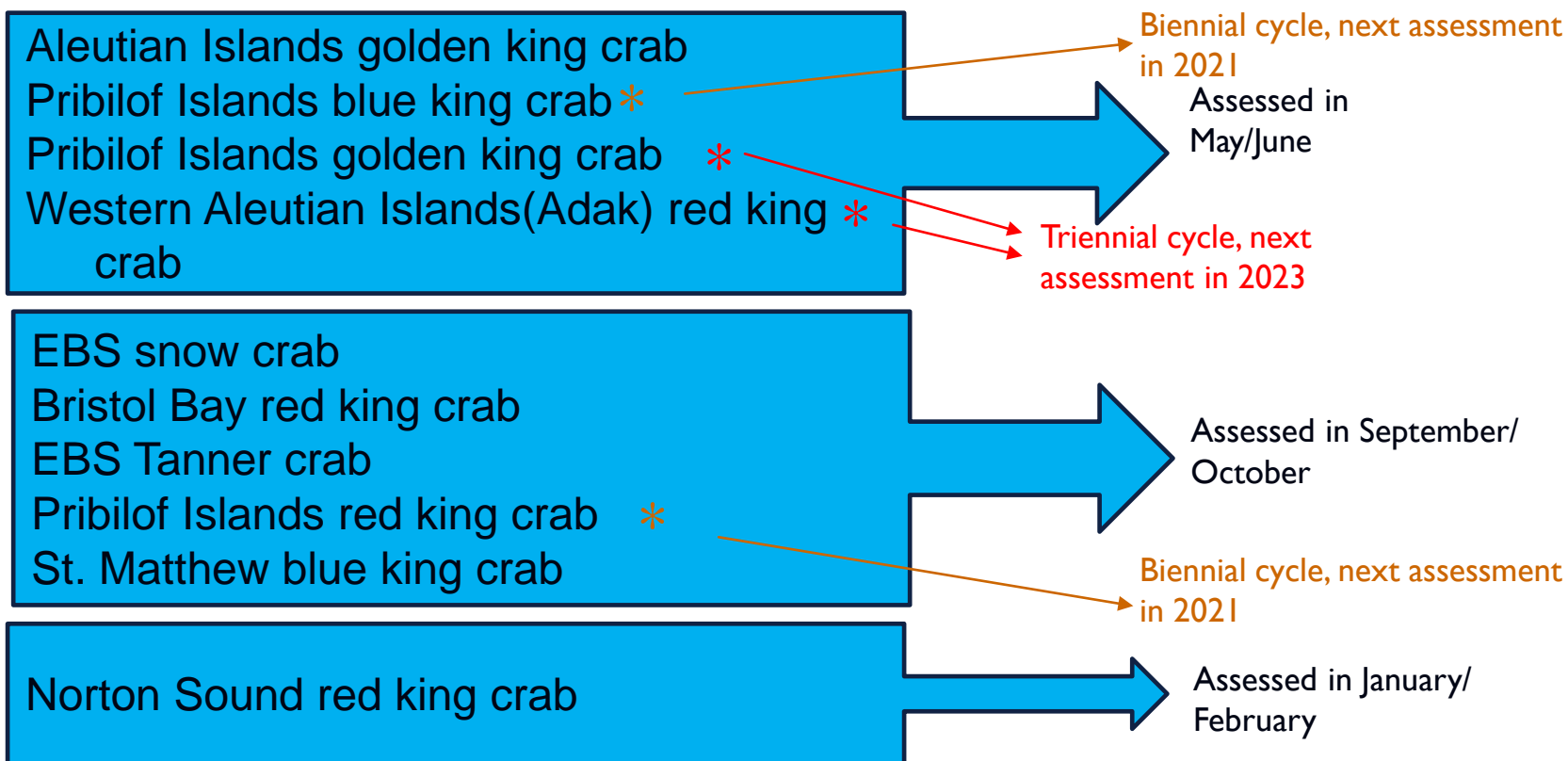

C5 BSAI CRAB STOCKS

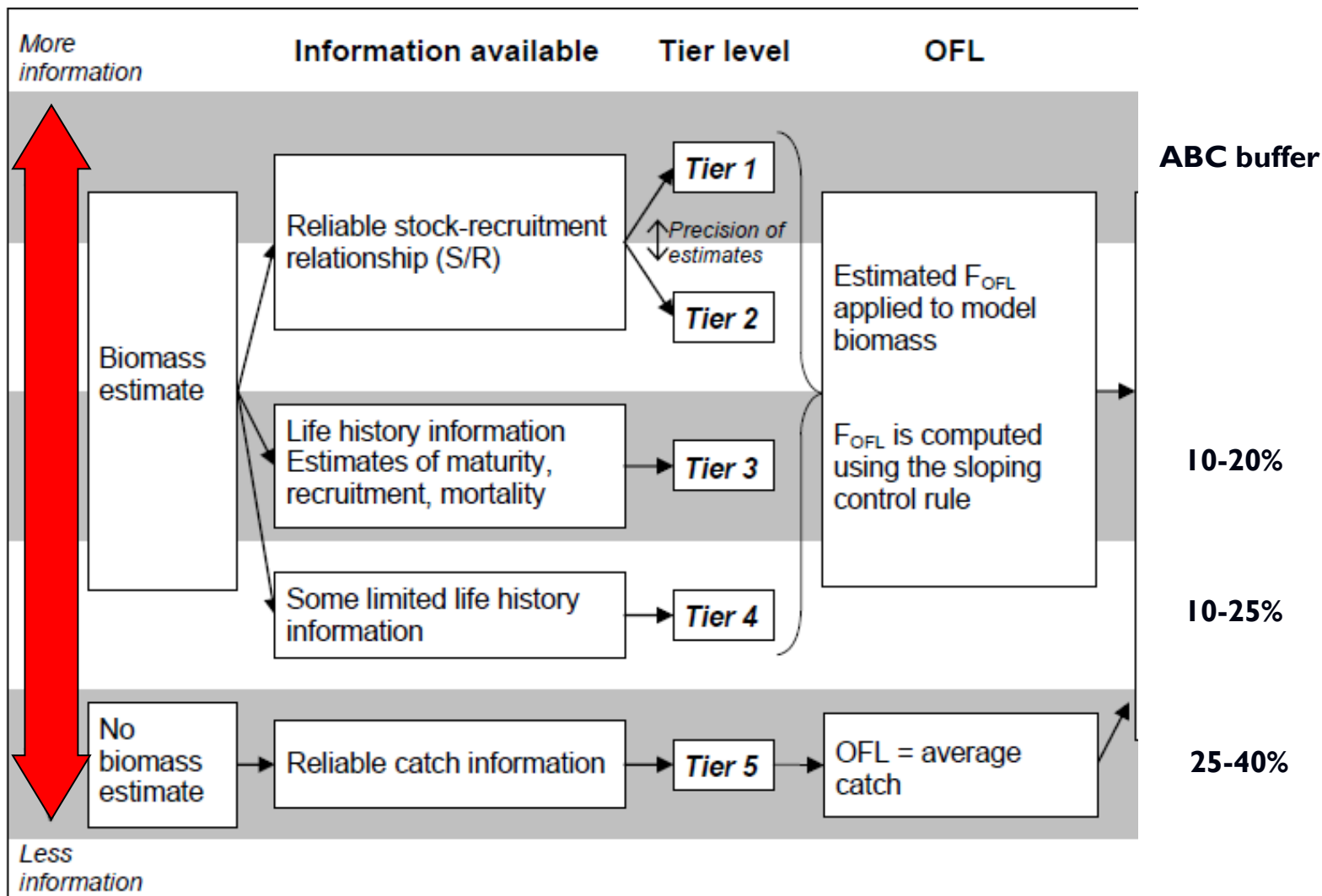
KATIE PALOF & MARTIN DORN,

CPT MEETING MINUTES - JANUARY 11-14, 2021



BSAI CRAB STOCKS MANAGEMENT TIMING





JANUARY 2021 AGENDA

- **NSRKC final assessment, OFL and ABC**
- AIGKC proposed model runs for May/June
- Draft risk tables
- Updating TOR for crab SAFEs
- Stock prioritization and frequency review
- 2021 crab survey planning
- Industry (ABSC) fishery questionnaire
- Crab PSC in groundfish fisheries initial review
- Research priorities (Top 5)
- Climate change and crab management considerations
- Crab Economic SAFE
- Updating survey weight-length relationships
- VAST model diagnostics updates
- Research updates: IBM snow crab, BSFRF research projects, tagging projects
- Modeling workshop





NSRKC

FINAL ASSESSMENT 2021



NORTON SOUND RED KING CRAB - FINAL 2021 ASSESSMENT: STOCK STATUS, OFL/ABC

- Single model (Model 19.0) was presented at the request of the CPT in September.
- Data available for assessment the same as in Sept 2020. No summer fishery since NSEDC was not buying crab.
- CPT reviewed draft GMACS model for NSRKC, but the model is not ready for use.
- CPT also received reports about ongoing research to evaluate
 - Barren females
 - Tagging studies
 - Pot loss



NSRKC MODEL APPROACH

- Male only assessment
- Seven size bins
- Fit to NMFS bottom trawl survey and ADF&G trawl survey in Norton Sound
- $M = 0.18$ for length class 1-6, higher mortality for length classes 7 and 8
- Discard mortality = 0.2
- Fishery harvests occur instantaneously:
 - Winter fishery: Feb 01: Nov – May
 - Summer fishery: July 01: Jun – Sept



PROPORTION OF LEGAL SIZED CRAB BY SIZE CLASS

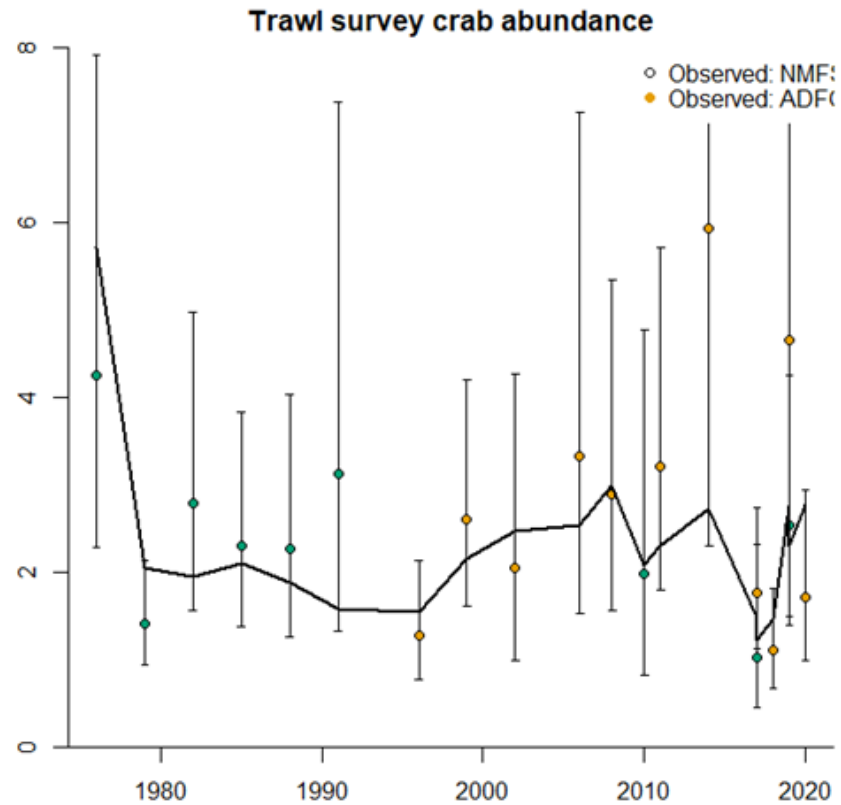
- Observer and trawl data were cleaned up.

	64-73	74-83	84-93	94-103	104-113	114-123	124-133	>133
Old	0.0	0.0	0.0	0.12	0.80	1.00	1.00	1.00
New	0.0	0.0	0.0	0.29	0.93	1.00	1.00	1.00

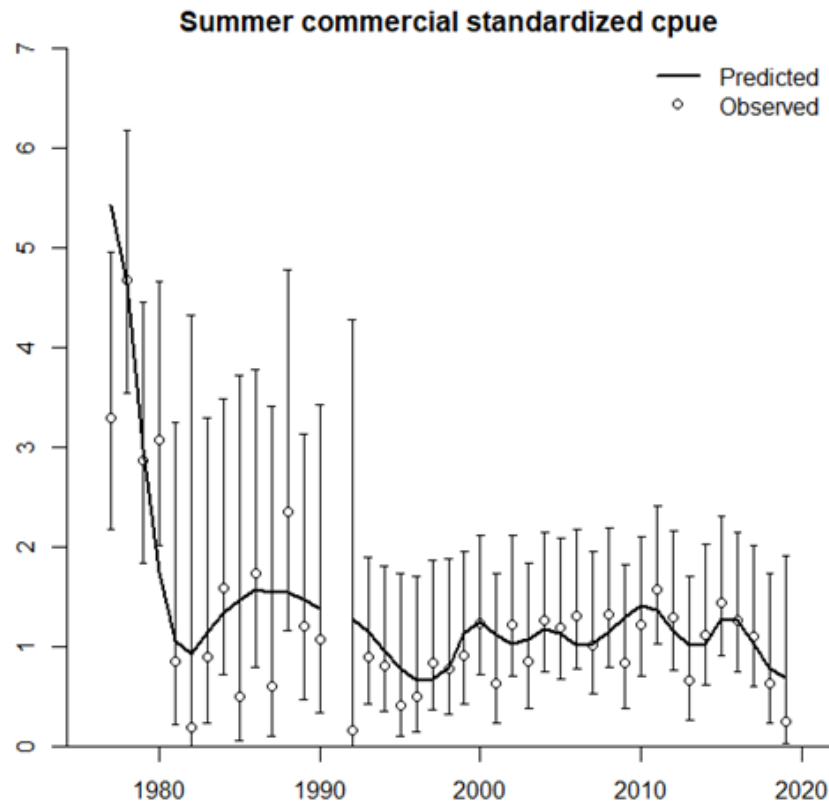
- More legal (CW > 4.75 inch) crab per size class
 - Higher legal crab biomass
 - Higher OFL

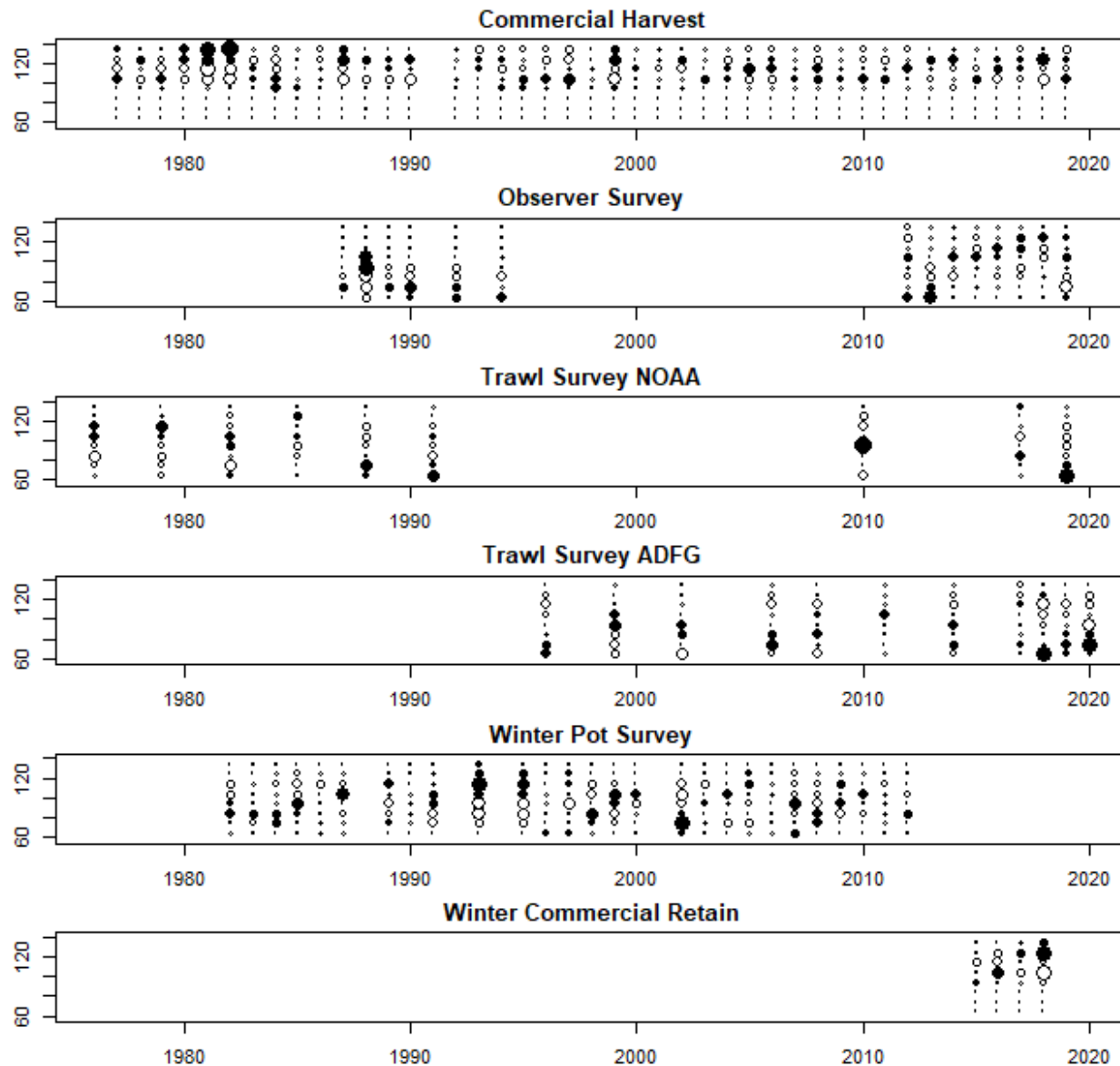


NSRKC MODEL FITS

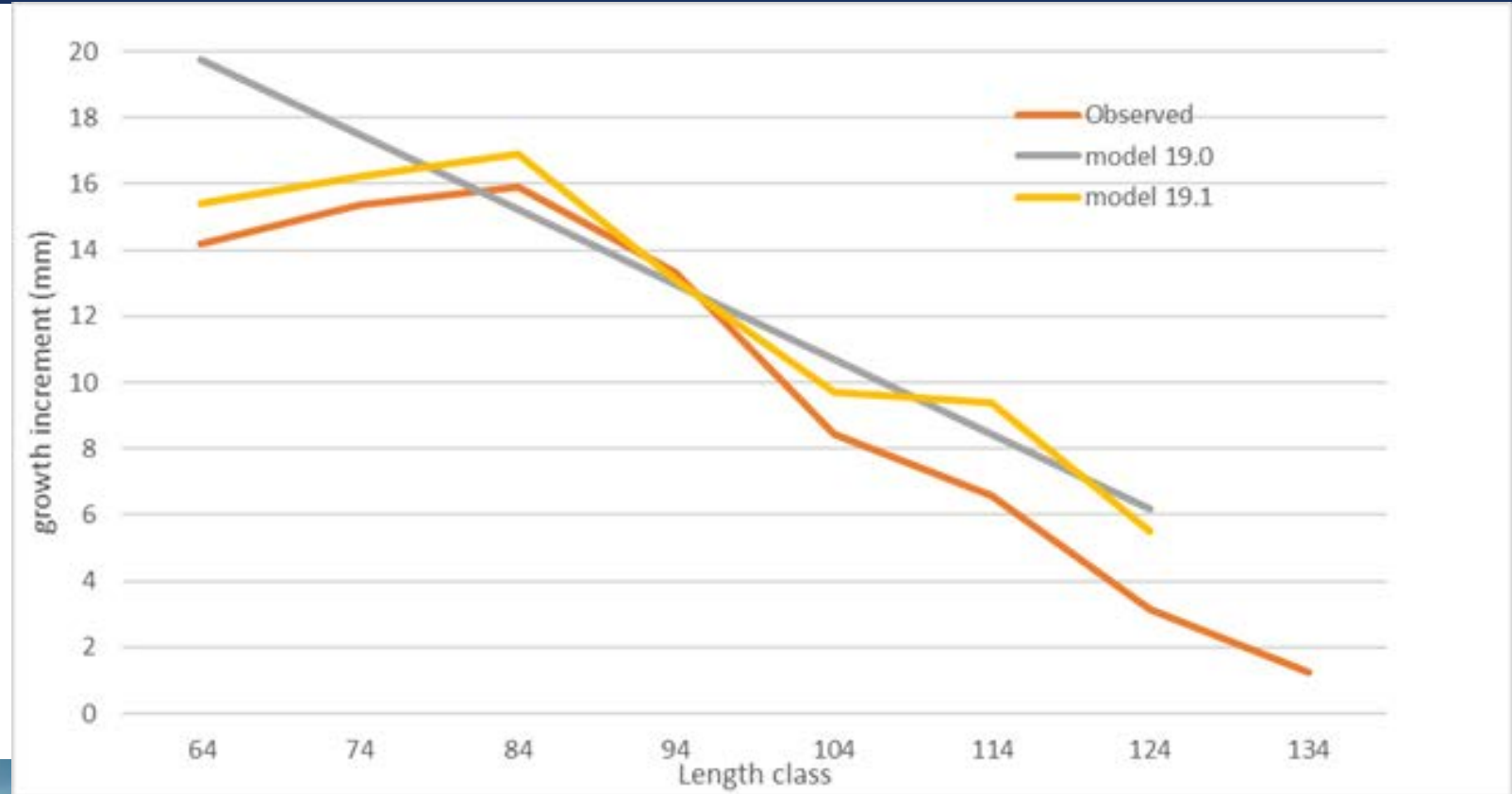


NSRKC MODEL FITS

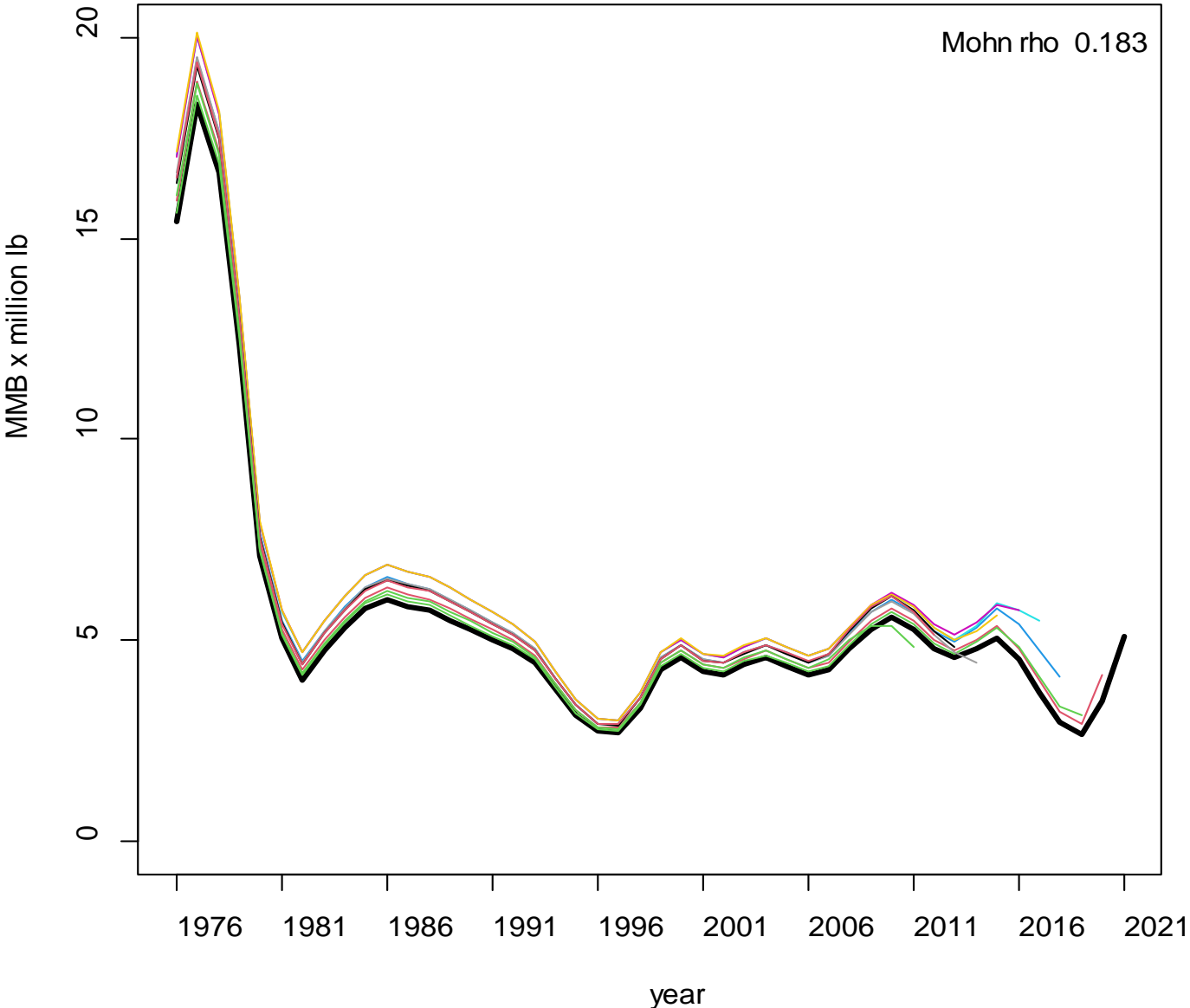





Both models (status quo and GMACS) seem to be overestimating growth



Retrospective Analysis



SSC concern from last year	2021?	Explanation
1. Considerations of other stocks with similar levels of uncertainty	Yes	
2. Concerns with model specification in part indicated by a positive retrospective pattern, whereby successive assessments indicate increasingly pessimistic estimates of stock size for the same years. The full magnitude of the retrospective bias is unknown given that peels of the data go back only a few years. The cause(s) of the pattern are unknown	No	Retrospective patterns are relatively small compared to other stocks and within commonly cited acceptable ranges. The retrospective pattern was characterized for 10 years of peels.
3. Shortage of discard data and resultant inability to manage the stock based on total catch, which is the standard for federal fisheries	Less	Hamachan presented methods to account for total catch; the LNR2 method was chosen by the CPT.
4. Unresolved issues associated with the apparent high <i>M</i> for the largest size class	Yes	
5. Discrepancies in stock size estimates between ADF&G and NMFS surveys as well as concerns about the spatial distribution of crab relative to the survey footprint	Yes	
6. Very low fishery CPUE and inability of the fishery to attain the ABC in 2019	Yes	
7. Unusually large numbers of old-shell males in the fishery in 2018-2019	Yes	
8. High proportions of barren females in survey and fishery observations indicating some reproductive failures in 2019	Less	Fewer barren females in 2020 and males are reaching the appropriate size for mating.
9. Below-average numbers of prerecruits (<94 mm CL) in 2015-2018 suggesting that below-average recruitment to the fishery will be experienced for several more years	Yes	
10. Large uncertainty in the magnitude of the most recent year class (prerecruits in 2019), preliminarily estimated to be large. However, these small crab are several years away from recruiting to the fishery as legal crab and they are challenged by unprecedented recent increases in Pacific cod, a crab predator, in Norton Sound.	Less	The year class is tracking and uncertainty is less now that the year class has been observed several times. 

NSRKC: CPT RECOMMENDATIONS ON OFL/ABC

- CPT recommends Model 19.0 for ABC and OFL setting
- CPT recommends a total catch OFL, using method LNR2 to estimate discards.
- Assessment author recommended a retained catch legal crab OFL, as in previous assessments.
- CPT recommends that SSC continue use of 30% buffer to set ABC



NSRKC: CPT RECOMMENDATIONS ON OFL/ABC

Status and catch specifications (million lb.)

Year	MSST	Biomass (MMB)	GHL	Retained Commercial Catch	Total Retained Catch	OFL*	ABC*
2017	2.31	5.14	0.50	0.49	0.50	0.67	0.54
2018	2.41	4.08	0.30	0.31	0.34	0.43	0.35
2019	2.24	3.12	0.15	0.08	0.08	0.24	0.19
2020	2.28	3.67	0.17	Conf.	Conf.	0.29	0.20
2021	2.26	5.00				0.63	0.44

Status and catch specifications (1000t)

Year	MSST	Biomass (MMB)	GHL	Retained Commercial Catch	Total Retained Catch	OFL*	ABC*
2017	1.05	2.33	0.23	0.22	0.24	0.30	0.24
2018	1.09	1.85	0.13	0.14	0.15	0.20	0.16
2019	1.03	1.41	0.07	0.04	0.04	0.11	0.09
2020	1.04	1.66	0.08	Conf.	Conf.	0.13	0.09
2021	1.03	2.27				0.29	0.20

Notes:

MSST was calculated as $B_{MSY}^{1/2}$

*OFL/ABC is a total catch in 2021. (Retained OFL/ABC in previous years)

Conversion to Metric ton: 1 Metric ton (t) = 2.2046×1000 lb

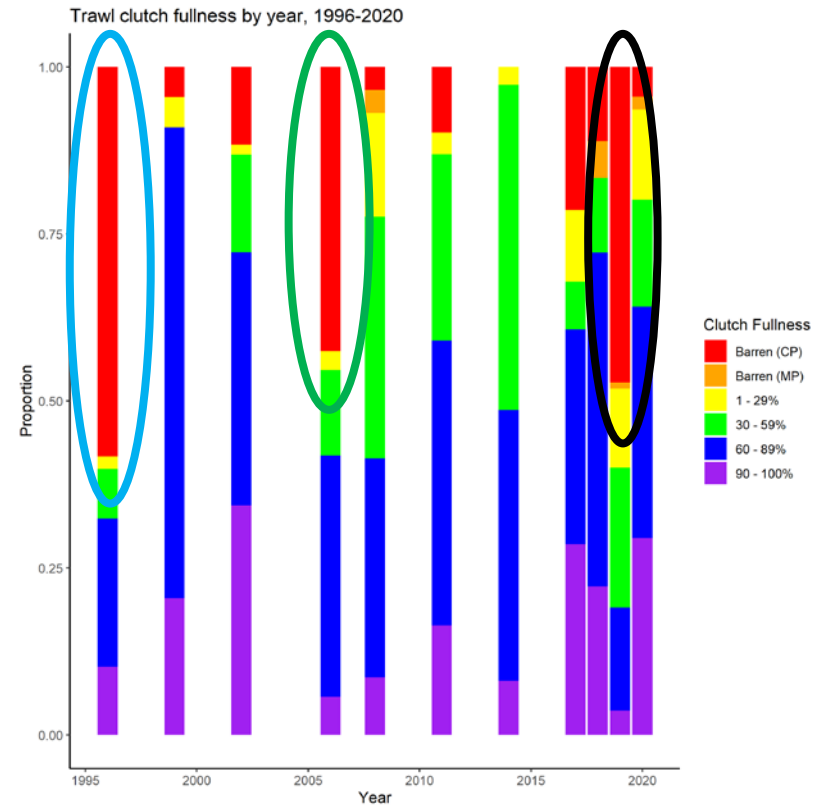
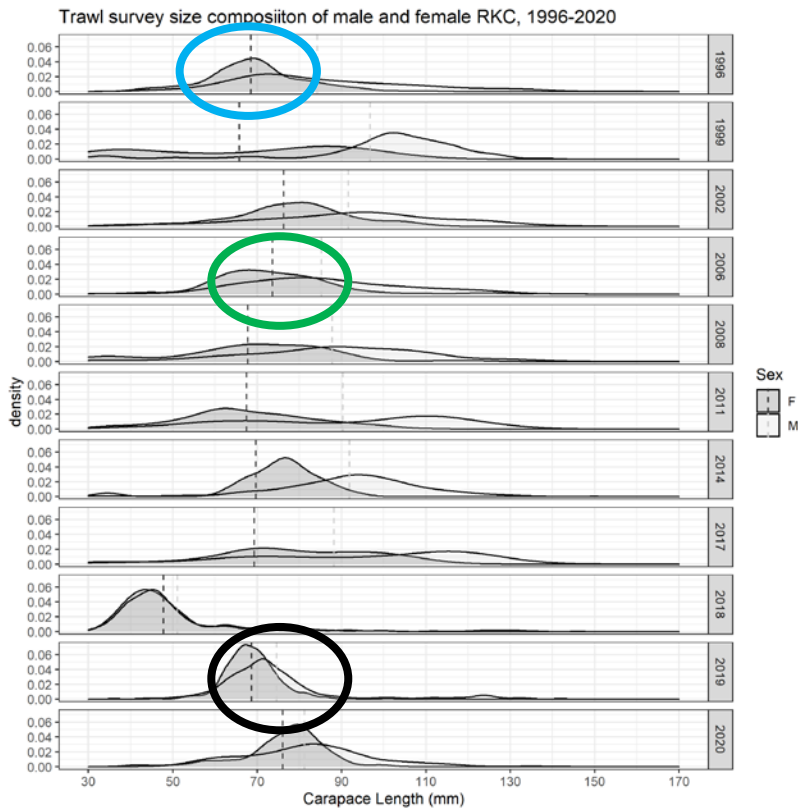


NSRKC: CPT RECOMMENDATION FOR FUTURE ASSESSMENTS

- Explore and document the reasons for the changes in the relationship between carapace length and carapace width.
- The OFL should be specified based on total catch including retained catch and non-surviving discard.
- Revisit growth assumptions. Growth appears to be consistently overestimated in the assessment, producing too many large crab.
- Revisit natural mortality assumptions.
- Clutch fullness figure should include confidence bounds.
- Further consider which of the methods to account for discards are most appropriate for NSRKC given probable future data availability.
- Explore having Jon Richar work on a VAST model for Norton Sound trawl surveys.



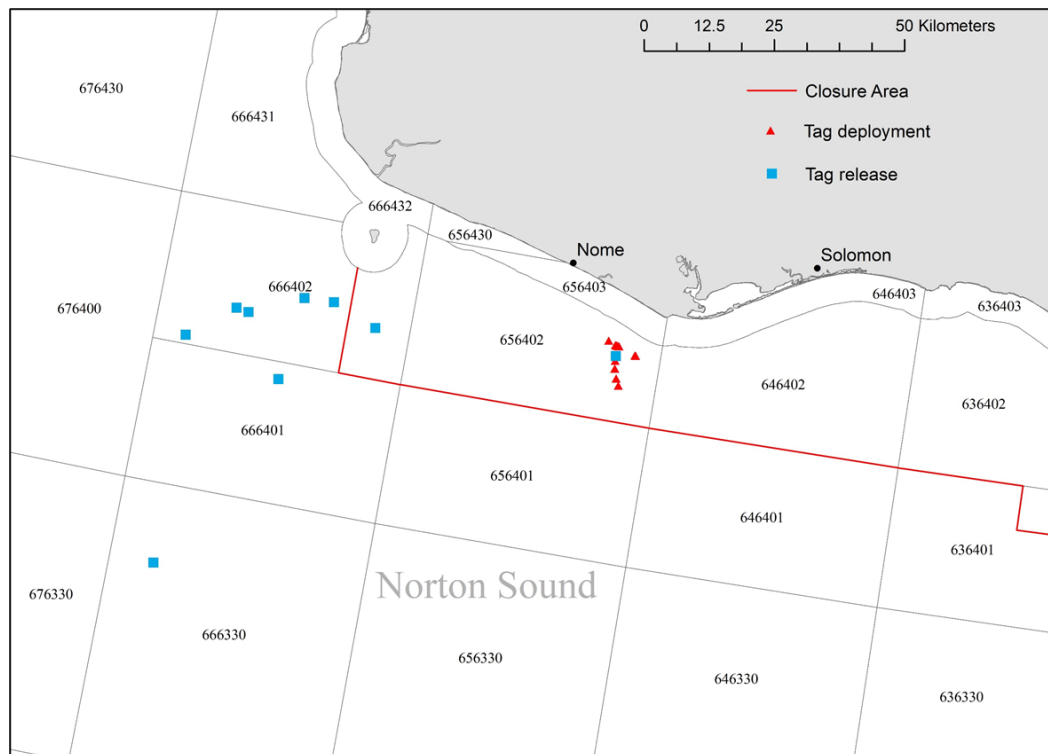
RESEARCH UPDATE: FEMALE CLUTCH FULLNESS: WE'VE SEEN THIS BEFORE



In 1996, 2006, and 2019 surveys crab cohort was 65-75 mm CL and predominantly female



RESEARCH UPDATE: LOCATING LARGE MALES



- The issue: RKC >123 mm CL are rarer than expected in fisheries and trawl survey.
- Assessment handles this by estimating a higher natural mortality for the largest two size bins
- 16 satellite tags deployed July 2020
 - 106 – 135 mm CL
 - Tags were set to collect data for four months
- 9 tags popped up on predetermined date
 - Oct 6 and Oct 7
 - 8 locations high confidence
- Will tag up to 140 crabs in spring 2021 (with ADF&G Kodiak and NOAA)



RESEARCH UPDATE: LOST POTS

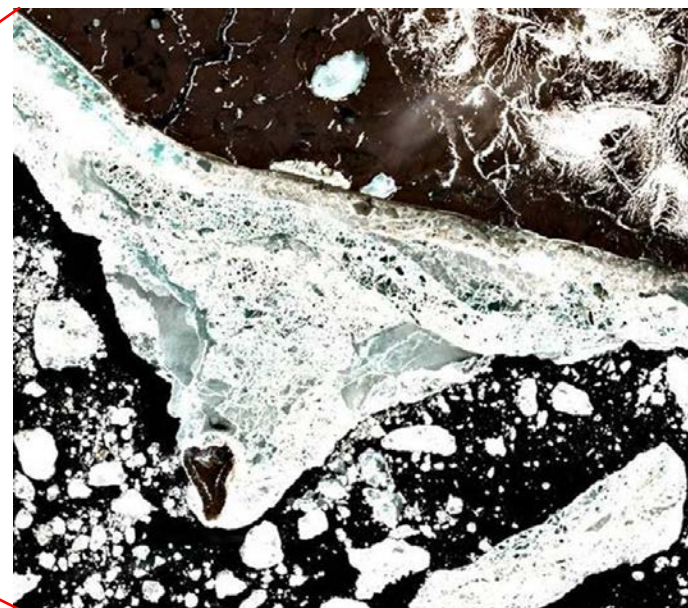
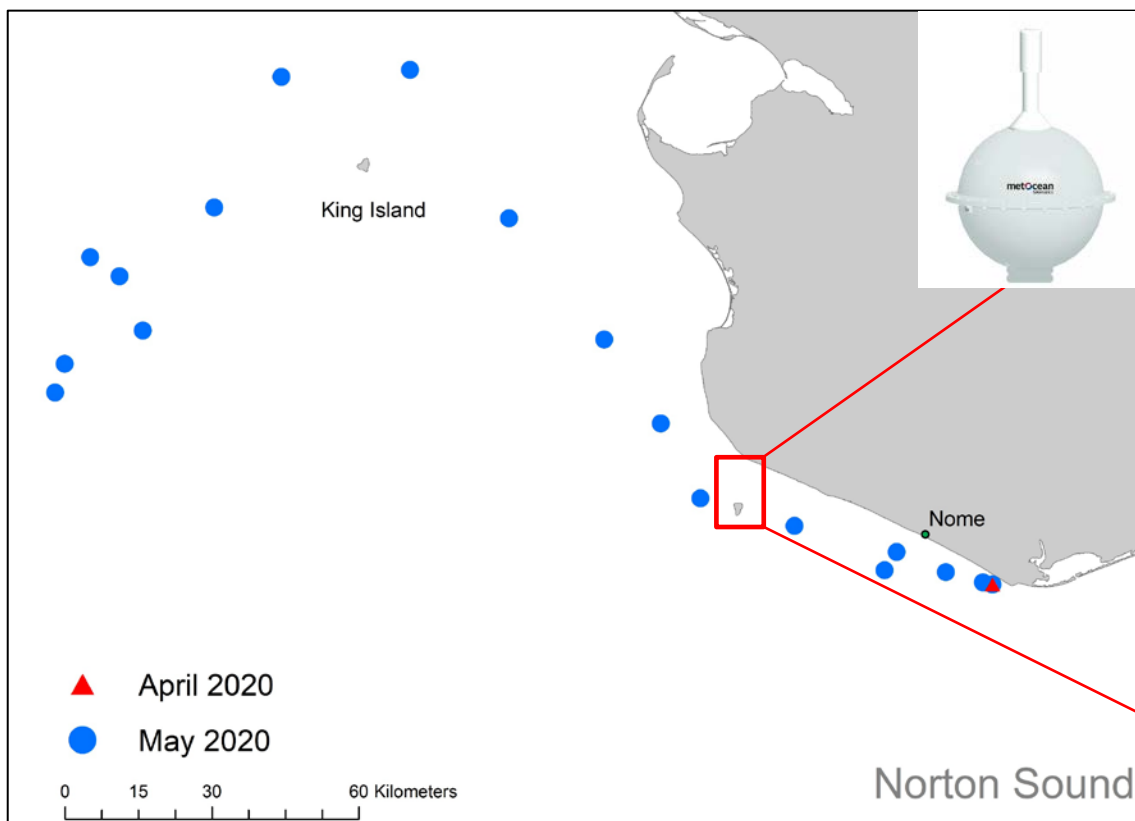
Lost pots (2005-2020)

- Crab pots are lost when the ice breaks off unexpectedly; pots are dragged with the ice to some unknown destination
- Predominantly a winter fishery occurrence
- 2017- 20 pot limit in winter fishery

Year	Winter Commercial	Winter Subsistence	ADF&G pot studies	Summer Subsistence	Total
2005–06	ND	50	6	1	57
2006–07	ND	132	7	0	139
2007–08	ND	6	4	4	14
2008–09	ND	8	2	0	10
2009–10	30	23	2	1	56
2010–11	3	8	0	9	20
2011–12	64	19	4	0	87
2012–13	23	4	3	7	37
2013–14	105	16	1	4	126
2014–15	104	16	0	1	121
2015–16	38	20		11	69
2016–17	201	11		6	218
2017–18	179	33		5	217
2018–19	32	59		10	101
2019–20	3	33			36



Lost Pots: 2020 Ice Movement



Average daily location by month



Lost Pots: Next steps

2021- Purchase additional ice trackers (Funded by: NSEDC-Outside Entity Funding)

Polar iSVP



Polar iSVP designed to float- maybe we need a device designed to sink?

Compact air launch ice beacon
sends out a satellite signal until it sinks



2021/ 2022- Obtain funds to start searching for lost pots?



AIGKC PROPOSED MODELS FOR MAY 2021

- Authors brought forward 7 models for the EAG and 4 for the WAG
- CPT recommended 4 models for consideration in May
- Additional models for EAG included:
 - GMACS implementation (Jan 2022/ May 2022)
 - Appendix to show continued progress
 - Common modeling framework will make technical review easier
 - Models to include the cooperative survey CPUE index (2015-2019)
 - Time period overlaps with observer CPUE index
 - Removal of observer CPUE unnecessary
 - Appendix for this model – use observer CPUE until cooperative CPUE is available



Table A. Model scenarios

Model	CPUE data type	Period for mean number of recruit calculation
19.1 (accepted model in May 2019 , implemented with up to 2019/20 data)	Observer data from 1995/96–2019/20; fish ticket data from 1985/86–1998/99; two catchability and total selectivity for the 1960–2004 and 2005–2019 periods, one retention and groundfish bycatch selectivity; and observer and Fish Ticket CPUE standardization by negative binomial models.	1987–2012 EAG and WAG
19.1a	19.1+ change the period for mean number of recruit calculation.	1987–2017 EAG and WAG
19.1b	19.1a+ three total selectivity periods (1960–2004, 2005–2015, 2016–2019).	1987–2017 EAG and WAG
19.1c	19.1a+ Gmacs (EAG).	1987–2017 EAG
19.1d	19.1a+ EAG cooperative survey CPUE indices for 2015–2019. observer CPUE indices for 1995/96–2019/20 and Fish Ticket CPUE indices for 1985/86–1998/99.	1987–2017 EAG
19.1e	19.1a+ EAG cooperative survey CPUE indices for 2015–2019. Use Fish Ticket CPUE indices for 1985/86–2019/20 without observer CPUE indices.	1987–2017 EAG
20.1	19.1a+ consider observer CPUE standardized with Year:Area interaction.	1987–2017 EAG and WAG

Comment 6: The fit to the cooperative survey index should be shown.

*Response:
Done (Figure A.8).*

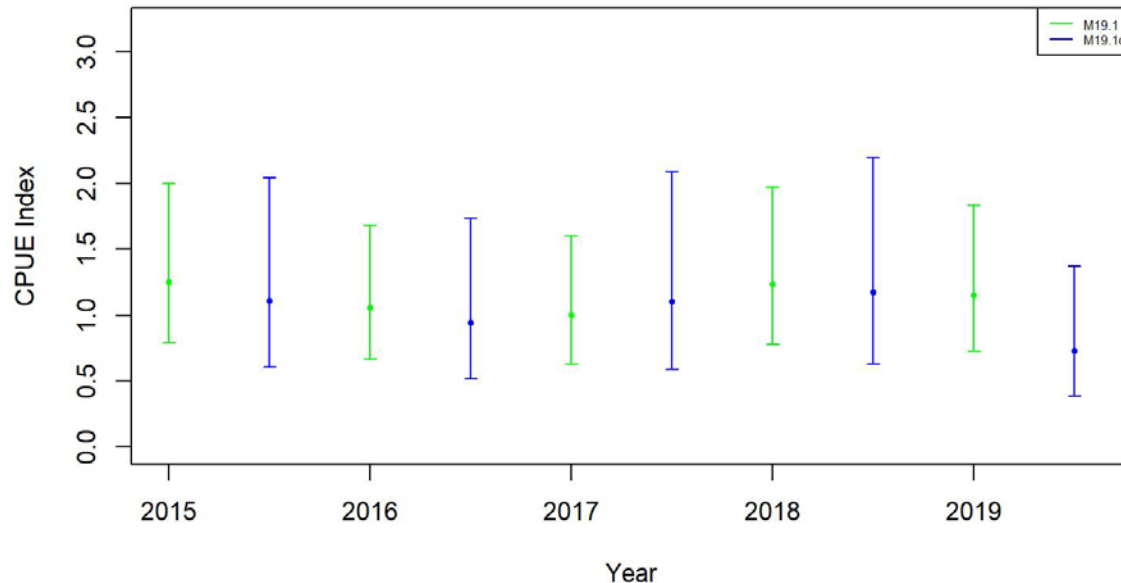


Figure A.8. Comparison of cooperative survey model CPUE indices (blue, 19.1d) and observer non interaction factor model CPUE indices (green, 19.1). The confidence limits are determined with $\pm 2SE$. Model estimated additional standard error was added to SE.



AIGKC PROPOSED MODELS FOR MAY 2021

- Model 19.1. This is the model on which the May 2019 and May 2020 assessments were based. It should be updated with new data.
- Model 21.1a. As for model 19.1, except that the period for defining the mean number of recruits is modified to 1987-2017. The CPT was provided with results for a range of periods for defining mean recruitment and the assessment outcomes were robust to the choice of period.
- Model 21.1b. As for model 21.1a, but with three total selectivity periods (1960-2004; 2005-2015; 2016+). The analysts should use figures and other analyses to justify the reasons for allowing for time-varying selectivity – which reduces the size of the retrospective patterns [but allowing virtually any population process to be time-varying could achieve this goal].
- Model 21.1c. As for model 21.1a, but with the observer CPUE data standardized including Year:Area interactions.



RISK MATRIX CONSIDERATIONS FOR CRAB, LESSONS FROM GROUNDFISH

- Applied to groundfish five stocks as test cases in 2018, then for all stocks with new assessments in 2019 and 2020.
- CPT is responding to a request from the SSC to evaluate whether it would be appropriate to use the risk table for crab assessment.



BSAI and GOA FMP: Acceptable Biological Catch

“Specification of ABC is similar to specification of OFL, in that both involve harvest control rules with six tiers relating to various levels of information availability. However, somewhat more flexibility is allowed in specifying ABC, in that the control rule prescribes only an upper bound.”

The fourth step in specifying ABC:

“Determine whether conditions exist that warrant setting ABC at a value lower than the maximum permissible value (such conditions may include—but are not limited to—data uncertainty, recruitment variability, and declining population trend) and, if so:

- a. document those conditions,
- b. recommend an ABC lower than the maximum permissible value, and
- c. explain why the recommended value is appropriate.

The above steps are undertaken first by the assessment authors in the individual chapters of the SAFE report. The Plan Team then reviews the SAFE report and makes its own recommendation. The SSC then reviews the SAFE report and Plan Team recommendation, and makes its own recommendation to the Council. The Council then reviews the SAFE report, Plan Team recommendation, and SSC recommendation; then makes its own recommendation to the Secretary, with the constraint that the Council’s recommended ABC cannot exceed the SSC’s recommended ABC.”

BSAI crab FMP: Acceptable Biological Catch

“**ABC Control Rule** is the specified approach in the five-tier system for setting the maximum permissible ABC for each stock as a function of the scientific uncertainty in the estimate of OFL and any other specified scientific

- ABC control rule for tiers 1-4 is given by $ABC \leq (1 - b_y) * OFL$
- The parameter, b_y , is the value for the annual buffer calculated from a P^* of 0.49 and a probability distribution for the OFL that accounts for scientific uncertainty in the estimate of OFL.

In reviewing the Stock Assessment and Fishery Evaluation Report, the Crab Plan Team and the Scientific and Statistical Committee shall evaluate and make recommendations, as necessary, on:

- the assumptions made for stock assessment models and estimation of OFLs;
- the specifications of the probability distribution of the OFL;
- the methods to appropriately quantify uncertainty in the ABC control rule; and
- the factors influencing scientific uncertainty that the State has accounted for and will account for on an annual basis in TAC setting

The Scientific and Statistical Committee will then set the final OFLs and ABCs for the upcoming crab fishing year. The Scientific and Statistical Committee **may set an ABC lower than the result of the ABC control rule**, but it must provide an explanation for setting the ABC less than the maximum ABC.”

SSC ranges for ABC

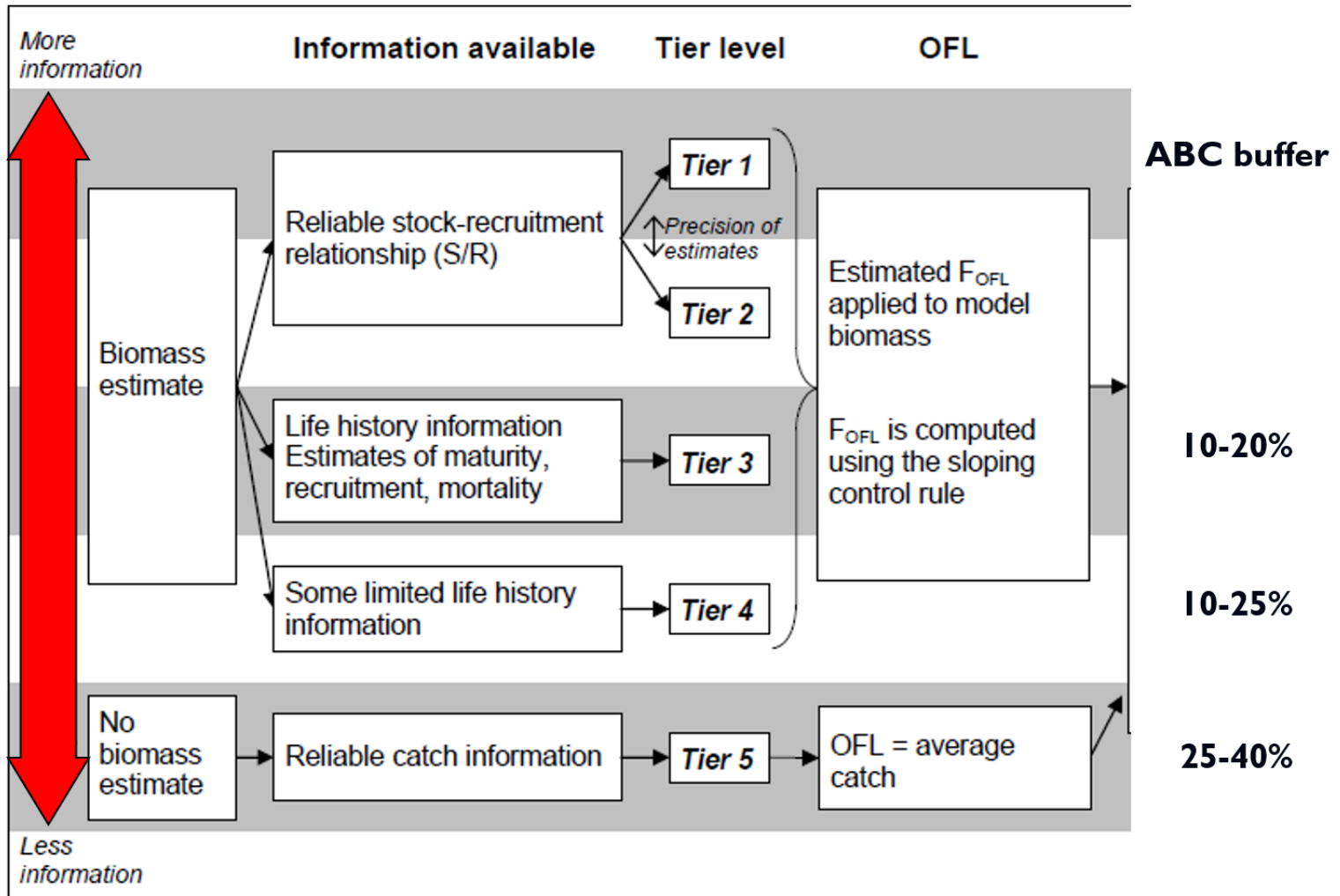


Table 4. Crab Plan Team recommendations from the September 2019 meeting. Note that recommendations are final values from the SSC for stock 7 (February) and 5 and 8 (June); stocks 9 and 10 were not assessed in 2019. Hatched areas indicate parameters not applicable for that tier. Values are in thousand metric tons (kt).

Chapter	Stock	Tier	Status (a,b,c)	F _{OFL}	B _{MSY} or B _{MSYproxy}	B _{MSY} basis years ^[1]	2019/20 ^[2] MMB	2019/20 MMB / MMB _{B_{MSY}}	γ	Mortality(M)	2019/20 ^[3] OFL	2019/20 ABC	ABC Buffer
1	EBS snow crab	3	a	1.93	126.1	1982-2018 [recruitment]	167.3	1.33		0.41 (mat. females) 0.31 (imm.) 0.30 (mat. males)	54.90	43.90	20%
2	BB red king crab	3	b	0.22	21.25	1984-2018 [recruitment]	15.96	0.75		0.18	3.40	2.72	20%
3	EBS Tanner crab	3	b	1.08	41.07	1982-current [recruitment]	39.55	0.96		0.30 (mat. females) 0.23 (imm.) 0.30 (mat. males)	28.86	23.09	20%
4	Pribilof Islands red king crab	4	a	0.21	1.73	2001-present [MMB]	5.37	3.10	1	0.21	0.86	0.65	25%
5	Pribilof Islands blue king crab	4	c	0.18	4.11	1980/81-1984/85 & 1990/91-1997/98 [MMB]	0.175	0.04	1	0.18	0.00116	0.00087	25%
6	St. Matthew Island blue king crab	4	c	0.04	3.48	1978-2018 [MMB]	1.08	0.31	1	0.18	0.044	0.035	20%
7	Norton Sound red king crab	4	b	0.12	2.06	1980-2018 [MMB]	1.41	0.68	1	0.18	0.11	0.09	20%
8	AI golden king crab	3	a	EAG (0.66) WAG (0.60)	11.76	1987/88-2012/13	15.94	1.36		0.21	5.25	3.94	25%
9	Pribilof Islands golden king crab	5				See intro chapter					0.09	0.07	25%
10	Western AI red king crab	5				1995/96-2007/08					0.06	0.01	75%

^[1]For Tiers 3 and 4 where B_{MSY} or B_{MSYproxy} is estimable, the years refer to the time period over which the estimate is made. For Tier 5 stocks it is the years upon which the catch average for OFL is obtained.

^[2]MMB as projected in Feb 2019 for Norton Sound red king crab, and June 2019 for AIGKC.

^[3]AIGKC OFL and ABC calculated by author outside the chapter for using the Approach 2 combination of EAG and WAG and 25% buffer between OFL and ABC.

A FEW OBSERVATIONS ON CRAB ABC RECOMMENDATIONS

- ABC recommendations for crab follow a different framework than for groundfish.
- For crab stocks the maximum permissible ABC is specified according to a P^* of 0.49, which results in a small buffer between ABC and OFL.
- The SSC/CPT has gradually adopted a convention in which the recommended ABC is always lower than the maximum permissible ABC and is linked to tier level of the stock.
- For each assessment, CPT recommends whether the ABC buffer should be increased or reduced to account for circumstances associated with the assessment.
- The SSC then either accepts the CPT recommendation, or makes its own recommendation.



Risk Table Criteria

	Assessment-related considerations	Population dynamics considerations	Environmental/ecosystem considerations	Fishery Performance
Level 1: Normal	Typical to moderately increased uncertainty/minor unresolved issues in assessment.	Stock trends are typical for the stock; recent recruitment is within normal range.	No apparent environmental/ecosystem concerns	No apparent fishery/resource-use performance and/or behavior concerns
Level 2: Substantially increased concerns	Substantially increased assessment uncertainty/ unresolved issues.	Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical.	Some indicators showing an adverse signals relevant to the stock but the pattern is not consistent across all indicators.	Some indicators showing adverse signals but the pattern is not consistent across all indicators
Level 3: Major Concern	Major problems with the stock assessment; very poor fits to data; high level of uncertainty; strong retrospective bias.	Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns.	Multiple indicators showing consistent adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels (i.e., predators and prey of the stock)	Multiple indicators showing consistent adverse signals a) across different sectors, and/or b) different gear types
Level 4: Extreme concern	Severe problems with the stock assessment; severe retrospective bias. Assessment considered unreliable.	Stock trends are unprecedented. More rapid changes in stock abundance than have ever been seen previously, or a very long stretch of poor recruitment compared to previous patterns.	Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock. Potential for cascading effects on other ecosystem components	Extreme anomalies in multiple performance indicators that are highly likely to impact the stock

APPLICABILITY FOR BSAI CRAB STOCKS

- The risk table seems feasible to apply to BSAI crab stocks.
- Its utility would be to provide support and documentation for the recommendation to increase, reduce, or maintain the ABC buffer.
- By forcing reconsideration of buffer rationales in every new assessment, it may help address the concern that crab ABC buffers only get larger over time.
- As we enter a period of rapid environmental change in Alaska marine waters, extreme conditions and assessment surprises are likely to occur more often.
- Adjusting ABC buffers should be regarded as a tool for rapid response, rather than a strategic approach to environmental variation (see ACLIM)
- CPT recommends the development of draft risk tables in May for snow crab, and SMBKC, and, if possible, BBRKC, Tanner crab, and NSRKC.



TERMS OF REFERENCE FOR CRAB STOCK ASSESSMENT - DISCUSSION

- There is a draft SAFE guidelines for crab from 2016.
- The document was never finalized or posted to Council website.
- At this meeting: CPT developed a list of proposed changes.
- Working towards a revised document for May/June for CPT and SSC approval.
- Requesting SSC review of the SAFE guidelines.



TERMS OF REFERENCE FOR CRAB STOCK ASSESSMENT - ADDITIONS

- Table for data used in the PSC bycatch calculations (Council requested).
- Naming conventions for models/model numbering (with example).
- Revise harvest specification tables to match SSC and Council needs.
- Required model runs – specifically requiring last year’s accepted model with and without new data.
- History of ABC buffers in recent years.
- Max ABC needs to be explicit in the document – how it is calculated and the resulting value.
- Environmental considerations – in the form of an ESP, scorecard or other.



TERMS OF REFERENCE FOR CRAB STOCK ASSESSMENT-DISCUSSION

- History of fishing section included in history of management.
 - Periods of opening/closure of fishery.
 - Harvest guideline revisions.
 - Changes to fishery access.
- Section or instructions for off-year SAFE updates. Usually this is just an update of harvest specification tables.
- 5-year stock projections – from CPT recommendations in Sept. 2020.
- OFL description: male only, all crab, catch and discards, etc. should be explicitly stated in the document.
- OFL calculation: explicitly stating what selectivity is included in the calculation.



STOCK ASSESSMENT PRIORITIZATION AND FREQUENCY- CPT DISCUSSION

SAFE chapter assessment frequency	Latest SAFE Update	Next SAFE Update
1 Eastern Bering Sea snow crab -annual	Oct 2020	Oct 2021
2 Bristol Bay red king crab -annual	Oct 2020	Oct 2021
3 Eastern Bering Sea Tanner crab -annual	Oct 2020	Oct 2021
4 Pribilof Islands red king crab -biennial	Oct 2019	Oct 2021
5 Pribilof Islands blue king crab –biennial	Jun 2019	Jun 2021
6 Saint Matthew Island blue king crab -annual	Oct 2020	Oct 2021
7 Norton Sound red king crab -annual	Feb 2020	Feb 2021
8 Aleutian Islands golden king crab -annual	Jun 2020	Jun 2021
9 Pribilof Islands golden king crab -triennial	Jun 2020	Jun 2023
10 West. Aleutian Islands red king crab -triennial	Jun 2020	Jun 2023



ST. MATTHEWS BLUE KING CRAB - CPT DISCUSSION

- Currently assessed annually, with the next assessment scheduled for Oct 2021
- Stock is under a multi-year rebuilding plan. There is no targeted fishery.
- CPT proposes moving a biennial cycle, at least temporarily, with the next assessment scheduled for Oct 2022.
- Advantages: Additional survey results would be available for each assessment, reducing potential for misleading signal on stock recovery
- Advantage: Would align the assessment cycle with the requirements to report on the rebuilding progress.
- Also help to align the assessment years with the next two expected ADF&G pot surveys



PRIBILOF ISLANDS RED KING CRAB - CPT DISCUSSION

- Currently at biennial cycle, with the next assessment scheduled for Oct 2021
- Data-limited stock
- Fishery closed due to conservation concerns about PIBKC.
- Assessment uses GMACS, limited potential for further model development.
- Would not impact potential harvest or opportunities to improve understanding of the stock
- Proposed a triennial cycle with next assessment in Oct 2022.



2021 SURVEY PLANNING

- Current plan is to complete full survey grid
- Alternatives – if needed –
 - Drop St. Matthew and Pribilof corner stations (reduce 4 -5 days)
 - Fisheries are closed
 - Corner stations introduced to reduce variance
 - There are impacts to dropping these (inconsistency in survey, higher variability in catch, etc.)
- CPT recommends weighing in further in May if alternatives become more likely



ABSC FISHERY QUESTIONNAIRE

- Skipper survey; pilot survey after 2020/21 BBRKC fishery (last fall)
- GOAL: utilize industry and community data collection to help fill data gaps
- Update from industry on this effort, weigh in on questions and what maybe useful in management in the future
- Current focus on BBRKC and snow crab
- CPT appreciates this effort and overall goal of increased interaction with harvesters
- CPT suggested refining and expanding current information being collected
- Updates on this in Sept CPT meeting
- Maybe helpful to incorporate into risk table? Or TAC setting process?
- Current questions (next two slides) and in ABSC presentation to CPT





SURVEY QUESTION OVERVIEW

Questions 1-5: Skippers' Observations

Q1: Based on your observations this year, did the amount of crab encountered during the fishery suggest a change in the abundance of the stock compared to the past couple of years?

Increased? About the same? Decreased?

Q2: During this season, did you move fishing locations more frequently than the previous three years?

Yes? No?

Q3: During crab fishing, did you observe other types of fishing vessels actively fishing in the vicinity?

Yes? No?

Q4: During this fishing season, the abundance of young males/pre-recruits compared to the last three years was:

Above average? Average? Below average?

Q5: During this fishing season, the abundance of females compared to the last three years was:

Above average? Average? Below average?





SURVEY QUESTION OVERVIEW

Questions 6-10: Additional Questions

Q6: Has your vessel used the designated at-sea king crab pot gear storage area box, defined in the Alaska state code at 5 AAC 34.827, in the last 5 years?

Yes?

No?

Q7: If possible, do you think it would make sense to move the pot gear storage area to inside a corner of the Red King Crab Savings Area box where bottom trawling is prohibited?

Yes?

No?

Q8: While actively fishing, did you report pot string locations through SeaState or another means?

Yes?

No?

Q9: Did you encounter any tagged crab during this fishing season?

Yes?

No?

Q10: Do you feel there are questions that should be added or removed from this poll? Are there any additional comments or concerns not addressed in the above questions that you feel should be taken into consideration?



CRAB PSC IN GROUND FISH FISHERIES – COUNCIL ACTION

- Update from Council staff on preliminary/initial review
- CPT comments:
 - Inconsistencies across stocks in PSC inputs and calculations, largely due to when these were developed
 - BBRKC – thresholds match those in the state harvest strategy, but snow and Tanner crab were based on industry negotiations
 - Discussion on if values that PSC are based on should account for survey catchability (next slides)
 - Clarification on what data should be used to set PSC levels needed (where does this fit in?)
 - Industry comment on “unobserved mortality”



PSC PRESENTATION TO THE CPT (SLIDE 5)

- The Council also requested that the analysis include source numbers for the crab abundance estimates used to calculate the PSC limits and clearly state whether they are from raw numbers from the NMFS bottom trawl survey or from stock assessment model estimates.

	Abundance estimate	Effective spawning biomass
BBRKC	Modeled survey estimates of mature female abundance using data from NMFS bottom trawl survey	From stock assessment (mature males and females)
EBS Snow	Modeled estimates of total abundance (accounting for survey selectivity) using data from NMFS bottom trawl survey	N/A
EBS Tanner	Modeled estimates of total abundance (accounting for survey selectivity) using data from NMFS bottom trawl survey	N/A



PSC CONT.

- “Modeled estimate of total abundance”
 - Should these include survey catchability (Q)?
 - More relevant for snow and tanner, where Q is generally small
 - Appears that intent was to account for catchability?
 - If so, current threshold calculations need to be revisited.
- SSC feedback on:
 - Clarification on inclusion of Q
 - How to incorporate selectivity and catchability since they change with each assessment
 - How to define PSC calculations? (% of mature abundance?)



RESEARCH PRIORITIES – TOP 5

147	Life history research on data poor and non-recovering crab stocks	Certain crab stocks have declined and failed to recover as anticipated (e.g., Pribilof Island blue king crab, Adak red king crab). Research into all life history components, including predation by groundfish on juvenile crab in nearshore areas, is needed to identify population bottlenecks, an aspect that is critically needed to develop and implement rebuilding plans.
148	Spatial distribution, habitat requirements, and movement of crabs relative to life history events and fishing	There is a need to characterize the spatial distribution and movement of crab stocks. For example, information is needed to understand the distribution of male/female snow crab at time of mating, a better understanding of spatial stock dynamics and population connectivity for Tanner Crab east and west of 166, and to understand the distribution and movement of golden king crab in the Aleutian Islands in areas historically fished and not fished. There is a need to characterize the spatial distribution of male snow crab at time of mating relative to reproductive output of females in the middle domain of the EBS shelf. Additionally there is a need to investigate spatial stock dynamics and population connectivity for Tanner Crab (2 stocks).
225	Develop projection models to evaluate management strategies under varying climate, ecological, and economic conditions and evaluate impacts to managed resources and coastal communities.	There is a need to develop projection models that evaluate the robustness and resilience of different management strategies under varying climate, ecological, and economic conditions. Projection models should forecast seasonal and climate related shifts in the spatial distribution and abundance of commercial fish and shellfish, and impacts to communities.
592	Maturity estimates for Bering Sea and Aleutian Island crab stocks	Application of Tier 3 control rules for crab requires reliable estimates of maturity to determine mature biomass. Maturity estimates of BSAI crab stocks are, in many cases, based on old studies using outdated methods. New studies to estimate both male and female maturity curves are needed for several stocks, with Aleutian Islands golden king crab considered a priority.
715	Physiological responses of crab to climate stressors	Investigate how observed environmental changes (temperature, OA, etc.) affect crab physiological condition & survival of multiple life stages and reproductive output. Consider interactions among multiple stressors

