of a combined area modle
  - Re-design of cooperative survey to develop a recruitment index
  - Address past CPT/SSC comments on maturity data

PIGKC FINAL SAFE

- Triennial assessment, last assessment in 2023, no new model developments or data
- Directed fishery is opened annually by Commissioner's Permit
  - GHL of 59t (130,000 lb)
  - Low participation therefore catch data are confidential, catch does not reach the GHL
- 2023 assessment SSC recommendation was GF Tier 5 based on EBS Slope survey
  - OFL = M * MMB; where M = 0.22 yr^{-1} and size at maturity = 107 mm CL (both borrowed from AIGKC)
  - Slope data: 2002, 2004, 2008, 2010, 2012, 2016
  - Size/sex not recorded in 2002, 2004



Data courtesy of J. Hoff (ASFC)

PIGKC FINAL SAFE

Metric t

Year	Tier	Biomass (MMB)	Reference Years	GHL	Retained Catch	Total Catch	OFL	ABC
2021	5	N/A	1993-1998	59	15.5	21.6	93.0	70.0
2022	5	N/A	1993-1998	59	CF	CF	93.0	70.0
2023	5	N/A	1993-1998	59	CF	CF	93.0	70.0
2024	5 GF	517	2002-2016	59	CF	CF	113.7	85.3
2025	5 GF	517	2002-2016	59	CF	CF	113.7	85.3
2026	5 GF	517	2002-2016	59	CF	CF	113.7	85.3
2027	5 GF	512	2002-2016				112.6	84.5
2028	5 GF	512	2002-2016				112.6	84.5
2029	5 GF	512	2002-2016				112.6	84.5

CPT 30% buffer
ABC = 78.8 t

- OFL calculation from 2023 slightly different due to small error in mapping data to the PI management area
- CPT recommended a 30% buffer (up from 25% previously accepted)
  - It has now been 10 years since new survey data were collected increasing uncertainty
  - One-third of MMB data used are interpolated values
  - Comparability/consistency with other GKC stocks

SNOW (*C. opilio*) x TANNER (*C. bairdi*) HYBRIDS

SSC requests (October 2025)

- *At minimum, there needs to be consistency within the assessment process. The SSC highlights the disconnect between catch, which combines hybrids and snow crab, and survey biomass in the snow crab assessment model. The SSC also provided comments in the Tanner and snow crab assessments, soliciting input from assessment authors on the inclusion of hybrids in their respective assessments.*
- *The SSC recommends consideration of different inclusions/exclusions of hybrids into the snow/Tanner crab assessments (i.e., in survey and catch data) to evaluate sensitivity to these options and ensure an internally consistent approach.*
- *Addition of a section in the ESP on hybrids with a focus on their interaction with Tanner crab. This will hopefully provide a consistent place to track hybrids over time.*

SNOW x TANNER HYBRIDS

May CPT presentation

- State data collection and TAC-setting process (Tyler Jackson and Ethan Nichols, ADF&G)
- Survey hybrid ID and data considerations (Chris Long, NOAA AFSC)
- Sensitivity runs for including hybrid data in snow & Tanner assessments (Grant Adams and Buck Stockhausen, NOAA AFSC)
- Hybrid research update (Mike Litzow, NOAA AFSC)

SNOW x TANNER HYBRIDS

Background

- ADF&G observers record three codes: hybrid non-specific, hybrid–bairdi, and hybrid–opilio
  - Hybrid–bairdi constitute ~1-2% of hybrids
  - Possible to separate hybrids from retained catch data
- State regulations result in ~98% of landed hybrids being delivered as opilio
- NMFS survey IDs are qualitative, based on seven morphological characteristics
  - Developed from study using 1,114 genotyped carapaces – large males only
  - ID quality on survey degrades below ~ 50mm carapace width
  - IDs subject to unknown error, but survey data are coherent in time and space

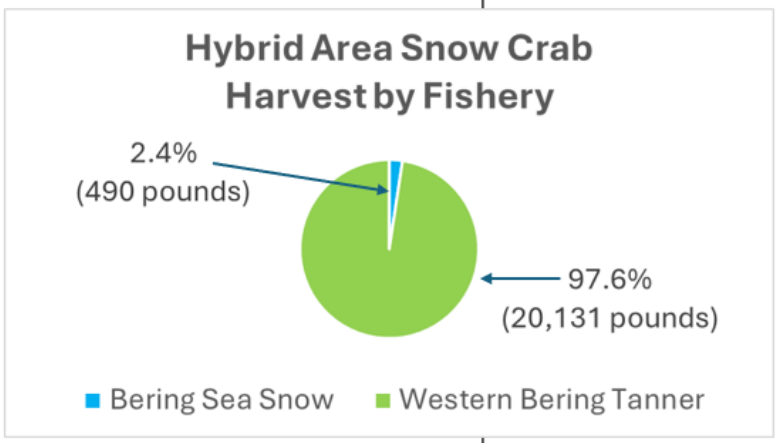
SNOW x TANNER HYBRIDS

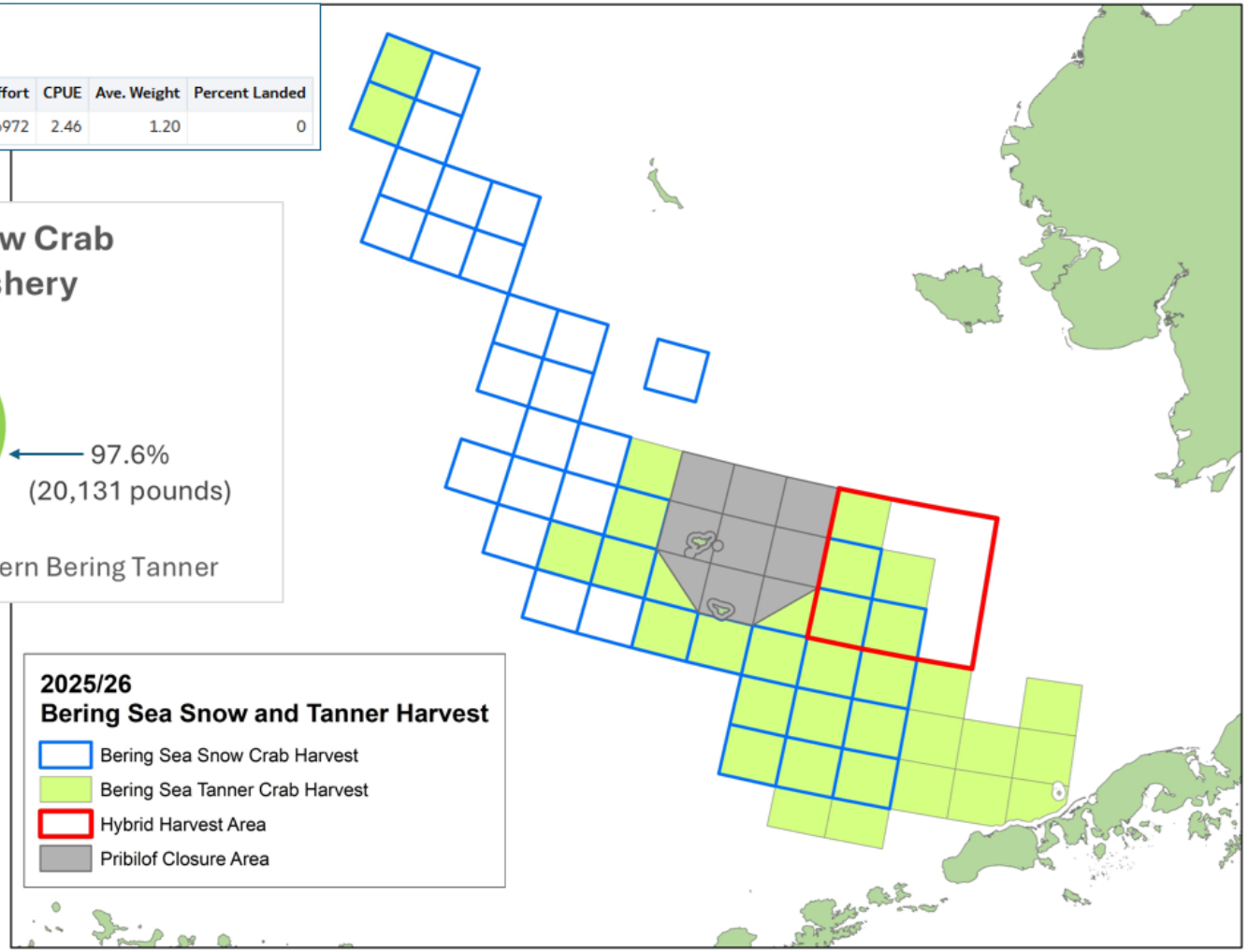
Background: 2025-26 TAC Setting

- 1 million pounds added to snow crab TAC (9.3 M lb. total) to allow vessels to target hybrids
- Expectation that 1M lb. / 11% of TAC would come from area of highest hybrid abundance (red box)
- As of 5/12/26, area not targeted by snow crab fishery, 3.17% hybrids in snow crab retained catch

2025/26 BSSC Hybrid Box

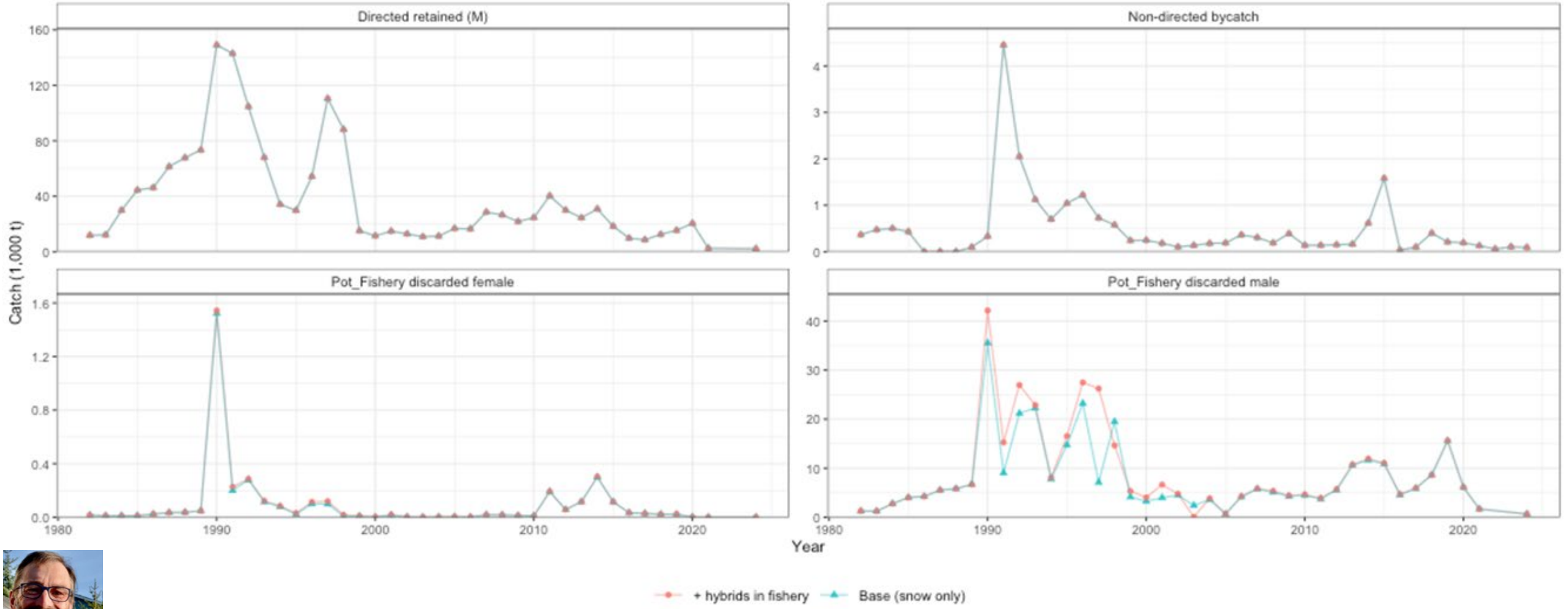
Vessels	Landings	Landed Weight	Number of Crab	Effort	CPUE	Ave. Weight	Percent Landed
14	21	20,621	17,116	6972	2.46	1.20	0





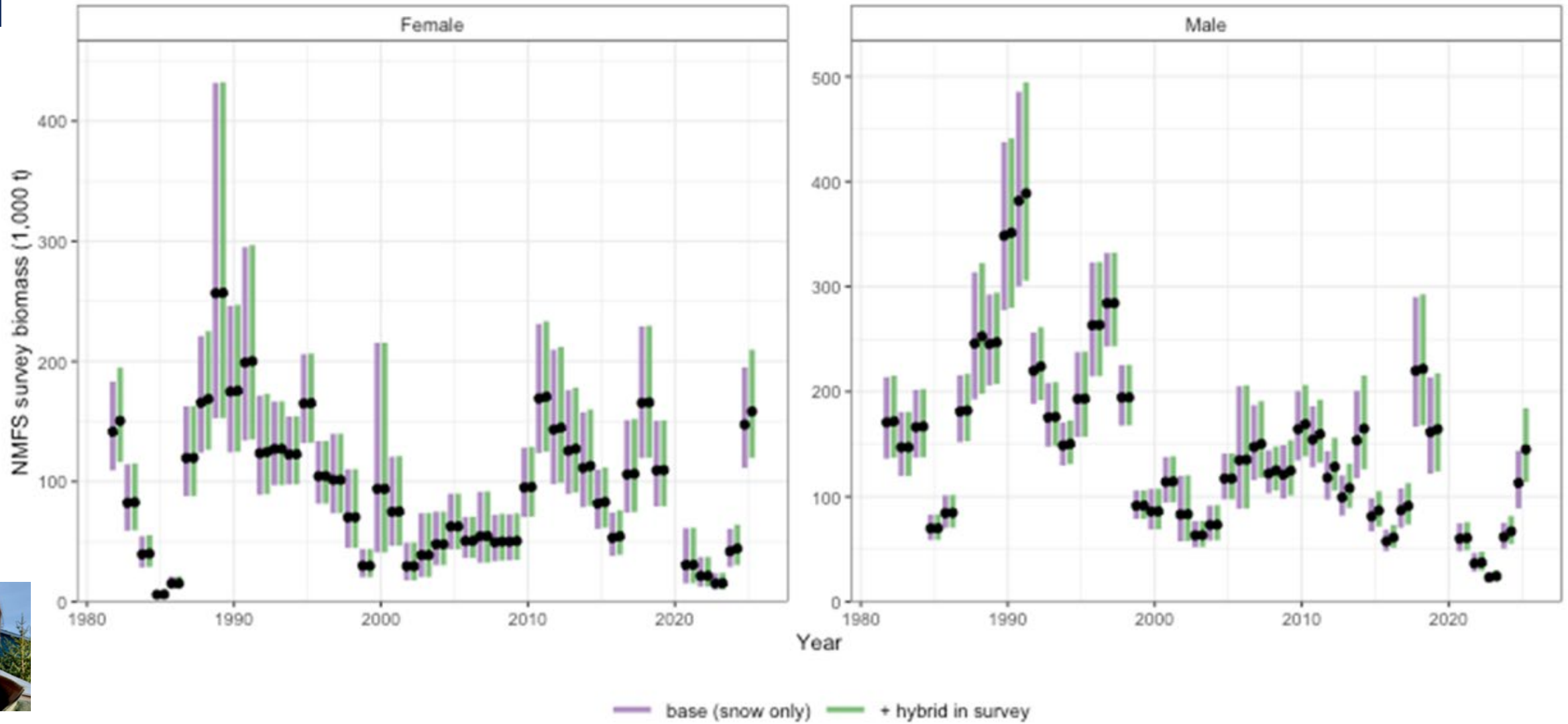
*Preliminary as of 5/12/26

SNOW CRAB CATCH & DISCARD DATA WITH AND WITHOUT HYBRIDS



Retained catch and trawl bycatch are identical across scenarios; Hybrid-fishery models add hybrids to directed discards.

SNOW CRAB SURVEY DATA WITH AND WITHOUT HYBRIDS



SNOW CRAB REFERENCE POINTS WITH AND WITHOUT HYBRIDS

Model*	Hybrids	BMSY	Status	Mature M (2024)	Immature M (2024)
Model 25.1c	None	179.46	0.89	0.285	0.292
Model 25.3a	Fishery	169.34	0.91	0.293	0.277
Model 25.3b	Survey	176.33	0.93	0.285	0.270
Model 25.3c	Fishery + Survey	168.16	0.95	0.293	0.271

*Model numbers will be corrected to 26.xx in September.

- Estimated status 7% higher than base when hybrid survey & fishery data included
- Similar effects (differences < 5%) for Tanner crab assessment

HYBRIDS – RESEARCH FINDINGS

- Causal model (DSEM) results explaining increased hybrid abundance with survey and ice cover data
  - Not the result of direct ice cover effects on hybrid survival
  - Not the result of increased snow – Tanner overlap
  - Support for release from snow crab competition / direct predation as cause of hybrid spike
- sdmTMB modeling shows incipient changes in snow / Tanner / hybrid niches in 2021-2025
  - Hybids deeper / Tanners shallower
  - Snow crab increasingly restricted to cold summer temperatures
- CPT recommends continued research on this implications for hybridization on introgression / adaptation relative to warming and acidification

HYBRIDS – CPT DISCUSSION AND RECOMMENDATIONS

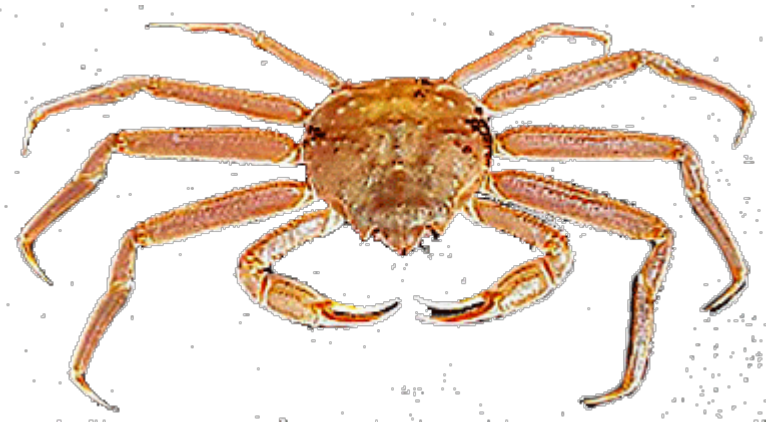
- Do not include hybrids in assessment models
  - Sensitivity runs show limited effects of including hybrid data
  - Necessary life history data lacking for hybrids (growth, maturity, mating dynamics, etc.)
  - Higher priorities for model development, especially for snow crab
- Continue tracking hybrid abundance in annual survey Tech Memo
  - Necessary information on trends in abundance, size comps, distribution already presented in this venue
  - Do not add hybrids to Tanner crab ESP – concern at overloading this document with extraneous information
- Address hybrid abundance with current FMP flexibility
  - Possibility for e.g. reducing ABC buffer to account for elevated hybrid abundance
  - State of Alaska retains TAC-setting flexibility
  - Addressing hybrids with FMP amendment as a possible future step if current flexibility proves to be insufficient

PROPOSED MODEL RUNS FALL 2026

TANNER CRAB PROPOSED MODEL RUNS

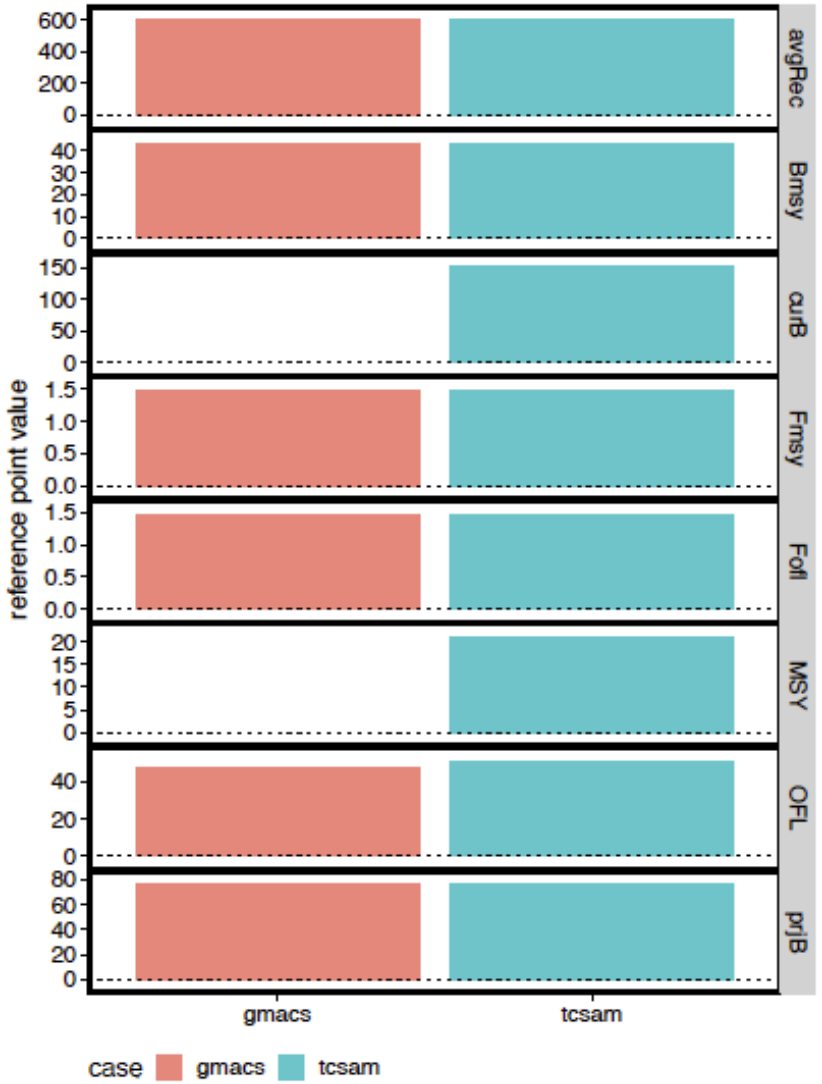
Outline

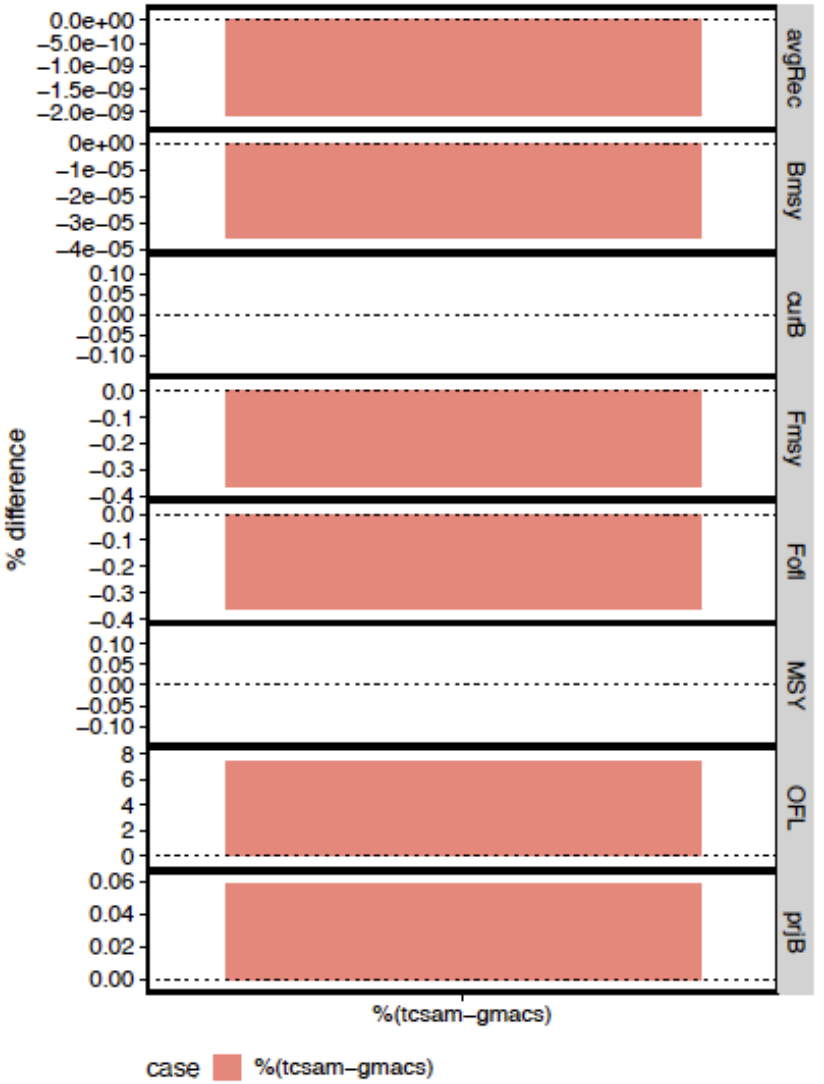
- TCSAM02 25_02 and GMACS G25_05 presented
- Sensitivity run for new survey data maturity workflow presented (author and CPT recommend adoption)
- CIE review in June 2026



TANNER CRAB: GMACS BRIDGING ANALYSIS

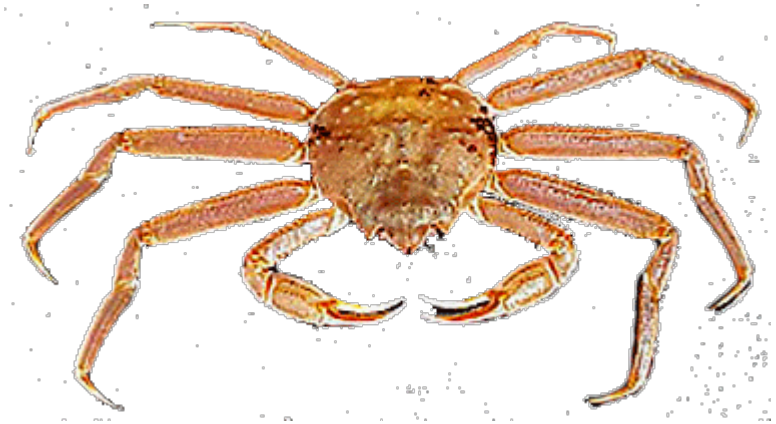
- Predicted values, derived quantities, and reference points all highly similar
- F_{OFL} and F_{MSY} < 0.5% difference
- OFLs differ by ~ 7.5%
  - Author proposes examining priors and penalties to align estimation frameworks
  - CPT finds OFL difference is reasonable; cautions against pursuing diminishing returns





TANNER CRAB: CPT RECOMMENDATIONS

- Bring forward TCSAM02 25_02 and GMACS G25_05 in September
- CPT anticipates using GMACS for setting specifications in September
- Author should ensure updated fishery catch time series is used in September (may be minor differences early in time series)



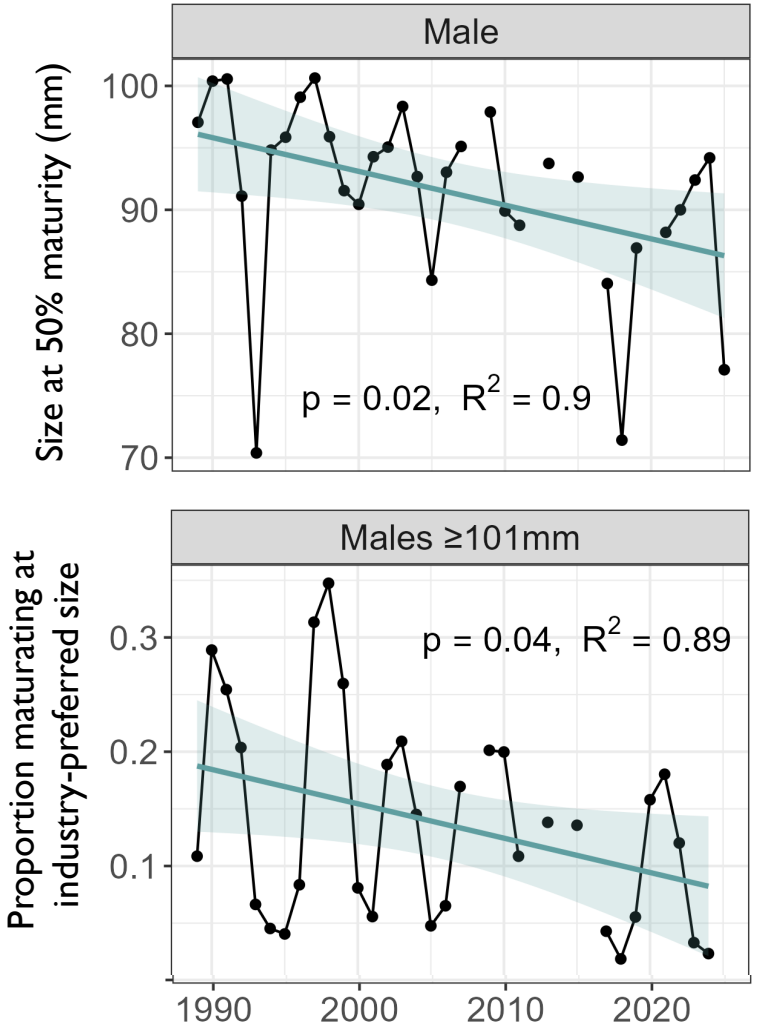
SNOW CRAB PROPOSED MODEL RUNS

Outline

- Size at maturity research update
- Candidate models
- CPT recommendations

SNOW CRAB SIZE AT MATURITY RESEARCH UPDATE (E. RYZNAR, AFSC)

- Size at 50% maturity and proportion reaching industry-preferred size both show declining trend
- Size at 50% maturity explained by:
  - Abundance entering terminal molt window (negative effect)
  - Abundance of large male competitors (positive effect)
- Proportion reaching commercial size explained by:
  - Abundance entering terminal molt window (negative effect)
  - Abundance of large males x exploitation rate (interactive effect)
- Consistent with Canadian research
- Suggests proportion reaching commercial size may respond to management action
- In prep for journal submission



SNOW CRAB: CANDIDATE MODELS

- New author (Grant Adams, AFSC)
- 14 candidate Tier 3 models considering 4 "axes of uncertainty":
  - Updates to GMACS and total male composition file
  - Inclusion of survey immature biomass index
  - Inclusion of new maturity data workflow
  - Inclusion of hybrids
- Convergence issues continue – bimodality in OFL for most models
  - Including immature index helps, but consists of "double-counting" data, produces unrealistically high mature male M (> 0.6), spread in jittered derived quantities (recruitment, MMB) persists
- Tier 4 model using SSC-recommended approach will be brought forward in September
- Model numbers will be corrected to 26.xx in September

SNOW CRAB: CPT RECOMMENDATIONS

- Given ongoing convergence issues, CPT expects Tier 4 model will again be used in September
- Bring forward 25.2c as base Tier 3 model (corrected size comp and plus size group data, inclusion of new survey maturity workflow)
- Recommendations for addressing convergence issues:
  - 25.2c male-only model (also requested for September)
  - Models fit to 1982-2019 data to determine if missing 2020 survey is cause of bimodality (continuing request)
  - Fix model parameters, confirm convergence, estimate parameters itreatively to identify source of bimodality
  - Examine parameter covariance matrix, explore the effects of most highly correlated parameters on convergence

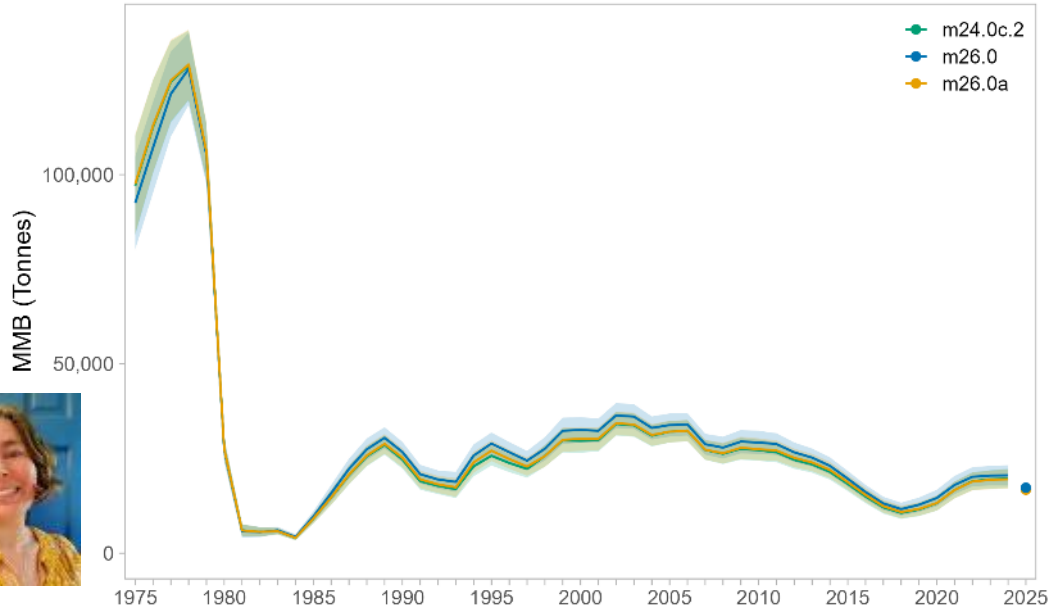
BBRKC PROPOSED MODEL WORK

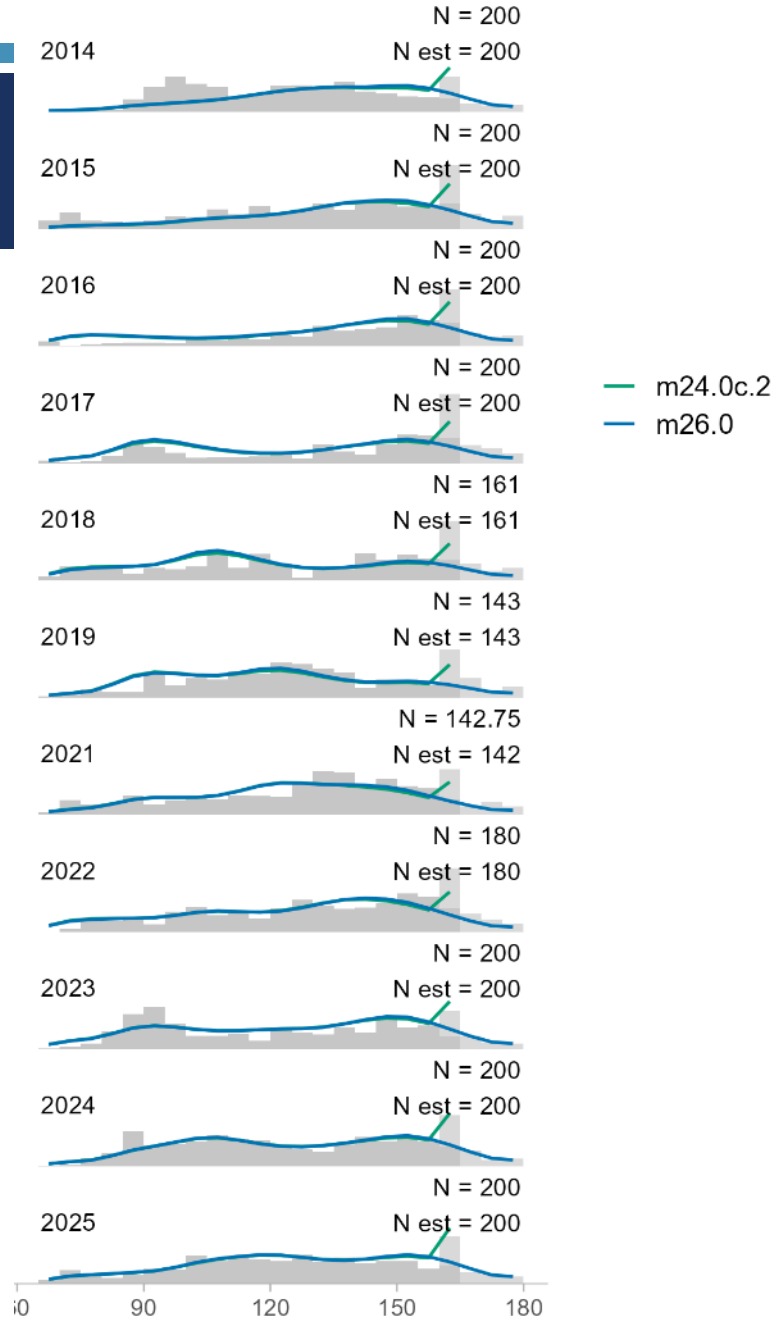
- Stable model in GMACS since 2018
- Directed fishery was open last three seasons after being closed for 2 seasons (2021/22, 2022/23) due to low mature female abundance
- Low recruitment in recent years (last 8-12 years), projected decline in biomass without a large recruitment event
- Model explorations around a few themes:
  - Housekeeping updates: GMACS version, bycatch size comp historical data updates
  - Increasing number of size bins for males and females in size comp data

MODEL EXPLORATIONS

Model summary:

- No changes with GMACS updates
- Similar model fit with increased size bins (26.0)
- Size composition data fits better and reduces need for plus group "build up" (recent years for NMFS male size comps to the right)
- Similar stock status and reference points





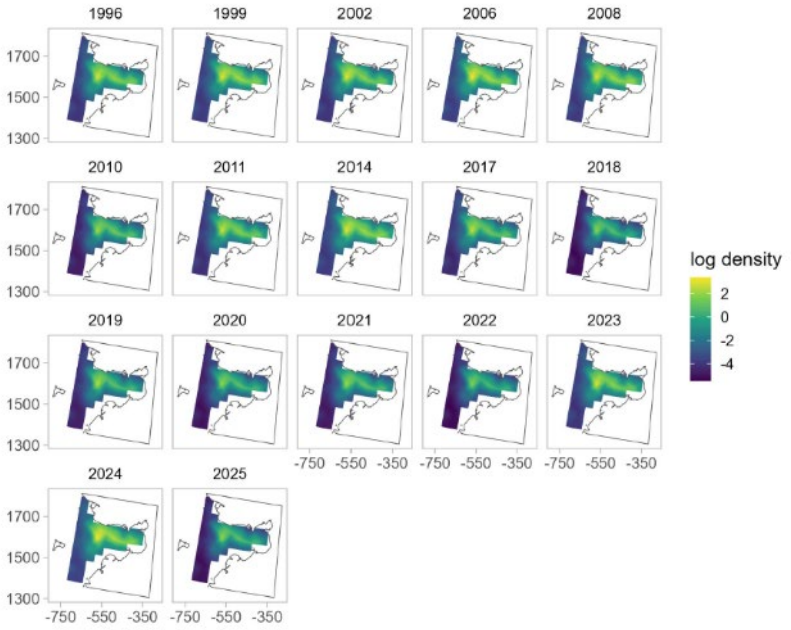
CPT RECOMMENDATIONS

- Fall models (will update to GMACS v2.20.37 to fix extended size comp error for Tanner bycatch)
  - Model 24.0c.2 – current base model
  - Model 26.0 – increased size bin base model
  - Tier 4 option from 2023 (REMA model on mature males in NMFS survey data)
- Future work
  - Further increase size bins for plus group and review growth assumptions (size bins, growth inputs)
  - Selectivity using BSFRF data in alternative model parameterizations (splines, etc.)
  - Model based indices to include Northern area crab into the modeling process (work in progress)
  - Retrospective patterns

NSRKC PROPOSED MODEL WORK

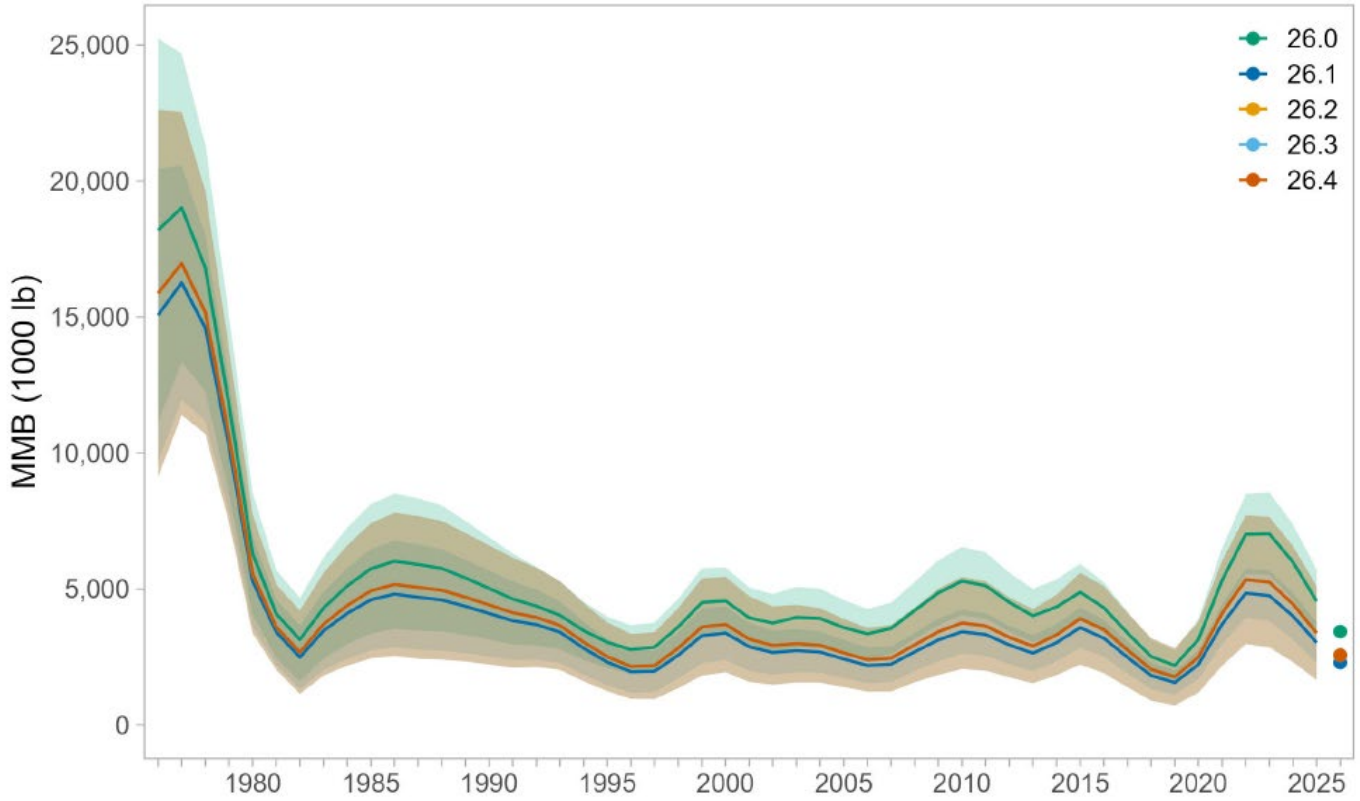
- Authors provided feedback to SSC / CPT comments
  - Transition to GMACS comments
  - Inconsistencies in area used to calculate abundance among trawl surveys –model-based indices explorations
  - Update to fishery CPUE standardization (in progress)
- Proposed models include: GMACS model updates, model-based indices, and explorations of catchability and selectivity estimation
  - Model based indices includes both ADF&G and NBS trawl survey data
  - Aligns spatial footprint to align with the entire stock and not just the center of distribution

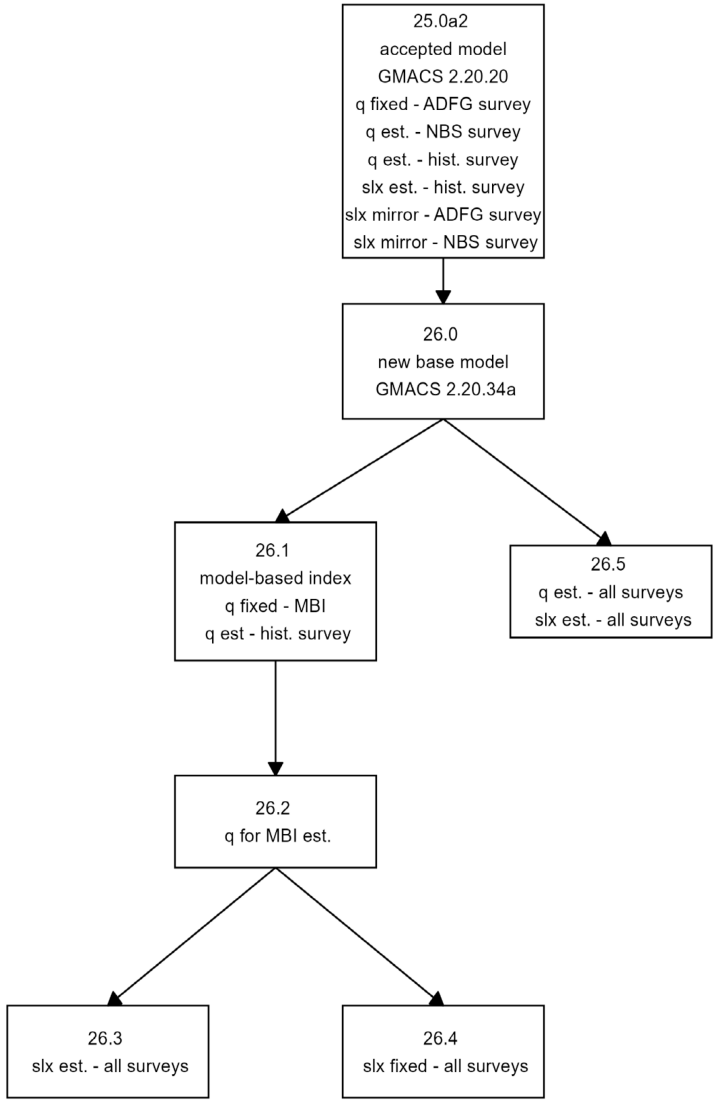
Spatial predictions



MODEL EXPLORATIONS

Mature male biomass



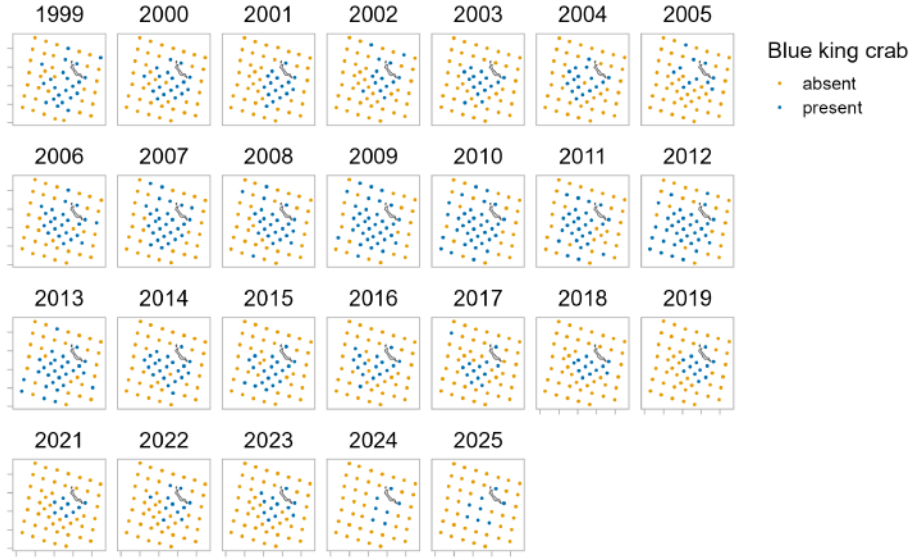


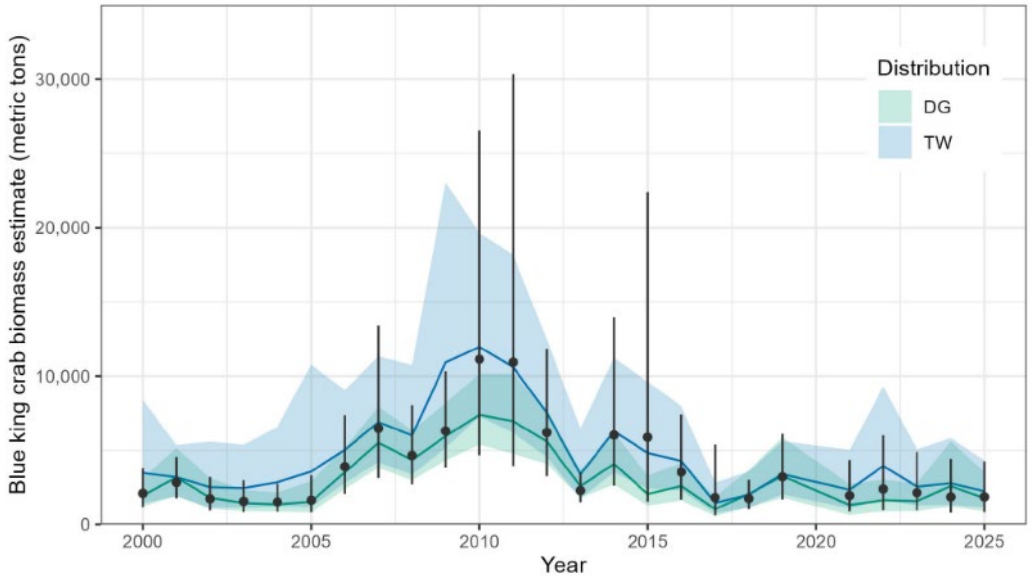
CPT RECOMMENDATIONS

- CPT recommended bringing forward models:
  - 26.0 (updated GMACS base model)
  - 26.1 (MBI with catchability fixed at 1, historic NS survey selectivity estimated, ADF&G and NBS survey selectivities mirrored)
  - 26.2 (26.1 + catchability for MBI estimated)
  - Both MBI models should bring forward MBI estimates with and without depth as a covariate with diagnostics
- Future work:
  - Model-based estimation for size compositions
  - Update fishery CPUE Std
  - Add subsistence catch to the assessment

SMBKC PROPOSED MODELS

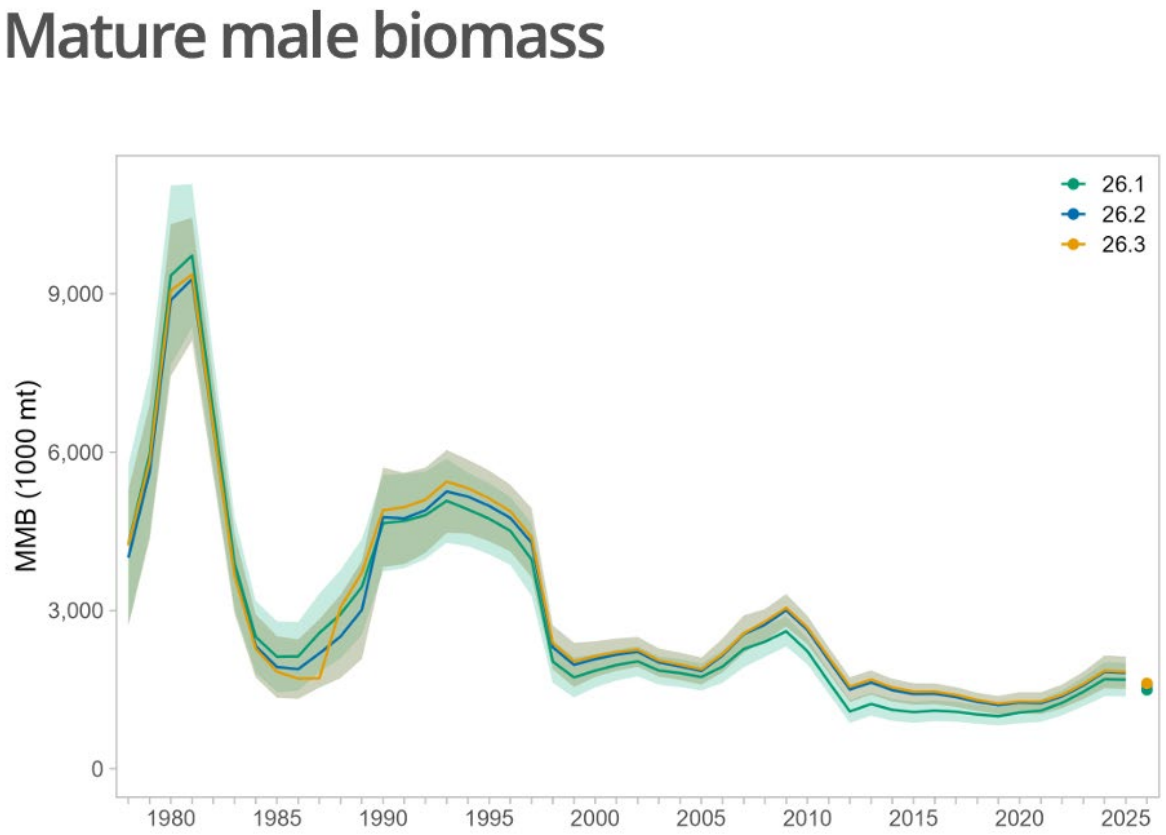
- Biennial assessment cycle, last assessment in 2024
- Currently under a rebuilding plan since 2020
- Model explorations
  - Update GMACs versions and data from "off" years
  - MBI to deal with loss of "corner" stations (starting in 2023)
    - Delta-gamma without depth covariate chosen
  - Three models presented:
    - 26.1 – base model with updated GMACS version and data
    - 26.2 – 26.1 using MBI survey index and catchability fixed at 1
    - 26.3 – 26.2 with catchability for the survey index estimated





CPT SMBKC RECOMMENDATIONS

- Models with MBI account for corner station removal
- Overall model results similar
- CPT recommends bringing forward:
  - Model 26.1 (updated base)
  - Model 26.2 – MBI with catchability = 1
- Future work:
  - MB size-composition
  - Selectivity estimates above 1 (Jan modeling workshop topic



BALANCE OF CPT REPORT

RISK TABLES

- Cindy Tribuzio, Stephani Zador, Kalei Shotwell (NOAA-AFSC) presented on groundfish experience
- Core difference for crab stocks: ABC is set below max using qualitative information
- CPT recommends two-tier risk tables for crab
  - Top tier to include persistent considerations (e.g., lack of SR relationship) that create uncertainty in the OFL, creating persistent buffer for each stock
  - Top tier does not set a baseline buffer, merely codifies persistent sources of uncertainty
  - Bottom tier to include considerations for the current year that may motivate a change in ABC buffer from previous years

RISK TABLES: PROPOSED CRAB FORMAT

	Assessment-related considerations	Population dynamics considerations	Ecosystem considerations	Fishery-informed Stock Considerations
Long-term/persistent	- Ongoing uncertainties related to stock specific or model specific uncertainty - Includes data related or assessment related uncertainties not accounted for in the model. - This uncertainty represents historical buffer considerations			
Current	"risk table" section. Should be used similar to groundfish risk tables to determine whether we would adjust the "long-term" buffer for each stock based on current uncertainty in the risk table categories			
	Level: 1,2, or 3	Level: 1,2, or 3	Level: 1,2, or 3	Level: 1,2, or 3

RISK TABLES: ADDITIONAL GUIDELINES

- No prescriptive formula will be used to adjust risk table scores, and an increase in risk table scores does not necessarily require an increase in the ABC buffer.
- Assessment authors to collaborate with ESP / ESR authors to populate risk tables.
- Risk tables for all annually-assessed stocks (limited CPT / assessment author capacity).
- Summary table in full SAFE introduction to track buffer history for each stock.

QUESTIONS?

- Thanks to all CPT members and crab assessment authors.
- Congrats to Mike Litzow on his retirement!