

A primer on risk tables for BSAI crab stocks

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Why?

Council motion October 2023:

The Council supports developing the risk table approach for crab stocks to provide a more comprehensive, transparent, and defensible justification for SSC recommendations on ABC buffers...

Risk table genesis

- The need for formal evaluation of ecosystem conditions within groundfish stock assessments became evident during the 2014-2016 marine heatwave.
- Previously, contextual ecosystem information had been used in an ad hoc fashion to support ABC recommendations.
- Oct 2017: Following the GOA Pacific cod crash (Barbeaux et al 2020), the SSC specified:
 - *“The SSC also recommends explicit consideration and documentation of ecosystem and stock assessment status for each stock ... to aid in identifying stocks of concern.”*
- Summer 2018: Working group formed in response to the SSC request to develop a consistent approach to recommending ABC reductions.

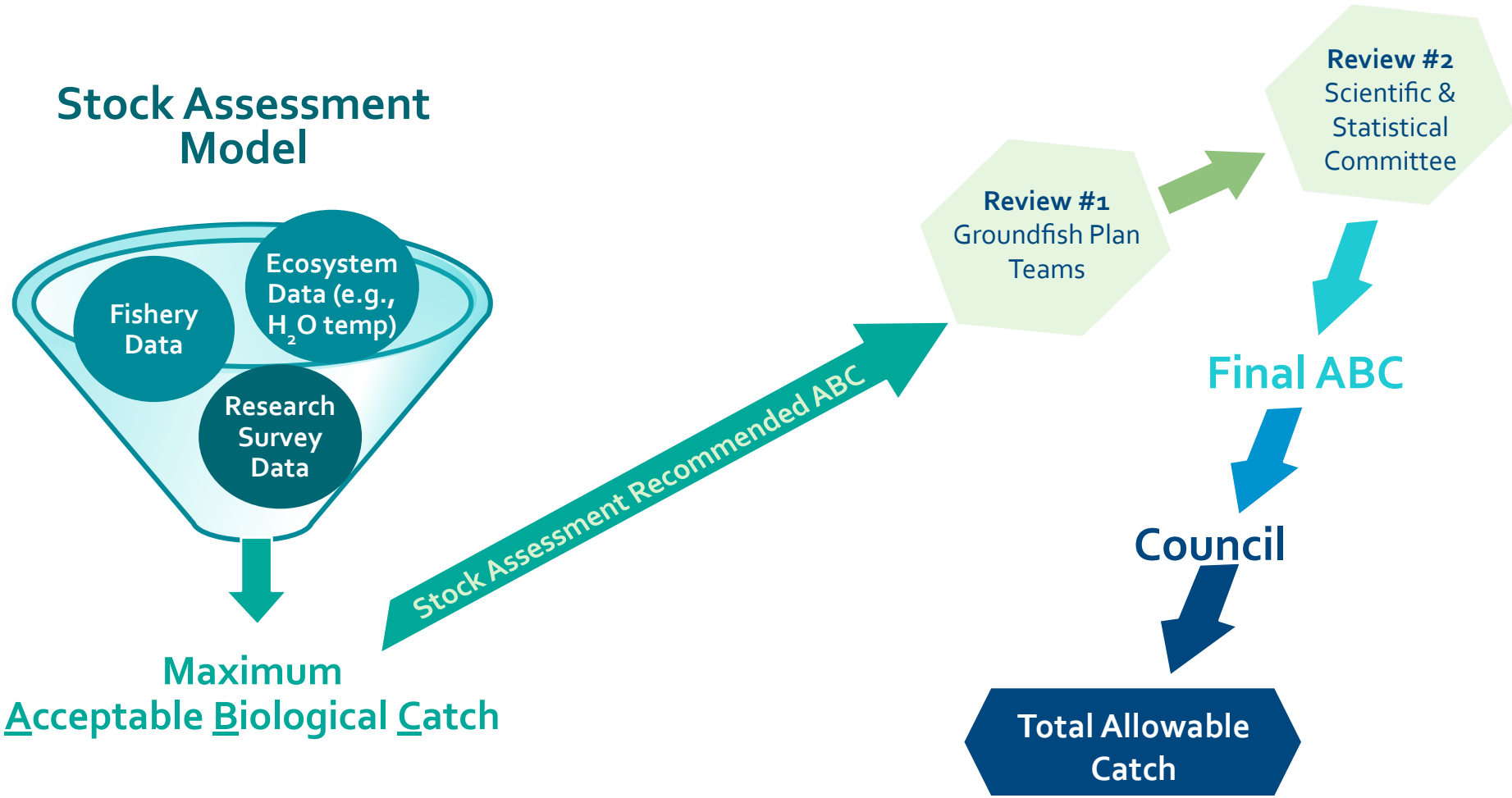
Risk Tables Version 1.0

Documenting relevant information/concerns that are not addressed within the assessment model

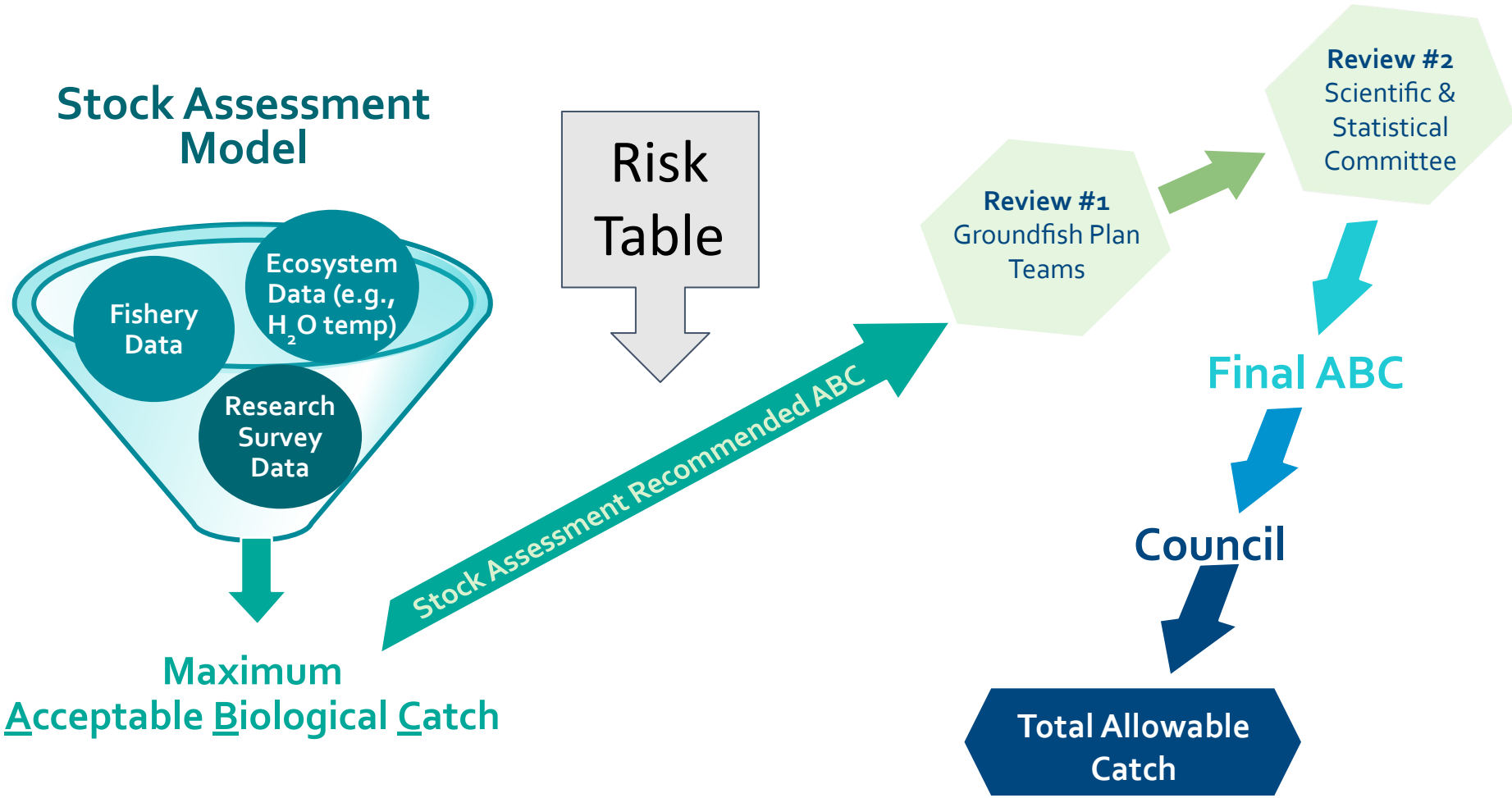
	Assessment-related	Population dynamics	Ecosystem
Level 1: Normal	Typical to moderately increased uncertainty/minor unresolved issues in assessment	Stock trends are typical for the stock; recent recruitment is within normal range.	No apparent environmental and/or ecosystem concerns relevant to the stock
Level 2: Substantially increased concerns	Substantially increased assessment uncertainty/unresolved issues.	Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical.	Some indicators showing adverse signals for the stock, but the pattern is not consistent across all indicators.
Level 3: Major Concern	Major problems with the stock assessment, very poor fits to data, high level of uncertainty, strong retrospective bias.	Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns.	Multiple indicators showing consistent adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels from the stock
Level 4: Extreme concern	Severe problems with the stock assessment, severe retrospective bias. Assessment considered unreliable.	Stock trends are unprecedented. More rapid changes in stock abundance than ever seen previously, or very long stretch of poor recruitment compared to previous patterns.	Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock. Potential for cascading effects on other ecosystem components

- No double-counting
- Specific to the year
- Not meant to be a comprehensive evaluation
- Information that might inform the current ABC

The annual catch limit-setting process for groundfish



The annual catch limit-setting process for groundfish



2018 – Five draft risk tables produced

2018 Gulf of Alaska Pacific cod risk table

Assessment-related considerations

Early recruitment estimates are uncertain and sensitive to model assumptions, resulting in uncertainty in biomass reference points. However other aspects of the assessment seem relatively robust.

Conclusion: Level 2, substantially increased concerns

Population dynamics considerations

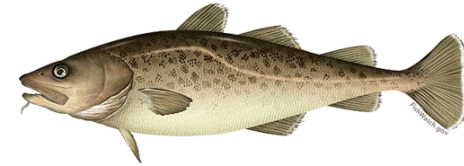
Three years of poor recruitment in 2014-2016. Female spawning biomass is currently estimated to be at its lowest point in the 41-year time series

Conclusion: Level 2, substantially increased concerns

Environmental/ecosystem considerations

Improved foraging conditions for adults and juveniles from 2017 to early 2018. However the onset of a new marine heatwave in October 2018 and projections of a weak El Niño are not conducive for age-0 survival.

Conclusion: Level 2, substantially increased concerns



Author's recommended ABC = catch that will maintain SSB above B20% in 2019 with 50% probability (13.6% reduction). ABC 17k tons

2018 Management Response

	Fishery Performance
Level 1: Normal	No apparent fishery/resource-use performance and/or behavior concerns
Level 2: Substantially increased concerns	Some indicators showing adverse signals but the pattern is not consistent across all indicators.
Level 3: Major Concern	Multiple indicators showing consistent adverse signals a) across different sectors, and/or b) different gear types
Level 4: Extreme concern	Extreme anomalies in multiple performance indicators that are highly likely to impact the stock.

- SSC/Council recommended that risk tables be done for all stocks.
- SSC requested the addition of a fishery performance column
- Fishery performance as reflective of the stock (not inform TAC)

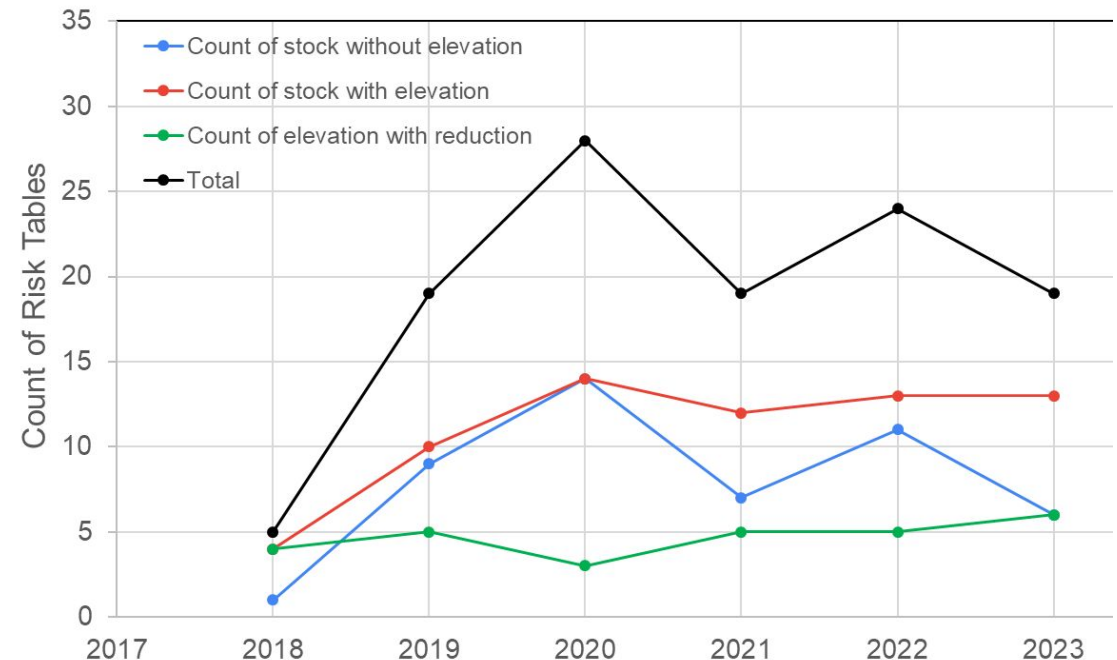
Lessons learned from risk table application to groundfish

- **Benefits**

- Provide transparency in a consistent framework, documentation of concerns that led to reduction or no reduction, ESR/SA working together
- Qualitative application of data can have quantitative impact
- Documentation of novel observations, non-stationarity

- **Challenges**

- Inconsistencies between risk levels and subsequent reductions or lack thereof
- How to complete for bycatch stocks, stock complexes, Tiers 5/6 stocks
- Difficult to know which information goes into what column



From SSC report October 2023

- **Risk tables have proven to be a valuable component of groundfish stock assessments** in providing a rationale for making ABC recommendations that reflect concerns about the stock assessment, population dynamics, the fishery, and the ecosystem.
- In their June 2021 motion, the Council supported delay of application of the risk table to the crab specifications process until further progress is made on groundfish.
- Based on the SSC preliminary guidance and recommendations in the Risk Table Workshop Report (p. 33 of June 2021 SSC Report, Appendix A) and further positive experience with risk tables for groundfish, **the SSC recommends that risk tables be developed for crab assessments.**
- **Risk tables would be used to provide a more comprehensive, transparent, and defensible justification for CPT and SSC recommendations on ABC buffers.**
- The SSC emphasizes that the use of risk tables does not change its overall approach to setting ABC buffers for crab and recognizes that it may take more than one assessment cycle to develop.

Council motion October 2023

- **The Council supports developing the risk table approach for crab stocks** to provide a more comprehensive, transparent, and defensible justification for SSC recommendations on ABC buffers with the following guidance and any lessons learned from the groundfish plan teams as provided by staff:
- The risk tables are intended to inform the SSC determination of adjusting ABC from maximum permissible when needed, to account for uncertainty that is not already included in the model or the tier system.
- Previous reductions to maxABC should not be the basis for reducing maxABC unless relevant risk factors for a stock continue to be present.
- The Council recommends that the consideration of risk and its incorporation into the assessment process continue to be regularly reviewed by the Council and SSC.

REFM/MESA proposed revisions to risk table categories in fall 2023 to address an SSC request for 3 levels of risk

- Our proposal for 2023, since we are already well into the stock assessment cycle, is to just **delete category Level 2 (Substantially Increased Concern) and use Levels 1, 3, and 4 (Normal, Major Concern, and Extreme Concern)**.
- We propose an edit to Level 1 from "Normal" to "No Concern" to align with the other categories.
- We would like to keep the current text for these categories, and **have a more thoughtful discussion in early 2024 for revising the text to align with the 3 category risk table**.
- We are hoping to get Plan Team and SSC feedback on the 3 categories that we can consider for any risk table revisions.

Risk table discussion from SSC report Dec 2023: the new risk levels

- **The SSC continues to support a three-category risk table with categories normal, increased, and extreme, and requests that the category descriptions be revised to cover the range covered by the original table.**
- The SSC appreciates the inclusion of the risk table with definitions in Stock Assessment and Fishery Evaluation (SAFE) documents and requests that authors include it (or continue to include it) for future operational full and operational update assessments.

Risk table discussion from SSC report Dec 2023: the fishery performance column

- There remains considerable confusion over the application of the fishery performance category of the risk table. **The SSC reiterates that only fishery performance indicators that provide some inference regarding biological status of the stock should be used.** SSC recommendation #5 from page 34 of the [June 2021 SSC report](#) states:
- “The SSC recommends that the fishery/community performance column should focus on information that would inform the biological status of the resource (e.g., an unexplained drop in CPUE that could indicate un-modelled stock decline, or a spatial shift indicating changes in species’ range), and not the effects of proposed ABCs on the fishery or communities or bycatch related considerations. The SSC recognizes that the community impact information is critical for informed decision making for TAC setting and recommends this information be included in other Council documents ...”
- For example, poor economic performance due to weak markets would not lead to an elevated fishery performance score. Examples of useful indicators include CPUE, fishery spatial and temporal patterns, and catches of thin or unhealthy fish (i.e., poor condition).
- In attempting to draw inferences from fishery performance, it is important to use caution and consult with industry representatives, if possible, since these indicators can also be influenced by factors unrelated to the stock, such as bycatch avoidance or economic factors.

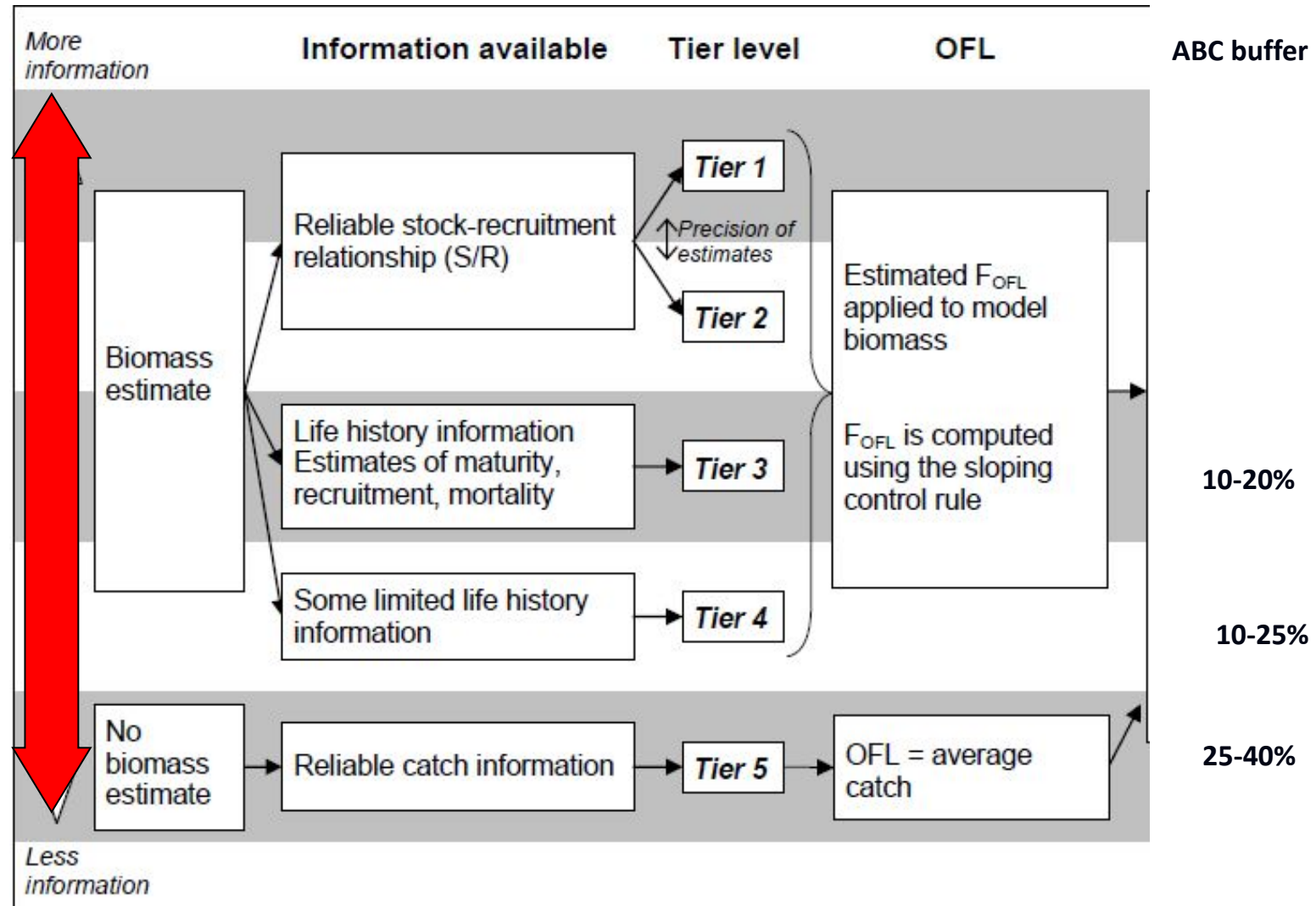
Risk table discussion from SSC report Dec 2023: other comments

- **The SSC recommends that the risk tables consider potential future risks when these can be anticipated.** For example, the upcoming El Niño conditions in the Gulf of Alaska (GOA) are likely to impact some groundfish species in the coming year.
- **When risk scores are reported, the SSC requests that a brief justification of the score be provided, even when that score indicates no elevated risk.**
- The SSC found that the [C3/C4 Risk Table Update 2018-2023](#) summary to be useful in placing the scores for individual species in a broader context and thanked Dr. Shotwell and GPT leadership and coordinators for the extra work it took to compile this for the SSC.
- The SSC recommends this table be updated each year and provided to the Plan Teams and the SSC. The summary table will allow tracking of stocks with elevated scores, stocks where an additional ABC buffer is recommended, the justification for those buffers, and identification of any other concerns that emerge with application of the risk table.

Crabby considerations

- Crab management recommendations by the CPT and SSC have a well-established approach using buffers for reducing the ABC from the maximum permissible (as defined by a P* approach).
- Risk tables ensure that a comprehensive and standardized approach is used across all assessments.
- **A key question for crab is whether concerns that led to the buffer recommendation last year are still the same, increased or reduced.**
- **Lower level of concern should result in a smaller buffer recommendation.**
- **If there are no concerns, the buffer should be towards the lower end of the range for the tier level of the stock**
- **The purpose is not to change current practice in making recommendations.**

BSAI crab stocks management



Proposed Risk Table Levels of Concern for 2024

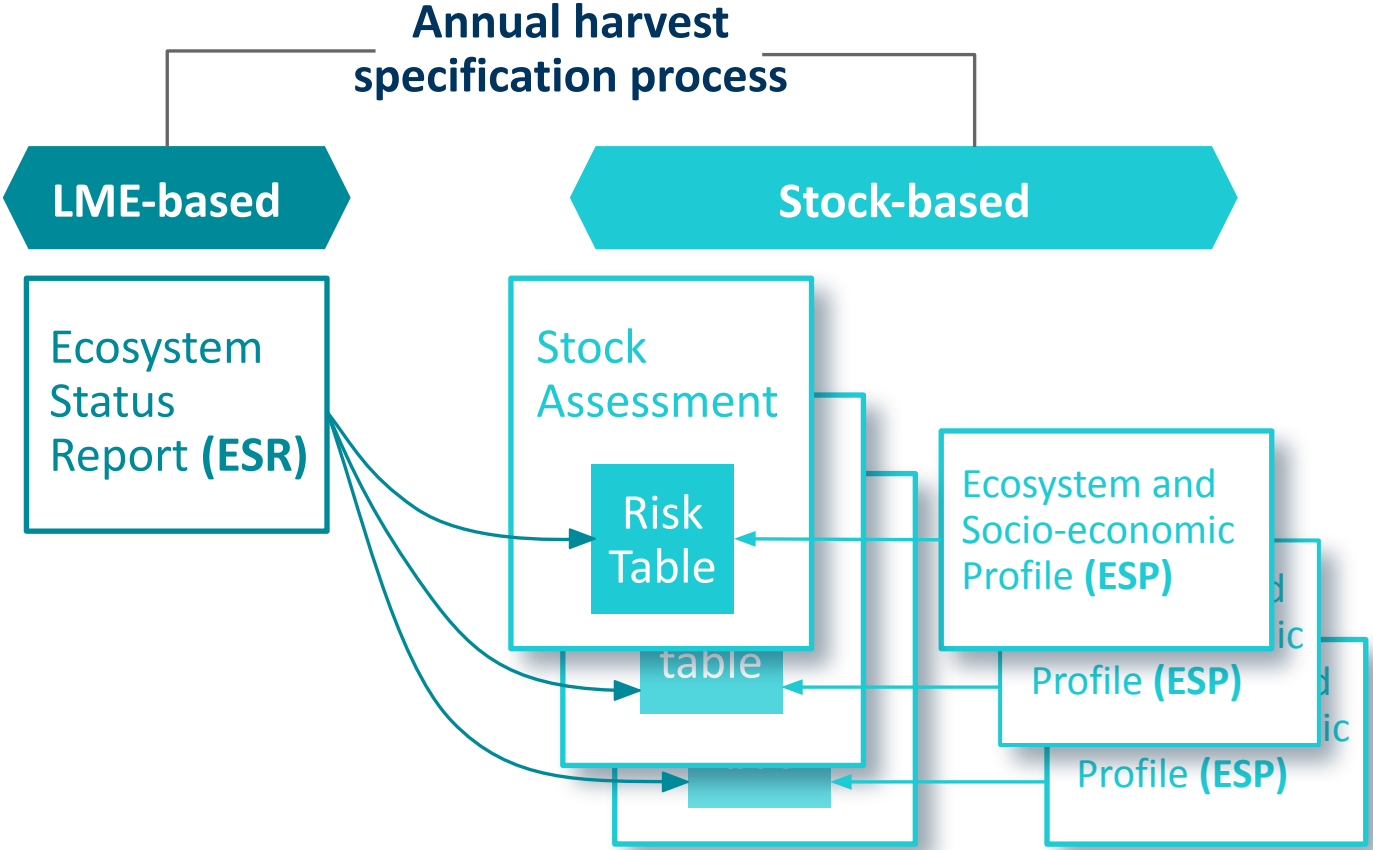
	<i>Assessment-related considerations</i>	<i>Population dynamics considerations</i>	<i>Environmental/ecosystem considerations</i>	<i>Fishery Performance</i>
Level 1: No Concern	Typical to moderately increased uncertainty/minor unresolved issues in assessment.	Stock trends are typical for the stock; recent recruitment is within normal range.	No apparent environmental/ecosystem concerns, or a few minor concerns with uncertain impacts on the stock.	No apparent fishery/resource-use performance and/or behavior concerns, or a few minor concerns with uncertain impacts on the stock.
Level 2: Increased concern	Substantially increased assessment uncertainty/unresolved issues, such as residual patterns, substantial retrospective bias.	Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical.	Several indicators showing adverse signals relevant to the stock but the pattern is not consistent across all indicators.	Several indicators showing adverse signals but the pattern is not consistent across all indicators.
Level 3: Severe Concern	Severe problems with the stock assessment; very poor fits to data; high level of uncertainty; very strong retrospective bias. Assessment of questionable reliability.	Stock trends are extremely unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns compared to previous patterns.	Multiple indicators showing consistent and strong adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels (i.e., predators and prey of the stock) that are likely to impact the stock. Potential for cascading effects on other ecosystem components.	Multiple indicators showing consistent and strong adverse signals a) across different sectors, and/or b) different gear types.

BBRKC example

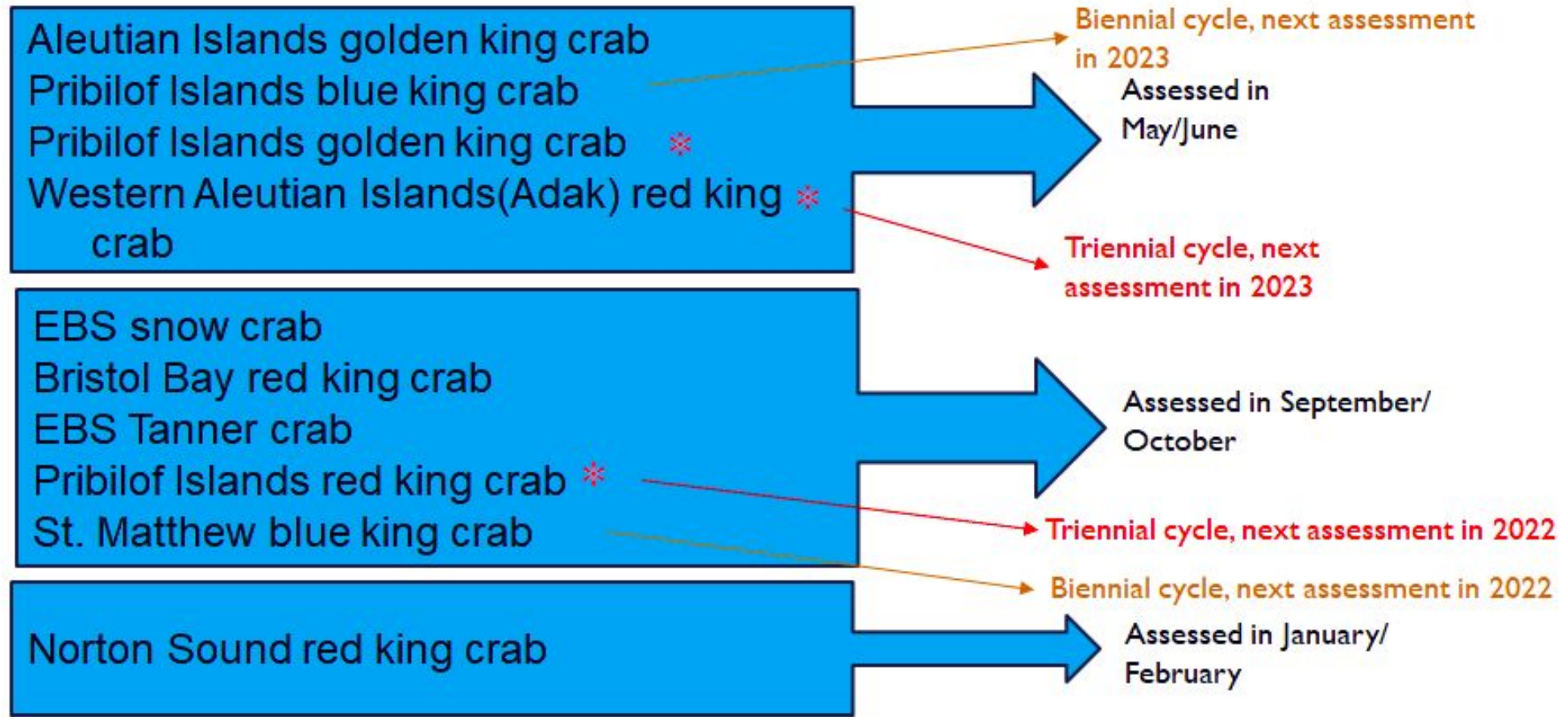
- Katie recommended continuing to use a 20% buffer for ABC for this stock because she felt that the level of additional uncertainty in the assessment matched the levels previously expressed in 2021 and 2022, although the basis for those concerns had changed somewhat.
- These included:
 - Continued lack of recent recruitment, coupled with near historically-low abundance
 - Poor and variable environmental conditions (e.g., cold pool distributional shifts)
 - The lack of fit to 2018-2023 NMFS female survey biomass
 - The retrospective patterns exhibited by the recommended model, even though this was improved over last year's assessment model (21.1b)

The CPT noted that the buffer consideration should focus on uncertainty not captured in the model but generally agreed with Katie's rationale. The CPT thus recommended that a 20% buffer on OFL be used to compute the ABC.

How ESRs and ESPs inform the ecosystem category (and sometime pop dyn and fishery performance categories)



Proposed yearly timeline for ecosystem info to feed into risk table



Proposed yearly timeline for ecosystem info to feed into risk table

Meet with ESR/ESP staff immediately following previous CPT mtg

