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

James 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
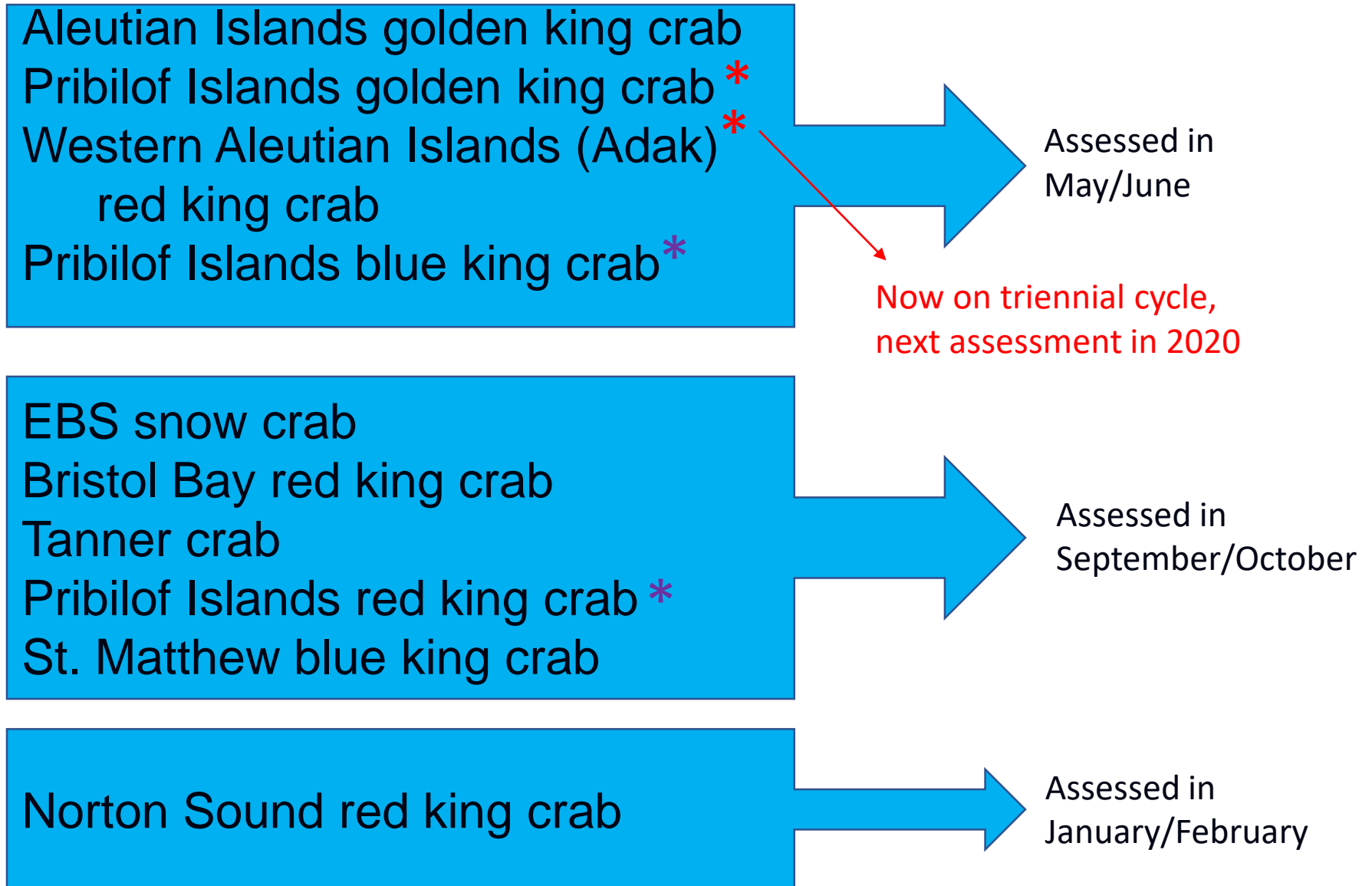
NOME

MILES

AUNTIE'S PORCH

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, past-chair
  - Martin Dorn and Katie Palof provisional Co-chairs
  - Ben Daly (ADF&G) Chair at Jan CPT meeting
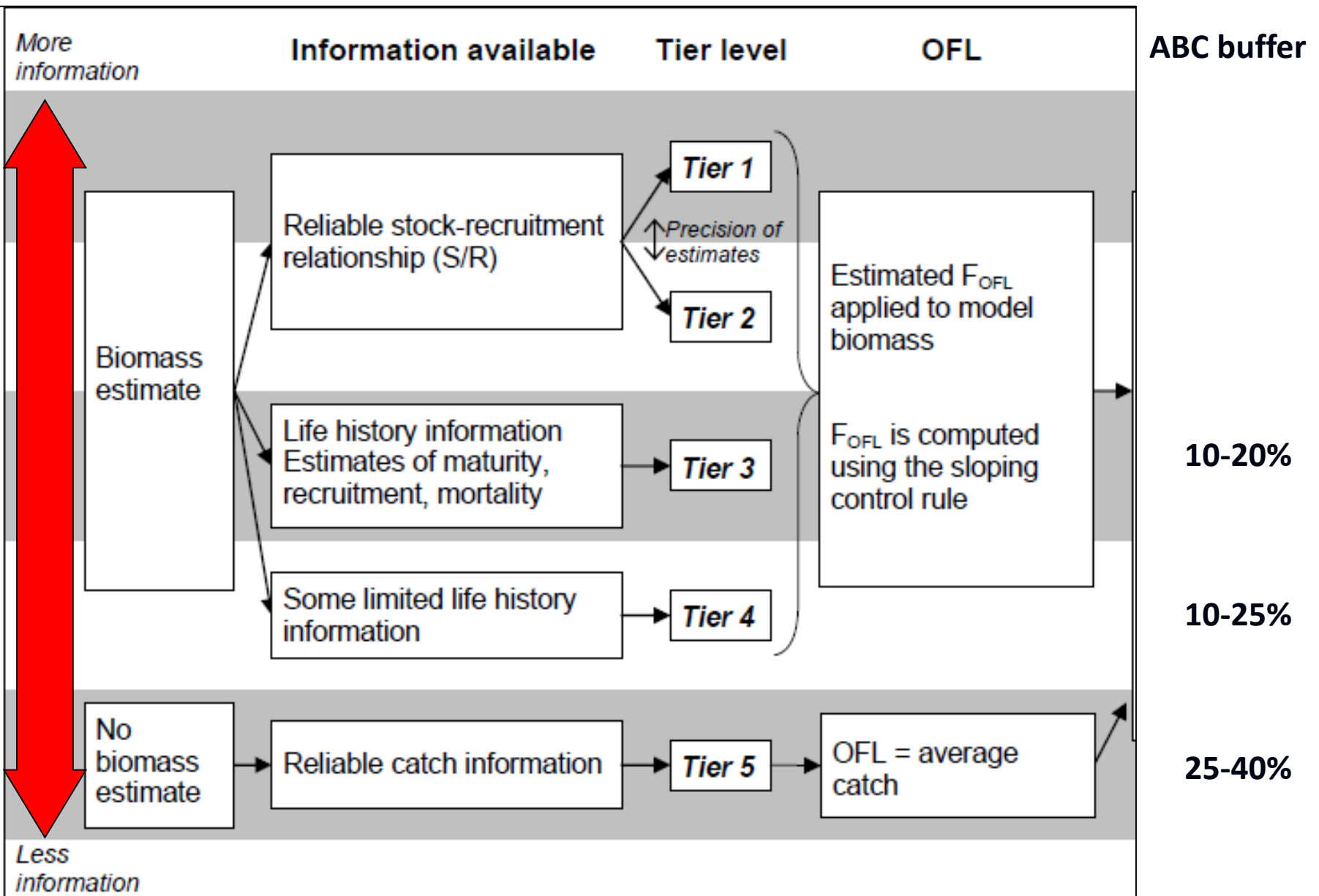 - 2 vacancies (NMFS & ADF&G)

January 2019 Crab Plan Team Report

- Norton Sound RKC fishery + research discussion

- Recommend final OFL/ABC for NSRKC

- **G**eneralized **M**odeling for **A**laskan **C**rab **S**tocks (GMACS) update

- AIGKC model update

- Tanner crab Management Strategy Evaluation (MSE)

- Outreach (NSEDC meeting, NSSP plant tour, crab pot fishery viewing)

- SMBKC rebuilding plan

BSAI Crab Stocks Management Timing

Aleutian Islands golden king crab
Pribilof Islands golden king crab *
Western Aleutian Islands (Adak) *
   red king crab
Pribilof Islands blue 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 *
St. Matthew blue king crab

Assessed in September/October

Norton Sound red king crab

Assessed in January/February

BSAI Crab Stocks Management

More information	Information available	Tier level	OFL	ABC buffer
Biomass estimate	Reliable stock-recruitment relationship (S/R)	Tier 1 / Tier 2 (Precision of estimates)	Estimated F_{OFL} applied to model biomass. F_{OFL} is computed using the sloping control rule	10-20%
	Life history information Estimates of maturity, recruitment, mortality	Tier 3		
	Some limited life history information	Tier 4		10-25%
No biomass estimate	Reliable catch information	Tier 5	OFL = average catch	25-40%

Less information

Norton Sound red king crab

- Northernmost red king crab fishery
- Entire life < 40m depth
- Life hx details "borrowed" from BBRKC
- Commercial fishery since 1977
  - Winter comm and subsistence (nearshore through ice)
  - Summer comm (offshore)

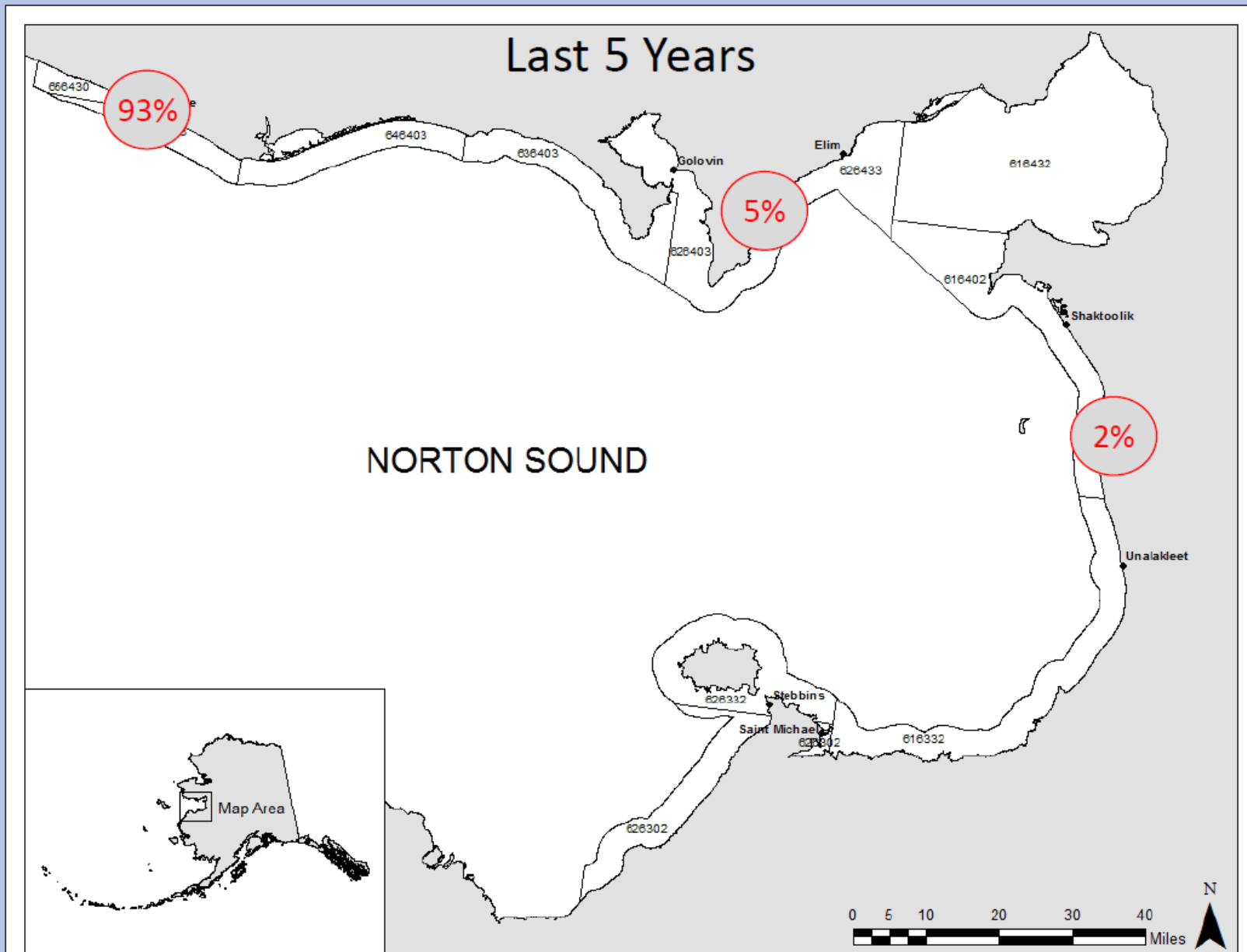# NSRKC fisheries and data overview
(Justin Leon, ADF&G Nome)

Data sources:
- ADF&G trawl survey: 1976 – 2017 ~triennial, abundance/length comp
- ADF&G pot survey: 1981-2012 (skipped 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 catch lengths: 2015-2018
- Subsistence fishery (year rounds)
  - 10 yr ave: 99 winter permits, 17 summer permits
  - Total and retained catch data 1976-2018
- Tagging: 1980-2018: biological data + recovery location
- Observer program: summer (2012-2018), winter (2016-2018)
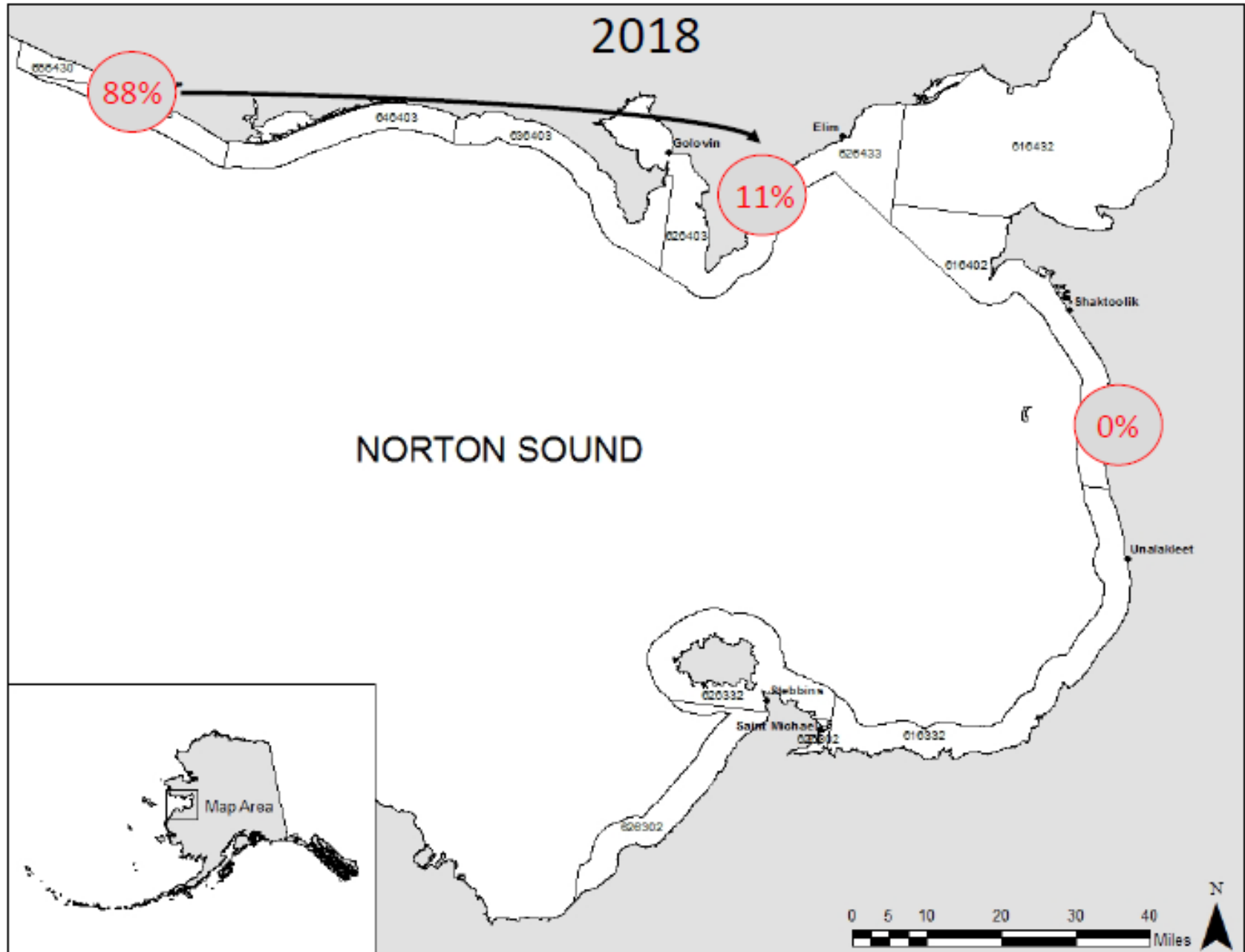
Knowledge gaps:
- M, S-R relationship, female info, rearing grounds, stock structure inside closure line, tag recovery information, observer coverage (i.e., temporally and spatially proportional to harvest)
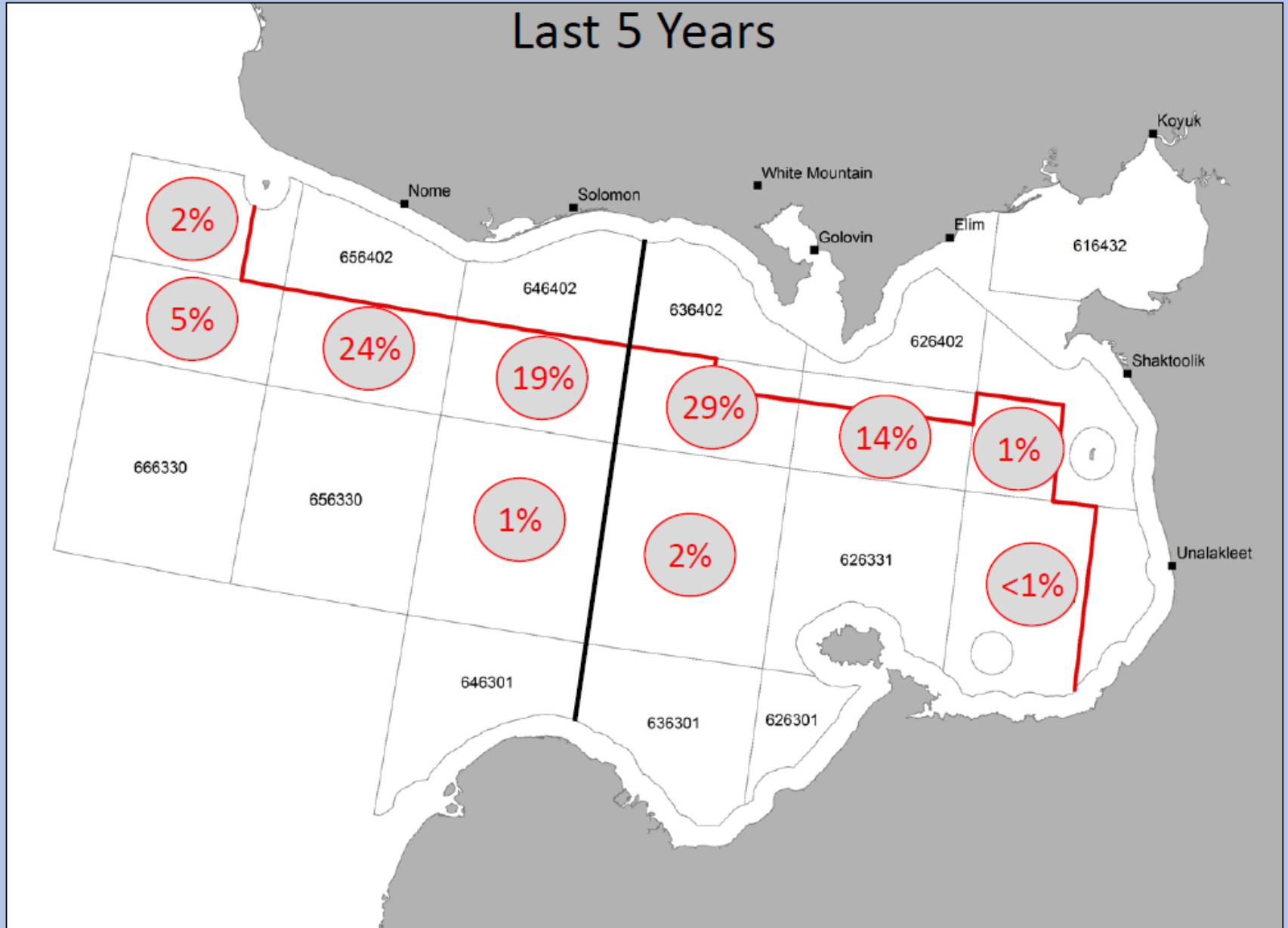
WINTER COMMERCIAL FISHERY OVERVIEW
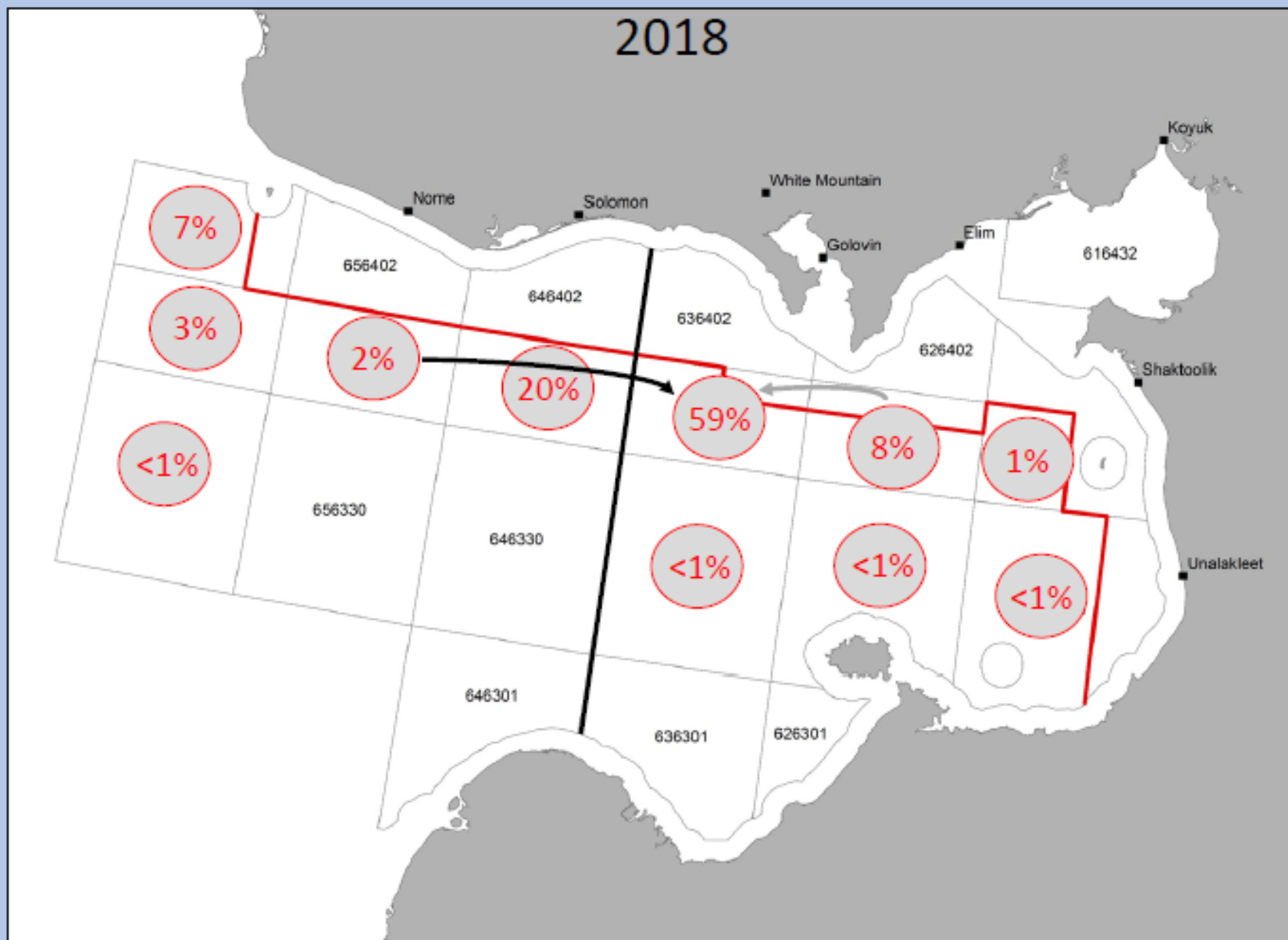
WINTER COMMERCIAL FISHERY OVERVIEW

2018

88%

11%

0%

NORTON SOUND

066430

040403

090403

020403

Golovin

Elim

026433

016432

016402

Shaktoolik

Unalakleet

020332

Stebbins

Saint Michael

016332

028902

Map Area

0 5 10   20   30   40
Miles

N

SUMMER COMMERCIAL FISHERY OVERVIEW

SUMMER COMMERCIAL FISHERY OVERVIEW

NSRKC biology overview
(Jenn Bell, ADF&G Nome)

Trawl survey spatial coverage
- Core 60 stations
- How to deal with untrawled stations?

Male size at maturity
- Physiological mature assumed at 50 mm CL (Paul et al, 1991)
- Borrowing from RKC studies around Kodiak (ratio of male size at functional maturity to female size at 50% ovigery) estimates male size at functional maturity for NSRKC at 91 mm CL
- Chela data?
  - Need smaller size classes (50-100 mm CL)

Where are the large males?
- 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
- Coverage (~1% of total pots), small boats limit ability to host observers
- Idea: "Observer logbook": fisherman record data on their own for some pots
- Retention rates relative to escape mechanisms: rings vs mesh

Norton Sound Red King Crab Final Stock Assessment

Toshihide "Hamachan" Hamazaki and Jie Zheng
Alaska Department of Fish and Game

Photo credit: Jen Bell (ADF&G)

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

Changes Fishery & Data

- Winter fishery 2018
  - Commercial: 9,189 (20,118 lb.) Down by 65% from 2017
  - Subsistence: 4,424 (8,848 lb.) Down by 27% from 2017
- Summer commercial fishery 2018
  - 6/24-7/29: 89,613 (298,396 lb.) Down by 28% from 2017
- Total retained harvest: 103,217 crab (0.34 mill. lb.) < ABC (0.35 mill. lb.)
- Standardized CPUE update (Appendix B)
- ADF&G 2018 Summer trawl survey
  - 7/22-7/29: 1108.9 k, CV =0.25, Down by 37% from 2017
- Winter Commercial Retained length-shell (2016-18)
- Changes in fishery regulation: None

CPT comments January 2018

Evaluate methods to improved ADF&G bottom trawl survey biomass estimation, including model based approaches.

Authors' reply:

VAST modeling approach has been considered. However, validity of the application of this method need to be evaluated before this approach is used for model assessment.

Quantitatively evaluate the representativeness of observer sampling.

Authors' reply:

From 2012 to 2017 distribution of samples taken by stat area differed greatly from those of commercial fishery. Further analyses are needed to examine spatial difference in length-shell composition.

CPT comments January 2018

Estimate fishery retention curve. Consider alternative (2-parameter and 1-parameter) curves for both retention and selectivity

Author's reply:

*Retention curve can be estimated by estimating total catch selectivity (fitting to total catch length/shell distribution) and multiples of total catch selectivity with retention curve (fitting to retained catch length/shell distribution). In Norton Sound, total catch data are available only for 7 years from 2012 to 2018. During 1986-1995 samples of retained and discarded crabs were collected independently (600~1000 for each). Total number of retained and discarded catch are unknown during the 1986-1995 surveys. Thus, **only 2012-2018 data were used to estimate total catch selectivity**, and **1987-1994 discards data were removed from the model.** Inclusion* of retained curve also changed observer data.

Model and Data configuration

TS: Total catch selectivity,
PL: Observed legal prop by length class
RS: Retention selectivity

Model	Observer data	Available Years	Likelihood Commercial Retained	Likelihood Observer
Baseline	Discards length-shell	1986-1995 2012-2018	TS *PL	TS *(1-PL)
Retention selectivity	Total catch length-shell comp	2012-2018	TS*RS	TS
	Discards length-shell	1986-1995	TS*RS	TS*(1-RS)

CPT comments January 2018

Provide Tier 3 calculations and evaluate its suitability for Tier 3 status.

 Author's reply

We calculated F35% for base model that resulted to 1.86 with B35% of 1.22 million lb. Based on 2019 projected MMB of 3.11 million lb and legal biomass of 2.50 million lb, OFL retained legal biomass by Tier 3 calculation is 1.86 million lb that was 7.75 times higher than Tier 4 OFL of 0.24 million lb

SSC comments February 2018

Requests more information on the evidence of biennial mating and some consideration of the implications, if any, on fishery harvest strategy.

Author's Reply: Further research is needed to confirm.

Recommend a spatial comparison of the ADFG and NMFS trawl survey 2017.

Author's Reply:

12 stations were surveyed by both ADFG and NMFS trawl survey in 2017. On average, swept area of NMFS survey (0.042 km^2) was about twice of ADFG (0.023 km^2). Average CPUE (# of crabs/km^2) of males of CL greater and equal to 64mm of ADFG (91.7) was about twice of NMFS (47.3). CPUE of ADFG trawl was also higher for small males. On the other hand, NMFS trawl caught more than 3 time higher females (58.5) than ADFG (17.7). Simultaneously, there was high variations among stations.

Consider whether switch of commercial buyers in 2005 may have affected the apparent CPUE and its standardization.

Author's reply:

In the standardization of commercial CPUE (Appendix B), variable "Year of commercial fishery" was identified as the most influential factor. The variable, in effect, addresses any deviations associated with particular year of fishing, including changes in regulation.

Request to include Quantitative Baseline of Annual Community Engagement and Dependency .

Author's reply:

This will be done by Economic SAFE, but not in this chapter.

CPT comments September 2018

Limit the January discussion to Tier 3 vs. Tier 4. The CPT does not need to see all of the model description again.

Author Reply: Model results with updated data were included in the report. However, the results would not be presented at the CPT.

A key concern is determining if Tier 3 status is appropriate for NSRKC. A thorough examination of the understanding (based on NSRKC-specific studies) of the processes that determine F35% is needed to make this determination.

Author Reply: We concur with CPT.

The CPT suggests comparing the calculated OFLs when the increased natural mortality on the plus group is included when computing a Tier 4 OFL to support the decision between Tier 3 vs. 4 status. A relevant question is what would happen if the stock was fished at *M* uniformly, as there is no assumed selectivity in Tier 4 rules. The basic thrust of these questions is to ensure that the OFLs presented for Tier 3 and Tier 4 are fair comparisons.

Author Reply: Tier 4 OFL* based on increased M on the large group is presented. OFL* (0.44 mil lb) was higher than CPT specified OFL (0.24 mil lb), but still lower than Tier 3 OFL (1.55-1.64 mil lb).

CPT comments September 2018

A summary slide of the pros and cons of Tier 3 vs. Tier 4 for this stock would be useful.

Author's Reply: The slide is provided:

Tier 3:

> *Pro: Harvest limit based entirely on biological process.*

> *Con: High uncertainties about model assumed/estimated biological process.*

Tier 4:

> *Pro: Conventional*

> *Con: Ad hoc harvest limit rule that may not be biologically justifiable.*

Impacts on fishery

Tier 4 OFL/ABC is generally lower than GHL, and thus current fishery harvest is limited by Tier 4 ABC. Under Tier 3 OFL/ABC harvest will more likely be limited by GHL. For example, under model 18.0, the maximum allowable harvest under GHL will be 0.32 million lb (up to 13% of projected legal catchable crab biomass of 2.50 million lb,). This GHL is higher than Tier 4b OFL of 0.24 mil lb but lower than Tier 3 OFL of 1.55 mil lb.

Norton Sound red king crab

# CPT comments September 2018

Perform sensitivities to the assumed knife-edge cutoff for maturity. Search out data to inform the appropriateness of the assumptions about maturity.

Author's Reply: While information about maturity size is biologically important, because the model does not include spawner-recruit relationship (i.e., Recruitment = f(matured)), **maturity information is used solely for calculation of MMB, B_{MSY}, B_{pred}, (B_{pred}/B_{MSY}), and ultimately FOFL***.*

FOFL is very little affected by the change of maturity criteria.

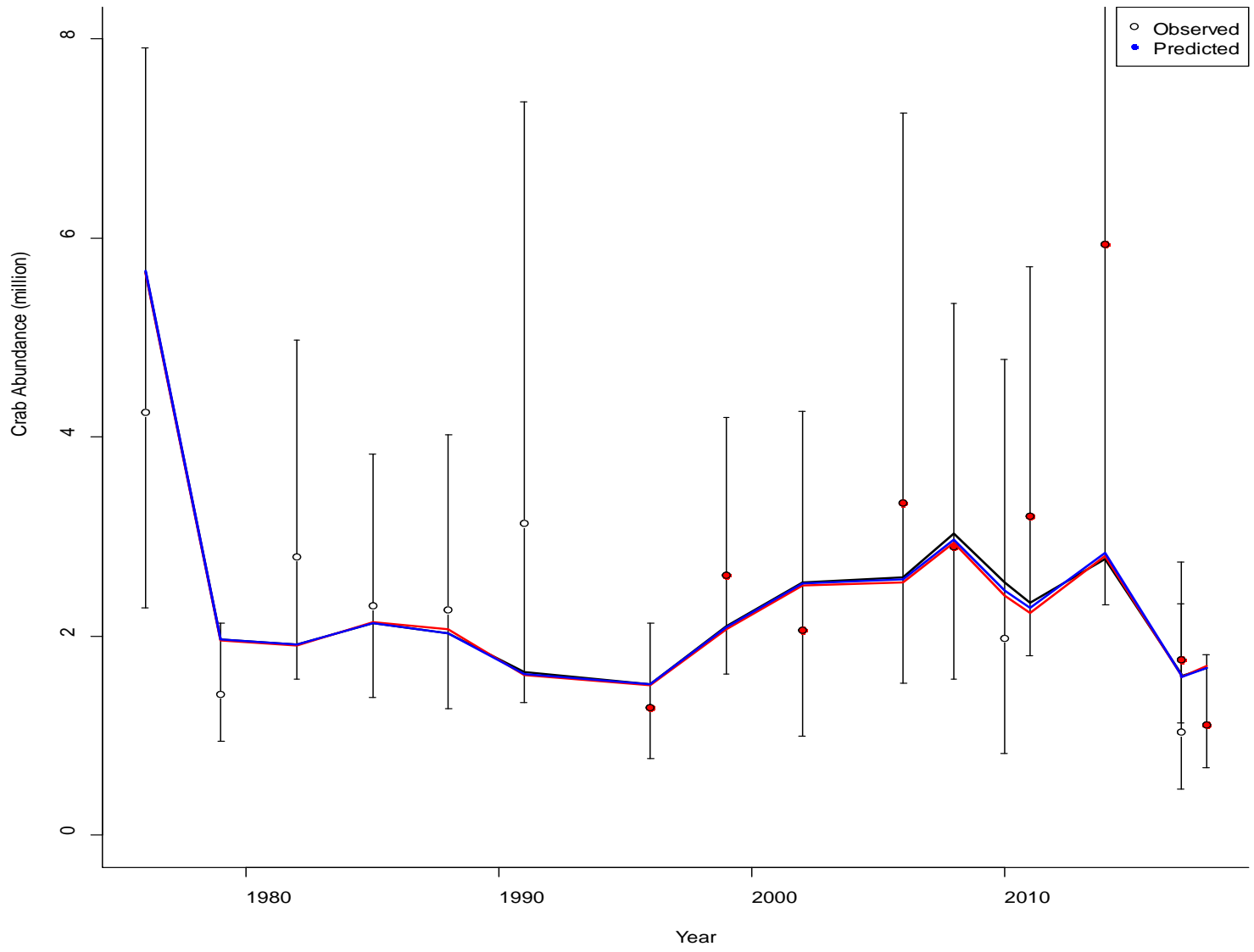# 2018 Trawl Survey red king crab distribution
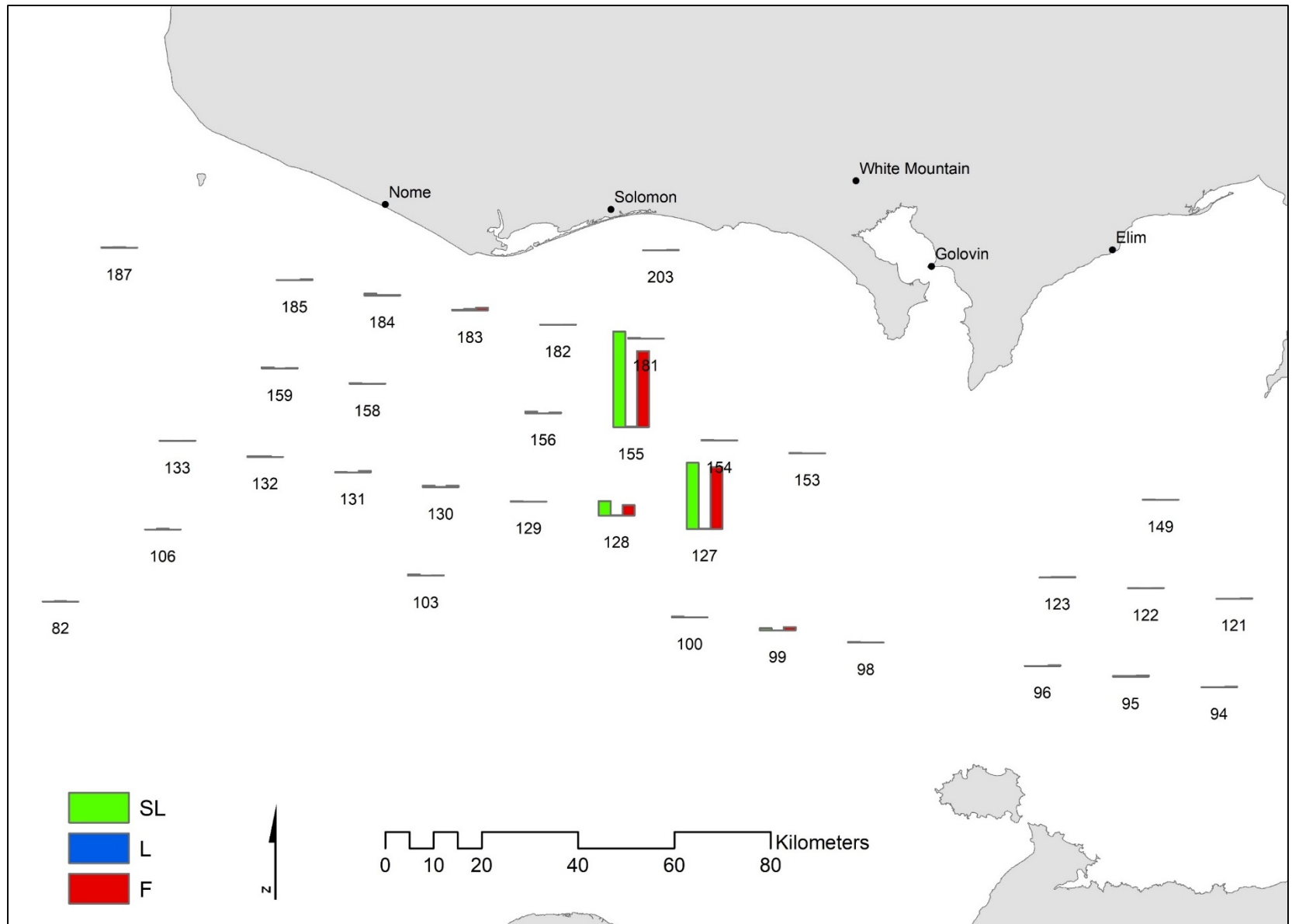
Norton Sound red king crab

Year	Agent	Female	Legal (>104)	Pre1 (90-104)	Pre2 (76-89)	Pre3 (<76)
1976	NMFS	1,021,572	1,976,523	1,485,909	591,973	165,849
1979	NMFS	302,601	771,002	39,180	8,101	185,336
1982	NMFS	2,097,511	702,561	941,075	330,374	1,513,300
1985	NMFS	1,221,058	1,119,285	850,338	526,338	690,060
1988	NMFS	1,653,212	1,051,009	568,578	638,630	792,923
1991	NMFS	877,035	1,416,006	387,234	320,579	1,033,641
1996	ADFG	643,247	567,639	249,011	156,842	468,697
1999	ADFG	915,135	1,718,561	682,813	155,992	467,877
2002	ADFG	1,373,860	786,389	512,964	413,754	646,672
2006	ADFG	2,361,646	862,993	565,242	1,093,104	1,501,881
2008	ADFG	1,715,846	1,016,407	727,488	848,561	1,044,702
2010	NMFS	829,599	806,809	840,798	330,033	688,283
2011	ADFG	1,678,631	1,790,972	455,708	446,136	1,380,161
2014	ADFG	901,391	1,746,881	2,109,261	1,546,795	830,240
2017	ADFG	653,182	941,797	288,615	258,235	713,943
2017	NMFS	1,325,065	746,137	322,684	327,242	1,007,975
2018	ADFG	6,438,063	303,806	151,903	212,664	7,169,809

The lowest legal crab abundance
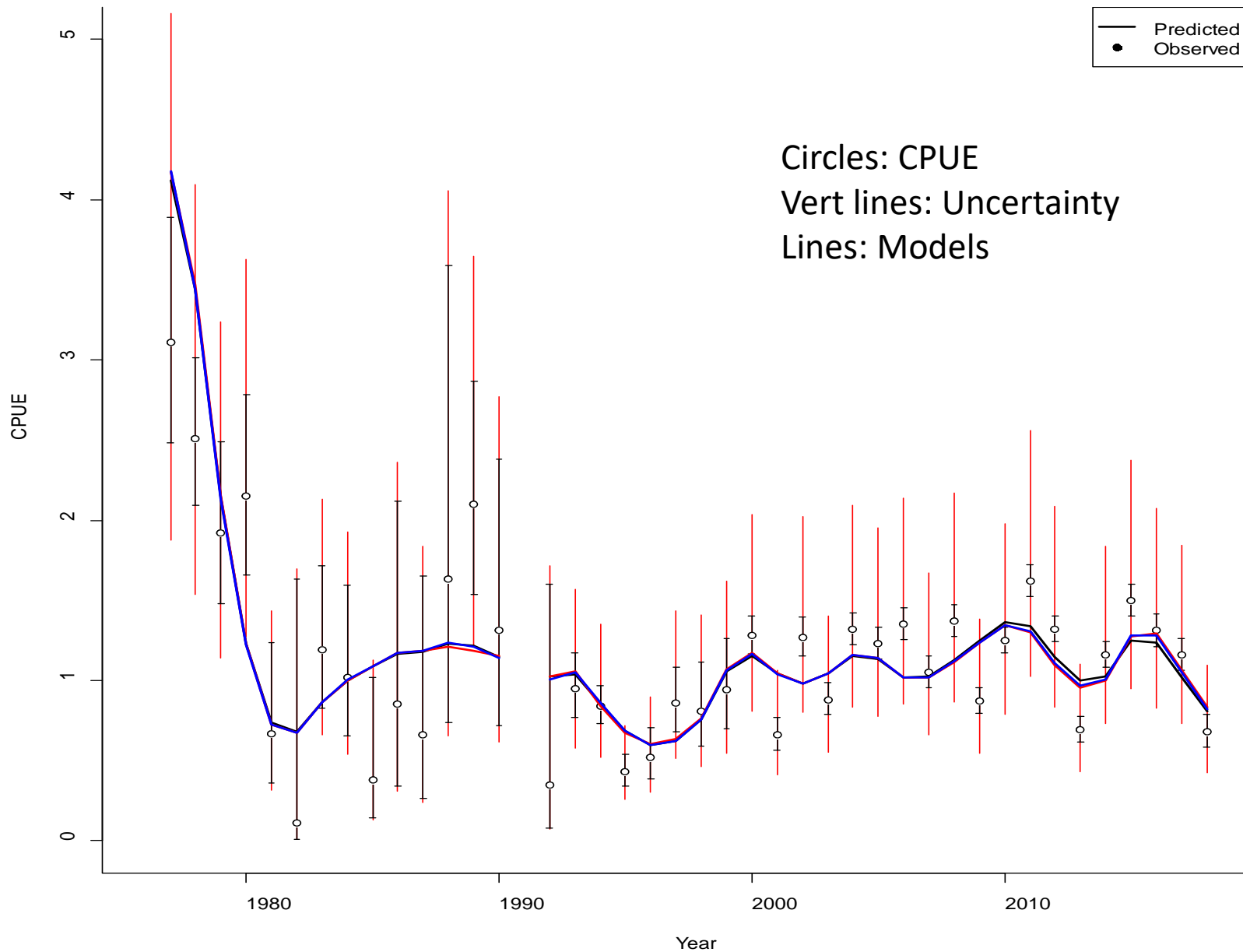The highest female and Pre3 abundance

Norton Sound red king crab

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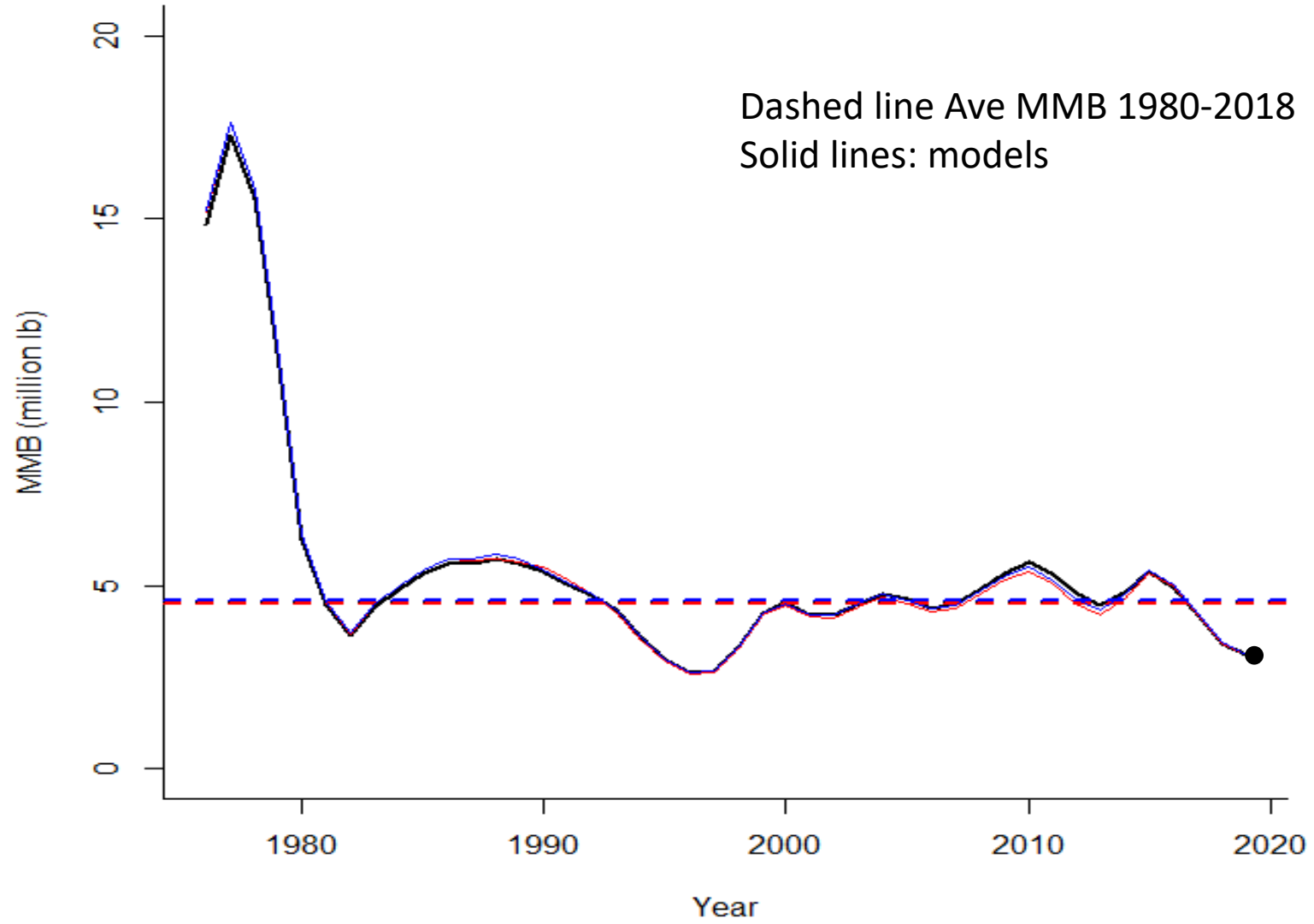Red circles: ADF&G survey
Lines: models

Trawl survey crab abundance

Norton Sound red king crab

Summer commercial standardized cpue

Circles: CPUE
Vert lines: Uncertainty
Lines: Models

Norton Sound red king crab

MMB Feb 01

Dashed line Ave MMB 1980-2018
Solid lines: models

CPT Discussion: model scenarios

- Model 18.0: Baseline 2018 model with updated data
  - Fit discards length (1987-1994, 2012-2018)
- Model 18.1a: Estimate Summer commercial retention
  - Fit total catch length (2012-18)
  - (CPT recommended Sept 2018)
- Model 18.1b: 18.1a + fit discards (1987-1994)
- Model 18.1c: 18.1b + 2 retention
- Model 18.1d: 18.1b + 2 total selectivity
- Model 18.2: 18.0 + Winter commercial retention (2015-18)
- Model 18.2a: 18.1a + Winter commercial retention (2015-18)
- Model 18.2b: 18.1b + Winter commercial retention (2015-18)
  - CPT Recommended (Jan 2019)

CPT Discussion: model scenarios

- Model 18.0: Baseline 2018 model with updated data
  - Fit discards length (1987-1994, 2012-2018)

- Model 18.1a: **Estimate Summer com retention**
  - Fit total catch length (2012-18)
  - (CPT recommended Sept 2018)

- Model 18.1b: 18.1a + fit discards (1987-1994)

Estimating the retention pattern does not change fit to population dynamics, but improved fits to commercial retention and tag recovery data that inform the size transition matrix and molt probability.

CPT Discussion: model scenarios

- Model 18.1c: 18.1b + 2 retention
- Model 18.1d: 18.1b + 2 total selectivity

Estimating separate retention and total selectivity patterns for two periods (pre and post super-exclusive, 1994) did not improve the model fit.

CPT Discussion: model scenarios

- Model 18.2a: 18.1a + Winter com retention (2015-18)
- Model 18.2b: 18.1b + Winter com retention (2015-18)
  - CPT Recommended (Jan 2019)

- *Given that summer total catch and winter retention data will be taken annually, incorporating those two datasets 8 (Model 18.2a, b) is desirable.*

- *This leaves choice between 18.2a and 18.2b (18.2b includes 1987-1994 discard length comp data, 18.2a does not)*

- *Both model scenarios estimated identical OFLs.*

- *It is inappropriate to omit the 1987-1994 data without a compelling reason, thus CPT recommends 18.2b.*

CPT model recommendations

- **Authors recommend model scenario 18.2b for OFL/ABC**
  - (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
  - Buffer consistent with CPT recommendation in January 2015
    - Consistent with 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 Discussion: Tier 4 vs Tier 3

Uncertainties associated with various biological processes

- High M at 2 largest size bins: uncertainty about emigration vs mortality
- Lack of male maturity data

Tier 3 calculations: OFL = 1.86 million lb

- 7.75 times higher than the Tier 4 OFL of 0.24 million lb

Length dependent OFL calculations

- Did not discuss

Full CPT not present discuss broadly

Not appropriate to elevate to Tier 3 at this time

January 2019 CPT recommendations

- Continue to evaluate methods to improve ADF&G bottom trawl survey biomass estimation, including model-based approaches such as VAST.

- Sensitivity analysis evaluating mark-recapture data
  - Fit with only marks that are at liberty for one year.

- Evaluate survey Q between NOAA and ADF&G bottom trawl surveys.

- Collect more chela-carapace length data, especially at the small size range, to improve on the size at maturity estimate.

- Continue to address CIE recommendations (e.g., jittering).

GMACS Update: Dr. Andre Punt, UW

Current status:

- Used for last two SMBKC assessments

- 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)

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 for snow and Tanner crab

For May 2019 CPT meeting:
- Bridging analysis for BBRKC
- BBRKC assessment in GMACS for Sept 2019
- Next is Pribilof Islands red king crab

AIGKC model update

Responses to May 2018 CPT, June 2018 SSC, and June 2018 CIE review comments:

- Previous year fishery ongoing at time of OFL/ABC setting, now use pervious year total catch for directed fishery (based on the TAC), model predicted directed fishery bycatch, and 3-yr mean total bycatch in groundfish fishery. Size comp data not used.

- Chela data for estimating size at maturity logistic curve: ongoing, using newly collected industry cooperative survey data, will investigate spatial and temporal changes in size at maturity.

- Incorporating industry cooperative survey data in model: current time series too short (4 years), will be presented to CPT in 2020 with a fifth year of data. Data summary and survey description for May 2019 CPT meeting. The plan is to continue the survey for both EAG and WAG.

- VAST spatial modelling approach: temporarily stopped, no progress

- Explore year-area interactions: reanalyzed CPUE index with interaction, suspected severe collinearity between Area and Year. Investigating further. Current assessment used main effect.

- Retrospective analysis: include for final assessment.

- Jittering to be done for May 2019 final assessment.

- Time varying discard mortality: pot fishery bycatch mortality rate scaled by the amount of annual bycatch. Will also be done for groundfish bycatch in next assessment.

- Reduced gear codes for CPUE standardization.

AIGKC model update

3 model scenarios for May 2019 OFL/ABC setting:

- 18_0: 2018 assessment model

- 18_1: 18_0 + CPUE standardization using fewer gear codes

- 18_1a: 18_1 + pot bycatch rate scaled by the amount of bycatch (i.e., time varying)

AIGKC model update

CPT recommendations:

- The projection for the 2019/20 fishing year should be based on setting the retained catch to the 2018/19 TAC and assuming that groundfish bycatch for 2018/19 equals the recent three-year mean groundfish bycatch. No catch composition data for the 2018/19 fishing year should be generated based on averaged past data.

- Scenario 18_1a should be dropped because the suggested approach for adjusting pot bycatch is plausible at the individual pot level, but not at the total bycatch level.

- Add a new scenario based on a revised definition of "area" when conducting the CPUE standardization – consideration should be given to including an interaction between year and the revised area definition in the standardization model. If an area*year interaction is supported, the final index should be an area-weighted index.
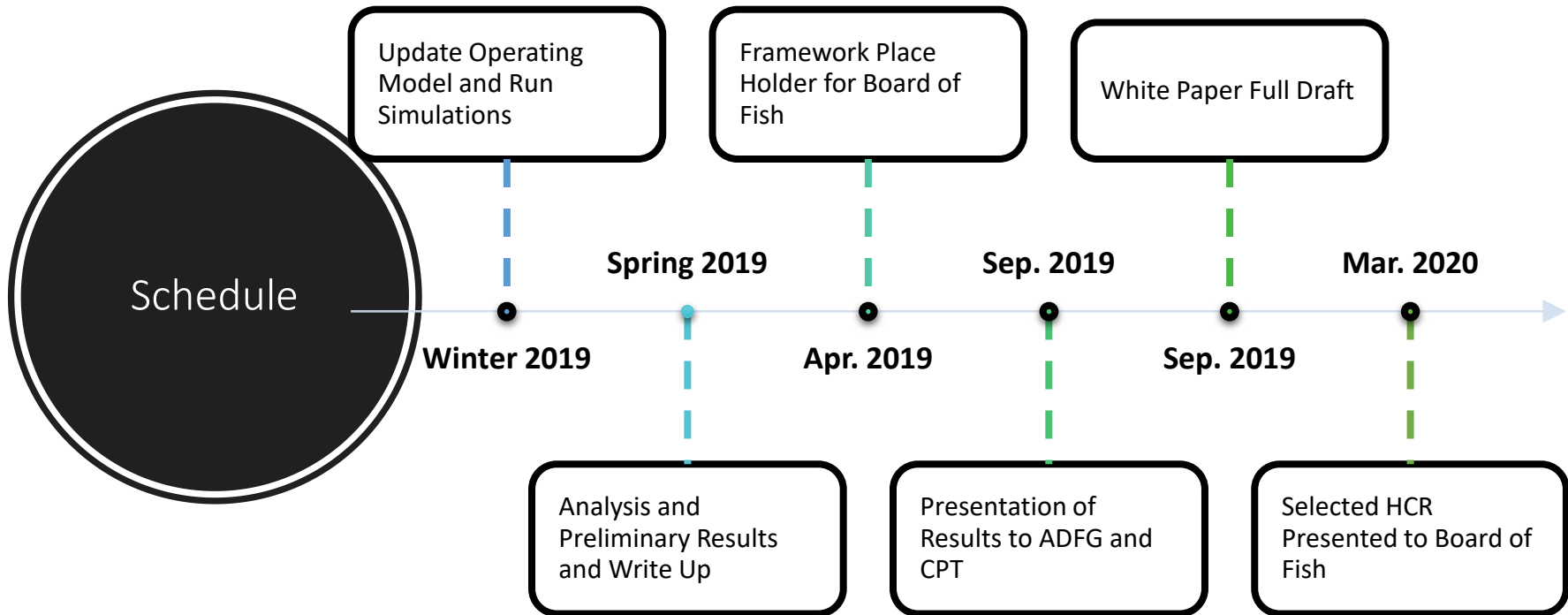
AIGKC model update

CPT recommendations:

- The next assessment should report results from the May 2017, September 2017, and May 2018 assessments as well as those from the new scenarios to enable an evaluation of the impact of changes to the model and the data.

- The increase in MMB in the last year of the assessment for the EAG is caused by a large recruitment three years ago, but this increase is not reflected in the standardized CPUE – the analysts should identify what in the data (e.g. the length-compositions) are the cause of the increased recruitment. Showing the fits to the length-composition data may help identify whether there is a basis in the data for higher estimated recruitment.

- The survey data will not be included in the assessment formally until the 2020 assessment. However, there would be value in plotting the length-composition data from the survey as it may provide evidence in support of the large estimated recent recruitment.

Tanner crab MSE
(Maddison Shipley, UW)

- Developing MSE for master's 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

Schedule

Update Operating Model and Run Simulations

Framework Place Holder for Board of Fish

White Paper Full Draft

Spring 2019

Sep. 2019

Mar. 2020

Winter 2019

Apr. 2019

Sep. 2019

Analysis and Preliminary Results and Write Up

Presentation of Results to ADFG and CPT

Selected HCR Presented to Board of Fish

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.

Outreach: Norton Sound Seafood Products (NSSP) plant tour

Outreach: crab pot fishery viewing

Winter fishery demonstration: pot setting

Step 1: snow-machines on sea ice

Step 2: cut hole in ice

Step 3: drop 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!!!