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
HOME

January 2019 Crab Plan Team Report

- No NMFS/NOAA staff
  - 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

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

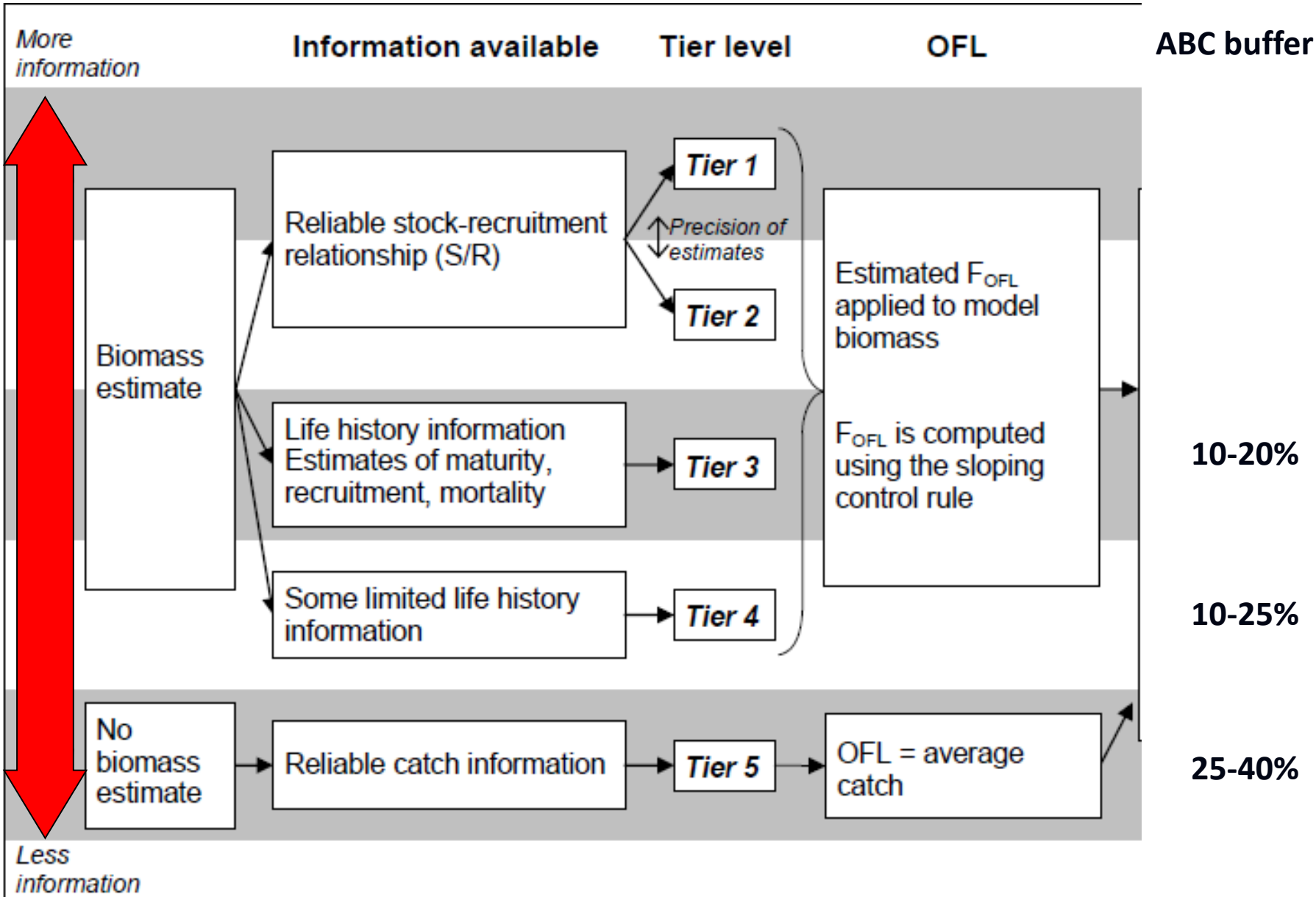
EBS snow crab
Bristol Bay red king crab
Tanner crab
Pribilof Islands red king crab *
St. Matthew blue king crab

Assessed in September/October

Norton Sound red king crab

Assessed in January/February

BSAI Crab Stocks Management



Norton Sound red king crab

- Northern most red king crab fishery
- Entire life-history in < 40m 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

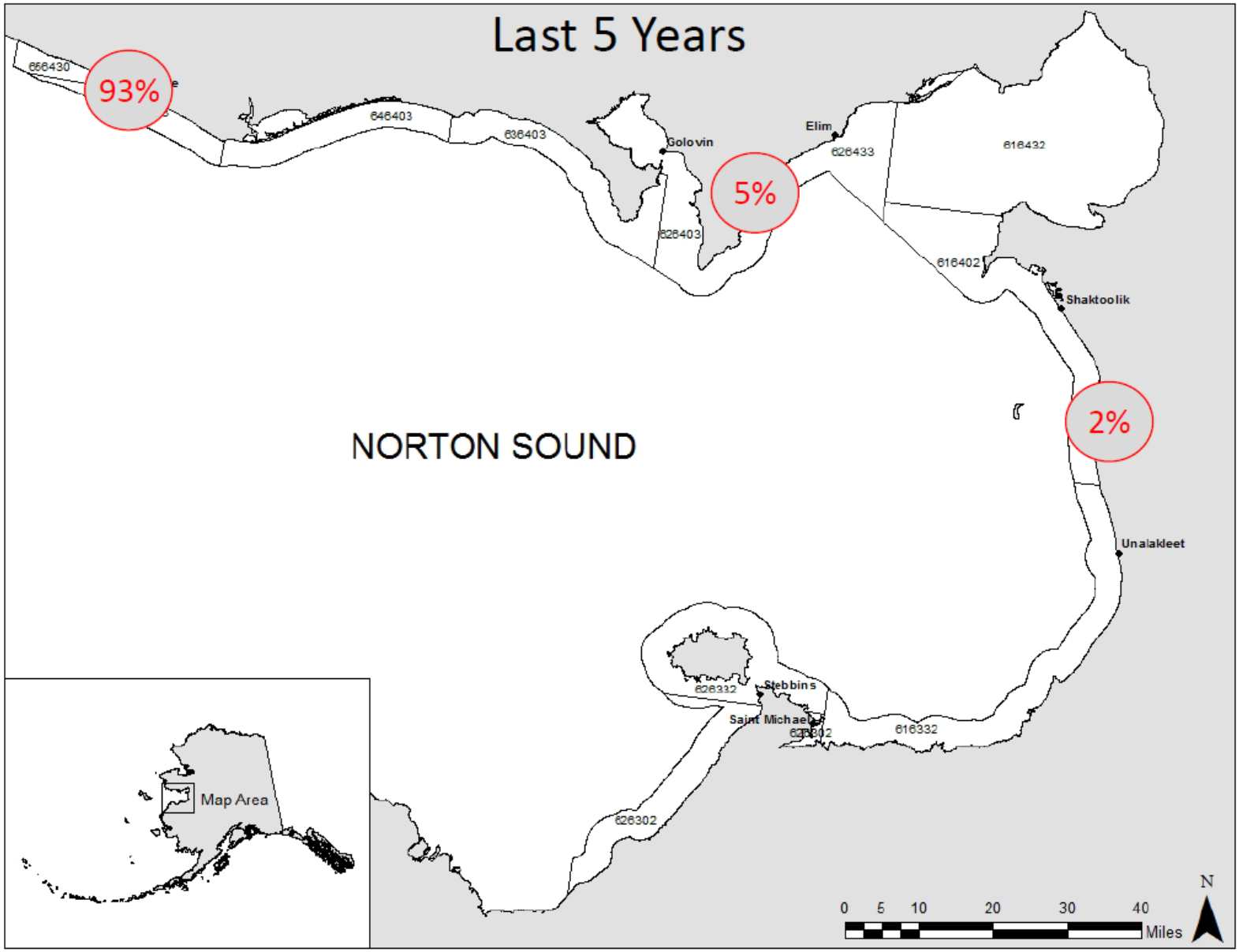
- Concerns
  - coverage (~1% of total pots)
  - small boats limit ability to host observers
- Idea: “Observer logbook”: fisherman self-record data
- Retention rates
  - rings vs mesh

Norton Sound Red King Crab Final Stock Assessment

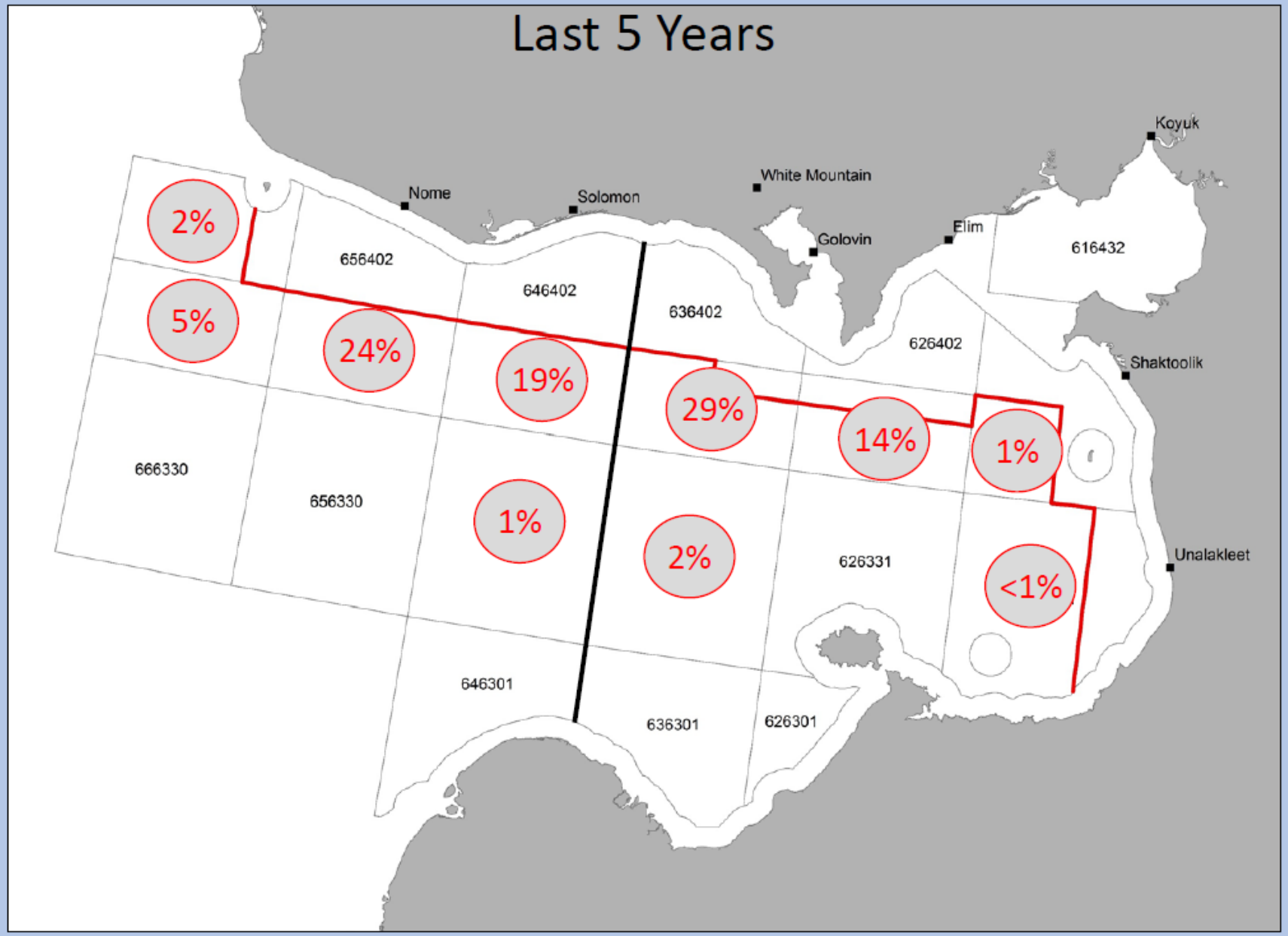
Toshihide “Hamachan” Hamazaki and Jie Zheng
Alaska Department of Fish and Game

Photo courtesy of Jen Bell (ADF&G)

WINTER COMMERCIAL FISHERY OVERVIEW

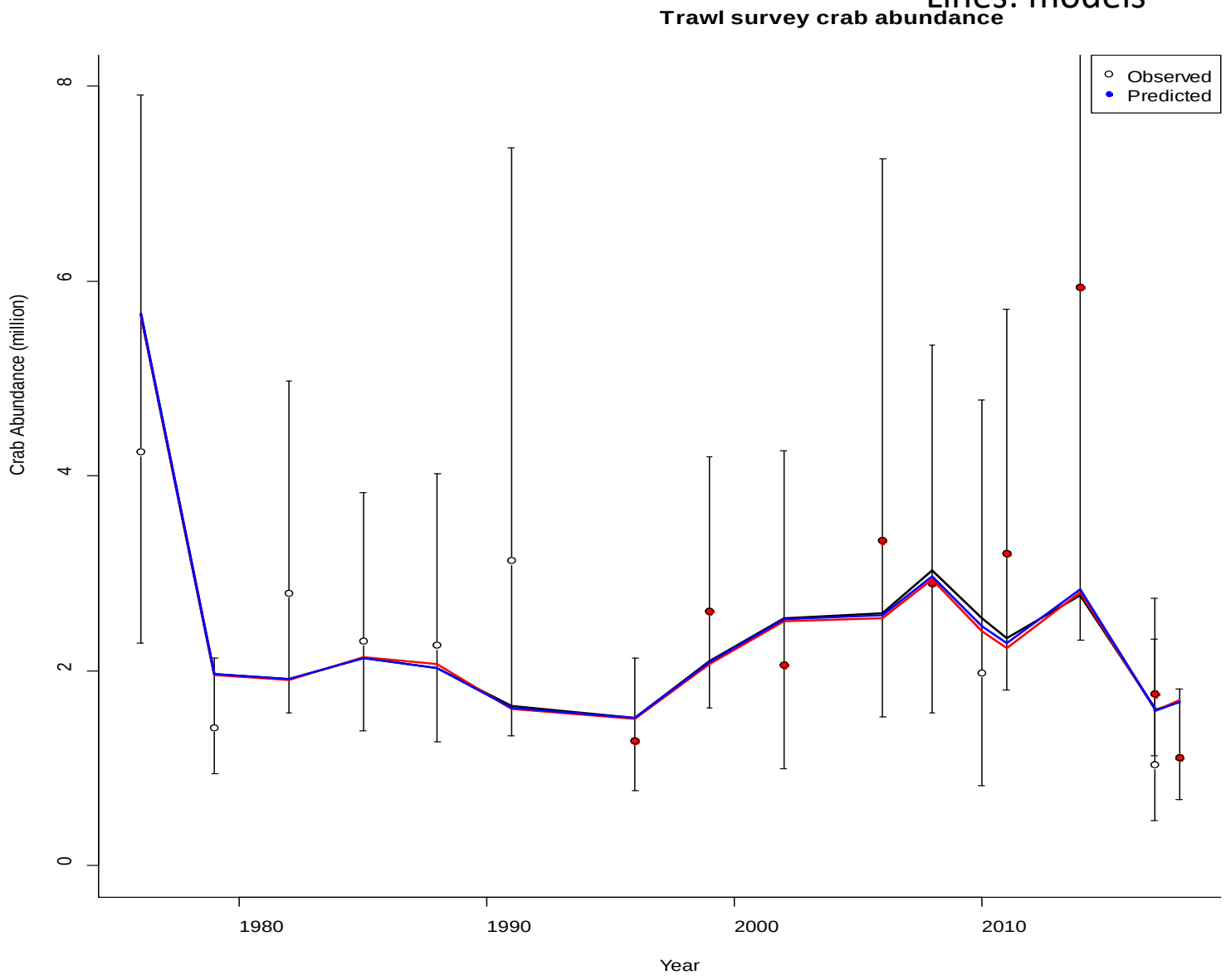


SUMMER COMMERCIAL FISHERY OVERVIEW

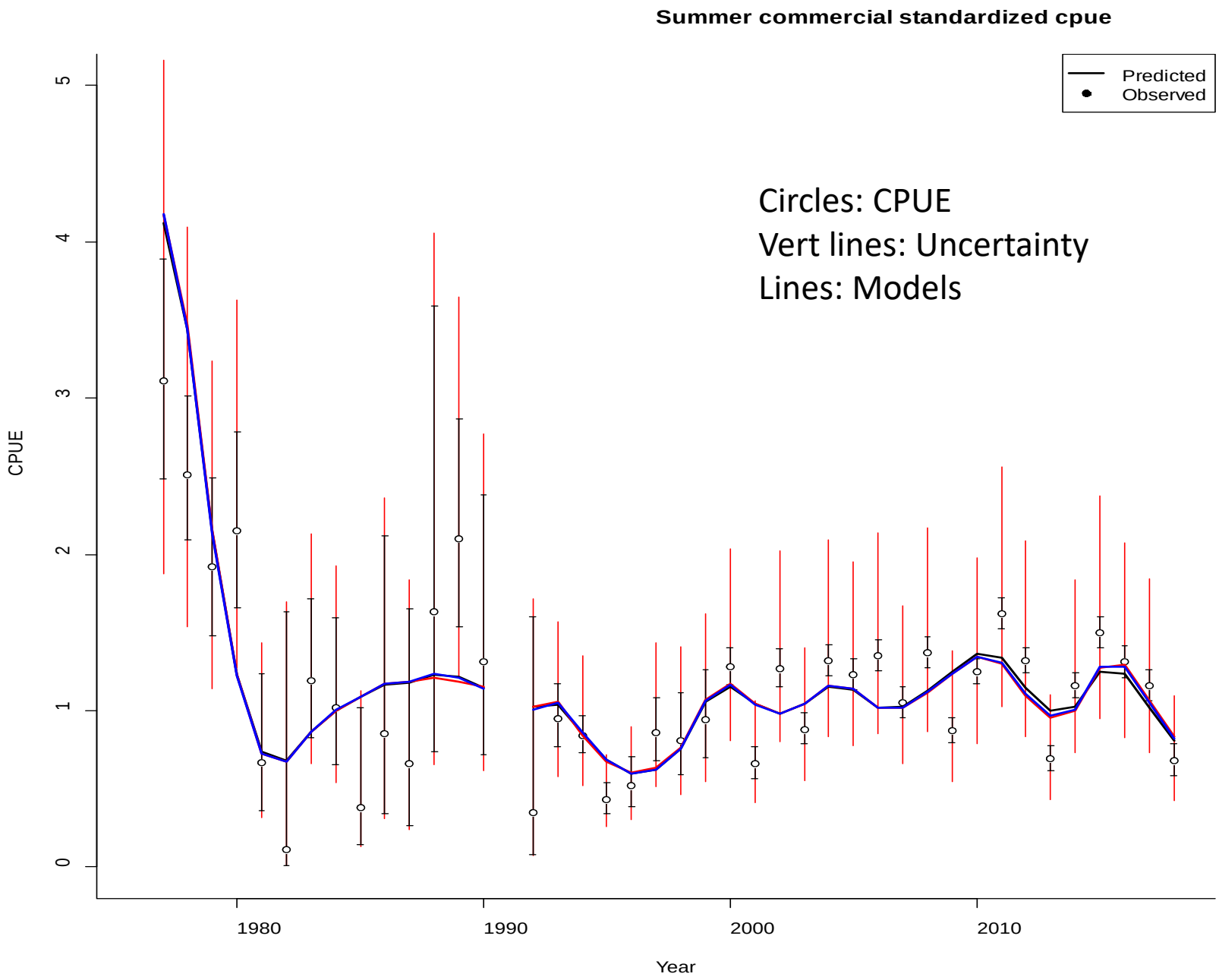


Norton Sound red king crab

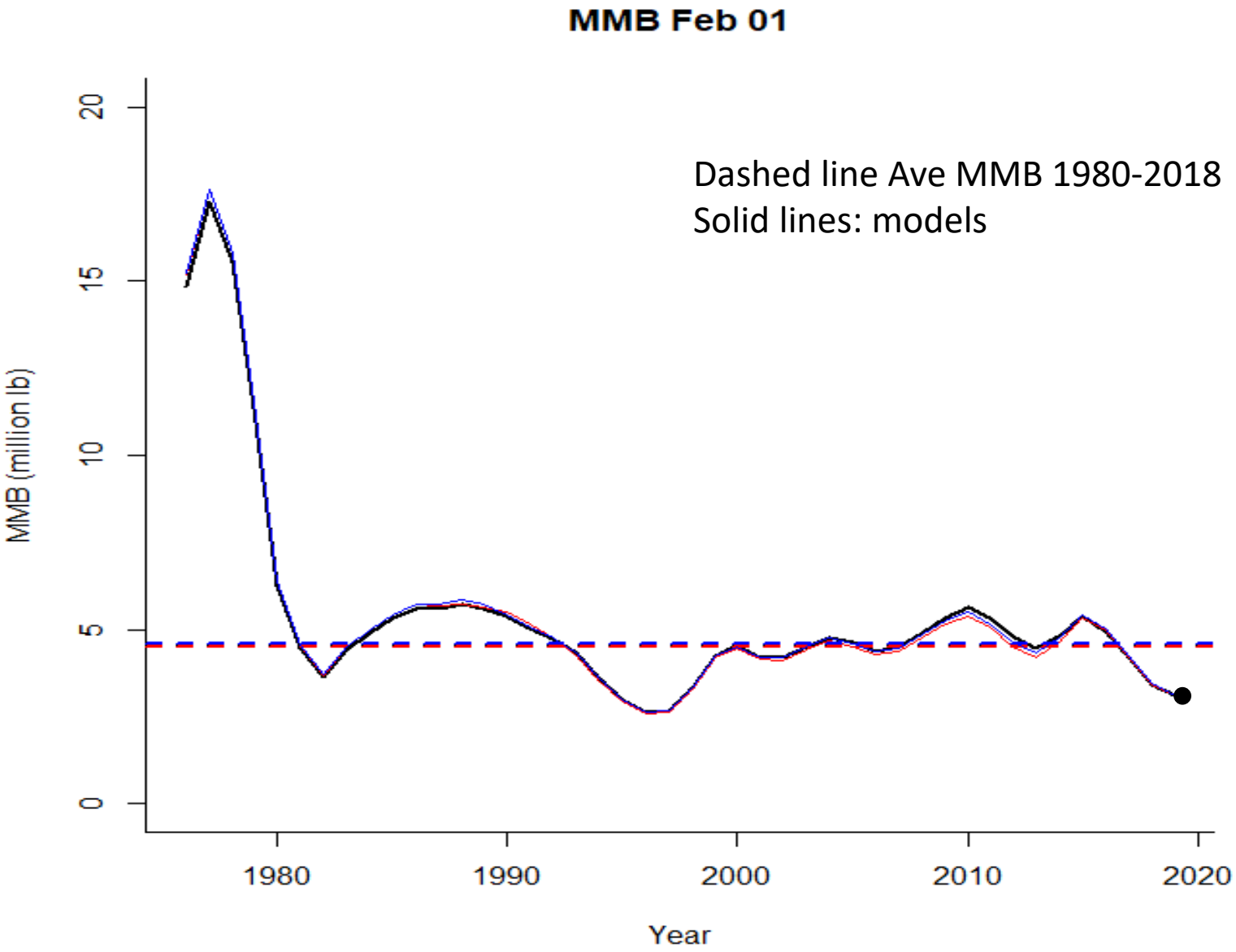
White circles: NMFS survey
Red circles: ADF&G survey
Lines: models



Norton Sound red king crab



Norton Sound red king crab



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

CPT Discussion: model scenarios

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 Mlb
  - 7.75 x Tier 4 OFL of 0.24 Mlb
    - 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

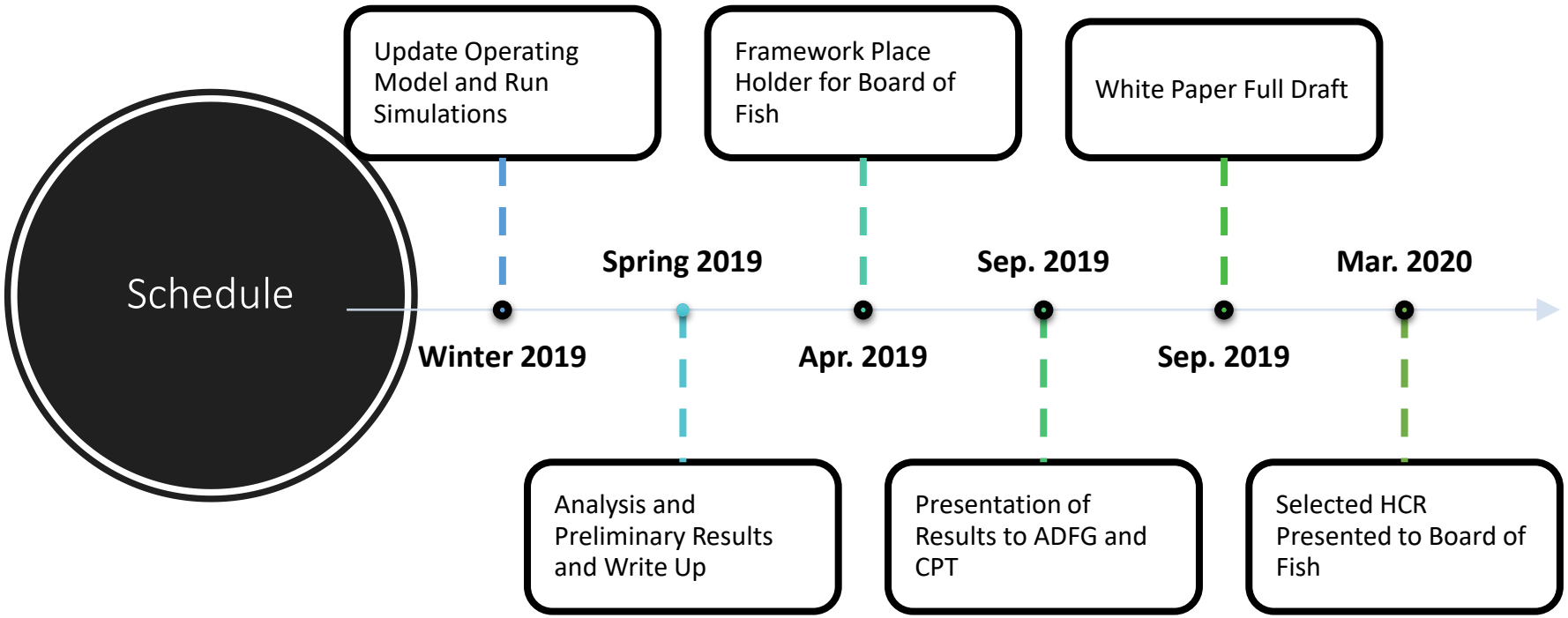
- Timing of data for OFL/ABC setting
- Chela data re-analyses for estimating size at maturity
- Industry cooperative survey data
- Area*Year interactions in CPUE standardization
- Spatial modeling via VAST
- Retrospective analyses
- Jittering

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!!!


ski-doo


ski-doo


YAMAHA

Saint Matthew Blue King Crab rebuilding progress, plans and associated assessment planning

Notification and implications

- Council notified October 22, 2018 that the Saint Matthew blue king crab stock was overfished.
- MSA requires that a rebuilding plan be prepared and implemented within 2 years
  - Must specify a time frame to rebuild
  - Time frame not to exceed ten years (unless this cannot be accomplished in the absence of all fishing mortality)

First steps for rebuilding plan= T_{min} and T_{max}

- Need to specify T_{min}
  - T_{min} = time the stock or stock complex to rebuild to its MSY biomass level in the absence of any fishing mortality ($\geq$50% probability)
- Need to specify T_{max} (maximum time for rebuilding)
- If T_{min} for the stock or stock complex is 10 years or less, then T_{max} is 10 years.
- If T_{min} for the stock or stock complex exceeds 10 years, then one of the following methods can be used to determine T_{max}:
  1. T_{min} + one generation time. "Generation time" = average length of time between when an individual is born and the birth of its offspring,
  2. Time to rebuild to B_{msy} if fished at 75 percent of MFMT, or
  3. T_{min} multiplied by two.
- In situations where T_{min} exceeds 10 years, T_{max} establishes a maximum time for rebuilding that is linked to the biology of the stock.

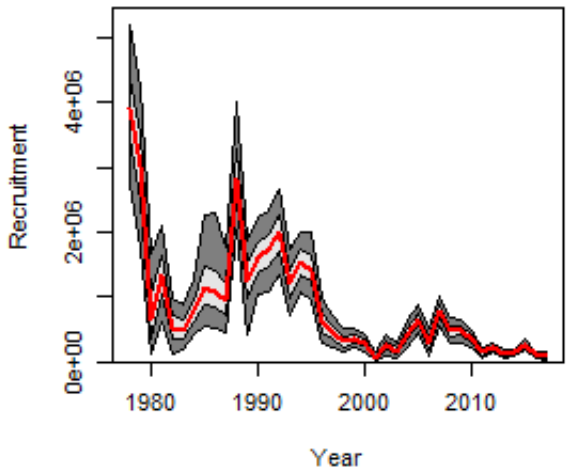
What are other (secondary) considerations for the rebuilding plan?

- Potential revisions to the State harvest strategy?
- Are there reasons to consider additional groundfish fishery measures to increase likelihood of rebuilding (habitat or other area closures)?
- Recommendations on ‘rebuilt’, 1 vs 2 years > B_{MSY}

January 2019 CPT discussion and recommendations

- GMACs code corrected for SMBKC assessment and updated code to be used for 2019 assessment; also coded to allow for projections
- Need SSC input/considerations on what is the most realistic estimate for recruitment for purposes of the rebuilding plan projections
- Implications for B_{MSY} time frame

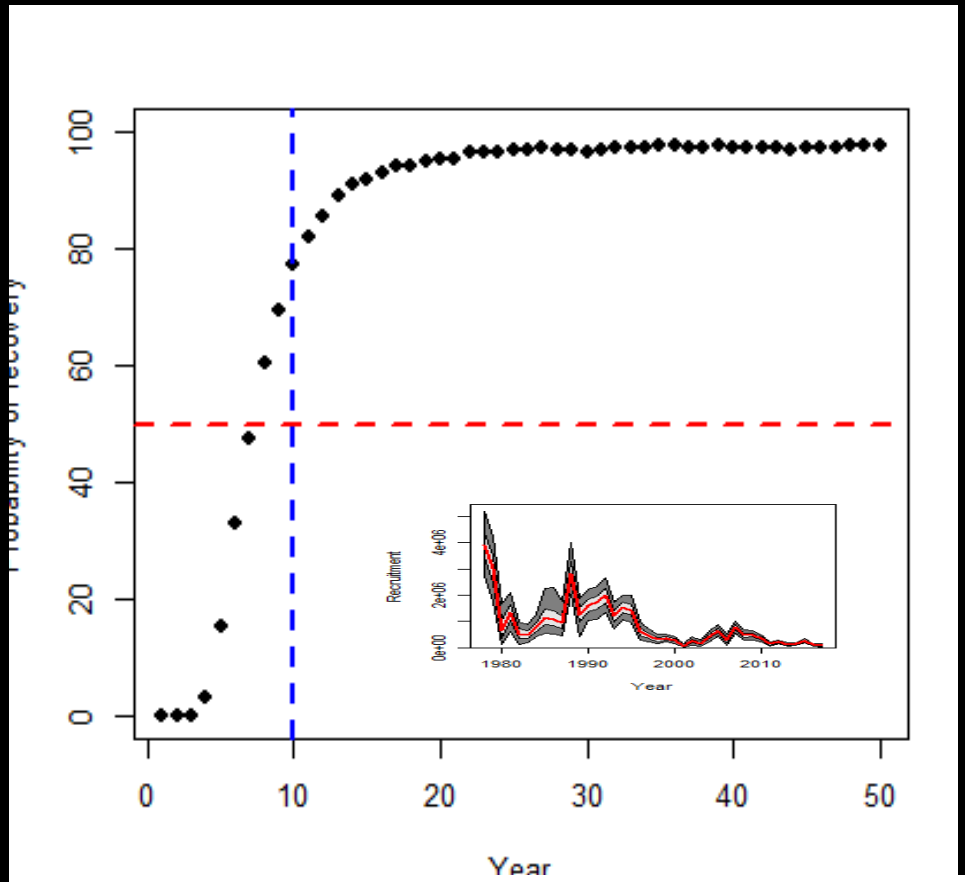
Progress/projections to Date

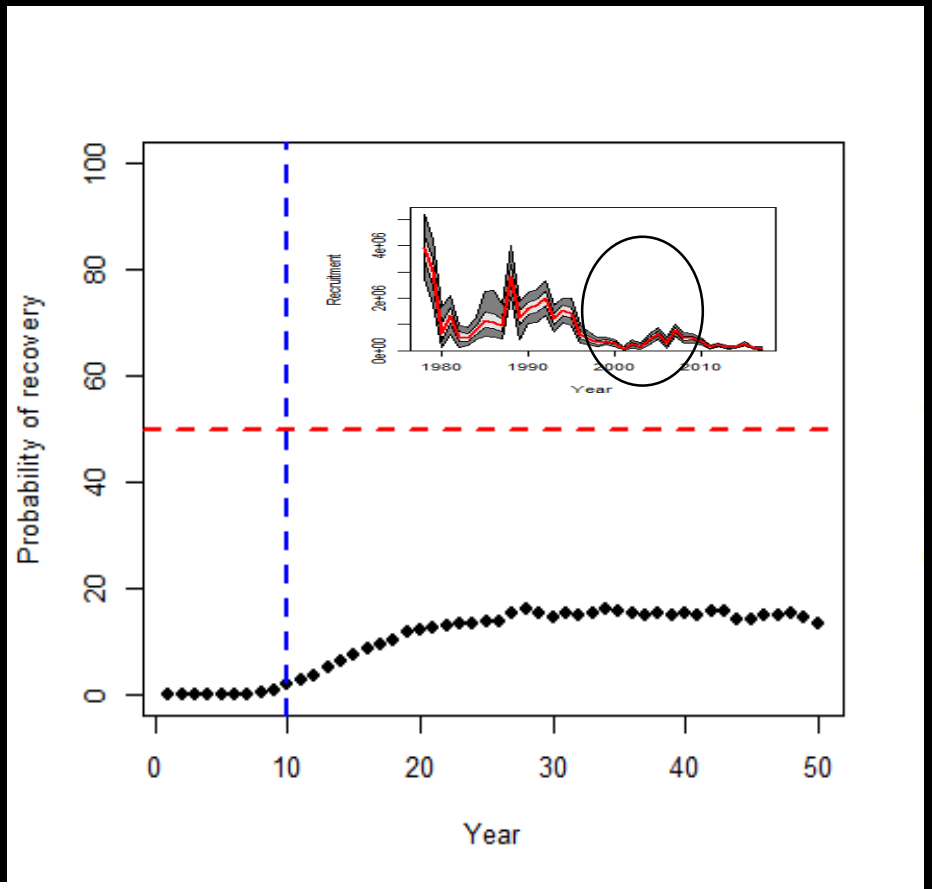


Recruitment

- Full time series
- Previous “rebuilding” time frame, 1999-2008
- Most recent “stanza”, 1995-2016
- Stock-recruit relationship

- Bycatch mortality
  - No significant role in rebuilding probability
- Mean generation time


Probability of recovery
0
20
40
60
80
100
0
10
20
30
40
50
Year
Recruitment
0e+00
2e+06
4e+06
1980
1990
2000
2010
Year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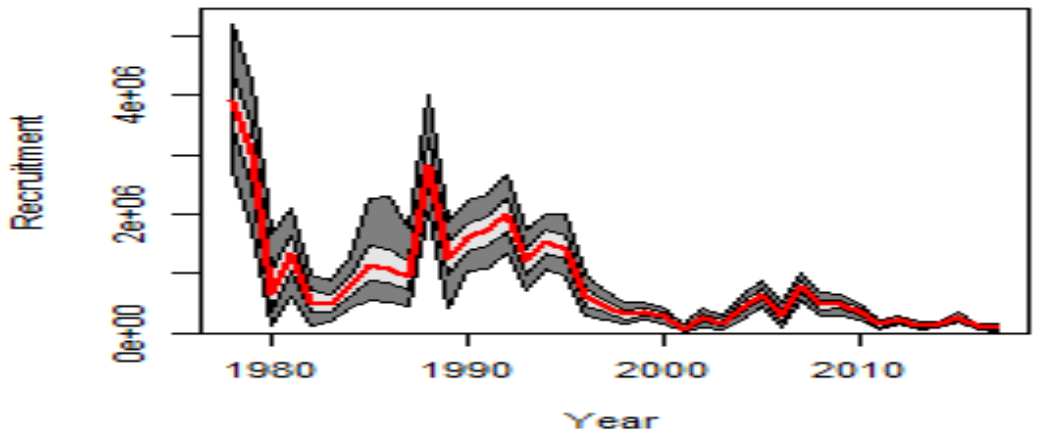

Recruitment
0e+00
2e+06
4e+06
1980
1990
2000
2010
Year

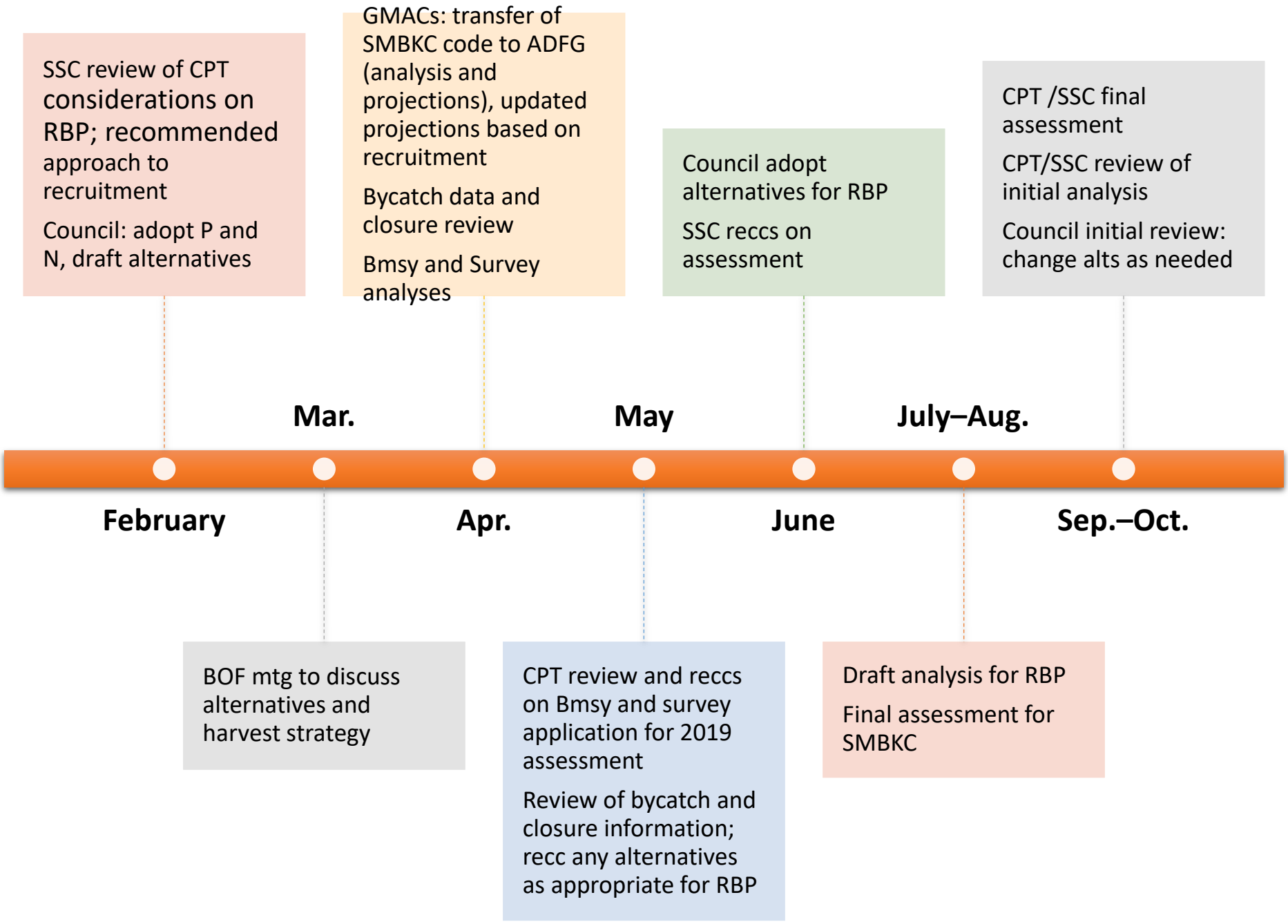
Analyses and Plans for Winter/Spring 2019

Assessment

- Transfer assessment and projection code to ADFG [late Feb - Andre/ADFG]
- B_{MSY} time frame [ADFG]
  - Log Recruit per spawner analysis to evaluate changes in productivity over time (similar to Jie's BBRKC examination)
  - Proposed changes to BMSY time frame: alternatives for inclusion in September final assessment
- Survey data review [ADFG]
  - Review of State and NMFS survey data, implications of offshore movement
  - VAST application to survey data

Rebuilding Plan

- Revised projections [Andre/ADFG/NPFMC]
  - Updated projections following Feb SSC; revised alternative projections consistent with proposed B_{MSY} alternatives
- Review of previous rebuilding plans [Diana]
  - Changes to assessment methodology and reference points since then
- Bycatch data review [NPFMC/NMFS]
  - Spatial locations of groundfish bycatch
  - Overlay existing area closures and review of rationale for closures
  - Size and sex composition of groundfish fishery bycatch


SSC review of CPT considerations on RBP; recommended approach to recruitment
Council: adopt P and N, draft alternatives
GMACs: transfer of SMBKC code to ADFG (analysis and projections), updated projections based on recruitment
Bycatch data and closure review
Bmsy and Survey analyses
Council adopt alternatives for RBP
SSC reccs on assessment
CPT /SSC final assessment
CPT/SSC review of initial analysis
Council initial review: change alts as needed
February
Mar.
Apr.
May
June
July–Aug.
Sep.–Oct.
BOF mtg to discuss alternatives and harvest strategy
CPT review and reccs on Bmsy and survey application for 2019 assessment
Review of bycatch and closure information; recc any alternatives as appropriate for RBP
Draft analysis for RBP
Final assessment for SMBKC

Council actions 2019-2020 following initial review draft

Dec	Feb	April/October
Council action as necessary Public review draft	Council Final action SOC final analysis	NMFS approval and regulations as needed Implementation prior to October 2020