

# BSAI Crab Management

## NSRKC specs and Crab Plan Team Report

Agenda Item C-1  
February 2019

# BSAI Crab Plan Team:

Katie Palof (ADF&G-Juneau), Co-Chair

*Martin Dorn (NOAA Fisheries/AFSC-Seattle), Co-Chair*

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

Diana Stram (NPFMC), Outgoing Coordinator

Jim Armstrong (NPFMC), Incoming Coordinator

*Bill Bechtol (UAF)*

*Ginny Eckert (UAF/UAS)*

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

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

André Punt (Univ. Of Washington)

Shareef Siddeek (ADF&G-Juneau)

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

*Cody Szuwalski (NOAA Fisheries/AFSC-Seattle)*

Miranda Westphal (ADF&G-Dutch Harbor)

*Vacant (ADF&G)*

*Vacant (AFSC Kodiak)*





ANCHORAGE 1049  
END OF IDITAROD SLED DOG RACE  
MILES

VALNIE'S PORCH

NO DOGS

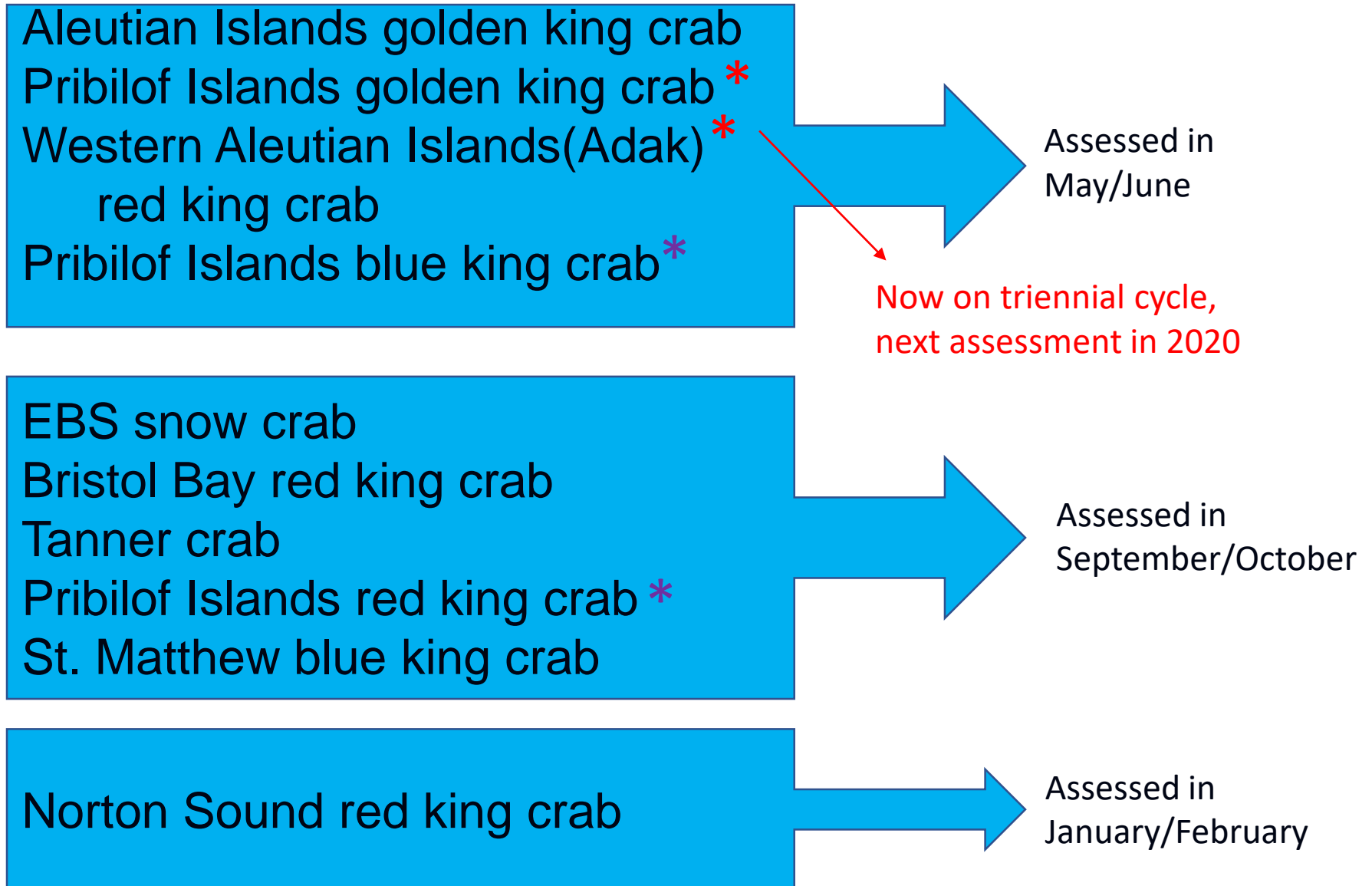
# January 2019 Crab Plan Team Report

- No NMFS/NOAA staff (~half of CPT)
  - Constrained agenda
  - Issues moved to May:
    - Snow crab PSC limit
    - VAST - SMBKC and other
    - SMBKC rebuilding
    - Tanner crab
    - Economic SAFE
- Membership:
  - Bob Foy
  - Martin Dorn and Katie Palof provisional Co-chairs
  - Ben Daly (ADF&G) Chair at Jan CPT meeting
  - 2 vacancies (NMFS & ADF&G)

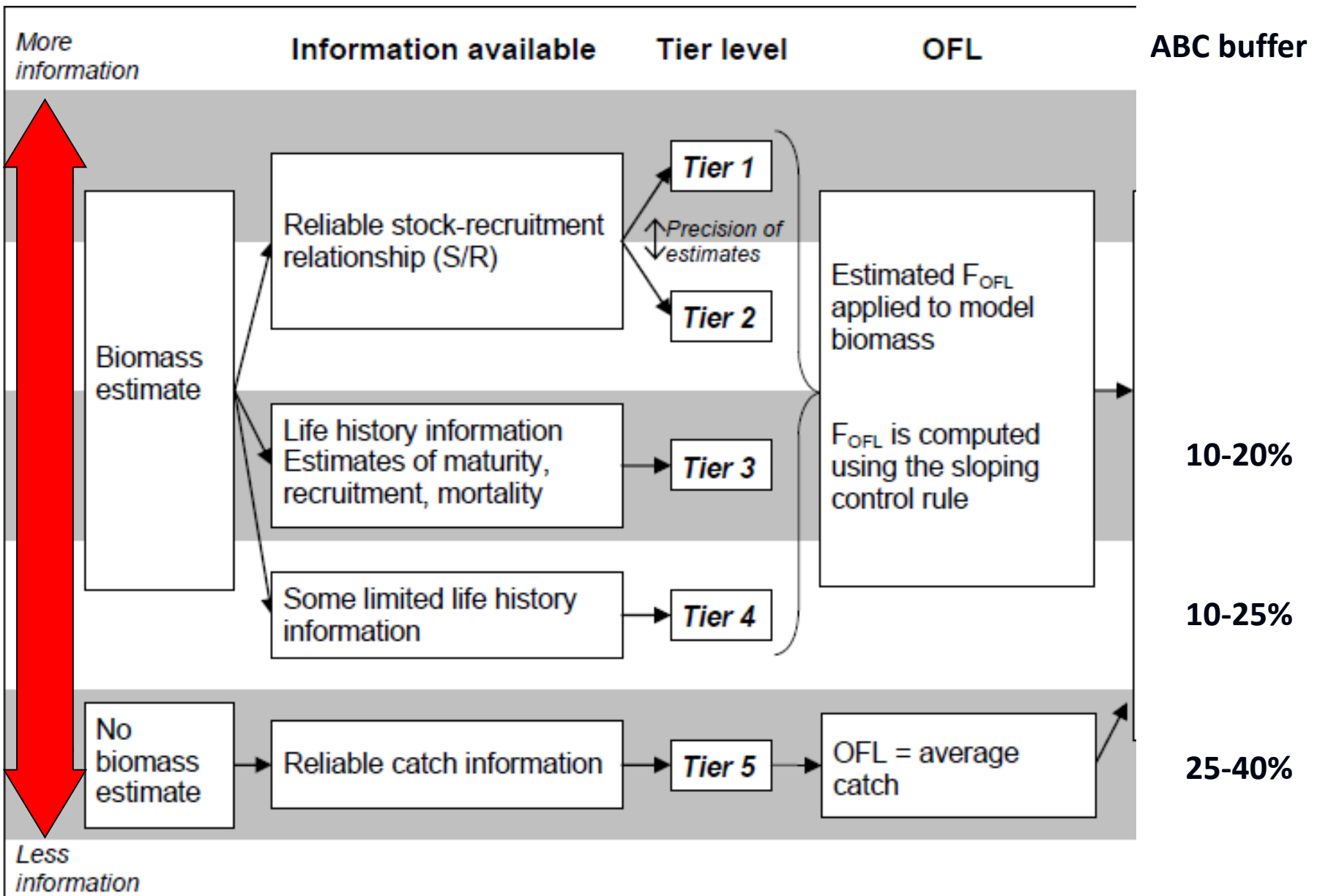
# January 2019 Crab Plan Team Report

- NSRKC – final OFL/ABC
  - fishery & Research
- GMACS – update
- SMBKC – rebuilding plan
- AIGKC – model update
- Tanner – MSE
- Other – NSEDC
  - NSSP plant tour,
  - Winter NSRKC thru-the-ice fishery

# BSAI Crab Stocks Management Timing



# BSAI Crab Stocks Management



# Norton Sound red king crab

- Northern most red king crab fishery
- Entire life-history in  $< 40\text{m}$  depth
- Many life-history details unknown (“borrowed” BBRKC)
- Commercial fishery since 1977
  - Winter commercial and subsistence (nearshore through ice)
  - Summer commercial (offshore)



# NSRKC fisheries and data overview

(Justin Leon, ADF&G Nome)

## Data sources:

- ADF&G trawl: ~ triennial, abundance / lengths
- ADF&G pot: 1981-2012 (most years), lengths
- Commercial (summer): June-Sept
  - 40 pot limit, most vessels 20-40 ft
  - Retained catch, CPUE, length comp data 1977-1990 + 1992-2018
  - Total catch data 2012-2018 (voluntary observer program started in 2012)
  - Discard data 1987-1990, 1992, 1994, 2012-2018
- Commercial (winter): Jan-April
  - Retained catch: 1978-2018
  - Retained lengths: 2015-2018
- Subsistence (year round)
  - 10 yr ave: 99 winter permits, 17 summer permits
  - Total and retained catch data 1976-2018
- Tagging
  - 1980-2018: biological data + recovery location
- Observer
  - summer (2012-2018), winter (2016-2018)

# NSRKC fisheries and data overview

(Justin Leon, ADF&G Nome)

## Knowledge gaps:

- Natural mortality
- Stock-Recruitment relationship
- Female info
- Rearing grounds
- Stock structure inside closure line
- Tag recovery information
- Observer coverage (i.e., temporally and spatially proportional to harvest)

# NSRKC biology overview

(Jenn Bell, ADF&G Nome)

## Trawl survey spatial coverage

- Core area: 60 stations
- CPT recommendations on untrawled stations
  - Environmental covariates (temperature, bathymetry) to define strata
  - VAST

## Male size at maturity

- Physiological mature assumed at 50 mm CL
- Borrowing from RKC studies around Kodiak
  - 91 mm CL
    - Based on ratio of male : female size at maturity
- Some NSRKC chela data, but more needed
  - especially at smaller size classes (50-100 mm CL)

# NSRKC biology overview

(Jenn Bell, ADF&G Nome)

## Where are the large males?

- Not in survey or fishery
- Model estimates high M for large size classes
- Alternative theories:
  - nearshore in summer (i.e., not in survey),
  - migrate out of fishing grounds

## Observer program data collection

- Concerns
  - coverage (~1% of total pots)
  - small boats limit ability to host observers
- Idea: “Observer logbook”: fisherman self-record data
- Retention rates
  - rings vs mesh

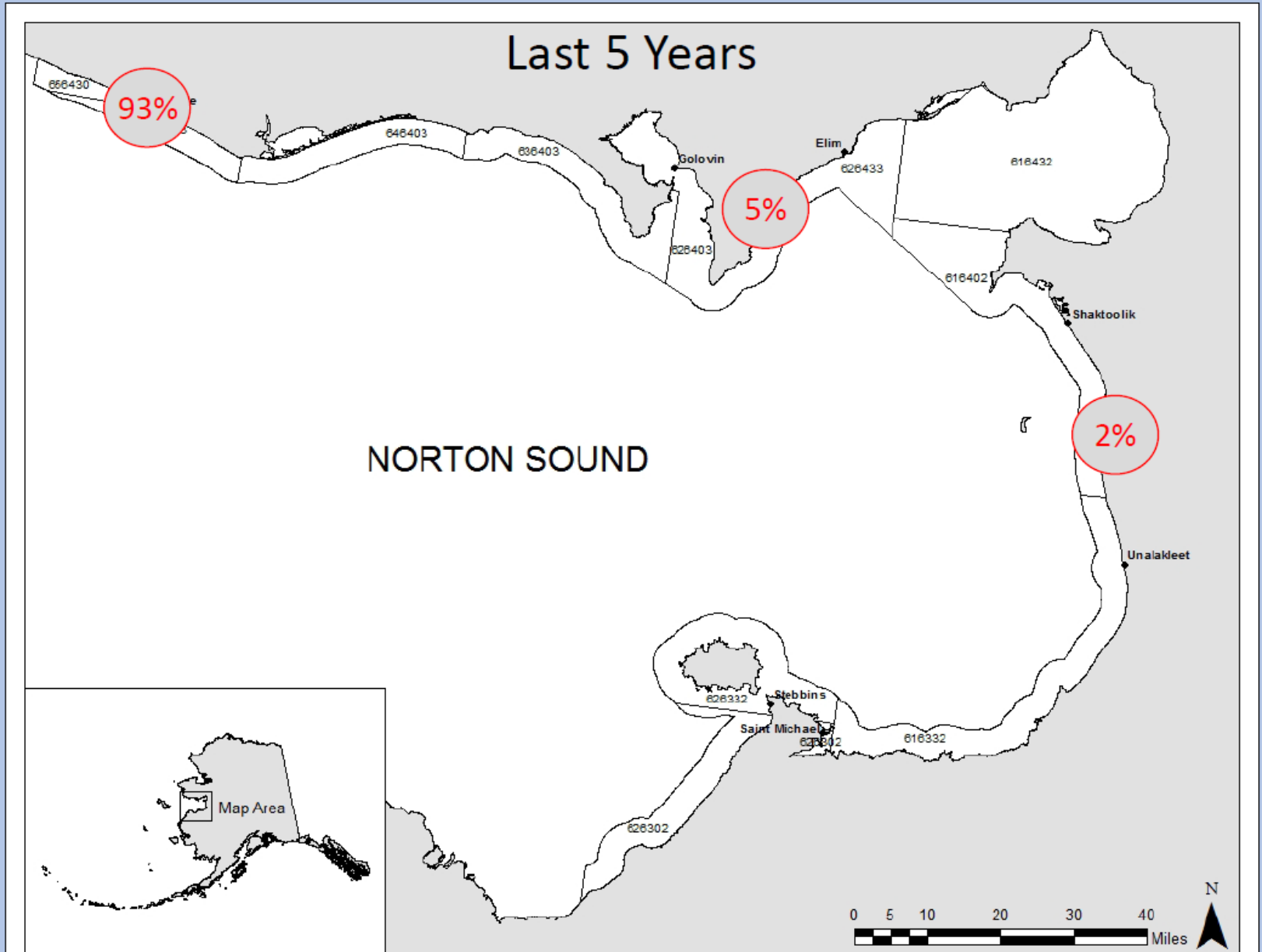
# Norton Sound Red King Crab Final Stock Assessment



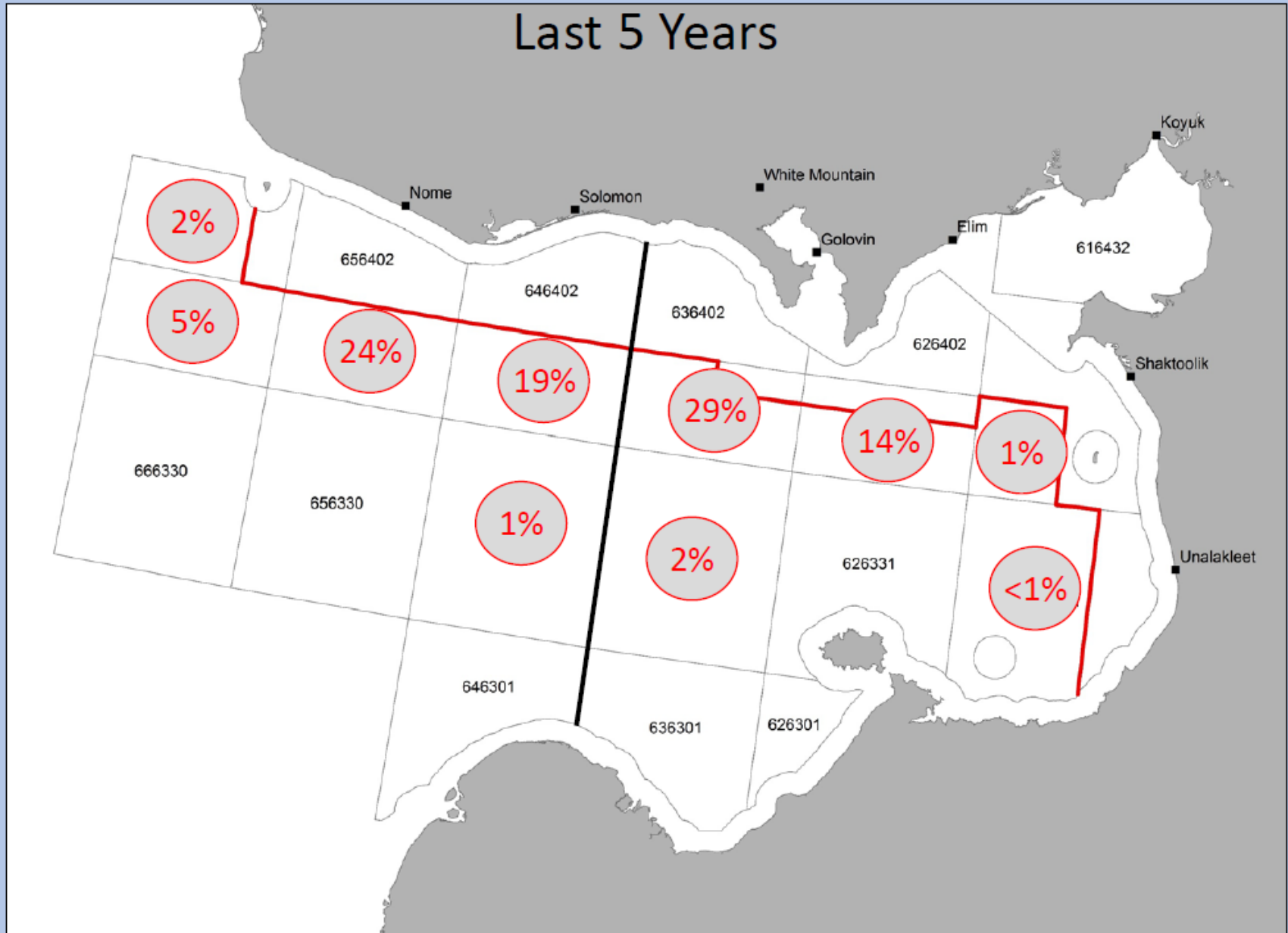
Toshihide “Hamachan” Hamazaki and Jie Zheng  
Alaska Department of Fish and Game

Photo courtesy of Jen Bell (ADF&G)

# WINTER COMMERCIAL FISHERY OVERVIEW



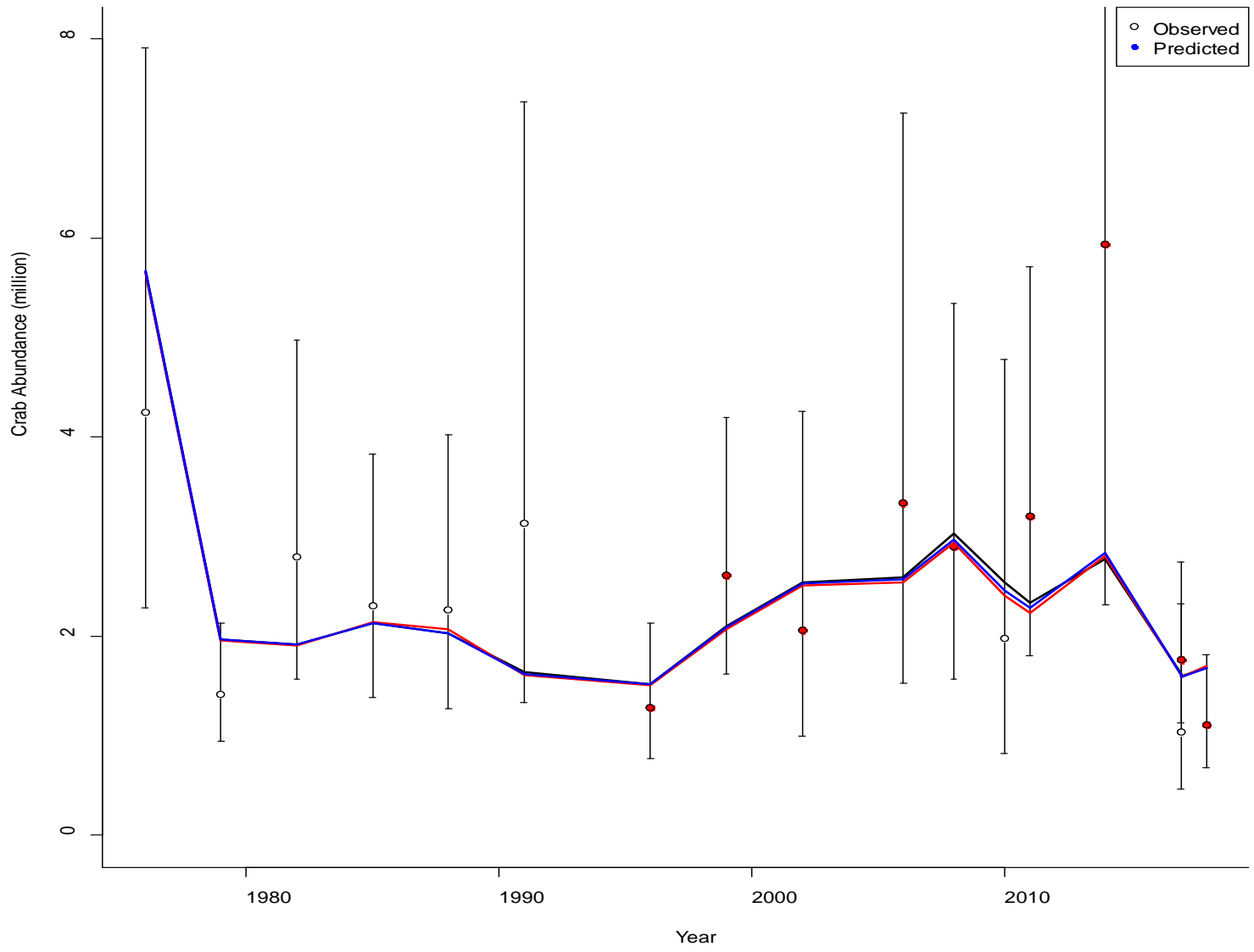
# SUMMER COMMERCIAL FISHERY OVERVIEW



# Norton Sound red king crab

White circles: NMFS survey  
Red circles: ADF&G survey  
Lines: models

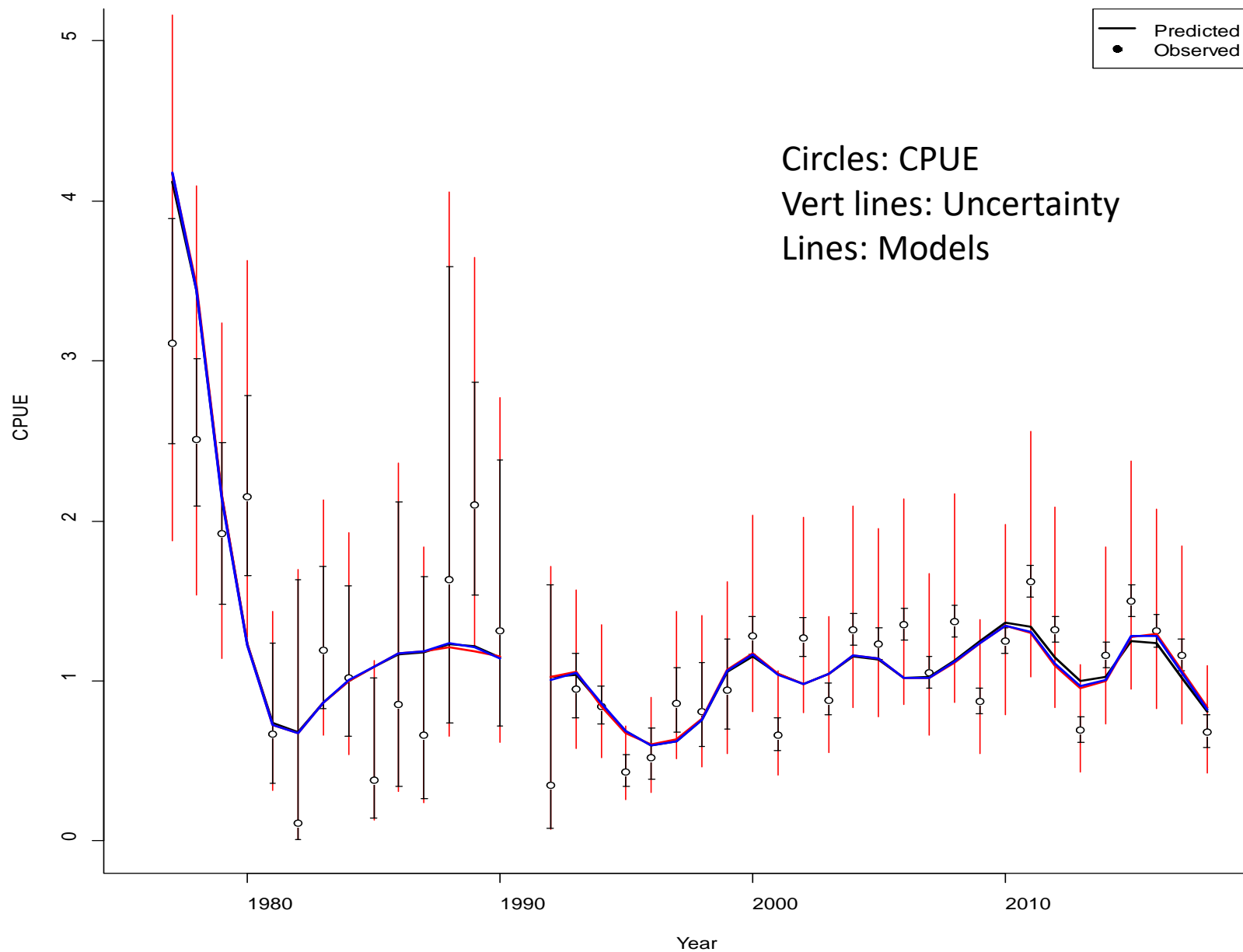
Trawl survey crab abundance



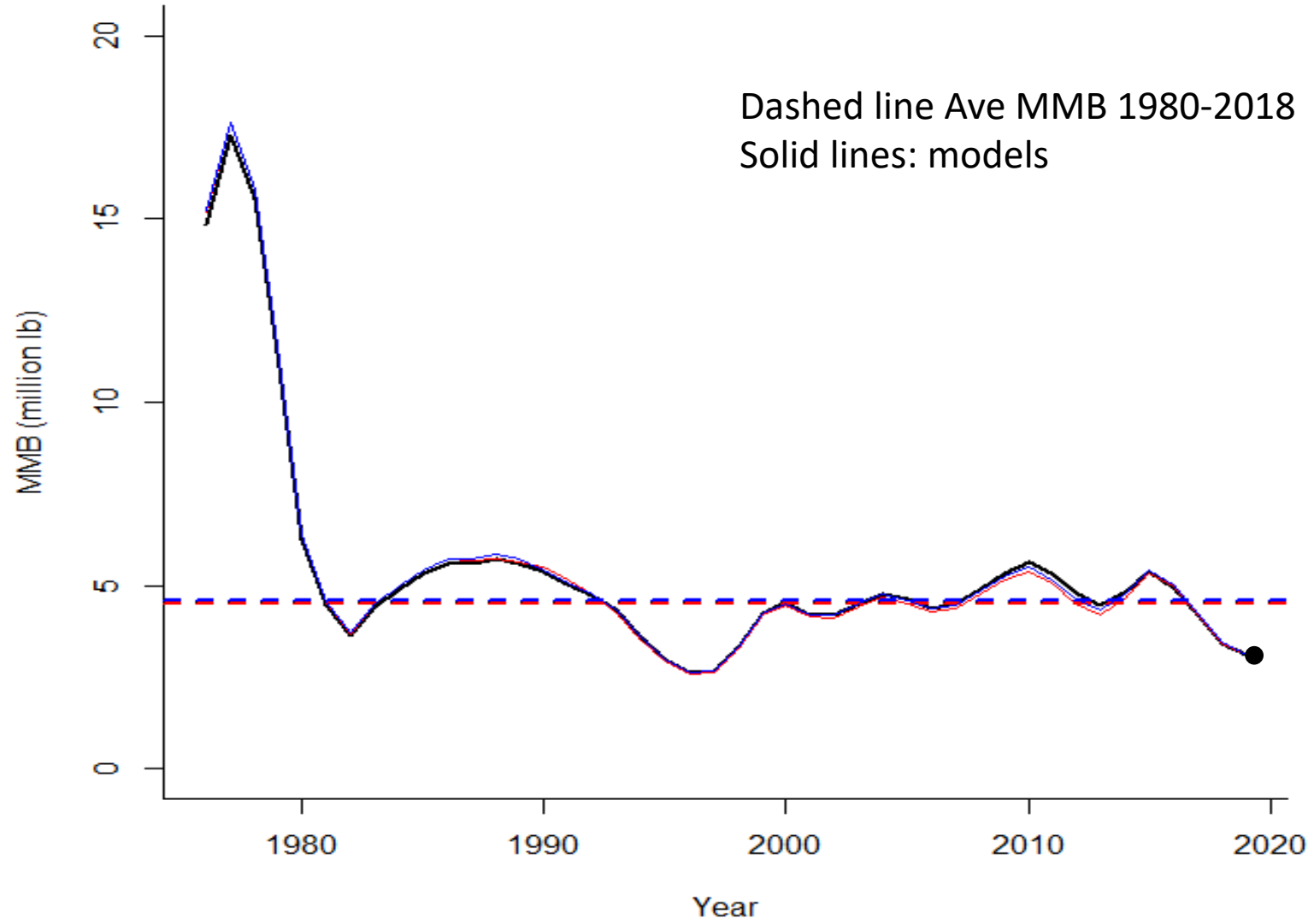


# Norton Sound red king crab

## Summer commercial standardized cpue



**MMB Feb 01**



# Assessment Model Assumptions

	Immature	Mature	Legal
1	64-73		
2	74-83		
3	84-93		
4		94-103	
5			104-113
6			114-123
7			124-133
8			≥ 134

- $M = 0.18$  for LC 1-6, higher mortality of classes 7 and 8
- Same selectivity and catchability for New and Old Shells
- Discard mortality = 0.2
- Fishery harvests occur instantly:
  - Winter fishery: Feb 01: Nov – May
  - Summer fisher: July 01: Jun – Sept
- Winter catch selectivity = winter pot survey selectivity

## Catch selectivity:

- Base model
  - Retained catch - fixed
  - Total catch - estimated
- 8 model scenarios
  - Estimate for total catch and retention
- Discard data
  - 1987-1994 data
- Two periods
  - pre and post super exclusive (1994)

# CPT model recommendations

- **Authors recommend model: 18.2b**
  - (estimates retention selectivity for winter and summer fisheries including 2012-2018 total catch length comp data, 1987-1994 discard length comp data, and 2015-2018 winter commercial retained length-shell comp data)
- **CPT concurred**
- **OFL = 110 t**
  - Retained catch OFL
- **ABC = 20% buffer = 90 t**
  - Consistent with
    - CPT recommendation January 2015
    - Other Tier 4 stocks (SMBKC)
    - High survey CV
    - Survey frequency (triennial)

## Stock Status

- 2018 total catch = 150 t
- 2018 OFL = 200 t
- **Overfishing did not occur**
  
- 2018 MSST = 1.09 thousand t
- 2018 MMB = 1.85 thousand t
- **Stock is not overfished**
  
- 2019 MSST = 1.03 thousand t
- 2019 MMB = 1.41 thousand t
- **Stock not approaching overfished status**

## CPT recommendations

- ADF&G trawl survey biomass estimates
  - VAST
- Sensitivity analysis on mark-recapture data
- Survey Q for NOAA and ADF&G trawl surveys.
- Chela-carapace length data
- CIE recommendations (e.g., jittering).

## CPT Discussion: Tier 4 vs Tier 3

- Uncertainties:
  - High  $M$  at 2 largest size bins:
    - emigration vs mortality
  - Lack of male maturity data
- Tier 3 OFL = 1.86 MIb
  - 7.75 x Tier 4 OFL of 0.24 MIb
    - Large  $M$  for large crabs
- Length dependent OFL
  - Did not discuss
- Full CPT not present discuss broadly
- **Not appropriate to elevate to Tier 3 at this time**



# GMACS Update: Dr. Andre Punt, UW

## Current status:

- Used for last two SMBKC assessments
- Being considered for application to data for the BBRKC OFL/ABC setting in Sept 2019
- Much of the coding done and tested
- Needs extension to allow for terminal molt (needed for snow + Tanner)
- Can use instantaneous or continuous F (this was improved from previous versions)

# GMACS Update: Dr. Andre Punt, UW

## Updates since fall 2018

- Instantaneous mortality corrected
- Additional selectivity options
- Retention and growth (all selected in the CTL file)
- Data only in DAT file, all specification via CTL file
- OFLs can be computed using crab harvest control rules
- Projections undertaken and all base models converge with low final maximum gradients and there is no evidence for differentiability issues

# GMACS Update: Dr. Andre Punt, UW

## High priority next steps:

- MCMC sampler output
- Final check for entire program
- Calculation of reference points (Tier 3 and 4; F35%)
- Calculation of OFLs
- Creating a forecast file

## Medium priority next steps:

- Labels (e.g. MALES instead of 1)
- Sex- and length-class-specific basal M
- Fished and unfished initial size-structure option
- Graphical summaries
- Testing Pribilof Island red king crab
- Updating SMBKC and BBRKC assessments
- Technical appendix for model specifications

# GMACS Update: Dr. Andre Punt, UW

## Other recommendations:

- Implementing the AIGKC and NSRKC assessments in GMACS
- Implementing terminal molt in the snow and Tanner crab assessments

## For May 2019 CPT meeting:

- Bridging analysis for BBRKC to make sure no issues arise in the results
- Assuming there are no problems, the BBRKC assessment will be conducted in GMACS for CPT evaluation at the September 2019 CPT meeting
- The next stock assessment to be conducted in GMACS is Pribilof Islands red king crab

# AIGKC (M.S.M. Siddeek et al., ADF&G)

## Issues for 2019/2020 (and beyond) assessments

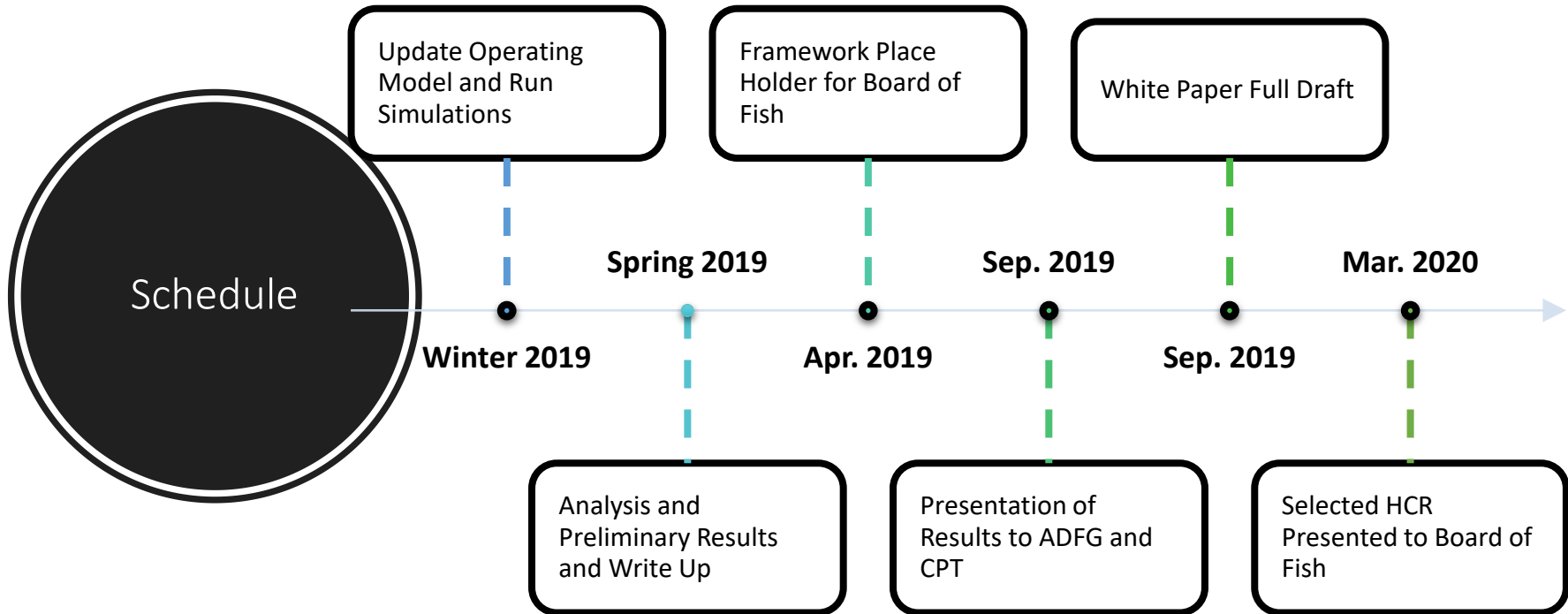
- Timing of data for OFL/ABC setting
- Chela data re-analyses for estimating size at maturity
- Industry cooperative survey data
- Area\*Year interactions in CPUE standardization
- Spatial modeling via VAST
- Retrospective analyses
- Jittering

# **Tanner crab MSE**

(Maddison Shipley, UW)

- Developing MSE for masters thesis
- Evaluate 7 state harvest policies: MMB, MFB, LMB considered
- Discussed simulation structure for projections
- Performance metrics: conservation, economic
- Finalizing harvest policy scenarios and performance metrics for spring simulations

# Tanner MSE timeline



When would the SSC like to see a presentation on the MSE?

# Norton Sound Economic Development Corporation's (NSEDC) office visit

Presentation/discussion regarding on NSEDC interests and activities by several of their staff:

- Tyler Rhodes, Wes Jones, John Baker, Ashley Dunker, Dawn Wehde and Renae Ivanoff
- Adam Bockman, Simon Kinneen
- Salmon, halibut, and red king crab fisheries.
- Chum and coho salmon hatchery program, releases in Snake River
- Community support
  - employment, access to fishery resources, fuel needs, small business support, education and other social benefits, financial assistance.
- Winter commercial red king crab fishery in Norton Sound
  - live market to Korea, harvested through sea ice:
    - air temperature, wind, and ice melt must be properly dealt with to maintain a high product quality.

St Lawrence blue king crab (not included in the Federal FMP).



# Norton Sound Seafood Products plant tour

- Staff (Josh Osborne) gave overview of plant activities
- Employ approx. 40 people in summer
- Red king crab - live or frozen
- Hold up to 12,000 lbs live crab
- Output up to 30,000 lbs frozen crab per day
- Live crab
  - Almost all to Korea
- Frozen market crab
  - 2 market categories based on shell condition.
  - Almost all to Japan.
- Processing halibut
- Beginning to process Pacific cod.

# Norton Sound Seafood Products plant tour



# Winter through-the ice crab fishery viewing

Winter fishery demonstration: pot setting

Step 1: drive snowmachines onto sea ice

Step 2: cut a hole in the ice

Step 3: drop a crab pot in hole

Ice core sample: freeze thaw cycles, algae growth

***The Team was exceptionally grateful to everyone that helped to facilitate the excursion!!!***







