of terminal molt at a smaller size; Mullowney et al. 2021). Cody noted that EBS snow crab have undergone a period of very low density of large males in the past and preliminary modeling explorations of EBS maturity-at-size data support the findings of Mullowney et al. (2021). A smaller size at terminal molt would likely reduce the reproductive capacity of the stock and decrease the number of crab reaching commercial size. Further, there is added complexity in that there is time-varying probability of terminal molt (i.e., maturity) at size. For this assessment, reference point calculations used the average maturity-at-size across years for which data were available, but those probabilities may not be representative of the population structure in future terminal years given current low densities. Lastly, the stock status confirmed that using $B_{35\%}$ places the stock above MSST, which does not seem appropriate given that the exploitable portion of the stock is estimated to be at an all-time low. The Tier 4_ssc approach would ease fishing mortality on the most reproductively important males, but maintains all the negative issues associated with using $B_{35\%}$ and creates a logical disconnect in that the F_{MSY} proxy, M, cannot reach the biomass target. Tier 4_specs reduces maximum fishing mortality similar to Tier 4_ssc, but B_{avg} (1982-2022) is larger than previously used biomass reference points. Tier 4_survey was dismissed because the CPT felt that model 23.3a better described the dynamics of the population and there was no reason to not use model estimated MMB for reference point calculation.

The CPT ultimately recommended using Tier 4_spec calculations, which result in a stock status that is 34% of B_{MSY} and an OFL of 0.31 kt. This decision was arrived at on the basis that $B_{35\%}$ does not appear to be a conservative biomass target under current conditions, and the stock status better aligns with what the CPT considers the state of the stock to be. The CPT also highlighted that Tier 4_spec calculations are based on moving the snow crab stock into Tier 4 for proxies of both F_{OFL} and B_{MSY}, and is therefore not a departure from methods outlined in the FMP. The CPT emphasized that the move to Tier 4 is only intended to be a temporary measure for 2023, and that the management approach should return to SPR-based methods once more appropriate reference point calculations are available. Solving the root of this problem would require reassessing the currency of management for this stock. The CPT recommended that the ABC buffer be decreased to 20% citing reduced concern over model convergence and bimodality, and use of Tier 4 harvest control rules (i.e., more conservative reference points).

Tanner crab final SAFE

Buck Stockhausen provided a presentation on the Tanner crab final SAFE for 2023/24.
The 2022/23 season was the first time since 2015/16 that the State of Alaska set a TAC for both the east (528 t TAC) and west (386 t TAC) Tanner crab management areas. The retained catch was approximately the TAC in both areas, but combined harvest was much less than the OFL (32,810 t). Total catch mortality for this stock was much less than the OFL, therefore overfishing is not occurring. The MMB in 2022/23 was greater than B_{MSY}, placing this stock into Tier 3a.

The NMFS EBS trawl survey results for Tanner crab generally were down in the east and up in the west for male biomass, while female biomass increased in both areas. There is evidence from the size compositions for a large recruitment event in the west, although this should be

interpreted cautiously because recent recruitment events have not materialized into larger size classes.

Buck addressed a number of CPT and SSC comments. He pointed out that the 2022 assessment model's retrospective pattern for MMB was small, although the pattern for recruitment was higher (an SSC request was to explain the large retrospective bias in MMB). He also highlighted recent model development and explorations because the CPT and SSC only recommended one model, essentially the 2022 accepted model (22.03b), be brought forward for specifications at this meeting.

The author provided a thorough review of the recent fishery season data. Overall, larger crab are caught in the east, which is consistent with previous years when that area was open to harvest. The author also provided spatial maps to visually examine spatial survey patterns for multiple life stages. The CPT appreciated the background material on both the fishery and survey data.

The assessment model is based on a Tier 3 size-structured modeling framework that is fit to survey and fishery data, including both removals and size composition data. The model presented here, 22.03b, is last year's accepted model with an adjustment to fix one parameter that was hitting a bound (the parameter controlling the slope of the curve describing retention in the directed fishery during 2006/07 to 2009/10). Overall concerns for this stock and model are similar to previous years. Recent recruit classes observed in the survey size compositions are not moving through the population as expected and, therefore,the model is overly optimistic about the current status of this stock.

Buck reviewed model fit compared to last year and overall. Model fit is very similar to past years, but with no parameters estimated at a bound. Additionally, the majority of jitter runs reached the MLE with a low maximum gradient, so there are no concerns about convergence. The CPT discussion focused on model fit to male maturity data and how it compared to the changes we've seen in size at maturity for snow crab. The same data on annual size at maturity are not available for Tanner crab, so the probability of undergoing terminal molt is estimated in the model for Tanner crab, whereas it is an annual input in the snow crab assessment. The data for Tanner crab does not exhibit the large variability in size at maturity that is seen in snow crab, but some interannual variability does exist.

The CPT agreed that model 22.03b represents the dynamics of the stock as well as possible, and is a slight improvement over prior years. This model is based on the previous assessment model, has good convergence, has no parameters at bounds, and the results are similar to the previous assessment. The model results in an OFL of 36,200 t for 2023/24.

Buck recommended a buffer of 25%, which he also recommended last year (the ABC would be 27,1500 t). Buffer considerations from the past include, but are not limited to: overestimating large crab, uncertainty in population trajectory, and lack of recent recruit classes moving through the population. In addition to the concerns from 2022, there is increased concern for

Chionoecetes stocks that the current harvest control rules do not adequately reflect the reproductive potential of different-sized males. Like snow crab, research suggests that large mature male Tanner crab are much more effective than small mature crab at mating and consequently MMB may not reflect the true contribution of different-sized males to the reproductive potential of the stock. While this issue has been recognized previously by the CPT, the recent concern regarding snow crab has increased our caution regarding the assumptions behind using $B_{35\%}$ and $F_{35\%}$ for these stocks. The CPT found these reasons compelling enough to adopt the recommendation for this year.

As requested from the CPT/SSC and the simpler modeling workshop, Buck provided survey-based Tier 4 "fallback" options based on several time periods for estimating the B_{MSY} proxy required for this approach. The CPT found the rationales behind the candidate time periods unconvincing and, ultimately, recommended using the entire time series since 1982 if this method was adopted for specification setting. This recommended time frame falls in line with what has been used for other Tier 4 stocks and reduces the complexity of choosing another time period without clear criteria. Buck suggested a buffer for this fallback method that would be approximately equivalent to the CV on model-estimated terminal biomass (~8.9%). The CPT approved the use of the CV to set the buffer, but recommended a 10% buffer in order to remain consistent with the current practice of setting buffers in 5% increments.

Overfishing status updates: WAIRKC,PIGKC, PIRKC,AIGKC, SMBKC

The Plan Team determined status updates for WAIRKC, PIRKC, AIGKC, SMBKC, and PIGKC based on total catch in the 2022/23 fishery. Estimated total fishing mortality for WAIRKC fishing in 2022/23 was 0.0012 kt and resulted from bycatch in the AIGKC fishery (0.0002 kt) and bycatch in the groundfish fisheries (0.0010 kt). PIRKC estimated fishing mortality was 0.004 kt. Estimated fishing mortality for AIGKC was 2.567 kt. Estimated total fishing mortality for SMBKC was 0.002 kt. PIGKC estimated total catch mortality is confidential. For all the above stocks, total catch mortality was less than the OFL; therefore overfishing did not occur.

For PIRKC and AIGKC MMB was above MSST, therefore these stocks were not overfished. Estimated MMB for SMBKC was below MSST, thus this stock remains in overfished status. WAIRKC and PIGKC are in Tier 5, therefore, an overfished status determination cannot be made due to lack of biomass data on the stock.

Bering Sea Fisheries Research Foundation update

Scott Goodman and Tim Lohrer provided an update on Bering Fisheries Research Foundation (BSFRF) research activities, funding opportunities, and future planning. Tim recently joined BSFRF as a scientific advisor. Scott began the presentation by potential future funding sources and priorities for future research, including movement, surveys, habitat, recruitment limitation, bycatch, and predation. Current research effort is focused on winter surveys of BBRKC. The first year of the Cooperative Pot sampling project (CPS1) was conducted in March/April 2023 for BBRKC. Planning is in progress for a similar BBRKC pot survey in 2024 and a smaller pilot-scale survey effort for snow crab. Scott noted that current and planned research activities

address several of the top 10 research priorities established by the North Pacific Fisheries Management Council (NPFMC) for 2022-2024. Improved maturity estimation was highlighted as an urgent need given issues with the currency of management in the snow and Tanner crab assessments. Madison Heller-Shipley's PhD work is aimed at addressing management options for *Chionoecetes* crab related to retention size and size-at-maturity.

Scott displayed location data from archival pop-up satellite tags deployed on CPS1 and on the 2023 NMFS summer Bering Sea bottom trawl survey. Tim provided an overview of CPS1 pot survey study design, methods, and preliminary results (water temperature, crab distribution, crab biological attributes, and movement data from satellite tags). As expected, bottom water was colder in March/April than on the summer trawl survey, with the cold pool reaching the northwest corner of the Bristol Bay management area. Crab spatial distribution in CPS1 was: 1) generally similar to that of the subsequent summer trawl survey in June; 2) generally absent in the southwest area below the red king crab savings area; and 3) generally "smoother" than the NMFS trawl survey owing to the larger sample size of the pot survey compared to the trawl stations. Spatial statistics are needed and in the queue for further analysis. It was pointed out that Emily Ryznar's modeling work shows that the NMFS trawl survey has good predictive skill for bottom trawl bycatch of BBRKC in the fall/winter/spring following the summer survey. In response to a question about habitat assessment in areas where crab are absent, it was noted that a project is in the works but funding has not been finalized (Weems et al., NPRB proposal is under review). The CPS1 study also found the majority (>60%) of the captured crab were in areas closed to bottom trawling.

Tim Loher reviewed the biological attributes of female spawning dynamics including the abundance of primiparous and multiparous mature females and egg condition. There were relatively few females captured compared to males, which may imply pot-shyness associated with molting activities. Further, there was a broader range of sizes over which the proportion of mature females occurred than what has been observed in summer trawl survey data, which could be due to a low sample size or timing. Tim summarized the plan for CPS2 which will include an additional pot survey and parallel Nephrops trawl work to better understand the biased sex ratio and the potential for pot shyness. Scott reiterated that planning for the next cooperative pot survey slated for 2024 (CPS2) is underway. The timing will match that of CPS1, but will not include satellite tagging. The spatial footprint will largely be consistent with CPS1, but some changes are under consideration including additional sampling in areas open to bottom trawling. Drafts of CPS1 results are forthcoming: a short report with methods and distribution data is coming imminently, and a second more in-depth report with statistical analyses, tagging analyses, and a fuller discussion will be available ahead of the January CPT meeting. Scott briefly noted what is on the horizon for research planning (pot sampling, camera work, trawl sampling, tagging charters, gear work, etc.) and that coordination with State of Alaska and NOAA partnersis underway.

Research Priorities/ CPT Vacancies

Sarah Rheinsmith (NPFMC) presented the MSA-required process for identifying science-based research priorities, which are identified by NPFMC as 5-year priorities, but renewed on a triennial basis with the previous review in 2021. Current priority categories by rank include: (1) critical ongoing monitoring, (2) urgent, (3) important (near term), and (4) strategic for future needs. The different Plan Teams will serve as initial filters to consolidate the priorities with the SSC reducing the list in February 2024 to 8–12 priorities subject to public input and reduced to 10 priorities for presentation to the Council in April 2024. An online link for public input into existing or new priorities is open through October 31, 2023.

The CPT will prioritize the top 3–5 priorities for crab in January 2024, but general consensus was for the CPT to review and narrow priorities to a top 10 prior to January. A tentative ½ day virtual meeting will be held sometime in late November or early December to start the prioritization process, and identify a mechanism for prioritization. The CPT expressed confusion over the current research prioritization categories, and noted that better explanation of categories such as “critical, ongoing monitoring” would be helpful in determining the top 3-5 priorities. Additionally, pre-filtering out research priorities that belong to a broader category of priorities would be helpful. The list of potential priorities currently listed in the database remain as candidates. Brian Garber-Yonts offered to serve as a liaison to the Social Science Planning Team which is meeting on November 3, 2023 to discuss research priorities. In response to CPT uncertainty over the results of identifying research priorities, Sarah noted that priorities are distributed to funding entities (e.g., NPRB) for funding considerations. Industry representatives noted that these priorities guide a lot of which research to pursue next , and some items are figured out and some are not in terms of logistics and working with agencies, etc., to identify issues and possible funding. Nicole Watson (NPFMC) is also working on a process to track priority submissions, and will also review new potential priorities (submissions up to October 31) to see which already exist in the research priority database. Research priorities identified in 2021 largely remain true, although a new priority could emerge.

The CPT discussed the two current vacancies on the team: one position intended to focus on a management perspective (tentatively from ADF&G) and one position (previously from ADF&G) with biometric expertise. The ADF&G management position has worked out well being based out of Dutch Harbor because of the link to the fishing industry. For the biometric position, it would be useful to have someone with stock assessment expertise that could help with assessments, but that individual doesn’t necessarily need to come from the crab realm. It was noted that all crab stocks have an assessment author on the CPT except for Norton Sound RKC. Although not in the current list of member positions, the CPT also lacks an individual with social science skills beyond Brian’s role as an economist. Brian noted that most agencies have limited socioeconomic positions, so finding a position might involve recruiting from academia. Nominees for these positions could presumably be presented for consideration at the December Council meeting. People should contact Sarah with names of individuals that might be interested in being on the CPT.

Survey Modernization

Mike Litzow (NMFS-Kodiak) presented an update on the process for survey modernization. The NMFS survey team is proposing updates to the Bering Sea summer bottom trawl survey that include updated survey techniques, modernized equipment, and efforts to improve sampling methodology to provide a holistic view of the Bering Sea to include surveys in the Northern Bering Sea (NBS), Eastern Bering Sea (EBS), and Bering sea slope. Additionally, the survey modernization would aim to reduce total tow time to aid with catch volume, number of tows performed, and split catch. The six proposed components of the survey modernization effort are:

1. Sampling design – area, frequency, sampling density (work started in 2023; Lewis Barnett)
2. Determining 15 versus 30 minute catchability/selectivity correction factors (work started, more data collections needed; no lead)
3. Combining slope/shelf data and determine calibration factors between current slope and shelf gears (work started in 2023; no lead)
4. Survey bottom trawl gear and fishing methods redesign (workshop with stakeholders planned for October 2023; Shawn Russel, Nicole Charriere)
5. New survey gear calibration (no start date yet, no lead)
6. Survey time series calibration, transition design, and transition implementation (no start date yet, no lead)

Projects 1-4 can be done in parallel, projects 5-6 can be completed only after 1-4 are done.

Given the number of changes proposed, Mike indicated that the NBS survey is going to be moved to a biennial cycle, on odd years. The process for modernizing the survey is still in the early stages, and the need for stakeholder engagement at this point was highlighted. Establishment of public facing workshops to gain feedback on the modernization process is underway. The October 2023 workshop will specifically focus on component number 4, and additional industry insight is requested. If interested please email: Nancy Roberson nancy.roberson@noaa.gov, workshop coordinator. It was also suggested that ADF&G be included in northern Bering Sea survey effort reduction conversations, as the ADF&G NSRKC trawl survey could offset the biennial NMFS NBS survey, and side-by-side gear comparisons between the two surveys could be warranted to permit the inclusion of both data sources in the NSRKC assessment model.

New business

Request for Reporting on Industry voluntary crab avoidance measures at the December 2023 Council meeting. Sarah Rheinsmith communicated the Council request for industry members to provide on voluntary crab avoidance measures at the December 2023 meeting, during B reports.

Upcoming meetings:
Jan 8th - 12th, Anchorage, AK
May 13th - 17th, Location TBD
September 9th - 13th, Seattle, WA

January modeling workshop topics:

- Review the SAFE intro “recommendations for all assessments”
- GMACS development - NSRKC, Tanner
    - Potential for GMACS user group pre-meeting to work on a consensus version of GMACS file annotation
- Simpler modeling workshop suggestions / outcomes
    - Q: options for using BSFRF data
    - Reductions in bycatch fleets in the models
- BSFRF selectivity studies used for BBRKC and Tanner crab (Buck)
- Currency of management discussion (modeling workshop and CPT discussion)
- B35% / F35% discussions on appropriateness for terminally molting crab
- Review projections for crab stocks, including the settings for these projections and how they should be reported (future CPT meeting - Jan or May).

January CPT agenda topics:

- NSRKC final SAFE
- AIGKC proposed models
- Economic SAFE
- Research priorities
- Currency of management discussion
- Tier 4 reference period criteria
- UFMWG (unobserved fishing mortality working group) update
- Handling mortality rates - consistency among stocks and next steps
- ESP development and prioritization (30 mins discussion and planning for May)
- Stock prioritization
- Research updates:
    - Genetics of RKC (Carl St. John)
    - Stock enhancement review of research (Ben Daly)
    - LTK for NSRKC (Sara Wise)
    - Temperature effects on survival, intermolt duration, molt increment, and growth rates of early benthic snow cra band tanner crab (Louise Copeman, AFSC-Newport)
    - Bitter crab disease spatiotemporal dynamics (Laurie Balstad)

Others in attendance: *(alpha order)*

Ali Whitman
Allie Conrad
Andrew Olson
Andy Nault
Anne Vanderhoeven
Austin Estabrooks
Bo Whiteside
Brian Ritchie
Bridgette Ferris
Caitlin Stern
Cassie Whiteside
Charlie Hansel
Chris Siddon
Connie Melovidov
Cory Lescher
Craig Lowenberg
Dana Hanselman
Dana Rudy
David Bryan
Diana Evans
Doug Wells
Edward Paulsen
Elizabeth Siddon *
Emily Ryznar
Ernie Weiss
Frank Kelty
George Steers
Gordon Kruse
Gretar Gudmunson
Hamachan Hamazaki*
Heather Mann
Heather McCarty
Henry Tashijan
Intrafish media
Jamie Goen
Jared Weems
John Gauvin
John Hilsinger
Jonathan Richar
Joshua Songstad
Julien Lartigue
Kalei Shotwell
Katie Sweeney
Kristen Dobroth
Kyle Trader
Lance Farr
Landry Price
Leah Zacher
Samuel Comeau
Leah Zacher
Linda Kozak
Lorena Rosenberger
Lucas Henkel
Madison Heller-Shipley
Maggie Mooney-Seus
Marc Solano
Mark Stickert
Martin Dorn
Michael Martin
Nat Nichols
Nick Sagalkin
Nicole Kimball
Nicole Watson
Nikolai Silverstol
Noelle Yochum
Paul Wilkins
Rachel Sapin
Ralin Sunurin
Russel Dame
Ruth Christiansen
Sam Cunningham
Scott Callahan
Scott Goodman *
Sean Dwyer
Sean Rohan
Shannon Hennessey
Sherri Dressel
Steve Ricci
Susie Zagorski
Tim Loher *
Tom Gemmell
Vicki Vanek
Wes Jones
Zach Liller

* denotes a presenter at CPT