BSAI Crab Management

SAFE Report and Crab Plan Team Report

Agenda Item C-1
February 2018

Presented By:
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BSAI Crab Plan Team:

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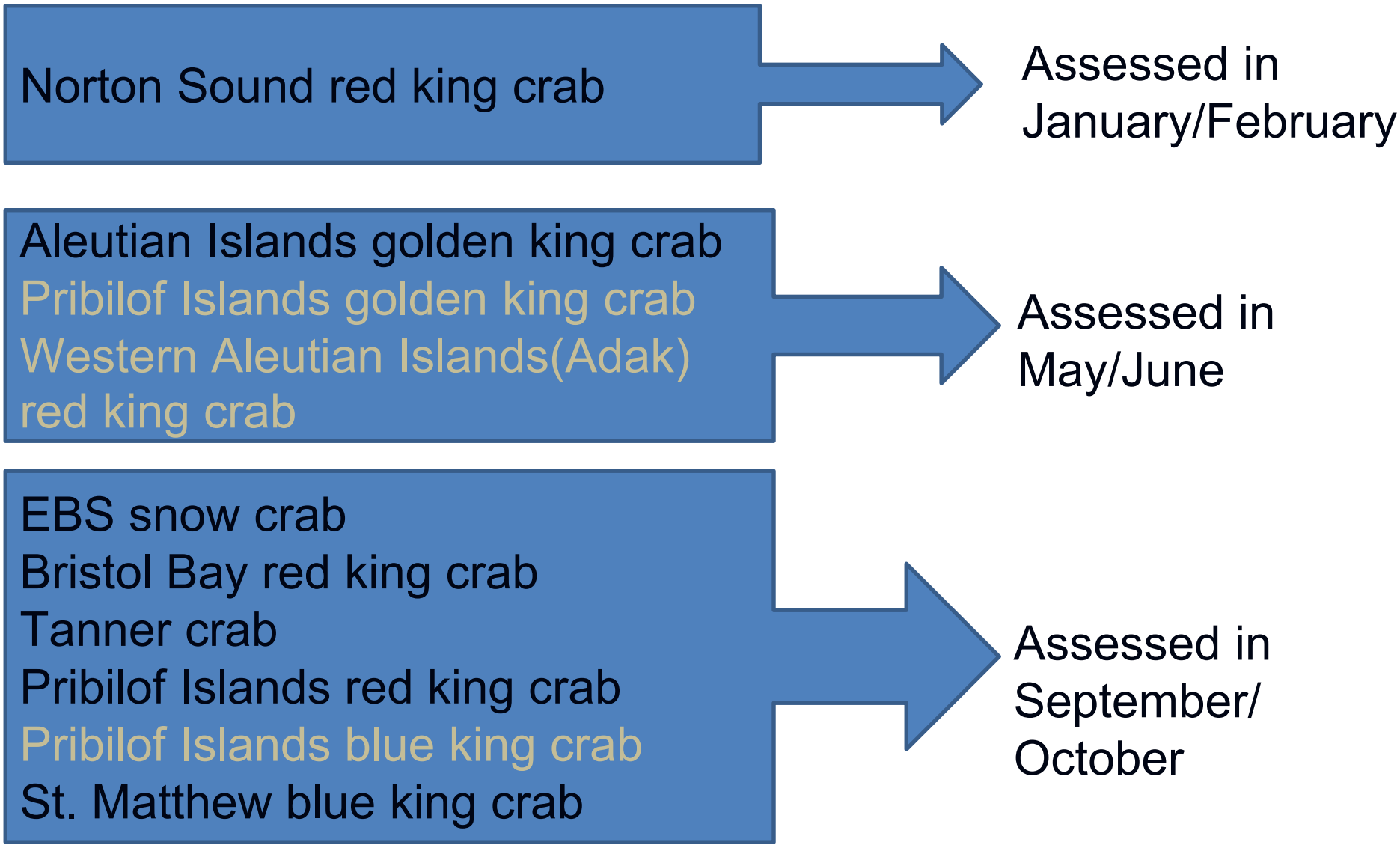
February 2018 Crab Plan Team Report

- 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

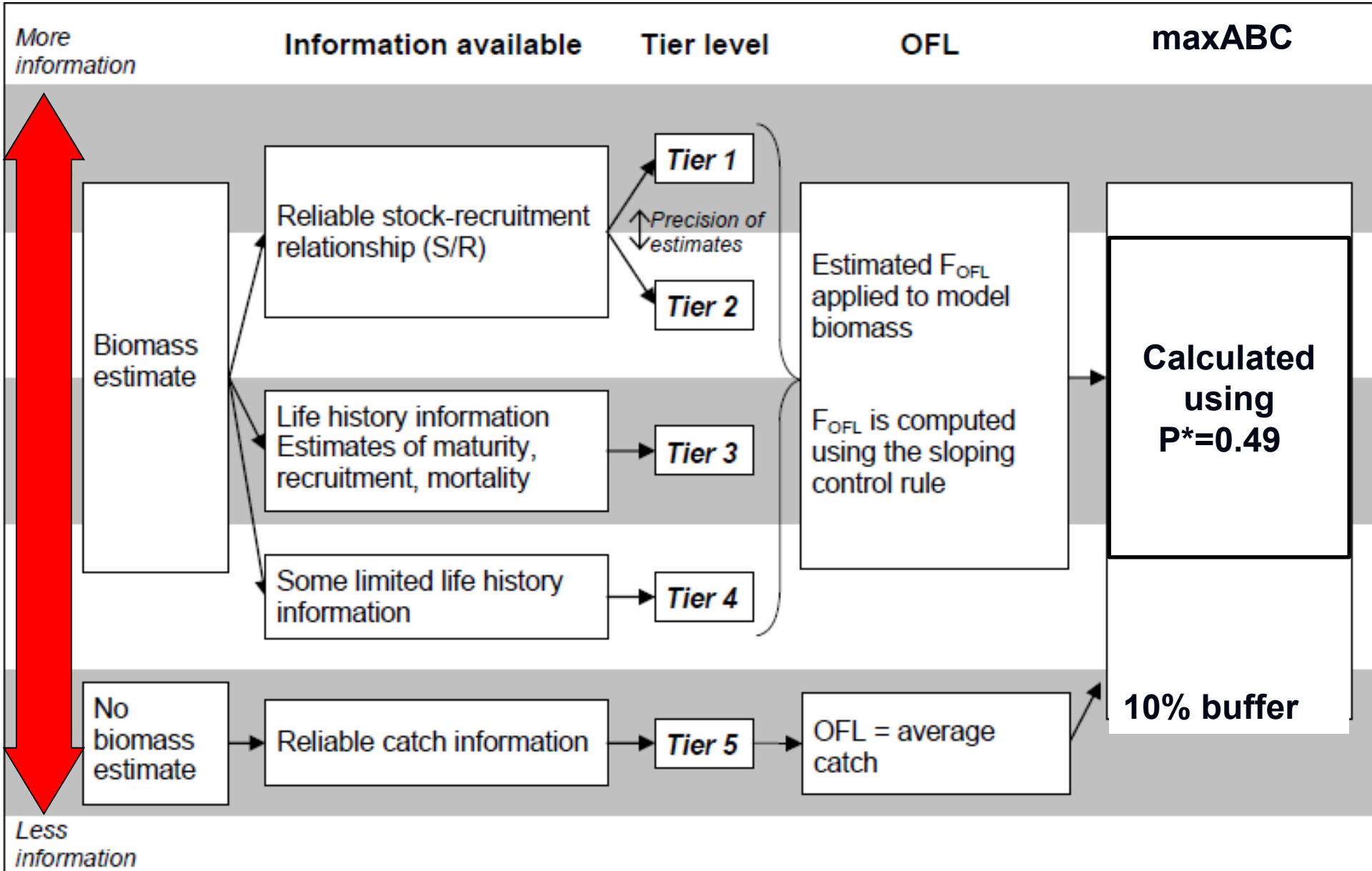
BSAI Crab Stocks Management Timing



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

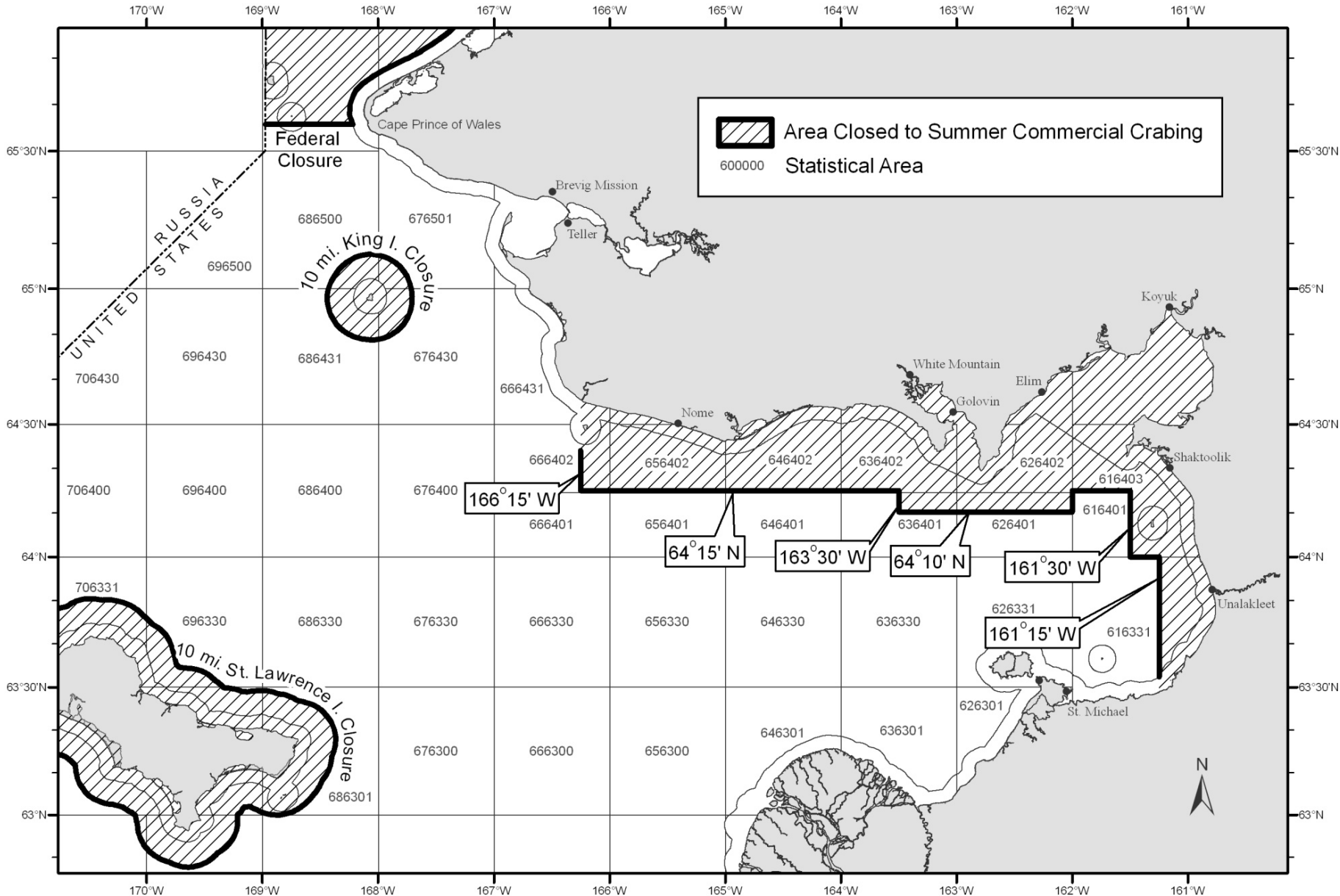


Norton Sound Red King Crab SAFE2018

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 < 40m 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.

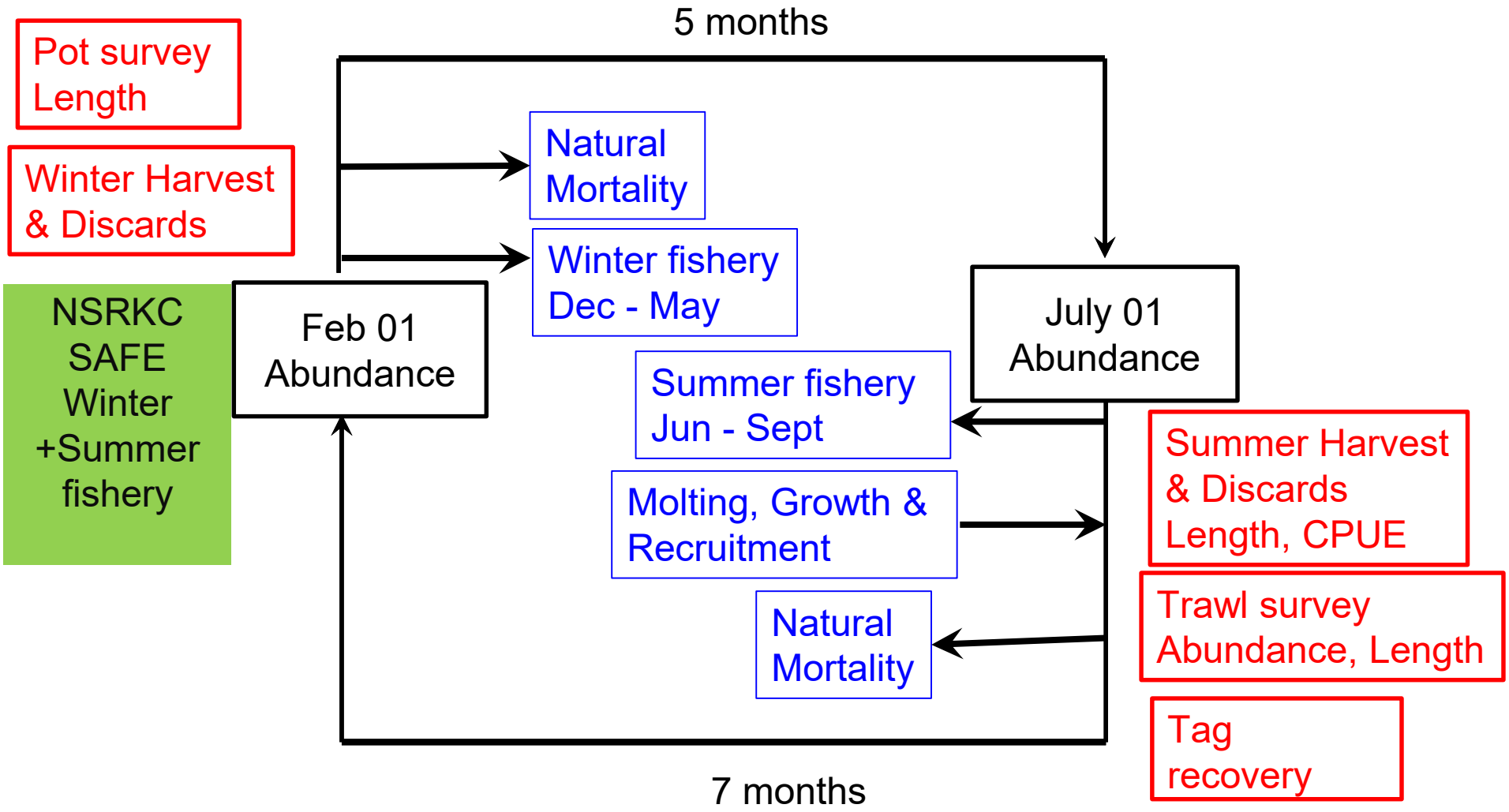
- Summer commercial fishery 2017
  - 6/26-7/25: 135,322 (411,736 lb.)

- Total retained harvest:
  - 167,369 (0.50 mill. lb.) < ABC (0.54 mill. lb.)

NSRKC Stock Assessment Model

Modeling process

Available Data & model fit

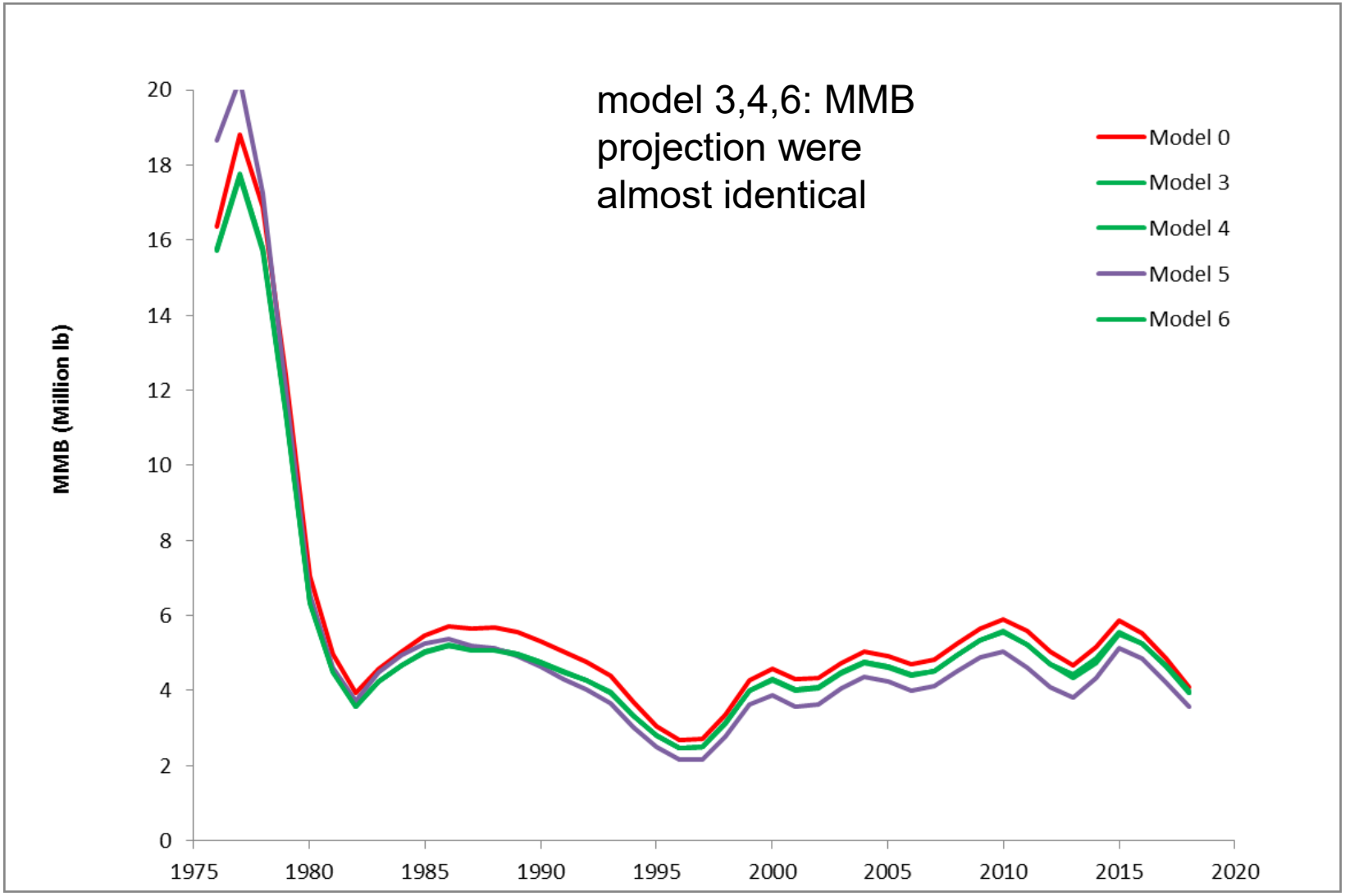


Alternative Models

	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*ms1	0.18*ms1
Alt 3	2p	0.18	0.18	0.18	0.18	0.18	0.18	0.18*ms1	0.18*ms1
Alt 4	2p	0.18	0.18	0.18	0.18	0.18	0.18	0.18*ms1	0.18*ms2
Alt 5	2p	0.18	0.18	0.18	0.18	0.18	0.18*ms1	0.18*ms2	0.18*ms3
Alt 6	2p+sp	0.18	0.18	0.18	0.18	0.18	0.18	0.18*ms1	0.18*ms1

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

Alternative models: MMB



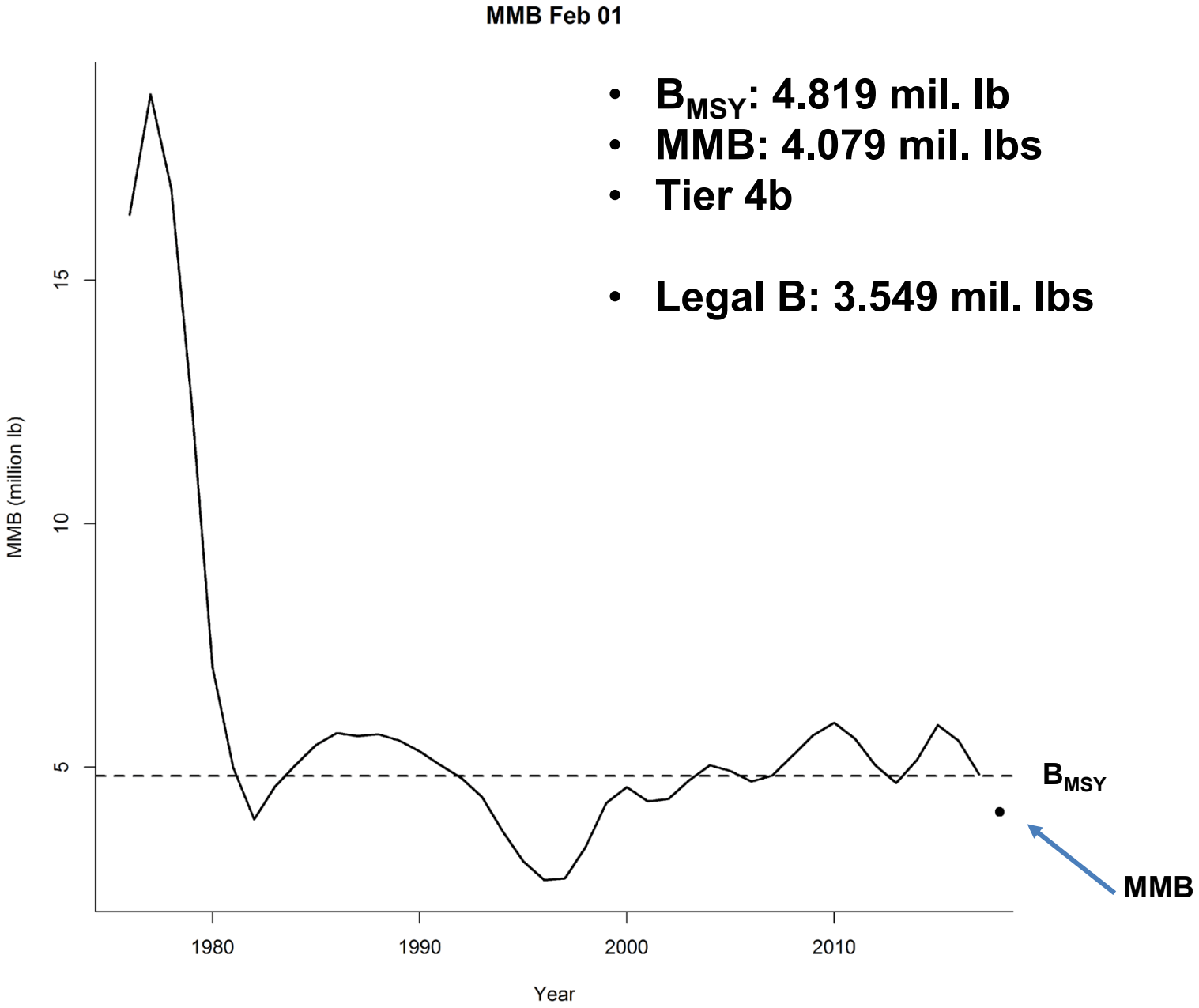
Model Selection

- 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



- B_{MSY}: 4.819 mil. lb
- MMB: 4.079 mil. lbs
- Tier 4b

- Legal B: 3.549 mil. lbs

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

Year	MSST	Biomass (MMB)	GHL	Retained Catch[1]	Total Catch[2]	Retained Catch OFL	Retained catch ABC
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

Year	MSST	Biomass (MMB)	GHL	Retained Catch[1]	Total Catch[2]	Retained Catch OFL	Retained catch ABC
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 B0
- Tanner crab male maturity
- Model weighting
- Observer bycatch characterization
- ADFG harvest strategy development