

# BSAI Crab Management

## AIGKC specs and Crab Plan Team Report

Agenda Item C-3  
June 2018 Council

# BSAI Crab Plan Team:

*Bob Foy (NOAA Fisheries /AFSC-Kodiak), Chair*

*Ben Daly (ADF&G-Kodiak), Vice-Chair*

*Ginny Eckert (UAF/UAS)*

*Diana Stram (NPFMC)*

*Miranda Westphal (ADF&G-Dutch Harbor)*

*Shareef Siddeek (ADF&G-Juneau)*

*Martin Dorn (NOAA Fisheries/AFSC-Seattle)*

*André Punt (Univ. Of Washington)*

*Bill Bechtol (UAF)*

*Brian Garber-Yonts (NOAA Fisheries/AFSC-Seattle)*

*Buck Stockhausen (NOAA Fisheries/AFSC-Seattle)*

*Katie Palof (ADF&G-Juneau)*

*Krista Milani (NOAA Fisheries/AKRO-Juneau)*



# May 2018 Crab Plan Team Report

## Administration

- ▶ Membership: Jack Turnock (NMFS) retired, CPT will seek nominations for this and other vacancies
- ▶ General Recommendation: A standard set of plots should be prepared to summarize the B0 calculations for each model-based crab assessment

# May 2016 Crab Plan Team Report

- ▶ Recommend final OFL/ABC for AIGKC
- ▶ Crab aging study
- ▶ **Generalized Modeling for Alaskan Crab Stocks (GMACS)** for BBRKC
- ▶ Norton Sound RKC discussion
- ▶ Tanner, snow, BBRKC model updates
- ▶ Research Priorities
- ▶ Crab Economic SAFE
- ▶ Other updates (Tanner MSE, BSFRF, NPRB growth project, crab observer data)

# BSAI Crab Stocks Management Timing

June 2018

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

Assessed in  
May/June

Now on triennial  
cycle, next assessment  
in 2020

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

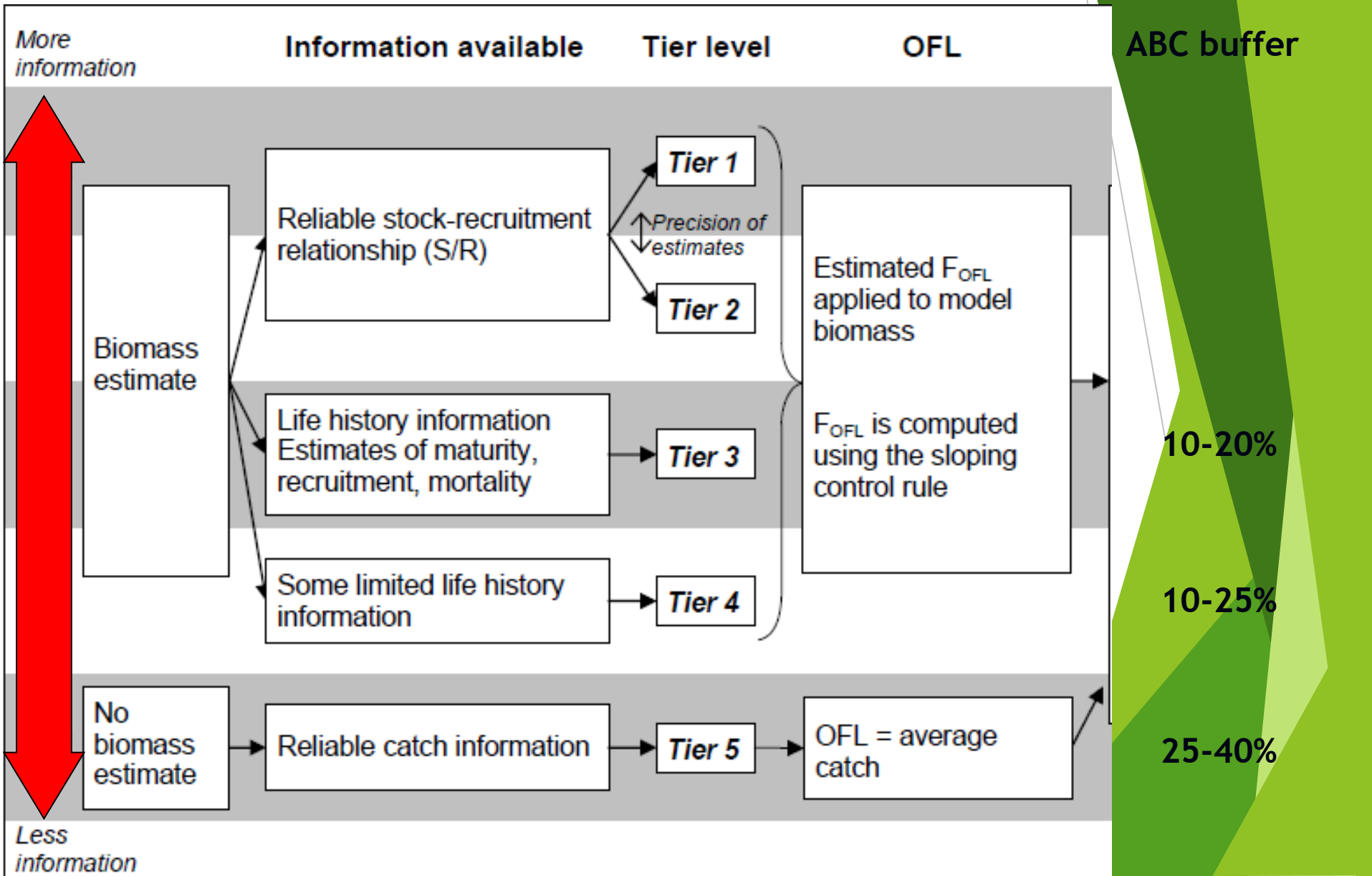
Assessed in  
September/October

Norton Sound red king crab

Assessed in  
January/February

# BSAI Crab Stocks Management

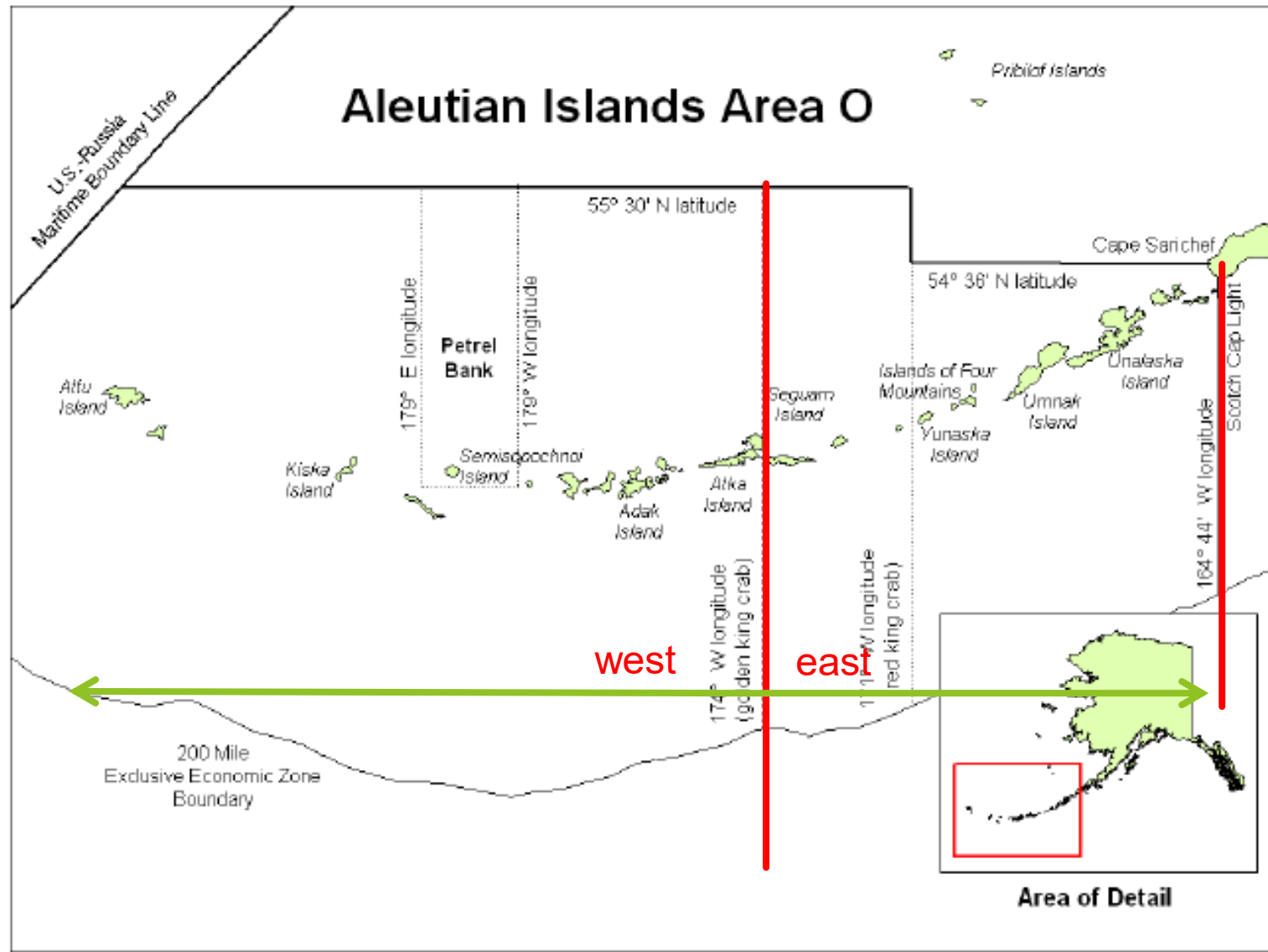
June 2018



# <sup>C3</sup> Aleutian Islands Golden King Crab Final Stock Assessment

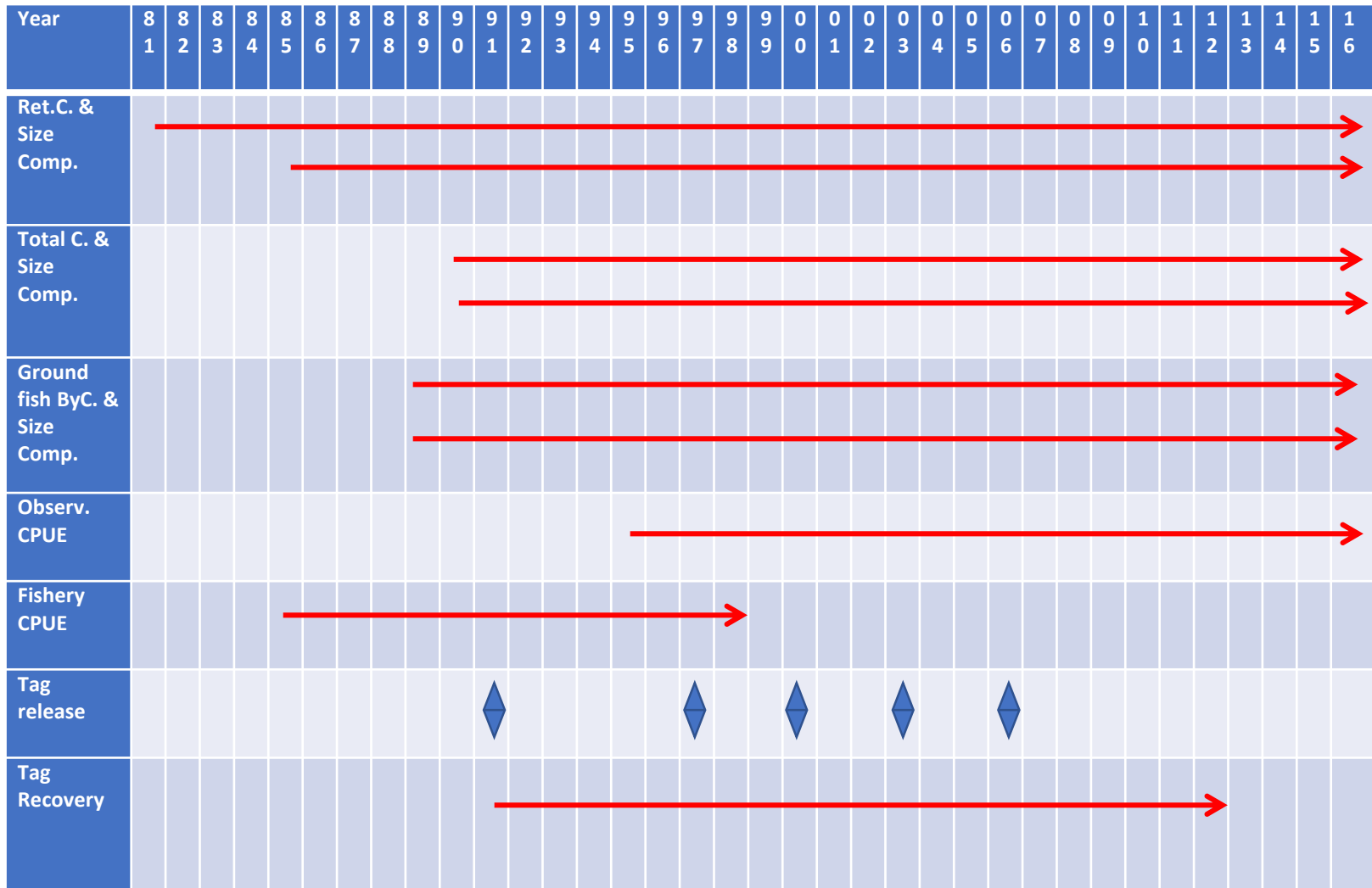


M.S.M. Siddeek et al  
Alaska Department of Fish and Game





# Data



# CPT Discussion

## Timing mismatch of assessment and TAC setting

- ▶ Fishery ends in May, OFL/ABC set in May
- ▶ Most recent fishery data not included in OFL/ABC setting
  - ▶ 2017/18 data not included in this assessment
- ▶ However, model simulations CAN be completed after the OFL/ABC are approved by the CPT/SSC (but before TAC setting) with the most recent fishery data

## How to improve timeliness of scientific advice

- ▶ Use best estimate of most recent total catch for assessment
  - ▶ Current total harvest
  - ▶ Apply last year's size compositions as approximations

# CPT Discussion

## Length at maturity breakpoint analysis

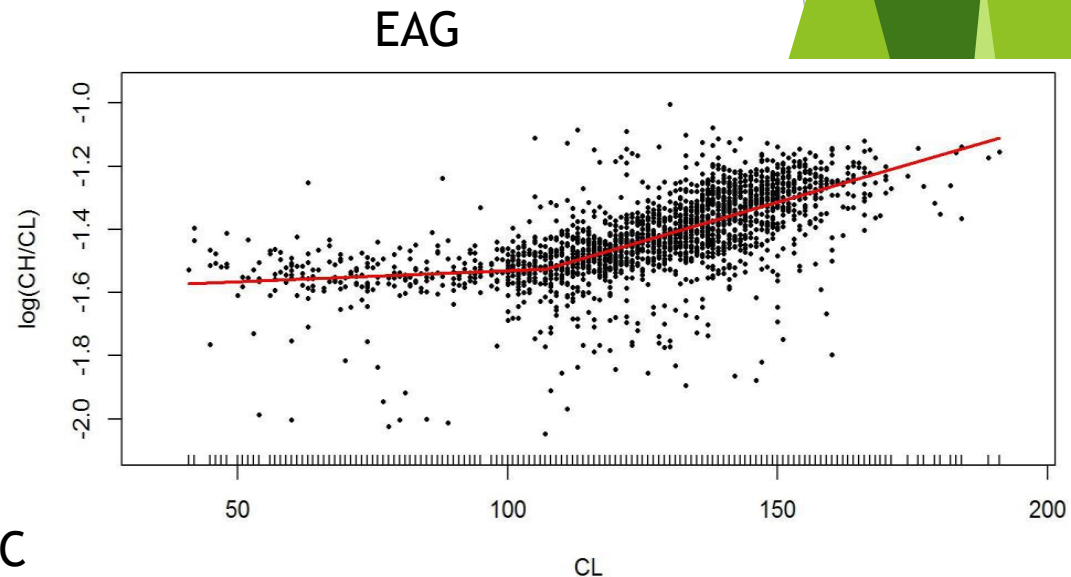
- ▶ Revised:  $\log(\text{chela-height}/\text{carapace-length})$  vs. carapace-length
- ▶ Estimate of breakpoint did not change: 111 mm CL was used as knife-edge breakpoint for maturity

Some concerns about over-estimating mature biomass

Additional chela measurement data will be collected by ADF&G observers in upcoming AIGKC fishery

New techniques being developed by AFSC Kodiak lab for snow and Tanner

- should be explored for AIGKC

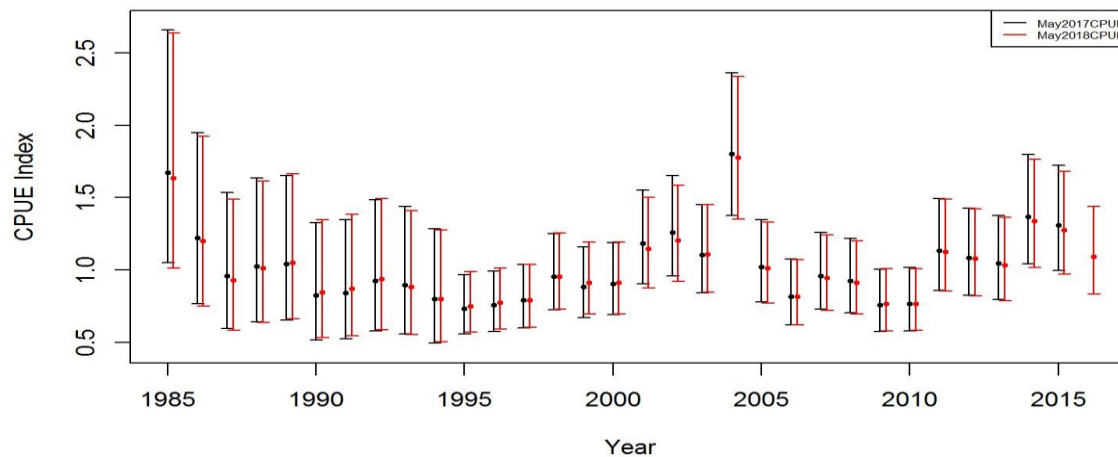


# Model scenarios

Model 17\_0: Base model from last year updated with new data

- ▶ Compared area definitions for CPUE analysis:
  - ▶ ADF&G statistical areas (40-50 areas total)
  - ▶ Groups of ADF&G statistical areas (10 areas total)

## EAG



\*Effect negligible

# CPT model recommendations

- ▶ Authors recommended three model scenarios: **17\_0** (base), **17\_0d** (3 catchability and total selectivity periods), **17\_0e** (McAllister and Ianelli reweighting)
- ▶ CPT recommended **17\_0 (base)** for OFL/ABC
- ▶ **OFL = 5,514 t (12.12 mill lb)**
- ▶ **ABC = 25% buffer = 4,136 t (9.12 mill lb)**
  - ▶ Largely relies on fisheries data: Observer and fisheries CPUE
  - ▶ Natural mortality estimated in model
  - ▶ Is time period for average recruits (1987-2012) as “a time period determined to be representative of the production potential of the stock.”?
  - ▶ Bycatch data not available for 1981/82-1989/90
  - ▶ Additional uncertainties

## Stock Status

- ▶ 2016/17 total catch = 2.83 thousand t
- ▶ 2016/17 OFL = 5.69 thousand t
- ▶ Overfishing did not occur; 2017/18 data not available
  
- ▶ 2017/18 MSST = 6.044 thousand t
- ▶ 2017/18 MMB = 14.205 thousand t
- ▶ Stock is not overfished
  
- ▶ 2018/19 MSST = 6.046 thousand t
- ▶ 2018/19 MMB = 17.952 thousand t
- ▶ Stock not approaching overfished status

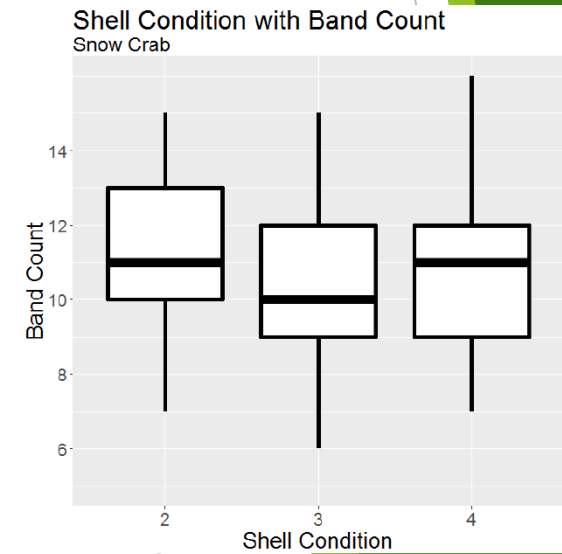
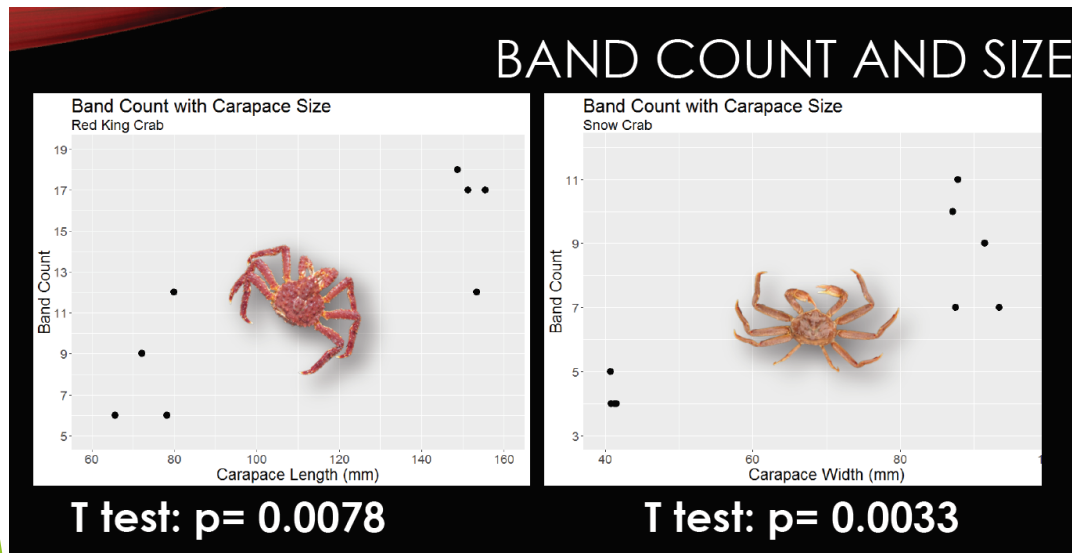
# May 2018 CPT Recommendations

- ▶ OFL and ABC recommendations for the coming fishing year should include total catch for the concluded fishing year
- ▶ Reanalyze chela measurement data for AIGKC using new analytical techniques developed for snow crab and Tanner crab
- ▶ Work on appropriate statistical models for analysis of ADF&G cooperative pot survey that reflect the nested sampling design of vessels, strings within vessel, and pots within strings and consider the use of random effects
- ▶ Continue work on the VAST spatial modeling approach
- ▶ Continue exploration of year-area interactions using appropriate analytical methods, and develop area weights using fishing footprint calculations

# Crab Aging Study: April Rebert, UAF

June 2018

- ▶ Evaluated age structures of RKC and snow crab in Alaska: eye stalks, stomach parts (zygocardiac, mesocardiac)
- ▶ Zygocardiac most readable, but only 25% in RKC and 35% in snow crab
- ▶ Relationship between band counts and size lengths, but not shell condition



- \*More work is needed to validate that bands are connected to molting or growth
- \*Crab aging techniques at least several years away



# C3 GMACS Update: Dr. Andre Punt, UW June 2018

Overview: Previously major discrepancies between Dr. Jie Zheng's BBRKC model and results in GMACS

Goal: results from the two models should be closer

Plan for September CPT meeting: reproduce BBRKC model results when using the same data inputs

Long-term plan: to be discussed at the September CPT meeting

- ▶ Likely fall to NOAA and ADF&G to determine the future direction of the BBRKC assessment in GMACS

# <sup>C3</sup> Norton Sound RKC

June 2018

## Commercial and subsistence fisheries overview (Justin Leon, ADF&G Nome)

- ▶ Subsistence: open year round, no sex/size restrictions
- ▶ Commercial (winter): through ice, Jan-April, CDQ + open access harvesters, 20 pot limit (high pot loss), biological data from processors, voluntary observer program since 2012
- ▶ Commercial (summer): June-Sept, 40 pot limit, most vessels 20-40 ft, voluntary observer program since 2012 (sample 1-2% harvested crab)

## Overview of biology and available data (Jenn Bell, ADF&G Nome)

- ▶ Move from Tier 4 to Tier 3?
  - ▶ CPT: concerns about data (ADF&G triennial survey, consistent survey area, small number of observed harvesters, skip molting, info on sublegals)
  - ▶ Size at maturity (>70 mm?): arbitrary without supporting data, but core to assessment and Tier 3 designation

**\*CPT discussed desire to reduce Tier status, but emphasized the importance of data quality**

# Model scenarios for Fall 2018 assessments

- ▶ CPT and SSC made recommendations for model scenarios to be included in the Fall 2018 assessments for the following stocks:
  - ▶ Bristol Bay red king crab
  - ▶ snow crab
  - ▶ Tanner crab

# Research Priorities

## Reviewed all current Council research priorities

- ▶ Recommended some status changes
- ▶ Recommended revisions to existing titles
- ▶ Social and economic research priorities important, but do not directly relate to CPT stock assessment discussions
  - ▶ Recommended Social Science Planning Team be tasked with ranking

## Identified new research priority

- ▶ “Understanding benthic production expectations with climate change”

## Prioritized a “Top 5” (urgent/important category)



Research ID	Title	CPT Priority	Priority Rank
148	Spatial distribution and movement of crabs relative to environmental variability, life history events, and fishing	Urgent	1
232	Develop management strategy evaluations that incorporate changing climate and economic conditions and impacts to coastal communities	Urgent	2
196	Genetics, population dynamics, and management implications of hybridization between Tanner and snow crab in the Bering Sea	Important	3
592	Maturity estimates for Bering Sea and Aleutian Island crab stocks	Urgent	3
174	Develop spatially-explicit stock assessment models	Important	4

# Research Priorities: Top 5 discussion

June 2018

## 148: Spatial distribution and movement of crabs relative to environmental variability, life history events, and fishing

- ▶ *Critical for the development of the complex models needed to predict future stock abundance, stock boundaries, stock production, and management strategies.*

## 232: Develop management strategy evaluations that incorporate changing climate and economic conditions and impacts to coastal communities

- ▶ *Lead to better-informed harvest strategies.*

## 196: Genetics, population dynamics, and management implications of hybridization between Tanner and snow crab in the Bering Sea

- ▶ *Hybrids: unknown portion of population, identification difficulties, presence of back-crosses, complicates OFL and TAC setting.*

## 592: Maturity estimates for Bering Sea and Aleutian Island crab stocks

- ▶ *Needed to better characterize mature biomass (key parameters uncertain for many stocks)*

## 174: Develop spatially-explicit stock assessment models

- ▶ *Not currently used in stock assessments, but life history parameters likely vary spatially. Could account for spatial trends in catch data and stock boundaries.*

# <sup>C3</sup> Economic SAFE (Dr. Brian Garber-Yonts, NOAA) June 2018

## Upcoming SAFE

- ▶ New analysis of vessel operating costs
- ▶ Analysis of vessel ownership entities and IFQ ownership entities
  - ▶ Resolve unknown extent of quota leasing (leaseholders vs quota owners)
- ▶ Economic report card: social and economic component for each stock

## 2016 economic status and performance indicators

- ▶ Ex-vessel landings 30% decrease in 2016
- ▶ Ex-vessel revenue decreased 3.6% and first wholesale revenue decreased 3.9% over all BSAI crab stocks
- ▶ Decline mitigated by increase in ex-vessel and wholesale prices
- ▶ 2016: overall crew positions decreased 10%, processing hours decreased 33%
- ▶ BBRKC: crew daily wages increased (lower TACs), vessel income averaged 500K in 2016
- ▶ Overall, most fishery profit going to quota share sector

# Economic SAFE (Dr. Brian Garber-Yonts, NOAA)

## Future Economic SAFEs

- ▶ Include report card matrices
- ▶ Add demographic and ownership details
- ▶ More detail on processing sector income



# C3 Other Crab Plan Team Updates

## Tanner crab MSE (Maddison Shipley, UW)

- ▶ Masters project, collaborating with ADF&G
- ▶ Could inform ADF&G harvest strategy revision

## BSFRF (Scott Goodman)

- ▶ 2018 survey plans: Tanner crab selectivity + recruitment patterns
- ▶ CPT requested Tanner crab workshop report

## NPRB growth project (Dr. Punt + student Lee Cronin-Fine, UW)

- ▶ Improving mathematical form of size-transition matrices
- ▶ Implemented in GMACS

## Crab observer data (Ben Daly, ADF&G Kodiak)

- ▶ ADF&G no longer collecting legal retention status information
  - ▶ subjectively determined by observer
- ▶ Implications for assessments discussed