

# BSAI Crab Management

## SAFE Report and Crab Plan Team Report

Agenda Item C-1  
February 2018

Presented By:  
William Stockhausen (AFSC)

**BSAI  
Crab Plan Team:**

*Bob Foy, Chair (NOAA Fisheries /AFSC – Kodiak)*  
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*Laura Slater (ADF&G – Kodiak)*  
*William Stockhausen (NOAA Fisheries /AFSC - Seattle)*  
*Jack Turnock (NOAA Fisheries/AFSC – Seattle)*  
*Miranda Westphal (ADF&G – Dutch Harbor)*



# February 2018 Crab Plan Team Report

- Recommend final OFL/ABC for NSRKC
- Other business
  - Bimodality in snow crab posterior distributions and MCMC discussion
  - Recruitment averaging for status determination
  - Tanner crab male maturity
  - Dynamic B0
  - Model weighting
  - Bycatch
  - ADFG Harvest strategies

# BSAI Crab Stocks Management Timing

Norton Sound red king crab

Assessed in  
January/February

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

Assessed in  
May/June

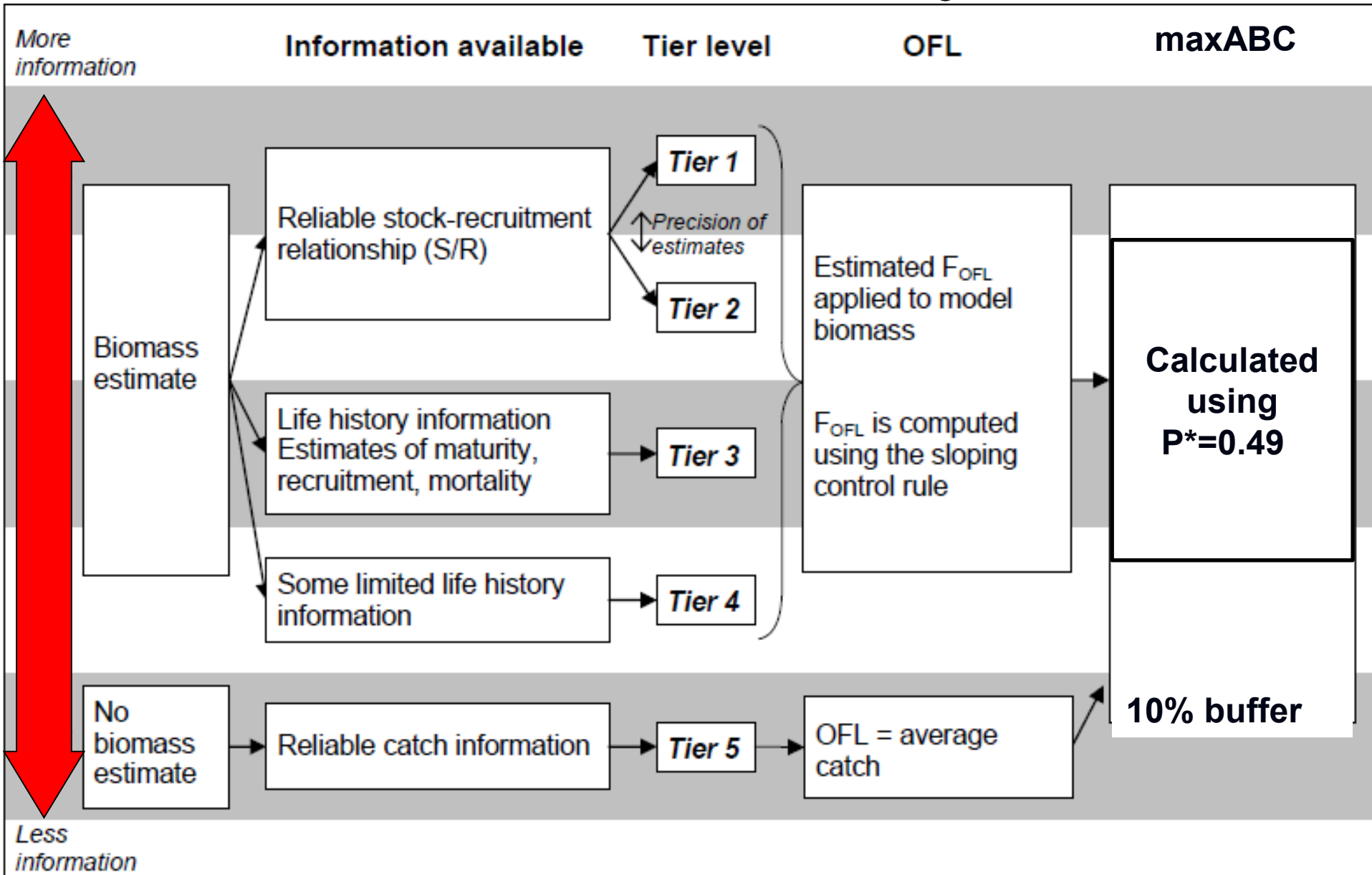
EBS snow crab  
Bristol Bay red king crab  
Tanner crab  
Pribilof Islands red king crab  
Pribilof Islands blue king crab  
St. Matthew blue king crab

Assessed in  
September/  
October

# Model timing

Stock	CPT review and recommendations to SSC	SSC review and recommendations to Council	Assessment frequency	Year of next Assessment
Norton Sound red king crab (NSRKC)	January	February	Annual	2018
Aleutian Is. golden king crab (AIGKC)	May	June	Annual	2018
Pribilof Is. golden king crab (PIGKC)	May	June	Triennial	2020
Western Aleutian Is. red king crab (WAIRKC)	May	June	Triennial	2020
EBS snow crab	September	October	Annual	2018
Bristol Bay red king crab (BBRKC)	September	October	Annual	2018
EBS Tanner crab	September	October	Annual	2018
Pribilof Is. red king crab (PIRKC)	September	October	Biennial	2019
Pribilof Is. blue king crab (PIBKC)	September	October	Triennial	2020
Saint Matthew blue king crab (SMBKC)	September	October	Annual	2018

# Current Crab Tier system

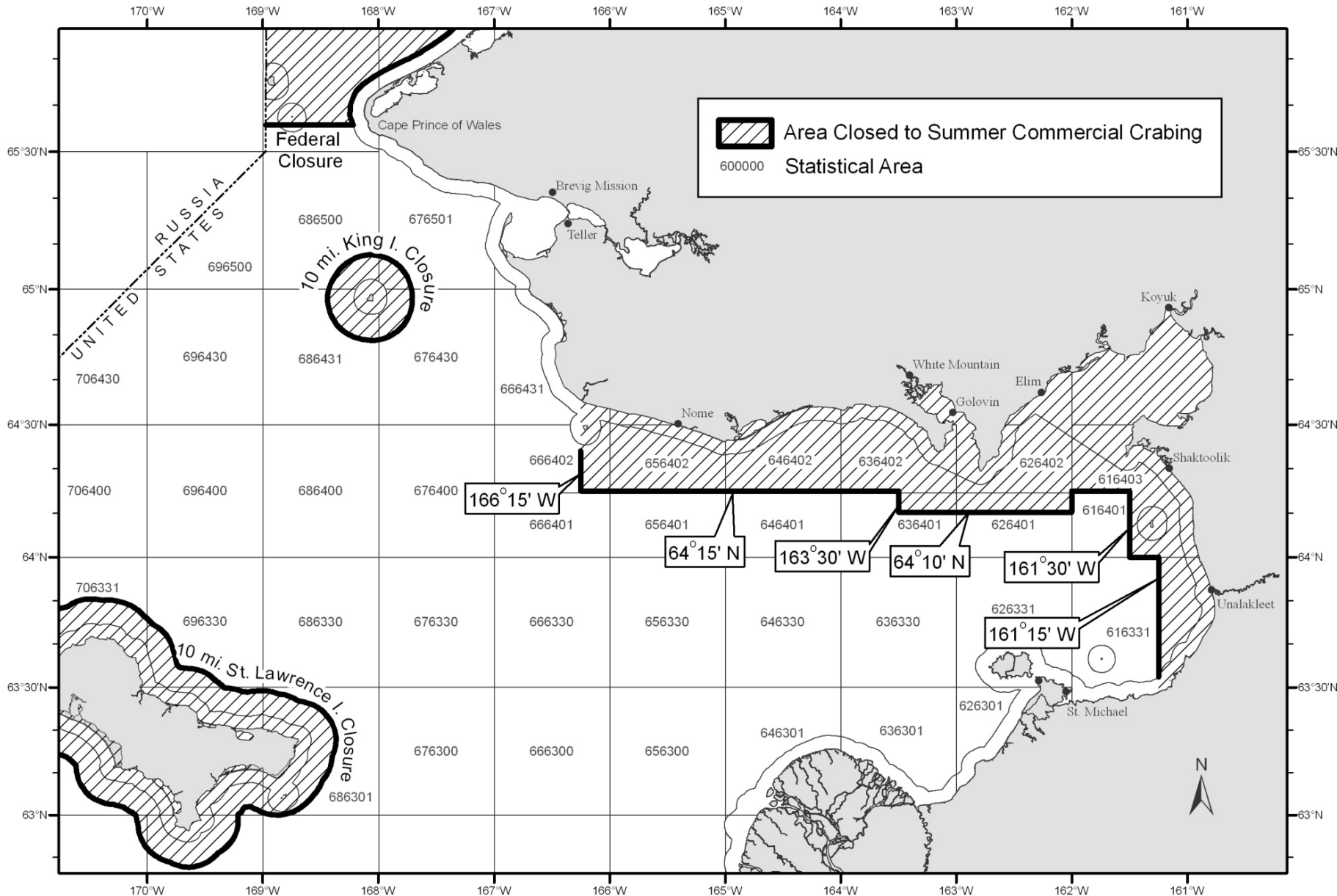


# Norton Sound Red King Crab SAFE2018

Jan 09 2018

Toshihide “Hamachan” Hamazaki,  
Jie Zheng  
Alaska Department of Fish & Game  
Division of Commercial Fisheries

# Fishery District





# Characteristics of Norton Sound red king crab

- Northernmost red king crab population that can support commercial fishery
- Live entire life-history in  $< 40\text{m}$  depth
- Many life-history / stock separation details unknown (“borrowed” from BBRKC)
- Commercial fishery started in 1977

# Norton Sound Fisheries

- Fishery Periods:
  - Summer: July-August
  - Winter: December-April
- Summer Fisheries (majority of catch):
  - Commercial, CDQ, Subsistence
  - Small boat pots fishery
- Winter Fisheries:
  - Commercial, Subsistence
  - Pots through Ice
- Majority of harvest occurs in Summer Commercial Fisheries



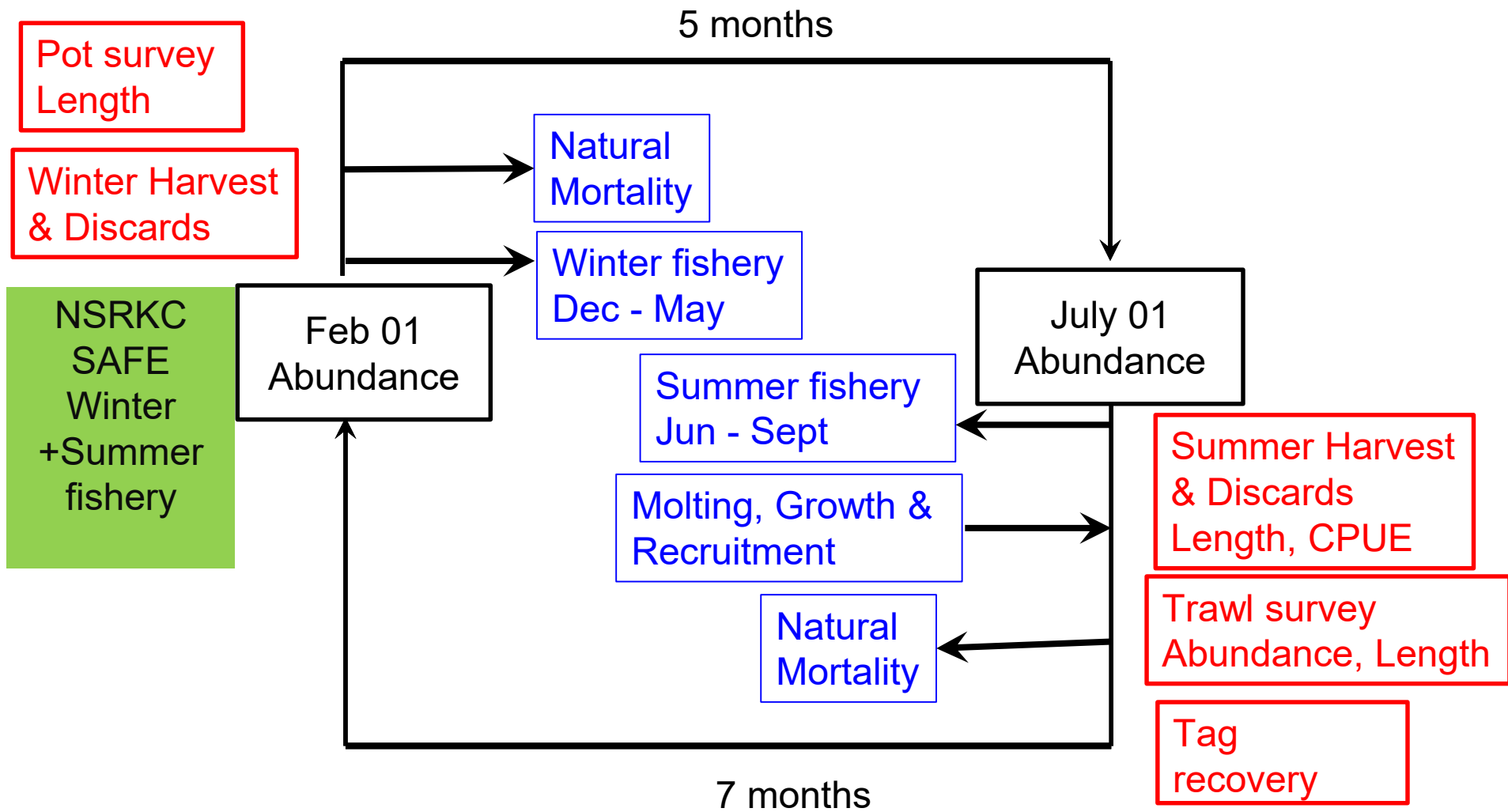
# 2017 Fishery Catch

- Winter fishery 2017
  - Commercial: 26,008 (77,843 lb.) The highest ever.
  - Subsistence: 6,039 (15,097 lb.). About average.
- Summer commercial fishery 2017
  - 6/26-7/25: 135,322 (411,736 lb.)
- Total retained harvest:
  - 167,369 (0.50 mill. lb.) < ABC (0.54 mill. lb.)

# NSRKC Stock Assessment Model

## Modeling process

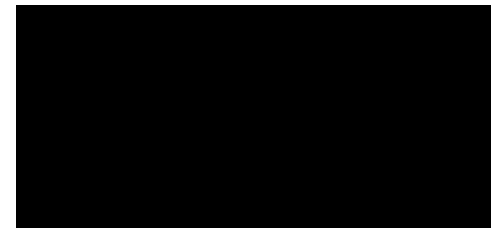
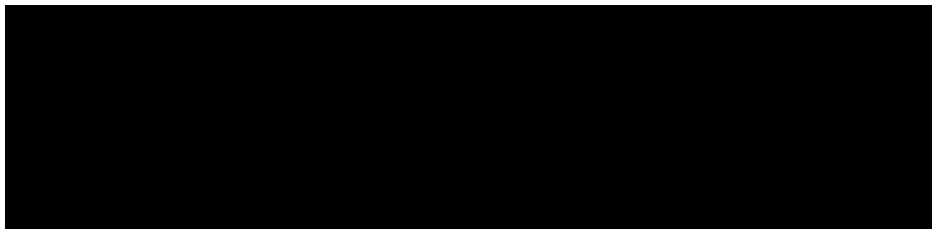
### Available Data & model fit



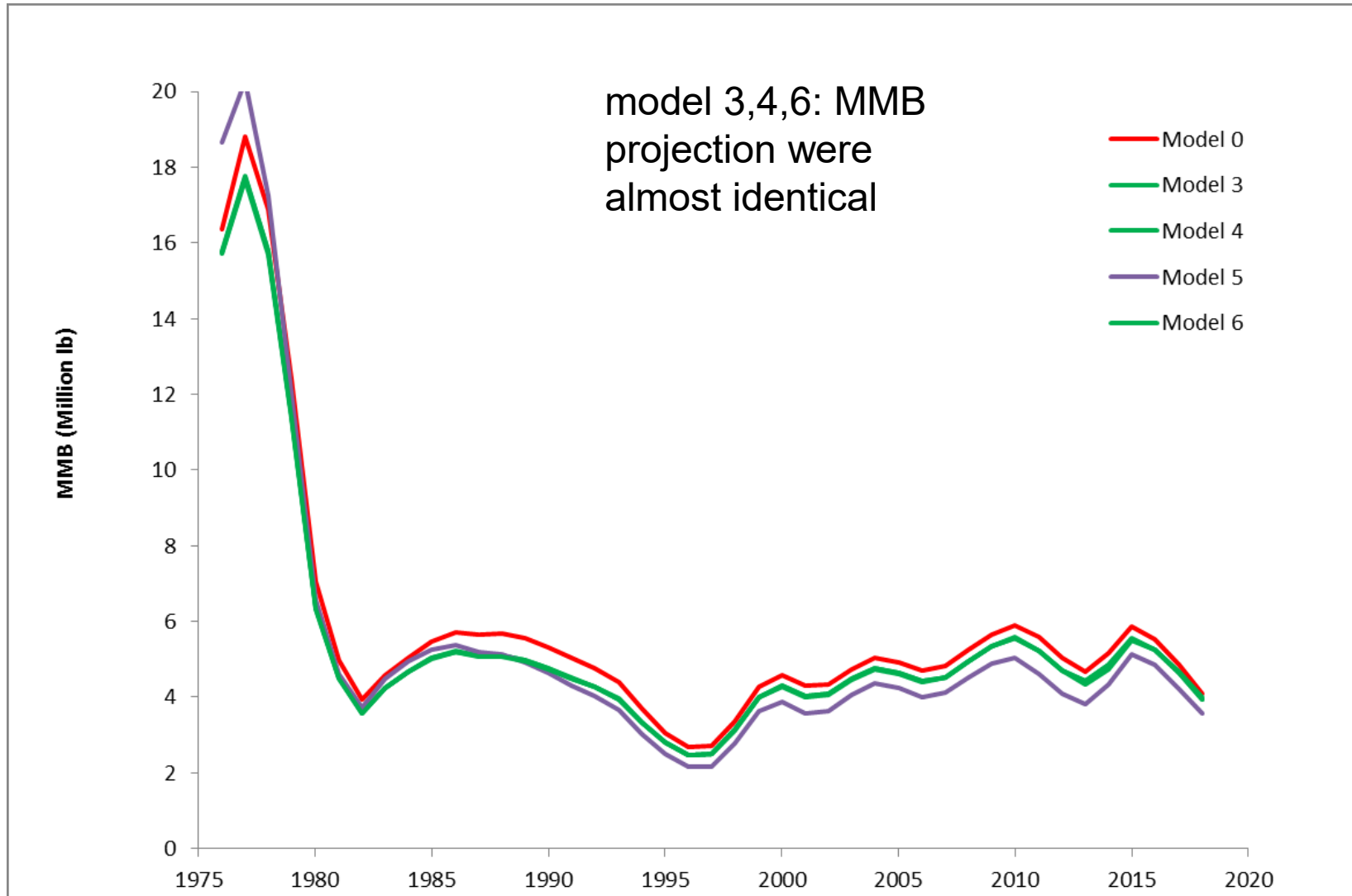
# Alternative Models

	Fish. Sel.	M1 64+	M2 74 +	M3 84+	M4 94+	M5 104+	M6 114+	M7 124+	M8 134+
Default	1p	0.18	0.18	0.18	0.18	0.18	0.18	0.18* <b>ms1</b>	0.18* <b>ms1</b>
Alt 3	2p	0.18	0.18	0.18	0.18	0.18	0.18	0.18* <b>ms1</b>	0.18* <b>ms1</b>
Alt 4	2p	0.18	0.18	0.18	0.18	0.18	0.18	0.18* <b>ms1</b>	0.18* <b>ms2</b>
Alt 5	2p	0.18	0.18	0.18	0.18	0.18	0.18* <b>ms1</b>	0.18* <b>ms2</b>	0.18* <b>ms3</b>
Alt 6	2p+sp	0.18	0.18	0.18	0.18	0.18	0.18	0.18* <b>ms1</b>	0.18* <b>ms1</b>

- sp: 2014-2016 summer pot survey data
- fishery selectivity function 1 vs. 2 parameters model



# Alternative models: MMB

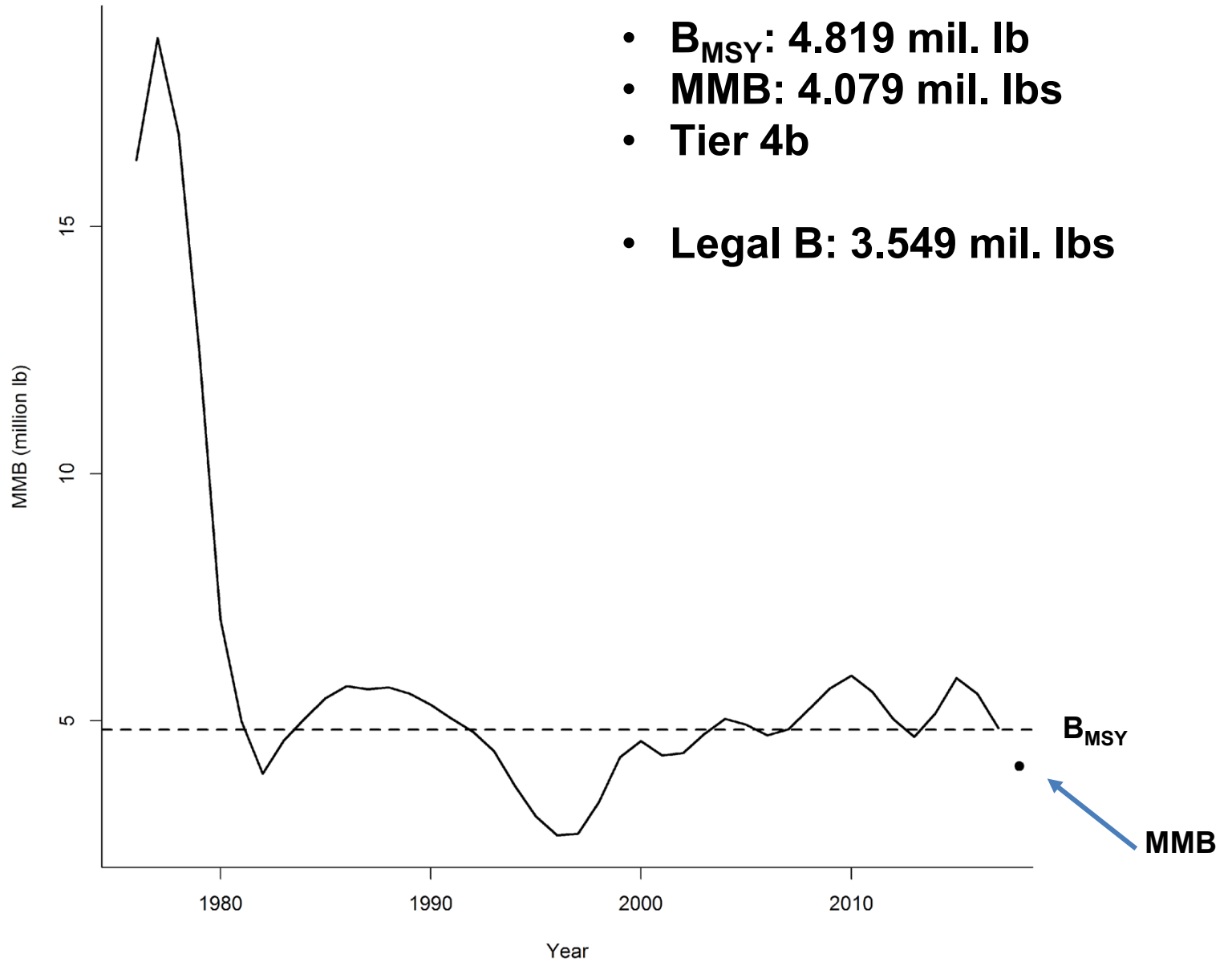


# Model Selection

- **Model 3 vs. Model 4 vs. Model 6**
  - No model fit improvement, but more parameters (M4)
  - Adding more data did not change anything (M6)
  - Identical MMB projection and dynamics
- **Model 3 vs. Model 5**
  - Slight model fit improvement, but more parameters (M5)
- **Model 3 vs. Model 0**
  - Major fit improvement, but not where expected (M3)
  - Model 3 fishery selectivity of concern
  - **CPT recommended Model 0**

# Base Model

MMB Feb 01





# Tier, OFL, and ABC Recommendations

- The CPT recommended Model 0 (base model) with updated data and Tier status 4b:
  - Biomass (MMB)
    - 1.85 thousand t (4.08 million lb)
  - Retained catch OFL
    - 0.20 thousand t (0.43 million lb)
  - ABC (< max permissible)
    - applied 20% buffer to incorporate scientific uncertainty
    - 0.16 thousand t (0.35 million lb)
- SSC concurred with CPT recommendations

**Norton Sound Red King Crab**

**thousands t**

<b>Year</b>	<b>MSST</b>	<b>Biomass (MMB)</b>	<b>GHL</b>	<b>Retained Catch<sup>1</sup></b>	<b>Total Catch<sup>2</sup></b>	<b>Retained Catch OFL</b>	<b>Retained catch ABC</b>
2014/15	0.96	1.68	0.17	0.18	0.18	0.21	0.19
2015	1.09	2.33	0.18	0.18	0.24	0.33	0.26
2016	1.03	2.66	0.24	0.23	0.24	0.32	0.26
2017	1.05	2.33	0.23	0.22	0.24	0.30	0.24
2018	1.09	1.85	TBD	TBD	TBD	0.20	0.16

**millions lb**

<b>Year</b>	<b>MSST</b>	<b>Biomass (MMB)</b>	<b>GHL</b>	<b>Retained Catch<sup>1</sup></b>	<b>Total Catch<sup>2</sup></b>	<b>Retained Catch OFL</b>	<b>Retained catch ABC</b>
2014/15	2.11	3.71	0.38	0.39	0.39	0.46	0.42
2015	2.41	5.13	0.39	0.40	0.52	0.72	0.58
2016	2.26	5.87	0.52	0.51	0.52	0.71	0.57
2017	2.31	5.14	0.50	0.49	0.50	0.67	0.54
2018	2.41	4.08	TBD	TBD	TBD	0.43	0.35

**Stock Status**

- **overfishing did not occur**
- **stock is not overfished**
- **stock is not approaching overfished**

# CPT Discussion and Recommendations

- Evaluate methods to improve ADF&G bottom trawl survey biomass estimation, including model-based approaches.
- Evaluate representativeness of observer sampling quantitatively.
- Estimate a fishery retention curve.
- Provide Tier 3 calculations and evaluate its suitability for Tier 3 status.

# Modeling Workshop Topics

- Bimodality in snow crab posterior distributions and general MCMC discussion
- Recruitment averaging for status determination
- Dynamic  $B_0$
- Tanner crab male maturity
- Model weighting
- Observer bycatch characterization
- ADFG harvest strategy development

