

C2 BSAI CRAB STOCKS

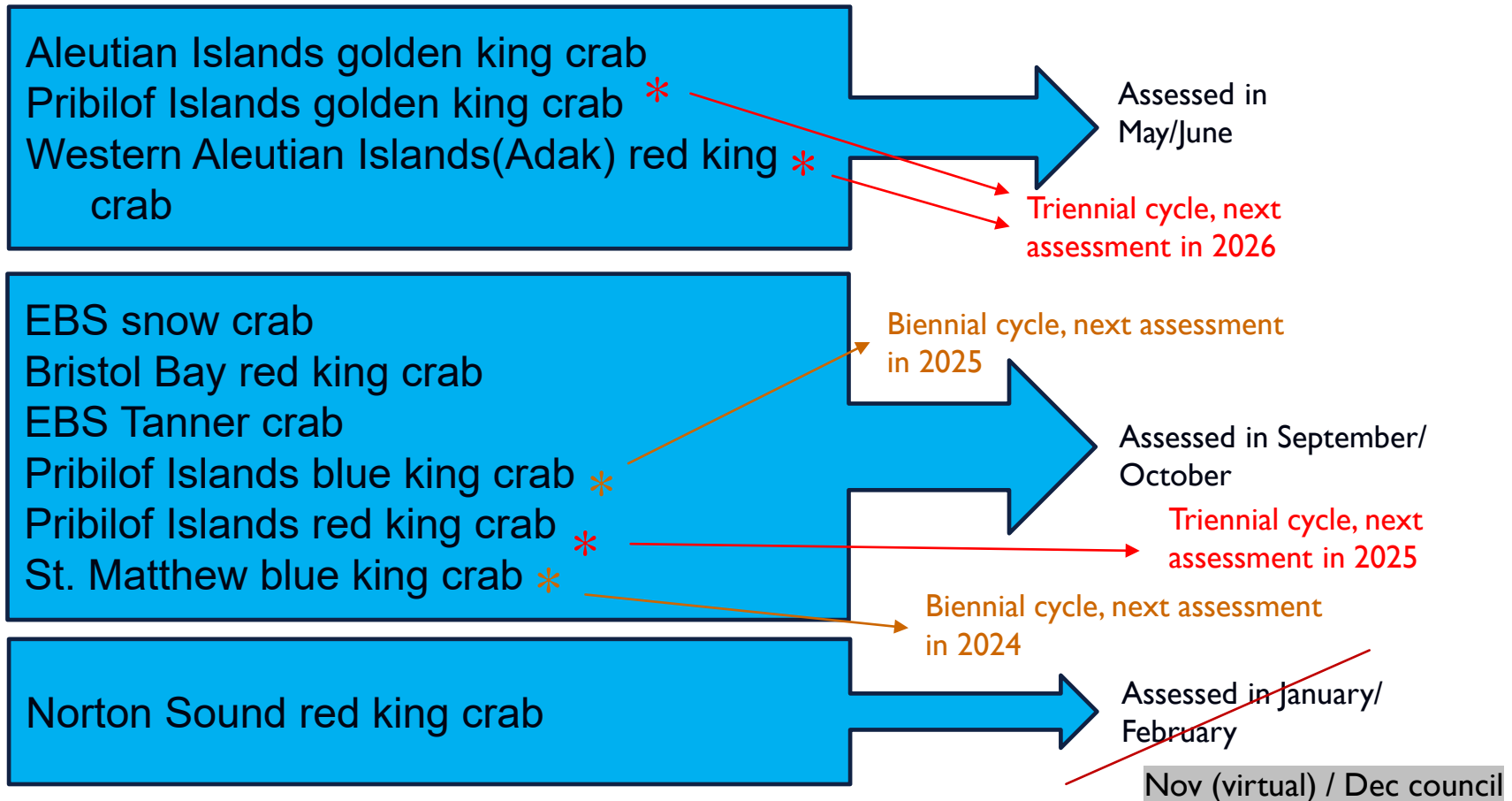
KATIE PALOF & MIKE LITZOW (CPT CO-CHAIRS)

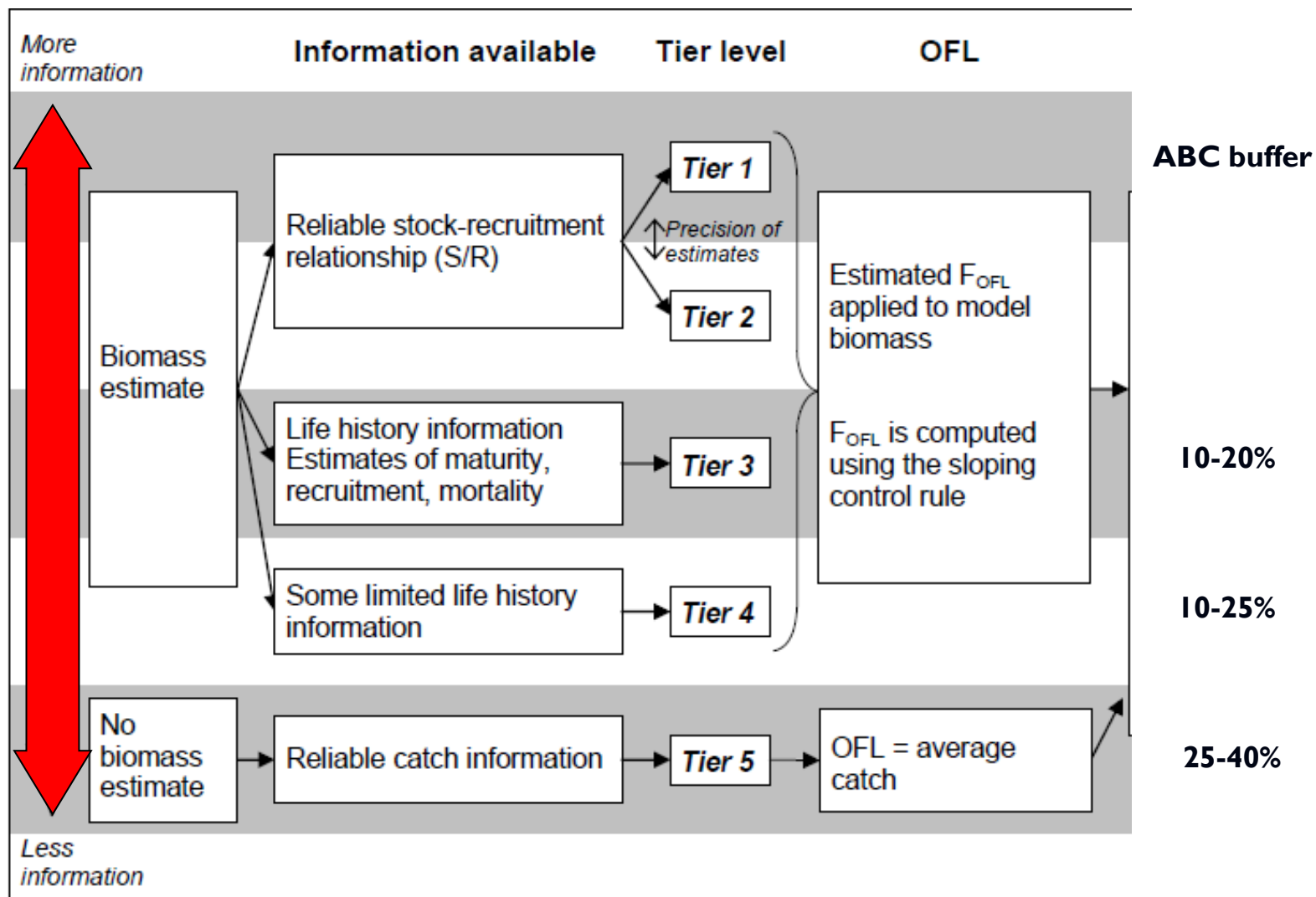
JUNE 2024 NPFMC MEETING | KODIAK, AK

CPT MEETING MINUTES – MAY 14TH – 16TH | ANCHORAGE, AK



BSAI CRAB STOCKS MANAGEMENT TIMING





MAY 2024 AGENDA

- ✓ **AIGKC final assessment, OFL and ABC**
- ✓ Proposed model runs:
 - ✓ Snow crab
 - ✓ Tanner crab
 - ✓ BBRKC
 - ✓ SMBKC
- ✓ BSFRF research updates
- ✓ Council topic updates
- ✓ ESP updates and planning
- ✓ Survey updates
- ✓ Crab observer program updates
- ✓ GMACS updates



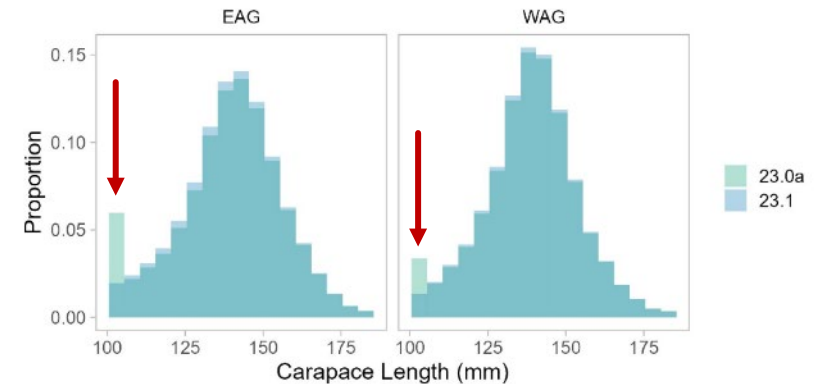


ALEUTIAN ISLAND GOLDEN KING CRAB (AIGKC)

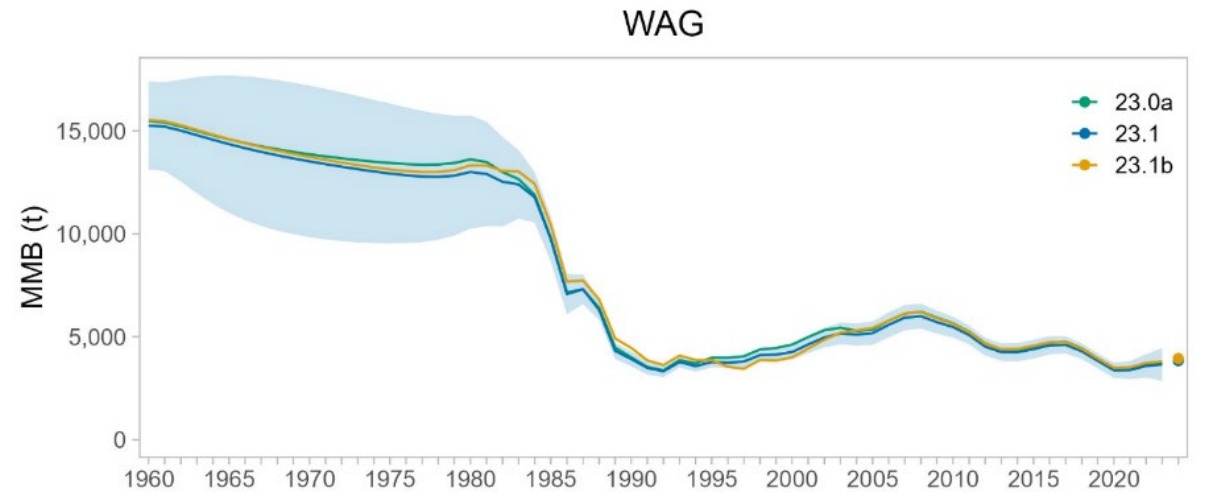
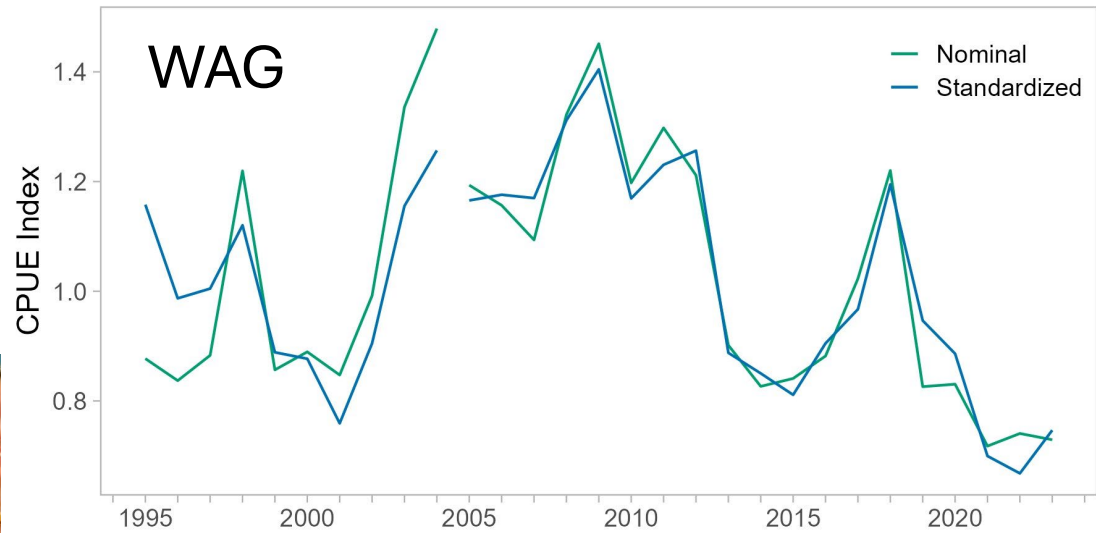
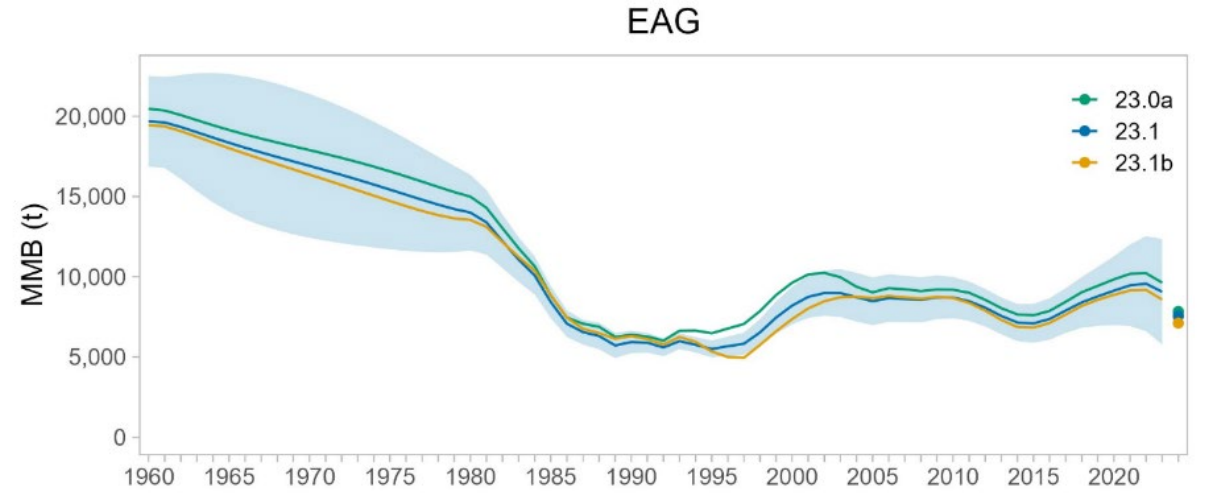
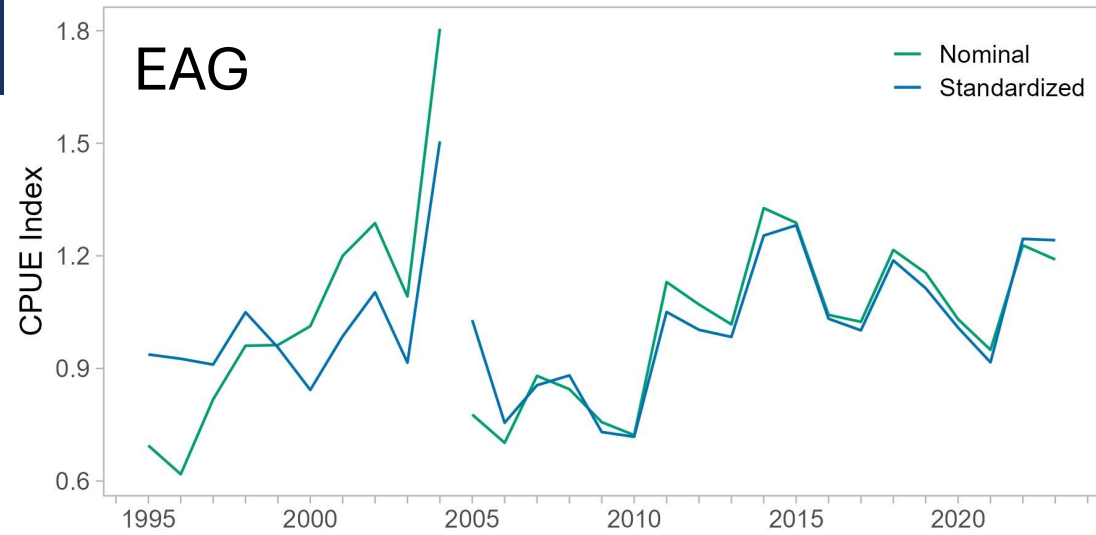
FINAL SAFE, OFL / ABC 2024

AIGKC EXPLORATIONS

- First final models under new authorship (Tyler Jackson)
- Data streamlining and recreating historic data from database performed in Jan 2024
- CPUE standardization
 - Detailed in appendix A; updated reviewed in Jan 2024
 - Changes from Jan to May:
 - Explore Tweedie distributions
 - Remove $s(\text{Lon}, \text{Lat})$ as covariate – overfitting concerns
 - Correct fish ticket data pull (included many 0 data entries that were errors)
- Model options:
 - 23.0a (base model 2023)
 - 23.1 (23.0a + truncated size composition to exclude crab less than the smallest size bin)
 - 23.1b (23.a + two selectivity periods in pre-rationalization CPUE)



MODEL FIT



FINAL RECOMMENDATIONS

- Model 23.1 for both areas
- 25% ABC buffer consistent with 2023 assessment
 - Level of uncertainty similar
 - Improvements in data processing and CPUE standardization
 - Poor model fit to index and poor retrospective patterns still prevalent

Table 14: Comparison of biological reference points for EAG models.

Model	MMB (t)	B _{35%} (t)	$\frac{MMB}{B_{35\%}}$	$\bar{R}_{1987-2017}$	F _{35%}	F _{OFL}	OFL (t)
23.0a	7,834	7,138	1.10	2,822	0.55	0.55	3,035
23.1	7,551	6,905	1.09	2,781	0.55	0.55	2,825
23.1b	7,112	6,906	1.03	2,795	0.59	0.59	2,699

Model	MMB (mil lb)	B _{35%} (mil lb)	$\frac{MMB}{B_{35\%}}$	$\bar{R}_{1987-2017}$	F _{35%}	F _{OFL}	OFL (mil lb)
23.0a	17.27	15.74	1.10	2,822	0.55	0.55	6.69
23.1	16.65	15.22	1.09	2,781	0.55	0.55	6.23
23.1b	15.68	15.23	1.03	2,795	0.59	0.59	5.95

Table 15: Comparison of biological reference points for WAG models.

Model	MMB (t)	B _{35%} (t)	$\frac{MMB}{B_{35\%}}$	$\bar{R}_{1987-2017}$	F _{35%}	F _{OFL}	OFL (t)
23.0a	3,904	4,698	0.83	1,869	0.54	0.44	945
23.1	3,837	4,638	0.83	1,866	0.54	0.44	900
23.1b	3,944	4,716	0.84	1,914	0.57	0.46	951

Model	MMB (mil lb)	B _{35%} (mil lb)	$\frac{MMB}{B_{35\%}}$	$\bar{R}_{1987-2017}$	F _{35%}	F _{OFL}	OFL (mil lb)
23.0a	8.61	10.36	0.83	1,869	0.54	0.44	2.08
23.1	8.46	10.23	0.83	1,866	0.54	0.44	1.98
23.1b	8.70	10.40	0.84	1,914	0.57	0.46	2.10



SNOW CRAB: PROPOSED MODEL RUNS 2024

Outline

- Proposed models
 - Tier 3
 - Tier 4 fallback option
- Narrative description of modeling approach (in report)
- Currency of management
 - MMB time series for different currencies
 - “Arbitrary” selection of vulnerable size as currency
 - Possible next steps building on Clark (1991) yield curve analysis
- Population projections under continued sea ice decline



PROPOSED MODELS

Tier 3

- Last year's accepted model (23.3a)
 - Probability of maturity defined outside model
 - BSFRF data as prior on NMFS survey selectivity
- Effort put into modeling narrative, currency of management decision
- CPT endorses continued use of this model

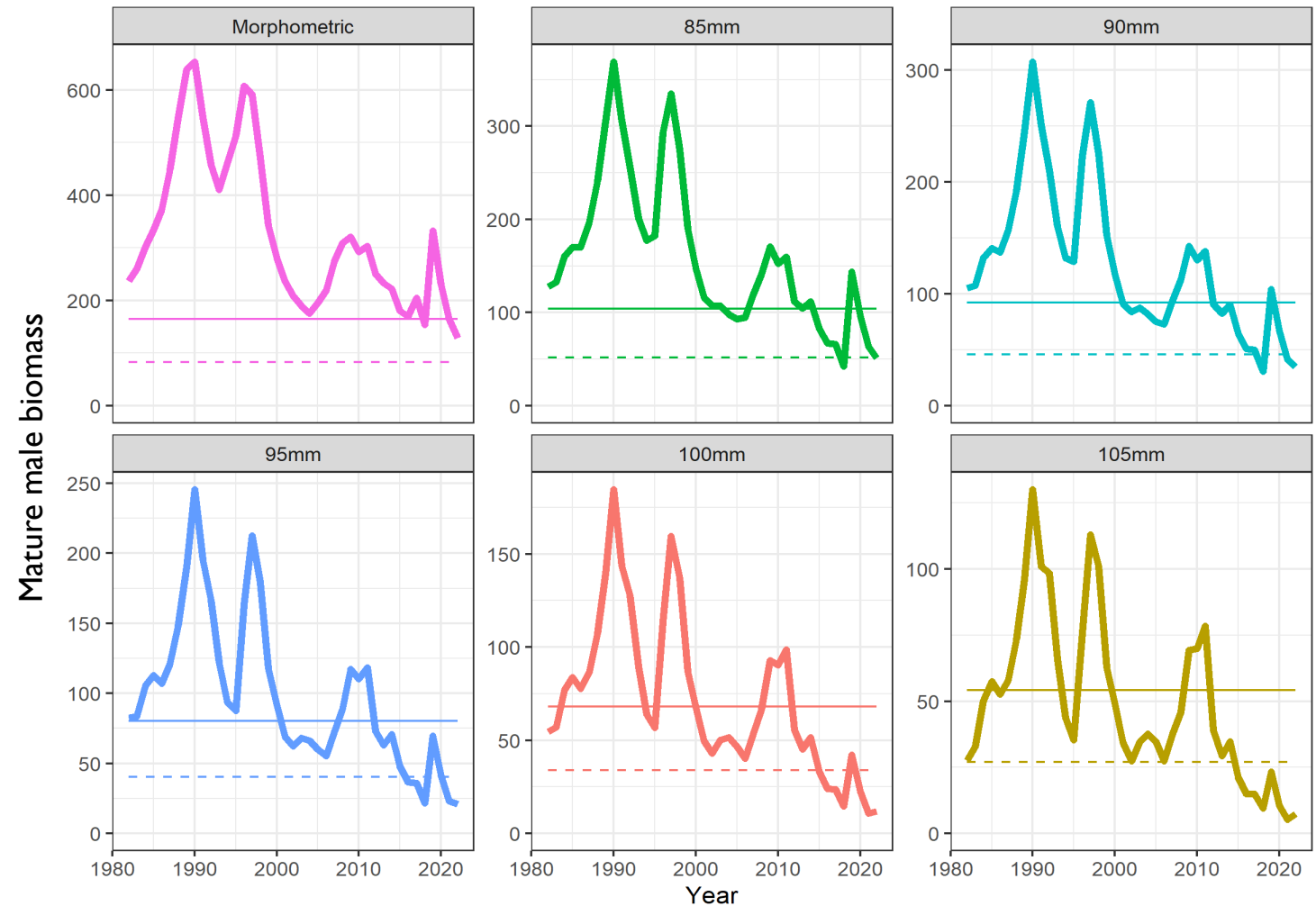
Tier 4 “fallback”

- Based on survey estimate of male biomass ≥ 95 mm carapace width
- SSC provided input on technical details - smooting survey estimates and use of natural mortality in the estimate
- Two versions will be brought forward in October



CURRENCY OF MANAGEMENT: IMPLICATIONS FOR STATUS & OFL

Estimated mature male biomass from model 23.3a using different currencies of management



CURRENCY OF MANAGEMENT

Possible ways forward

- Set currency = vulnerable biomass (95mm CW)
 - Concerns: arbitrary definition, not based on MSY calculation
 - Vulnerable to changes in fishing practices (e.g., exploitation of legal-size crab < 101 mm CW)
 - CPT does not recommend
- Expand Clark (1991) approach
 - Evaluate robustness of F_{MSY} proxy to different assumptions concerning density-dependence to evaluate choice of currency for management
 - CPT endorses moving forward with this approach

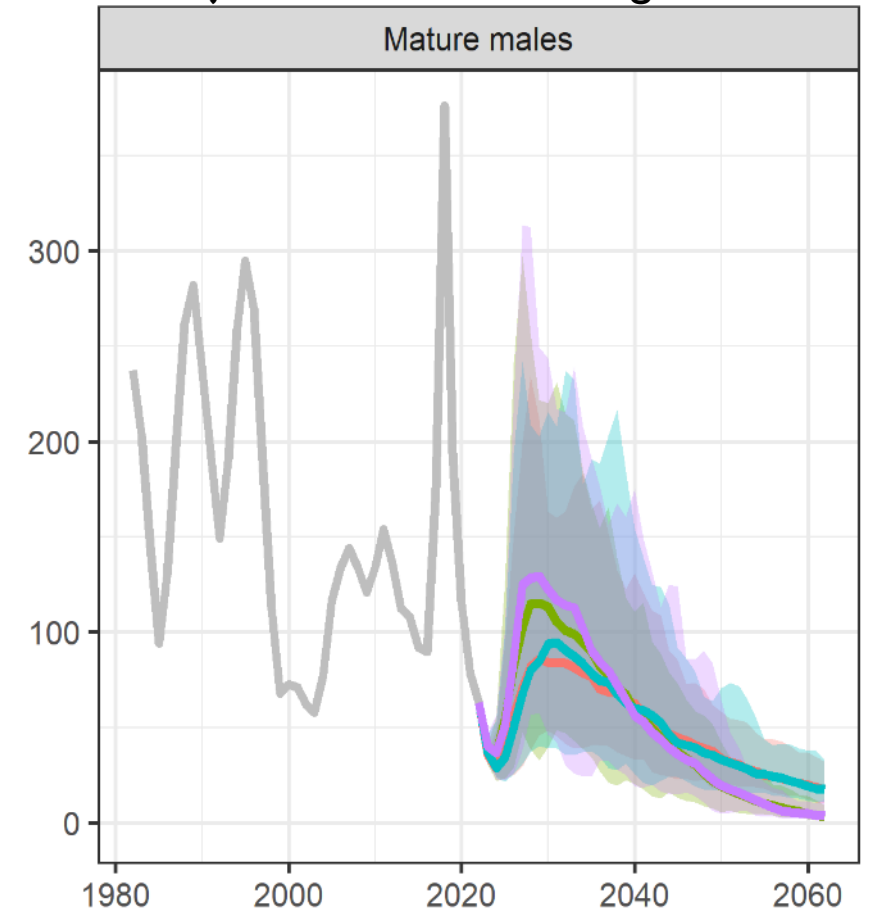


DECADAL-SCALE POPULATION PROJECTIONS

- Three recent papers have confirmed the importance of marginal ice habitat for snow crab (Szuwalski et al. 2023, Mallowney et al. 2024, Litzow et al. in press)
- **Density dependence** and **environmental covariates** explain variability in *mortality*, *recruitment* and *maturity* better than no covariates.
- Impacts of changes in **ice** are strong for *mortality* and *recruitment*
- **Density dependence** in *mortality* allows for a short window for rebound, after which the population declines



Projection under declining sea ice



TANNER CRAB PROPOSED MODEL WORK

- Author provided feedback to SSC / CPT comments
 - Focus of model development was GMACS transition
- Updated BSFRF data into model (updates from 2013-2017 and new 2018 data)
- Proposed models include: TCSAM02 and GMACS models
- Good progress on GMACS models
- CPT recommended models for September final specifications
 - Base model 22.03d: 22.03b 2023 accepted model with BSFRF data input data updates
 - Tier 4 option from 2023 (REMA model on NMFS survey data) will be brought forward in Sept.



BBRKC PROPOSED MODEL WORK

- Stable model in GMACS since 2018
- Directed fishery was open in 2023/24 after being closed for 2 seasons (2021/22, 2022/23) due to low mature female abundance
- Model explorations around a few themes:
 - GMACS updates
 - Selectivity estimation using BSFRF data as a prior for NMFS survey
 - Molting probability time blocks
- CPT recommended models for September final specifications
 - Base model 23.0a (with corrections in .p7 version, estimated male M)
 - Model 24.0c – model 23.0a with reduced time block for molt probability
 - Tier 4 option from 2023 (REMA model on mature males in NMFS survey data) will be brought forward in Sept.



SMBKC PROPOSED MODEL WORK

- New primary author Caitlin Stern (ADF&G Juneau)
- GMACS stable model since 2016; bi-annual assessment (last assessment 2022)
- Declared overfished in 2018 and under a rebuilding plan since 2020 (No directed fishery since 2015/2016)
- New data:
 - 2022 ADF&G pot survey (slight increase from 2018 pot survey)
 - 2023 NOAA survey and groundfish bycatch
- Model explorations around natural mortality – SSC suggested RKC stocks use similar methods to BBRKC
- CPT recommended models for September final specifications
 - Base model 16.1 (16.0 with corrections to historic pot survey data, updated data, and season timing change for MMB in GMACS). Change in model numbering to be consistent with CPT policies
 - Model 24.1: 16.1 as base but with a fixed value of M from BBRKC assessment in 2023 ($M = 0.23$)
 - Model runs without the NMFS survey corner stations to match the 2024 survey





BALANCE OF CPT REPORT



BERING SEA FISHERIES RESEARCH FOUNDATION

RESEARCH UPDATE

■ CPS2

- 646 pot lifts, 128 Nephrops trawl sets
- ~7,000 RKC captured
- Pot: 76% male / 24% female
- Trawl: 44% male / 56% female

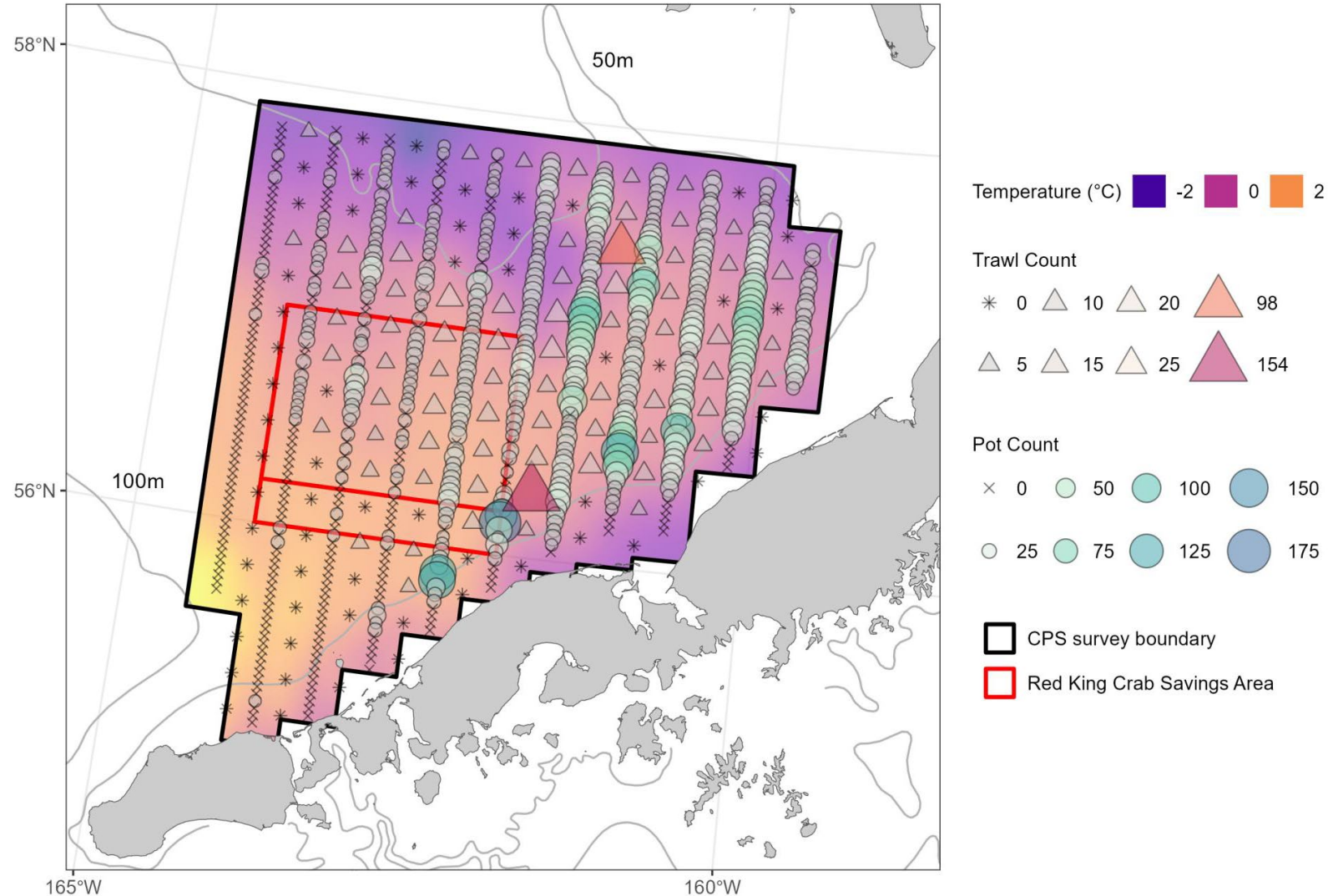
■ Other BBRKC work

- Camsled / larval collectors
- Sat tags



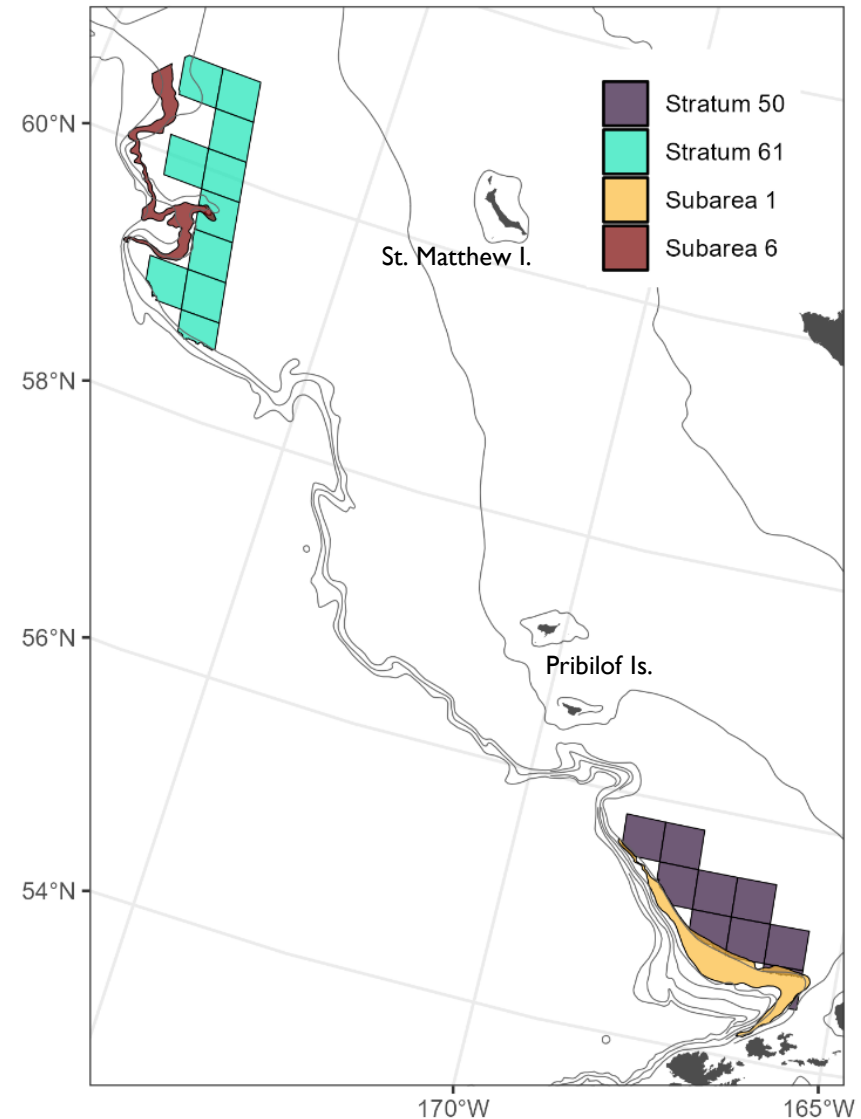
2024 BBRKC Collaborative Pot Sampling

Total BBRKC



BERING SEA FISHERIES RESEARCH FOUNDATION RESEARCH UPDATE

- Slope:shelf gear comparison to 400m for survey modernization (August 2024)
- *Opilio* collaborative sampling tentatively planned alongside NMFS, using pots & Nephrops trawl



QUESTIONS?

- Thanks to all CPT members and crab assessment authors.
- Thanks to Sarah Rheinsmith-Gardiner for ALL of her work as our plan team coordinator!

