Bering Sea District *C. bairdi* Tanner crab harvest strategy review update

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Westward Region

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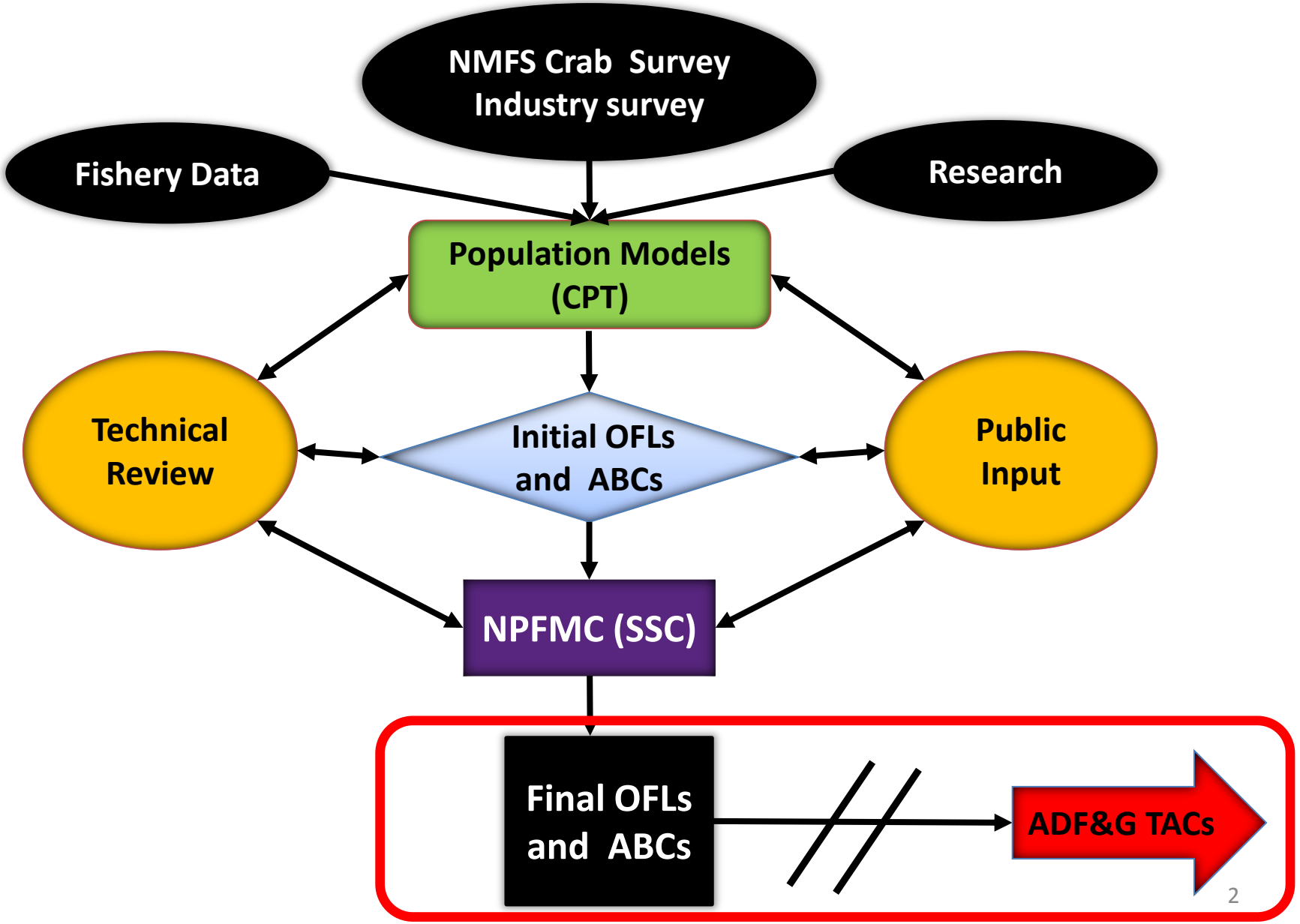
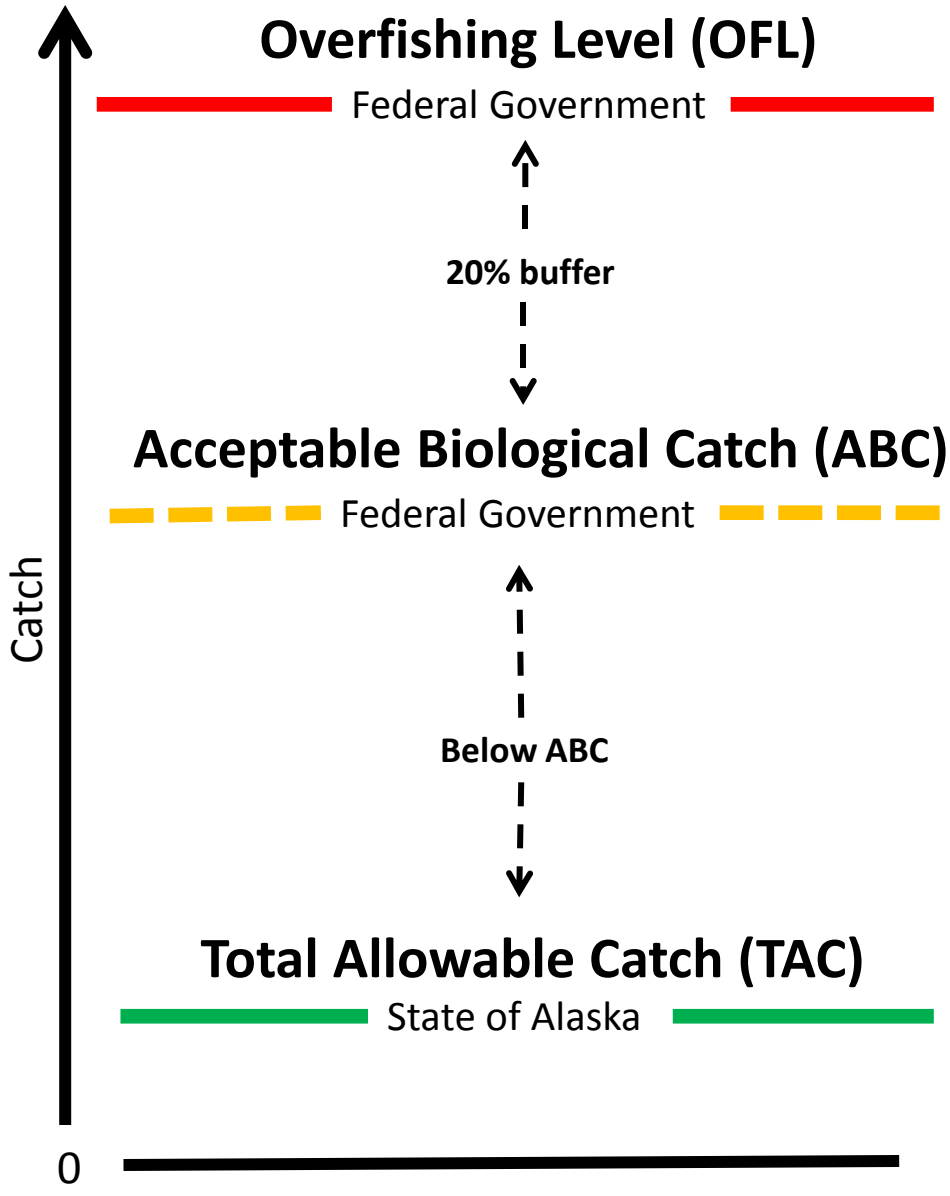
RC3 Tab3

Federal Crab Stock Assessment Process





OFL: Level of fishing mortality that jeopardizes the capacity of a stock to produce the maximum sustained yield on a continuing basis.

ABC: Level of annual catch that accounts for scientific uncertainty and is set to prevent the OFL from being exceeded.

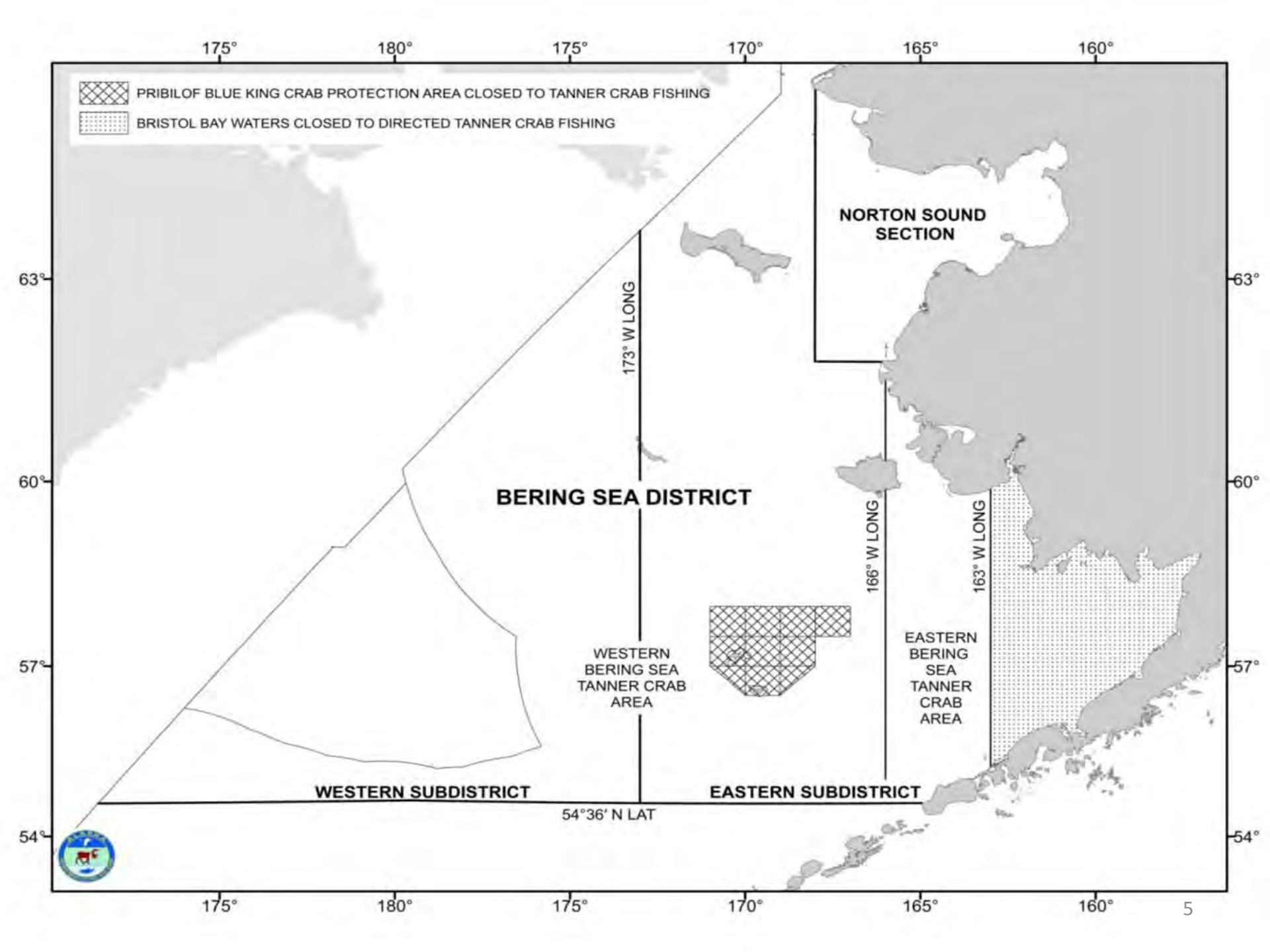
In practice ABC limits mortality of **ALL** male and female crabs regardless of size, from all sources of fishery mortality (i.e. retained catch, bycatch in directed and nondirected crab fisheries, and groundfish fisheries).

TAC: Annual catch target for the directed fishery, set to prevent exceeding the ABC for that stock. **Limits legal sized males**, but must consider all sources of mortality to ensure the ABC is not exceeded. Considers model uncertainty (e.g., model overestimates large males, does not consider females as measure of spawning biomass).

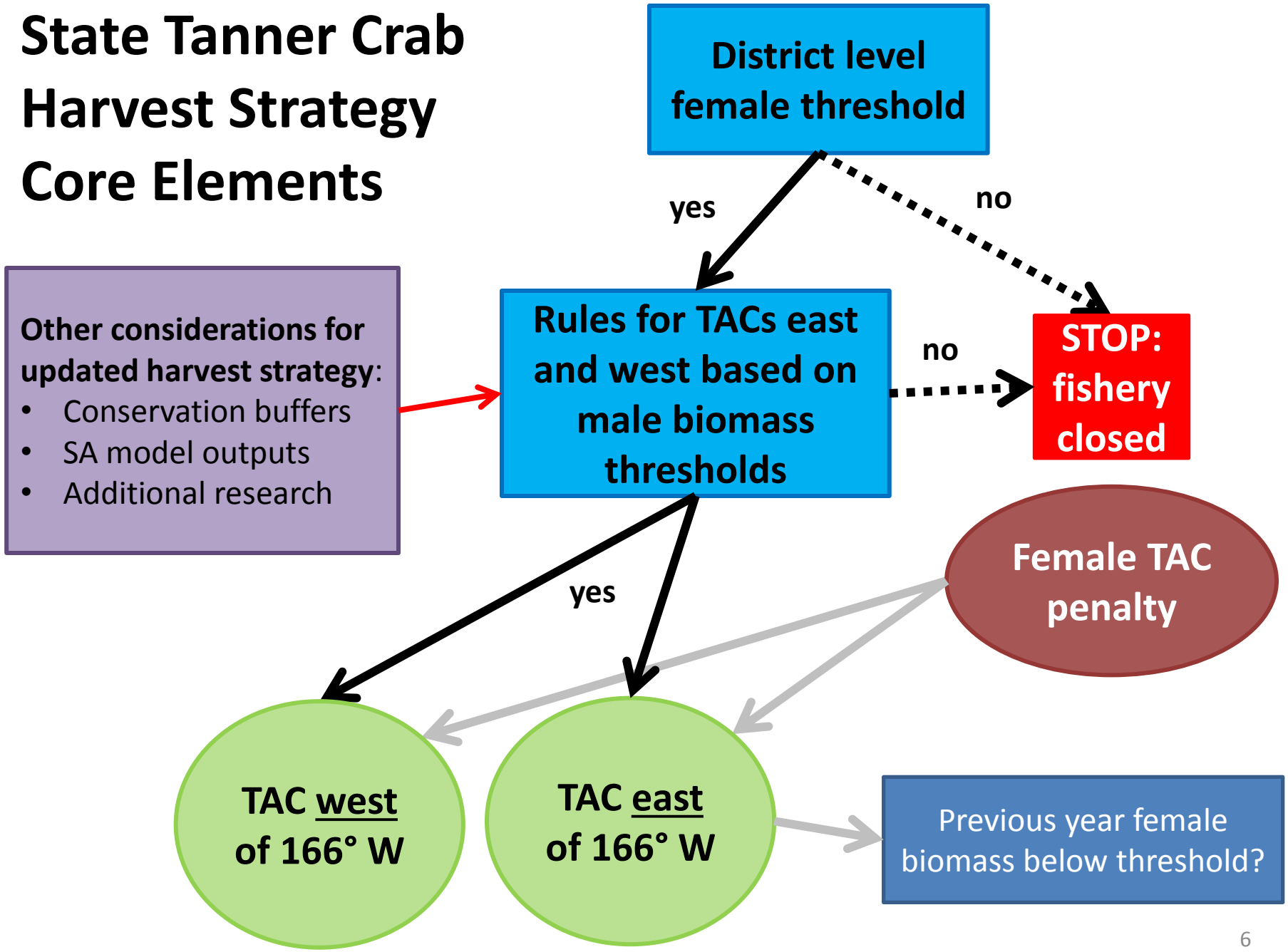
Federal Tanner Crab Stock Assessment Model

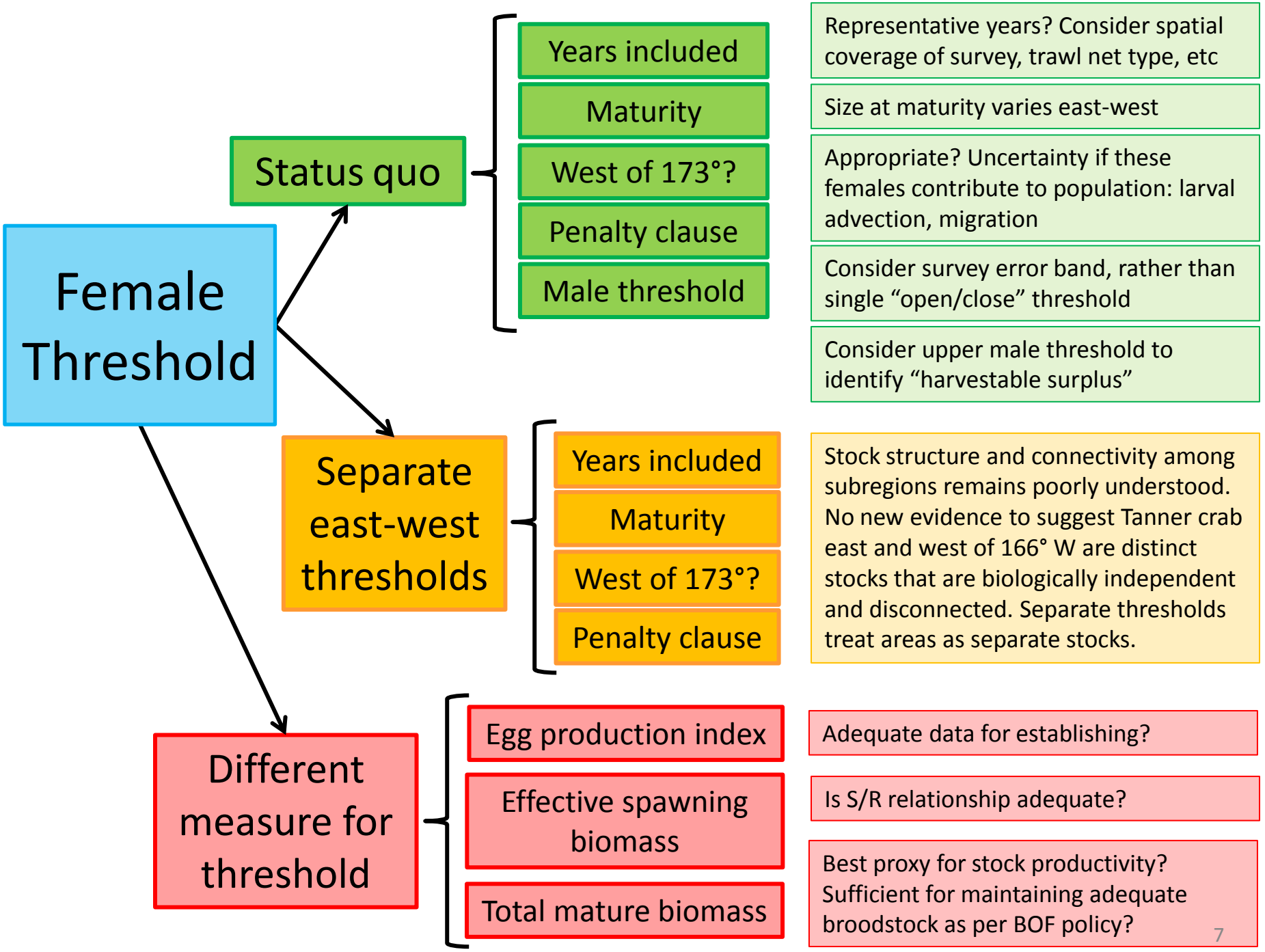
NPFMC CPT in 2016 has concerns about the model: "***The assessment model has consistently overestimated large male crab in the size compositions, which has large implications for estimation of mature male biomass and resulting OFL setting. It was suggested that the greater male growth rate estimated in the model relative to available empirical data may be contributing to this offset.***" (Crab Plan Team, Minutes September 20-23, 2016).

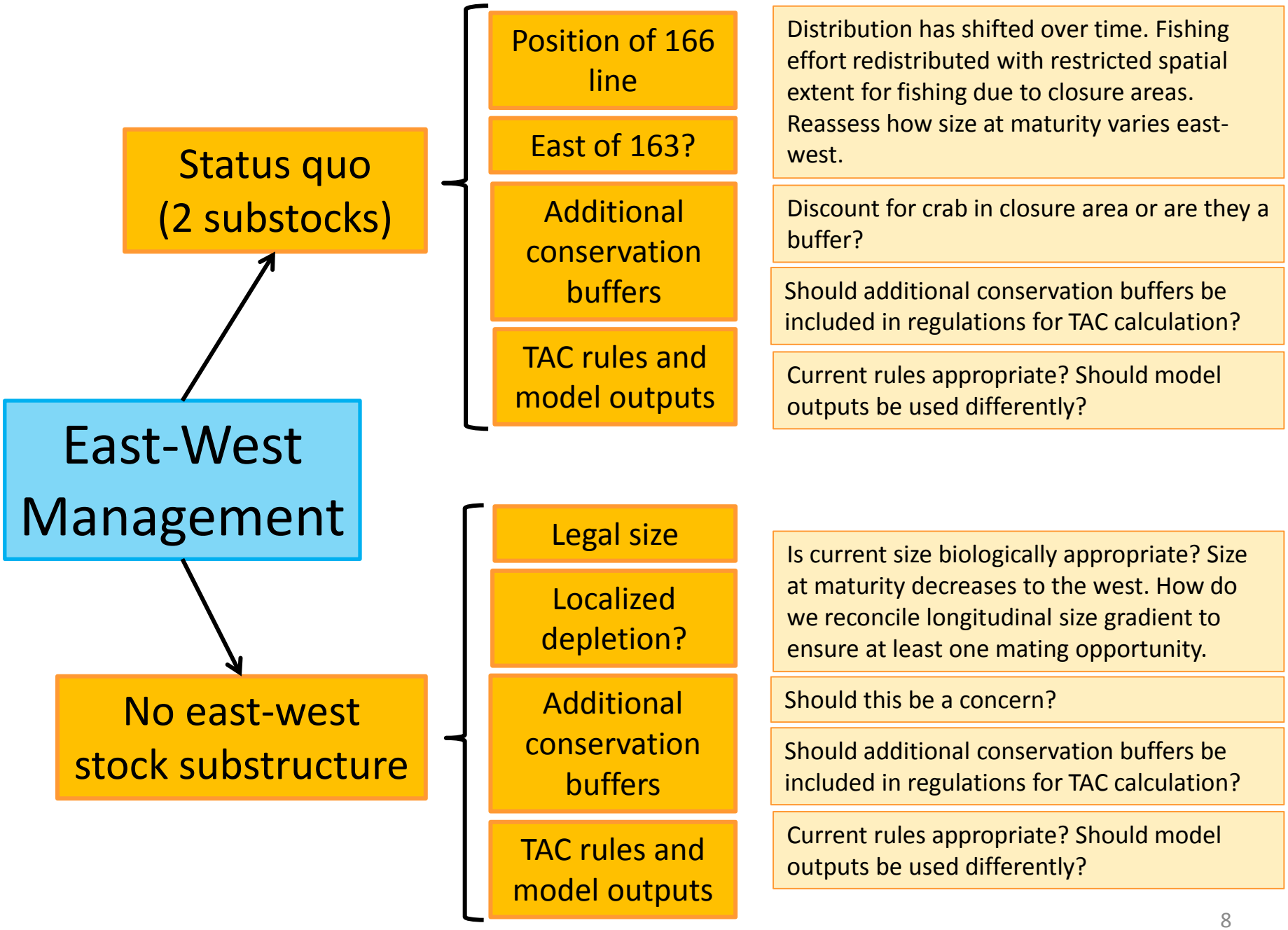
NPFMC SSC in 2012 recommended that ***"Over the long term, Tanner crab productivity [in the eastern Bering Sea] should be evaluated based on better measures of spawning biomass than mature male biomass, as is currently used, which ignores the dominant role of females in reproduction"*** (Report of the Scientific and Statistical Committee to the North Pacific Fishery Management Council, Minutes October 1–3, 2012. North Pacific Fishery Management Council, Anchorage: in response to FMP amendment 24).

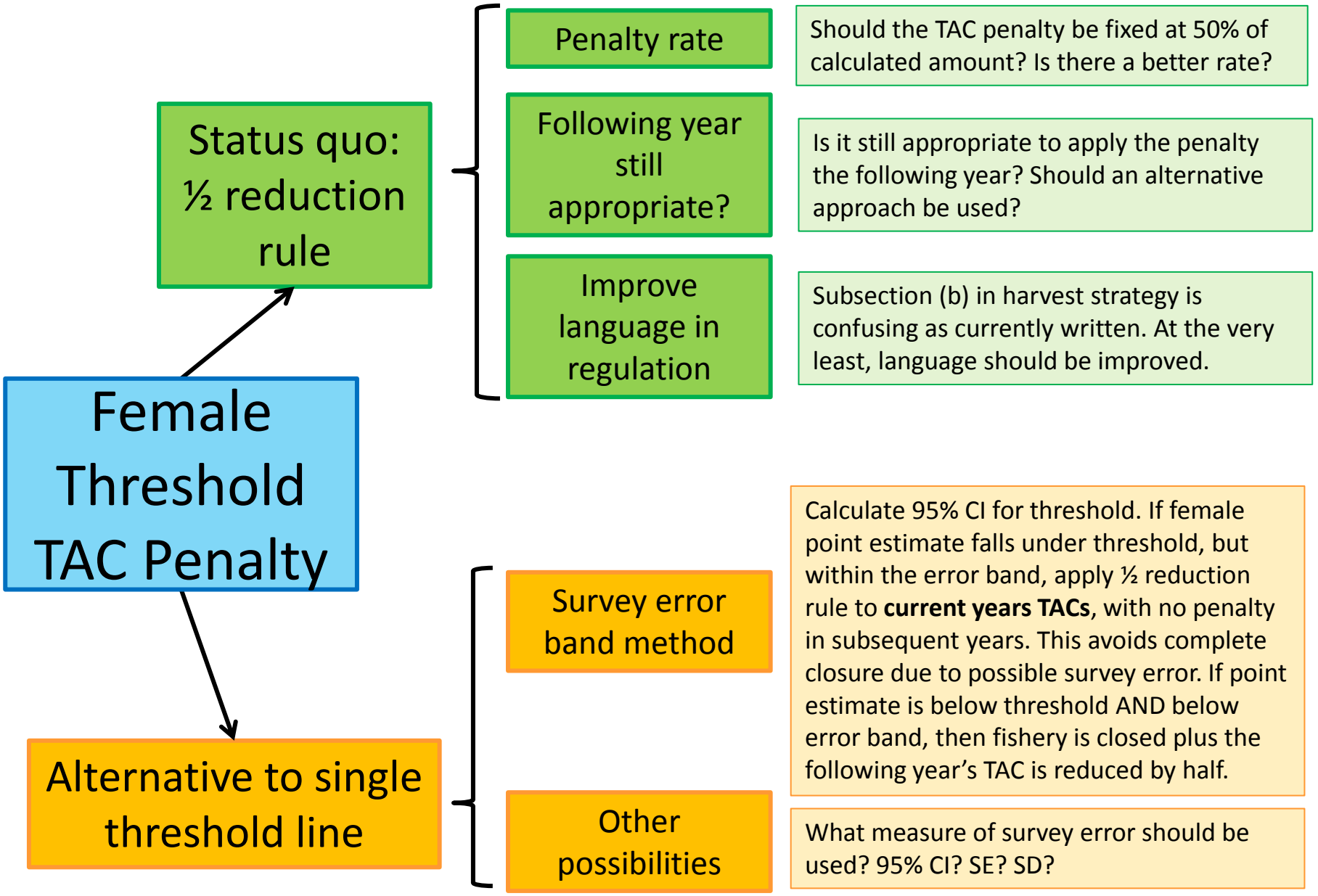

175°
180°
175°
170°
165°
160°
PRIBILOF BLUE KING CRAB PROTECTION AREA CLOSED TO TANNER CRAB FISHING
BRISTOL BAY WATERS CLOSED TO DIRECTED TANNER CRAB FISHING
NORTON SOUND SECTION
63°
173° W LONG
BERING SEA DISTRICT
60°
166° W LONG
163° W LONG
57°
WESTERN BERING SEA TANNER CRAB AREA
EASTERN BERING SEA TANNER CRAB AREA
WESTERN SUBDISTRICT
EASTERN SUBDISTRICT
54°36′ N LAT
54°

State Tanner Crab Harvest Strategy Core Elements




Female Threshold
Status quo
Years included
Maturity
West of 173°?
Penalty clause
Male threshold
Representative years? Consider spatial coverage of survey, trawl net type, etc
Size at maturity varies east-west
Appropriate? Uncertainty if these females contribute to population: larval advection, migration
Consider survey error band, rather than single “open/close” threshold
Consider upper male threshold to identify “harvestable surplus”
Separate east-west thresholds
Years included
Maturity
West of 173°?
Penalty clause
Stock structure and connectivity among subregions remains poorly understood. No new evidence to suggest Tanner crab east and west of 166° W are distinct stocks that are biologically independent and disconnected. Separate thresholds treat areas as separate stocks.
Different measure for threshold
Egg production index
Effective spawning biomass
Total mature biomass
Adequate data for establishing?
Is S/R relationship adequate?
Best proxy for stock productivity? Sufficient for maintaining adequate broodstock as per BOF policy?


East-West Management
Status quo (2 substocks)
No east-west stock substructure
Position of 166 line
East of 163?
Additional conservation buffers
TAC rules and model outputs
Legal size
Localized depletion?
Additional conservation buffers
TAC rules and model outputs
Distribution has shifted over time. Fishing effort redistributed with restricted spatial extent for fishing due to closure areas. Reassess how size at maturity varies east-west.
Discount for crab in closure area or are they a buffer?
Should additional conservation buffers be included in regulations for TAC calculation?
Current rules appropriate? Should model outputs be used differently?
Is current size biologically appropriate? Size at maturity decreases to the west. How do we reconcile longitudinal size gradient to ensure at least one mating opportunity.
Should this be a concern?
Should additional conservation buffers be included in regulations for TAC calculation?
Current rules appropriate? Should model outputs be used differently?


Female Threshold TAC Penalty
Status quo: ½ reduction rule
Penalty rate
Should the TAC penalty be fixed at 50% of calculated amount? Is there a better rate?
Following year still appropriate?
Is it still appropriate to apply the penalty the following year? Should an alternative approach be used?
Improve language in regulation
Subsection (b) in harvest strategy is confusing as currently written. At the very least, language should be improved.
Alternative to single threshold line
Survey error band method
Calculate 95% CI for threshold. If female point estimate falls under threshold, but within the error band, apply ½ reduction rule to current years TACs, with no penalty in subsequent years. This avoids complete closure due to possible survey error. If point estimate is below threshold AND below error band, then fishery is closed plus the following year's TAC is reduced by half.
Other possibilities
What measure of survey error should be used? 95% CI? SE? SD?

Other Considerations

Additional conservation buffers:

- Newshell-Oldshell selectivity discount
- Closure area discounts
  - Reduce exploitation rate on areas open to fishing, OR
  - Are they functionally a conservation buffer already?

Hybrids: Account for in SA or harvest strategy?

5 inch retention in the east:

- Are crabs 5.0-5.5 inches being retained?

Involvement

Harvest strategy review team

- ADF&G biologists and analysts
- Consultation with NMFS crab scientists
- Industry representatives
  - BSFRF (Scott Goodman)
  - Ad Hoc Tanner crab group

Management Milestones

EBS trawl survey: June-August 2017

Initial analyses and model input: August 15, 2017

Crab Plan Team: ~September 18-22, 2017

OFL/ABC adopted by Council: ~October 2-6, 2017

ADF&G TAC setting: ~October 2-11, 2017

ADF&G/Industry TAC meeting: ~October 12, 2017

Fishery opening: October 15, 2017

Roadmap

ADF&G

- Prioritize analyses on status quo core elements (green boxes in previous slides)
- Alternative analyses as time allows or as prioritized by board (orange boxes)

Industry representatives

- Work in parallel with ADF&G analyses
- Explore feasibility of data limited analyses? (red boxes)

NMFS scientists

- Consult and coordinate throughout analysis

Present updated harvest strategy to BOF in late June 2017

Questions?