



Gulf of Alaska Groundfish Plan Team MINUTES

November 12-15, 2019, Alaska Fisheries Science Center, Seattle, WA

North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501

Plan Team Members in attendance:

Jim Ianelli	AFSC REFM (co-chair)	Nat Nichols	ADF&G
Chris Lunsford	AFSC ABL (co-chair)	Jan Rumble	ADF&G
Sara Cleaver	NPFMC (coordinator)	Paul Spencer	AFSC REFM
Obren Davis	NMFS AKRO	Marysia Szymkowiak	AFSC REFM
Craig Faunce	AFSC FMA	Ben Williams	ADF&G
Lisa Hillier	WDFW	Kresimir Williams	AFSC RACE
Pete Hulson	AFSC ABL	Vacant	USFWS
Sandra Lowe	AFSC REFM		

Members absent: Lisa Hillier (WDFW) participated on BSAI and GOA Groundfish Plan Teams and was in BSAI for this meeting.

Administrative

All documents provided prior to or during the meeting as well as presentations given during the meeting were posted to the Council's [electronic agenda](#).

Introductions: The meeting of the Gulf of Alaska (GOA) Groundfish Plan Team convened Tuesday November 12 at 3:30 pm at the Alaska Fisheries Science Center in Seattle, Washington. Introductions were made. A sign-in sheet was passed around for members of the public. Attendees in addition to PT members included: Julie Bonney, Ellen Yasumiishi, Molly Watson, Charlotte Levy, Kellii Wood, Kari Fenske, Kristin McQuaw, Wayne Palsson, Martin Dorn, Dana Hanselman, Carey McGilliard, Josh Baine Etherton, Patrick Ressler, Andrea Havron, Lauren Rogers, Bridget Ferriss, Mike Levine, Shannon Carroll, Beth Stewart, Chad See, David Witherell, Mark Fina, Jon Warrenchuk, Ruth Christiansen, Anne Hollowed, Megan Peterson Williams, Sabrina Devereaux, Ingrid Spies, Blake Burkholder, Jody R. Cook, Stephen Kasperski, Meaghan Bryan, Ben Fissel.

WebEx: Remote participation via WebEx was available for all sessions. Webex attendees did not all register with their full name, so a complete attendance list is not possible and names are recorded as they were shown. Members of the public who attended via WebEx included: Ernie Weiss, Katy, Kevin, Natura, Pat, Mike Levine, Ali Whitman, Yumi Arimitsu, Jerry Merrigan, Jason Gasper, Mark Stichert, Jean, Molly Zaleski

Other attendees may have been present via WebEx but not noted by recorders.

September 2020 Plan Team meeting: The September Groundfish Plan Team meeting will be held September 15-18, 2020 at the Alaska Fisheries Science Center, Seattle. PLEASE NOTE: US Driver's licenses will not be accepted for admittance to the NOAA facility if they are not Real ID compliant. Alternative identification, such as a passport, will be required if a license is non-compliant. For more information see <http://www.dhs.gov/real-id-public-faqs>.

Ecosystem considerations

Dr. Stephani Zador presented the Ecosystem Considerations for the Gulf of Alaska.

Several items were highlighted in her presentation including the presence of a marine heat wave in the GOA in 2019, which follows a previous heat wave in 2014 - 2016, and the subsequent return to average temperatures in 2017 and 2018. Some of the impacts on the marine ecosystems could be interpreted as lag effects from the previous heat wave, especially among large cetaceans. The 2019 heat wave was identified as a “red flag” event at the Preview of Ecosystem and Economic Conditions (PEEC) meeting in May.

The 2019 heat wave had similarities with the 2015 event in its rapid onset, however the heat index was lower in winter, similar to 2016. The timing of the heat wave could have different effects on the ecosystem. Temperature at depth as estimated from the AFSC Bottom Trawl (BT) Survey was higher in 2019 than in the 2015 event.

Satellite derived chlorophyll a (proxy for phytoplankton productivity) shows anomalous patterns for 2019, with a peak in June compared with peaks in April in 2017-2018 and in May during the previous heat wave event. This pattern was different in the Eastern GOA, where the peak was in May, although overall intensity of the chlorophyll data was lower than in 2018.

Euphausiid abundance was moderate to low relative to the time series, but not distributed equally throughout the Gulf. The Seward Line survey recorded near record high abundance in September 2018, however, in May abundance was very low. The AFSC acoustic survey krill index was moderate-low relative to the time series. Some seabird populations dependent on krill showed average success in breeding season, maybe due to higher local abundances of euphausiids in proximity to the colonies.

Copepod abundance was down in all areas. The May Seward Line survey was lower than the previous 7 years, and downward trends were observed in densities from the Icy Strait Surveys. Lipid content for all groups was also lower than 2018, but higher than in 2017 which is lowest in time series.

Increased abundance was observed for jellyfish across all regions, primarily *Chrysaora melanaster*, in the BT data.

Larval fish abundances from spring surveys were extremely low for the time series and were raised as a second “red flag” by the PEEC group. Especially important were the low abundances of pollock and cod, although given above average year classes for pollock in 2017 and 2018 it is not unexpected for low recruitment to follow. In contrast, puffin diets near Unimak Pass contained 50% pollock, however, larval surveys do not extend that far west. Chowiet (Semidi Is.) colonies had only 2% Pollock in diets. The Kodiak beach seine survey had low abundances, but was similar to other years without a strong year class.

Seabird diets show a more diverse pattern, including higher levels of capelin and sand lance than observed during the previous heat wave.

Groundfish condition indices (weight at length) from BT data were lower for all groups except Pacific cod. This could be related to increased metabolic rates due to the warming, and possible lagged effects from 2015-2016 conditions.

Seabird reproductive success was good overall, with the notable failure of kittiwakes at the Chowiet site, where nests were abandoned.

Large cetaceans showed some concerns with continued low counts of humpback calves in in Icy Strait. Modest increases in humpbacks were seen in PWS, with a diet mostly comprised of krill as herring numbers are low.

Notable observations – High numbers of Gray whale mortalities were observed coast-wide. Dead whales show signs of emaciation and are thought to be dying as they are returning to their North Bering Sea feeding grounds. Insufficient feeding in the summer of 2018 prevented the whales from accumulating enough reserves for the return journey. Thus, the effect is not directly linked to environmental conditions in the GOA.

One other notable observation was that Market Squid (*Doryteuthis opalescens*) have been observed consistently in the GOA, including egg cases found on nets in SE Alaska and on crab pots near Kodiak. These squid have also appeared in seabird chick diets. This may represent a potential climate-driven northern range expansion.

The Team had two recommendations for improving the ecosystem report: 1) The satellite chlorophyll data should be presented better to more easily see patterns that were being highlighted by the authors; 2) It may be useful to show how well predictions of poor recruitment based on environmental indicators correlate to consequent larval fish survey data.

Review of stock assessments

General Team Discussions

The Team noted a discrepancy in how partial assessments are being conducted when new survey data is available. Authors are provided the following guidance for what to include in partial assessments:

For Tiers 1-3 partial assessments should include catch/biomass ratios for all species in addition to re-running the projection model with updated catch information, and also including updated survey biomass trends when available (note that partial assessments for Tiers 1-3 do not involve re-running the assessment model; only the projection model). Partial assessments for Tiers 4-5 should include catch/biomass ratios, and re-running the random effects model only if there is a new survey data point available. Partial assessments for Tier 6 should include catch trends for all stocks.

Apportionment methodology is not specifically addressed in this guidance and this year the Team noted inconsistencies in how apportionment is determined for partial assessments. Some authors are using the most recent survey biomass estimates to apply regional apportionment percentages whereas others are using apportionment percentages determined in the last full assessment.

The Team recommended for Tiers 4-5 when the random effects model is re-run to include a new survey point, the author update the regional apportionment percentages using the most recent survey estimates.

For Tiers 1-3 on a 2-year cycle when only the projection model is run with updated catch and the new survey estimate is not included in model output, **the Team recommended** using apportionment percentages determined in the last full assessment. The rationale for this is to update apportionment values when survey data is used in biomass and ABC/OFL calculations (Tiers 4-5) but not when projection models are run that don't use new biomass estimates to inform reference points (Tiers 1-3). The AFSC will revise and clarify the partial assessment guidance in the annual assignment memo to include apportionment, and will address the issue of Tier 3 stocks on a 4-year cycle.

The Team discussed upcoming scheduled Committee of Independent Experts (CIE) reviews for GOA stocks and noted that notification to the public and Council could be improved (sometimes reviews occur without full notification at the Council meetings). The Team encouraged authors to consistently notify Council of upcoming CIE activities to ensure these activities benefit to the extent practical the provision of management advice.

The Team discussed the status GOA bottom trawl survey effort during deliberations and expressed concern regarding reducing the survey to two vessels and thinning the number of stations sampled in the survey in recent years. In 2019 there were notable shifts in apportionment in many of the stocks, largely

due to the absence of large catches of fish in the Western GOA but it is uncertain what's driving these observations. There was also concern expressed for not having additional survey effort focused in the Western and Central areas in 2020 to help inform the Pacific cod stock assessment model and effectively evaluate stock status. The Team continues to recognize the importance of the GOA bottom trawl survey for making informed management decisions and continues to support full funding for the continuation of this survey.

GOA Pollock

The GOA pollock stock assessment included two presentations: 1) Kalei Shotwell presented the GOA pollock Ecosystem Socioeconomic Profile (ESP) which is being presented for the first time for pollock; 2) Martin Dorn presented this year's stock assessment results.

The ESP was improved following Team input from the September meeting where the preliminary ESP was presented. It is included as an appendix to the GOA pollock SAFE.

A pollock life stage graphic and table was presented, showing seven stages in the cycle and the main influences on these stages. A suite of indicators was presented, starting with physical oceanographic data, biological indicators of pollock life stages and other species, and socio-economic data. Some indicators were highlighted as being high or low relative to long term means. The return of the marine heat wave condition was highlighted, with higher surface and bottom temperatures in 2019. A phytoplankton indicator based on satellite observations of chlorophyll a was also low. Zooplankton indicators were within average bounds. Larval pollock abundance was very low, but the discussion noted that weak year classes are not uncommon in the pollock time series, especially after observing an average year class in 2017 and an above average year class in 2018. Indicators related to adult pollock and their predators were within average bounds. Indicators relating to fishery and human dimensions were neutral with a noted increase in reliance on pollock catch for the port of Kodiak.

Preliminary Bayesian adaptive sampling for potential model covariates from the suite of indicators showed that pollock condition, heat wave index, and arrowtooth abundance may be good candidates for inclusion in the pollock assessment model.

In summary, while the ecosystem conditions were poor, its effects on adult pollock were not strong. Poor conditions were observed for young-of-the-year pollock and survey catches for young-of-the-year pollock were very low. Spatial distribution of juvenile pollock in 2019 FOCI surveys was different than usual.

Future work will include evaluation of the GOA CEATTLE climate-aware multispecies model, exploring alternative indicators such as different predators (sablefish) and refined condition indices.

A workshop on analytical methods for the ESP process will occur in March 2020, which may result in changes to next year's GOA pollock ESP.

Martin Dorn presented the GOA pollock stock assessment and noted that 2019 was an update assessment using a similar model as 2018 with only minor changes. The 2019 ABC is down 20 % which is very similar to last year's projection. New data included biomass, length and age composition from the AFSC Shelikof Strait 2019 acoustic survey, biomass and length composition from the AFSC GOA summer acoustic survey, and the AFSC GOA Bottom trawl survey, the ADF&G survey delta-GLM biomass index, and the 2018 fishery total catch and age composition.

Several recommendations by the Team in 2018 were addressed, including investigation of alternatives for maturity-at-age estimation, and vertical distribution of pollock from acoustic survey data. Due to time constraints, model sensitivity to incremental removal of survey indices was not explored. Fishery selectivity in recent years was also examined but were found to be estimated appropriately.

Shelikof Strait acoustic survey biomass was 3 % lower than the previous year at 1.28 million t, as the continued decline of the 2012 year was balanced by incoming 2018 and 2017 year classes. The 2018 year class appears to be strong, and was seen in all of the surveys. The 2019 GOA summer acoustic survey

showed a sizeable reduction in biomass (0.58 million t) of 56 % from 2017 and was substantially less than the winter Shelikof Strait survey (54 %). The AFSC GOA bottom trawl (AFSC BT) survey showed a decrease of 11 % to 0.26 million t over 2017 and was still near record lows for the time-series. The ADF&G BT survey was up by 2 % over 2018 estimates but was still relatively low for the time-series. Fishery performance was mixed, with the A & B seasons performing well, and the C & D seasons showing poor fishing. When the fishery closed November 1st, the TAC was not caught.

The 2012 year class, as 6 year old fish, dominated the catch at age in 2019, and was at the record for single year class catch since 1975. This year-class has displayed unusual population characteristics, including early maturation, reduced growth and lower mortality than general population trends.

A series of plots were presented showing the vertical distribution of survey biomass from the summer GOA acoustic survey. These plots showed differences in vertical distribution between survey years (2013 – 2019) show some evidence of a more pelagic distribution in recent years, but the evidence was relatively weak, not a strong pattern that would explain a reduced availability of pollock to the AFSC BT survey.

The author presented a single new model for 2019 and compared it with last year's accepted model. The models presented to the Team were:

- 18.3 – 2018 accepted model updated with 2019 data.
- 19.1 - Same as 18.3 but with an increased penalty on the random walk for time varying catchability for the Shelikof Strait survey.

The author recommended model 19.1 for this assessment and the Team concurred. The rationale for the model change was that the estimates of catchability (q) for The Shelikof Strait survey were greater than 1 in the most recent year, and this presented an unrealistic scenario given that the survey only covers a portion of the GOA stock. An increased penalty on the parameter estimation process restricted the estimate to ≤ 1 . The 2019 assessment also included an updated maturity estimate, based on a new method of data weighting. This method uses local adult pollock abundance associated with a survey trawl catch sample to weigh the maturity data. Results for 50% length and age of maturity were similar to unweighted data for most years.

The Team noted unusually low estimates of age at 50% mature for year 2017 data. In that year the Shelikof Strait survey maturity samples were dominated by the 2012 year class, with an absence of younger fish, resulting in a poor fit for the maturity ogive.

The author presented methods for deriving external model inputs, including age specific M , mean weight at age, and maturity schedule. The author presented a plot of cohort specific mortality, showing an apparent lower estimate of mortality of the 2012 year class relative to the mean responses of past cohorts.

The author presented several assessment-related plots including model sensitivity to sequential addition of new data, model fits to survey indices, and model fits fishery and survey age compositions. The model fits to the survey biomass indicated poor fits to the AFSC BT survey as well as well as the Shelikof Strait acoustic survey, with model predictions falling outside of the survey confidence bounds for the past two survey data points. The Team noted the residual pattern in the model predictions of fishery age data, specifically the poor fit to age-4 fish and the lack of fit to older fish (7+) in the last three years of data. The Team indicated that this suggests a continued issue with the fishery selectivity function, such as the logistic functional form not being adequate for the model.

Additional plots exploring model fits to a separate age 1 & 2 index from the winter acoustic survey, a retrospective analysis, and spawning biomass/ F plot were shown. The retrospective pattern showed low bias (Mohn's $\rho = 0.134$) and the biomass plots showed that the fishery was above $B_{40\%}$ and was expected to remain above $B_{40\%}$ in 2020. Author's projections indicate a slight decline in spawning stock biomass over the next two years, before stabilizing due to new recruits becoming mature. A Markov chain Monte-

Carlo analysis indicated a minimal probability of spawning biomass dropping below $B_{20\%}$ in the next five years.

The author presented a Risk Table update for 2019. A score of 2 (Substantially increased concerns) was assigned to assessment-related considerations, due mainly to the contradictory survey data, resulting in very poor model fits to recent survey indices. All other categories were scored as level 1, indicating typical conditions and normal levels of concern. Based on the elevated assessment concerns, the author recommended a 10% reduction in the maxABC. The Team noted the lack of a clear objective methodology for deriving the reduction quantity, but noted that the reduction was similar to what would have been achieved by using the last 5 year's average F, according to author's forecasts in the SAFE document. Using average F results in a 12 % lower ABC from maxABC. As such, the Team concurred with the author's recommended 10% reduction below maxABC.

The Team recommended a re-analysis of maturity at length and age be made for individual cohorts, which would prevent poor estimates for years where age and size diversity is low, such as 2004 and 2017.

The Team recommended the author examine fishery selectivity, as persistent patterns in the residuals of observed and model fitted catch-at-age may represent artifacts of the selectivity functional form used.

The Team recommended the author ensures adequate fishery data is collected and available due to the observer program implementation of Electronic Monitoring.

The Team recommended the author explore better methods for constraining the time varying catchability parameter to be under 1 for the Shelikof Strait acoustic survey.

The Team recommended an exploration of combining the Acoustic summer survey and the GOA bottom trawl survey using a VAST framework, similar to the approach used by Cole Monahan for EBS pollock surveys.

Pacific cod

Steve Barbeau presented the latest GOA Pacific cod assessment. The continued decline in abundance of this stock has persisted and was reinforced by the AFSC bottom trawl survey biomass and longline survey Relative Population Numbers (RPN) indices regardless of the assessment model. While the bottom trawl survey biomass increased in 2019 compared to 2017, it was the second smallest in the time series and was associated with the largest uncertainty in the time series. The AFSC longline survey RPN index for 2019 decreased and was the lowest in the time series. The Team discussed the potential for hook competition between cod and other species in the longline survey but it was noted that there was no hook saturation and that competition in the depths at which cod are caught was likely not an issue in 2019.

Environmental and ecosystem indicators such as the heat wave index and annual marine cumulative intensity index send mixed signals for juvenile and adult forage and potential growth and survival. Other population indices that were presented but not used in the assessment include the IPHC RPN index (slight increase but with largest uncertainty of time series) and the ADF&G large mesh survey (decreased from 2018 to 2019).

The Team recommended that the author coordinate with IPHC to obtain and evaluate length compositions so that the IPHC RPN index can be investigated within the assessment model.

Three model alternatives were presented for consideration, including last year's model with updated data. The changes that were introduced in the alternatives included adding pre-2007 conditional length-at-age data, changing the plus age group from 20+ to 10+, adding ageing error, and adding ageing bias for the pre-2007 age composition collections. The author recommended model 19.14.48c which incorporated all

of these changes. This model fits the available data adequately, has an acceptable retrospective pattern, and makes changes that are intuitive. The Team agreed with the author's recommended model.

Steve noted that there were no lengths collected from the pot fishery in 2019 from area 630 due to a complete replacement of observers with EM. If there were no directed fishing for cod in 2020 there would be no length data available to future assessments. While some work is ongoing between industry and the FMA Division of the AFSC (who administers the observer program) for the pollock fishery, the author noted that he has not yet engaged with them on future cod sampling protocols.

The Team recommended that the author work with the AFSC FMA Division (Observer Program) to identify alternative ways to collect information on cod for 2019 and beyond given the likelihood of a reduced fishery and expanding displacement of observers with EM and that these efforts should complement ADFG data collection efforts.

The recommended model estimates spawning biomass in 2019 to be at $B_{17.7\%}$ and in 2020 to be at $B_{17.6\%}$ before increasing in 2021 to be above $B_{20\%}$. The model indicates that recruitment continues to be below average in recent years (after 2014) and the Team noted that in the projection model average recruitment after 1977 is used. Consequently, both the Team and the public indicated that the projection model is likely too optimistic and discussed the potential for 2020 spawning biomass to drop below $B_{17.5\%}$. The author indicated that even if catch was 0 in 2020 that minor changes occur to the projection of 2020 and 2021 spawning biomass.

The author presented apportionment that was estimated with the random effects model. Apportionment in the Western GOA decreased by nearly 50% and increased in the Central GOA by over 56%. The increase in apportionment to the Central GOA resulted in an ABC for 2020 that was larger than 2019, even though the overall GOA ABC decreased. The Team noted that increasing ABC in any of the regions given the current circumstances of the stock was not desirable, the species can exhibit movement between regions, and that there are multiple indices that could be integrated within the random effects model to support apportionment estimation.

The Team proposed apportionment percentages that are an average between the apportionments estimated in 2017 and 2019 as an alternative to the 2019 random effects model results. The Team also recommended that the author investigate alternatives of the random effects model that integrates multiple population indices.

The Team agreed with the author's risk table level, a level of 2 - substantial concern. The author thinks that a reduction in maxABC is warranted but declined to recommend a reduction.

The Team agreed that a reduction from maxABC is warranted, given the concerns highlighted in the risk table, but concurs with the author to defer to the SSC to set the specific reduction percentage.

Shallow water flatfish

Meaghan Bryan presented the Tier 5 partial assessment for shallow water flatfish excluding northern and southern rock sole. There were several large declines observed in the 2019 GOA bottom trawl survey, most notably for Alaska plaice and yellowfin sole. The random effects (RE) model was re-run with the updated 2019 survey biomass estimates which were used for apportionments for all shallow water flatfish including northern and southern rock sole. The catch to biomass ratios were highest for butter sole; overall the harvest of shallow water flatfish is very low.

Northern and southern rock sole

Meaghan Bryan presented the Tier 3 northern and southern rock sole partial assessment which is part of the shallow water flatfish complex. The projection model was run with updated catches. Because northern and southern rock sole catches are not split out by species, a 50/50 split is assumed. The updated northern

and southern projected biomass levels are similar to last year's projection for 2020. The 2019 GOA survey biomass estimates are down 7% for southern rock sole and down 28% for northern rock sole. The Team noted that arrowtooth flounder are also in a declining trend. The catch to biomass ratios for northern and southern rock sole show a decline as well.

Deepwater flatfish

Carey McGilliard presented the assessment for the deepwater flatfish complex and recommended harvest levels for 2020 and 2021. This complex is assessed every four years, the next full assessment is scheduled for 2023. Dover sole comprises the vast majority of catch for this complex and are assessed using an age-structured model with a Tier 3a designation. Greenland turbot and deepsea sole fall under Tier 6. It was noted that catch of Kamchatka flounder have been accruing against the deepwater flatfish complex TAC since 2011 but are not currently incorporated in the assessment.

The author presented several model alternatives to the accepted 2015 model and recommended model configuration 19.3. Data included in the assessment that were updated included catch through 2019, fishery length composition through 2019, the 2017 and 2019 survey biomass indices and length composition data, and 2015 and 2017 survey conditional age-at-length data. Several changes were recommended to the 2015 assessment model in model 19.3, including removing the 1984 and 1987 survey biomass estimates, disaggregating age data for ages 1-3, changing the bottom trawl survey timing to June rather than at the start of the year, fixing historical fishing mortality at 0, setting the start of recruitment to 1978, and estimating natural mortality and catchability in two time blocks from the start of the model to 2013, and from 2014 to 2019. Several of these improvements to the model resulted from suggestions made during the 2019 CIE review, and investigating time blocks on natural mortality and catchability were in response to declining trawl survey biomass since 2013. The 2020 and 2021 catches were projected using the 2014-2018 average catch for Dover sole. The catch reporting system records catches at the stock complex level and then the proportion of each species is estimated by extrapolating observer data.

Carey scored the assessment-related concerns portion of the risk table Level 2 (substantially increased concern) because the model is not accounting for the time-varying growth patterns that have been observed and because no fishery age data are available; however, a reduction from maxABC was not recommended. Carey noted that even one year of fishery age data would be useful and that she would like to explore the development of a GOA-specific ageing error matrix as the model is currently borrowing an ageing error matrix from the West Coast.

Area apportionment was based on the Team's recommended method from 2016. For Dover sole area apportionment, a random effects model was used to smooth survey biomass estimates and fill in gaps in depth/area strata. The resulting proportions of predicted biomass by area are used as the basis for the 2020 and 2021 apportionments for the Dover sole component of the deepwater flatfish complex. Greenland turbot and deepsea sole area apportionments are based on average survey biomass for each species, 2001-2019.

The Team commends the author for the improvements made to the deepwater flatfish complex assessment and recognizes the considerable amount of work required to accomplish this.

The Team recommends Kamchatka flounder be included in the 2021 partial assessment as a Tier 6 species using 2011–2019 maximum catch (69 t) as the OFL. The Team suggests maximum catch is more appropriate than average catch based on the high variability and short time series of catch. The Team also recommends the author examine area apportionment relative to Kamchatka flounder and consider whether it's appropriate to apportion across the entire GOA or just the WGOA.

The Team recommends that the VAST appendix document be brought forward in conjunction with the 2021 partial assessment in September 2020.

Rex sole

Carey McGilliard presented a partial assessment for rex sole. This stock is assessed every four years, the next full assessment will be conducted in 2021. The 2019 survey biomass (90,414 t) was down 8% from the 2017 survey biomass (97,720 t). Carey highlighted several long-standing issues with the assessment that were resolved in 2017, mainly the addition of historical age data and the transition to a two-area model to address differing growth patterns in the Eastern and Western-Central GOA. These changes allowed rex sole to move from Tier 5 to Tier 3a in 2017.

For the partial assessment, Carey updated catch data through 2019 and projected catch for 2020 and 2021. Carey updated the area apportionment, which is done using the random effects model for both stock areas.

Arrowtooth flounder

Ingrid Spies presented the arrowtooth flounder assessment. One model change was made for this year's assessment. The assessment now starts in 1977 (from 1961 in the 2017 model), and the 1961 and 1975 surveys were removed as there is a lack of corroborating evidence for the low biomass estimates for those surveys.

The biomass estimate from the 2017 trawl survey (1,077 kt) was similar to the biomass estimate from the 2017 survey (1,053 kt), and each is a decrease from the survey biomass estimates in previous years, which peaked at 2,819 kt in 2003.

A risk table was presented in the assessment. Ecosystem/environmental considerations were evaluated at a risk level of 2 ("substantially increased concern") due to moderate to low euphausiid abundance, poor forage fish prey abundance, and a heatwave in the western GOA since Sept 2018 which may increase the metabolic demands of arrowtooth flounder and their predators.

There appears to be a shift to lower recruitment in recent years, beginning in 2006 (i.e., the 2005 year class). **The Team recommends investigating whether these lower recruitments are related to environmental conditions in the GOA.**

The Team noted that the decrease in biomass began before the recent heatwaves in the north Pacific and is similar to drops observed in other flatfish during this time and may be potentially linked to extended poor recruitment during cold pattern in 2006-2007. The Team also noted the potential of using AFSC longline survey data for arrowtooth flounder as they are caught in significant numbers on that survey.

The assessment contains survey length-frequency data from 1985, 1986, and 1989 that were collected opportunistically. **Because these data were not part of standard NMFS GOA bottom trawl surveys and the methodology for their collection is unclear, the Team recommends investigating whether they should be removed from the assessment.**

Flathead sole

Carey McGilliard presented the partial update assessment for flathead sole and the next full assessment is scheduled for 2021. The standard projection model was updated with the final 2018 catch and estimated 2019-2021 catches. The stock is in Tier 3a and the projection model estimates a 2020 ABC of 38,196 t. The projected spawning biomass for 2020 was slightly smaller than projected from last year's assessment. Apportionment was updated with the random effects model including the 2019 bottom trawl survey biomass. The majority of biomass is estimated to be in the Western and Central GOA, similar to the apportionment estimate in 2017. The catch to biomass ratio is low for this species.

Pacific ocean perch

Pete Hulson (AFSC ABL) presented the GOA Pacific ocean perch assessment for 2020. The assessment model was the same as the previous year's model. The POP assessment is undergoing a CIE review in April 2020, therefore no model changes were brought forward. Data inputs that were updated include

2019 bottom trawl survey biomass (down from 2017), 2019 bottom trawl survey age composition, fishery catch (which has increased tracking with ABC), and fishery age composition. Model fits are similar to the 2017 assessment and the model continues to underestimate bottom trawl survey biomass. Fit to age composition data are decent and both the fishery and bottom trawl survey show above average 2007/2008, 2010, and 2012 year-classes. Compared to the 2017 assessment parameters for catchability, mean recruitment, and selectivity have changed only slightly. The author noted that the time-blocks set for fishery selectivity seem to remain reasonable, as there are little plus age-group fish pre-2006 followed by an increase in the proportion of plus age-group fish after 2007. This increase of plus age-group fish in the fishery is still smaller than the bottom trawl survey proportion (which is modeled with logistic selectivity), thus, dome-shaped selectivity for the fishery still seems reasonable. The estimated stock biomass has shifted up, which resulted in a poor retrospective pattern (negative Mohn's rho). The author noted that this is a data driven result, as the model continues to attempt to fit the large bottom trawl survey biomass estimates. The author also noted that in 2018 the GOA rockfish fishery had the highest ex-vessel and first wholesale value.

There was substantial discussion about apportionment methods, as there were large apportionment changes estimated for 2020 based on 2019 bottom trawl survey biomass estimates. There was a large drop in the west Yakutat and western GOA trawl survey abundances. In west Yakutat, a three year weighted average is used and the decrease in apportionment resulted from a large biomass fraction in 2013 moving out of the three year window, the most recent three years are similar and smaller than 2013. In the western GOA the decrease in bottom trawl biomass estimates was due to the lack of large catch events in the hauls. However, more hauls in the western GOA caught POP in 2019 compared to 2017 (55 hauls with POP compared to 46 in 2017) and only 9% less fish in numbers and 17% less in weight were caught by the bottom trawl survey in 2019 compared to 2017. Taken together, there was nothing in the bottom trawl survey that was different than previous surveys, with the exception of the large catch events in the hauls. A general desire for stable apportionments while accounting for observed variability was expressed. The author presented a suite of potential apportionment options, including a hybrid method between the random effects model and a weighted average and apportionment as estimated with the VAST spatio-temporal model. Ultimately the random effects model used previously was recommended and accepted, although the author noted that in the next bottom trawl survey if large catch events are observed apportionment could likely change back to what has been previously in the western GOA. Apportionment was noted as a research area for future consideration, especially considering the number of species for which western GOA biomass decreased.

A Risk table was presented with an overall rating of Level 2 as the model does not appear to keep up with population growth. There is no increase in risk to the stock given the concerns raised, therefore no reductions to max-ABC are recommended.

The Team endorses the author considerations for the CIE review's terms of reference:

- **incorporating hydroacoustic information into the assessment as the species are regularly found throughout the water column,**
- **examining catchability, which has been an ongoing issue for POP and other rockfish species,**
- **coupled with selectivity (a manuscript is currently in preparation to inform priors)**
- **examining the VAST model for POP abundance and apportionment.**

Northern rockfish

Kari Fenske presented the partial assessment for northern rockfish. Pete Hulson is now the lead author for this assessment. The 2018 catch of 2,354 t is below the value predicted in 2018 (3,219 t). The estimated 2019 catch of 2,561 t is substantially below the 2019 ABC of 4,529 t. The ABC and spawning stock biomass are projected to decrease from 2019 to 2021. The stock is in Tier 3a.

A full assessment for northern rockfish will be conducted in 2020, and the authors indicate that some topics to be evaluated include the weighting of the composition data and exploring the covariance matrix from VAST for use in the likelihood calculation. It would also be useful to compare the authors' estimates of survey biomass from VAST to those produced from the AFSC RACE Division; a meeting has been scheduled in early 2020 to standardize the methods RACE uses to produce the VAST estimates.

The Team notes that the final catch for 2018 (2,354 t) was substantially different from the value predicted in 2018 (3,219 t), and recommends the authors investigate the source of this difference and whether more accurate catch projections can be produced in the future.

Shortraker rockfish

Pete Hulson (AFSC ABL) presented the GOA Shortraker rockfish assessment for 2020. The stock assessment includes a model change. This year, a random effects model is applied which utilizes both the bottom trawl survey biomass index and the AFSC longline survey RPW index. An increase in biomass was observed in the trawl survey along with a slight increase in the longline RPW, although it remains below the long-term average for that time series.

The assessment includes discussion of a general increase in the discard rates for this species; however, there is no apparent reason for why this is happening.

Four model scenarios were evaluated this year, with a stepwise evaluation of the results. The incorporation of the longline survey RPW has provided for a smoothing of the overall model results. The model down-weights the longline survey to better align the results with the trawl survey.

The Team and the author discussed the reasons for the weighting of the longline survey results. Comparing the results of the differences in the models indicates that the longline survey is heavily informing the model. The SSC similarly had comments on the weighting of the longline survey results and the author indicated that this is an ongoing area of research.

The author recommended, and the Team agreed with, model 19.2a. The recommended ABC will be an 18% decrease over the previous assessment. However, if the recommended model was used in 2017, the difference between the previous ABC and this year's ABC would only be a 1% decrease. The apportionment amounts to an 18% increase in WGOA, a 7% decrease in CGOA, and a 28% decrease in EGOA.

The overall score provided by the author for the risk table was a 1, and there was no need to reduce ABC from max ABC. The Team agreed with the author's score. However, the Team did discuss the disconnect between the survey biomass increasing and the model biomass decreasing. There was discussion about how that could be included in considerations of the assessment-related considerations in the risk table in the future. Lastly, the author and Team noted that as authors respond to previous assessment concerns, this brings up a question about the baseline to which the risk table compares relative level of risk over the years.

Dusky rockfish

This year a partial assessment was conducted for Dusky rockfish. This is a Tier 3a species so only catches were used to update the projection model for 2019-2021. The VAST model is used for the survey biomass estimator. This assessment projects a decrease in ABC through 2021. A full assessment using 2019 trawl survey data is expected in 2020. There was no further Team discussion.

RE/BS rockfish

Kalei Shotwell presented a summary of the full assessment for rougheye and blackspotted rockfish (RE/BS). Catch has remained generally consistent since 2010, with the majority of the catch coming from the CGOA rockfish fishery. Both the longline and trawl surveys show consistent trends with low contrast.

No changes were made to the assessment model. However, a number of data inputs were updated: 1) catch estimate for 2018 and new catch estimates for 2019-2021; 2) new fishery lengths for 2017; 3) new trawl survey biomass estimate for 2019, new trawl survey ages for 2017, and; 4.) new longline survey relative population numbers (RPN) for 2018 and 2019, and new longline survey lengths for 2018 and 2019. Reasonable model fits were observed with a slight decrease in the ABC. A strong 2010 year class continues to be observed.

With respect to past SSC comments about clarifying the incorporation of fishery age data by gear type, the authors included information about aging data obtained from both the longline and trawl fisheries. Aging samples are dominated by those obtained from the longline fishery, although there has been some increase in age samples obtained from the trawl fishery recently. The proportion of ages by management area has not changed, and there has not been a spatial shift in observers' age collections. The Team noted that this may change once a new regulatory requirement that requires the full retention of rockfish species by vessels using fixed gear is implemented in 2020. Increased use of electronic monitoring (versus human observers) may also affect aging data in the future.

The issues of how to meaningfully assess and manage a two species complex remains. The authors noted the SSC recommendation for an analysis that provides a more realistic range of management risk of combining RE/BS as one stock. Methods to enhance the assessment could include catch composition analysis, genetic species identification, and maturity curve differences. The author noted that it could be possible to use otolith morphometrics to address this in the future, but that methodology is not yet robust enough to use in the RE/BS model. The assessment includes an appendix that summarizes current efforts related to RE/BS stock i.d., growth, and maturity analyses.

The Team recommended that the authors incorporate additional information about species identification obtained through otolith morphology in future assessments.

The author summarized the findings of the 2019 bottom trawl and longline surveys with respect to RE/BS. The bottom trawl survey indicated that the RE/BS biomass is slowly increasing since 2013, with spatial distribution generally even along the slope. The 2019 survey biomass is 22 percent above the long-term average. The longline survey does not track the increases seen in the trawl survey, but the author noted that using both surveys collectively picks up more signals about changes in the RE/BS stock.

The Team recommended that the authors investigate depth strata in which there is overlap between the trawl and longline surveys to evaluate consistency in catch between the two surveys.

The same model that was used in 2015 and 2017 was used for the 2019 assessment, with similar parameters to 2017. Results included slightly higher survey catchability and slightly lower mean recruitments, and the longline survey selectivity is now slightly dome-shaped in the 2019 assessment. The model fit was similar to that seen in 2017.

The Team recommended that the author investigate how selectivity is modeled. In particular, there were some abrupt changes between ages in the average fishery selectivity.

The RE/BS area apportionment incorporated a random effects (RE) model that integrates the trawl survey biomass and longline survey RPW indices. Past area apportionments were done using the exponential weighting of the last three trawl surveys.

The Team accepted the new RE apportionment methodology, and recommended that this also be used in the future.

The author summarized the findings of the risk assessment per the four categories in the risk table. The overall score of 1 results in no need to consider an ABC below max ABC. The Team concurred with the authors' findings for the risk assessment, although there was discussion about whether the stock assessment component should be scored as a 2, rather than a 1. This was because this is a two-stock

model. However, the Team decided that because the results of the trawl and longline surveys are consistent, the recommended score was acceptable.

Demersal shelf rockfish (DSR)

Kellii Wood presented this year's assessment. Three management areas were surveyed in 2018 and the largest area, East Yakutat was surveyed in 2019. The yelloweye rockfish (the overwhelming majority of the complex) biomass point estimate continues to decline, warranting precautionary harvest levels. The authors highlighted SSC comments regarding the desire to compare the lower 90th percentile to the biomass point estimate. This comparison was provided in the document and for the Team. The Team agreed with the author that the use of the 90th percentile was a reasonable approach in setting harvest specifications given the infrequency of surveys and downward trend of the stock biomass. The risk table was explored as a possible alternative to the 90th percentile approach but the authors had some problems interpreting the provided guidance given this stock is not age-structured. The Team agreed with SSC comments that an age-structured model would be welcome. The authors noted that this project is stalled and undergoing review because of a turnover of staff and legacy issues. However, an ADFG Statewide Rockfish Initiative group has begun exploring various models such as a habitat suitability model that would improve methods currently being utilized for DSR species and those efforts may assist the assessment of this complex in the future.

Other rockfish

Cindy Tribuzio (AFSC ABL) presented the GOA Other rockfish stock assessment for 2019. She noted that this complex includes two categories--slope and demersal--based on their life history, and spatial distribution. The complex includes species in three different Tiers: 4, 5, and 6. The catch of the species in this complex is well below the ABC for all three areas. This complex is a group that is generally caught incidentally.

The author highlighted the changes to the input data for the 2019 assessment which included catch updated through October 1, 2019, updated NMFS bottom trawl survey data, updated random effects biomass model, and reported catch of inside waters catch. Also, catch accounting now has catch by species available back to 2010. Prior to that, the catch by species was based on an extrapolation of observed rates. There were no changes to the assessment methodology for this year.

The stock assessment indicates a declining biomass, which is aligned with the regular cyclical up and down nature of this complex. Most of the species in this complex have a declining biomass this year. Due to the decrease in the biomass, harvest recommendations are lower this year compared to the previous assessment. The author supported combining ABCs for CGOA and WGOA, and noted catch would have gone over the ABC in the WGOA in recent years.

For the 2021 assessment, the author will investigate 1) moving some species up a tier (harlequin to tier 4, yelloweye to tier 5 in WGOA/CGOA/WY), 2) moving species that are not caught in the survey out of Tier 5 to Tier 6, 3) incorporating "unidentified rockfish" (a group that shows up in catch accounting data) into assessment, and 4) continuing work on the potential for a GOA-wide DSR assessment. The latter has been a continuing discussion at the Council. The Council has requested to initiate a regulatory amendment to modify 50 CFR Part 679 to accommodate changes to both the OR and DSR complexes. The Team was asked to consider the economic and management considerations to be addressed by staff as part of this GOA-wide DSR discussion. Previous Team discussions on this are incorporated into Appendices of this stock assessment document and the Team did not have further comments.

The author discussed the risk table in the assessment. The overall score provided by the author was a 1.

The Team agreed with the recommendation from the author's risk table.

Beginning in 2020, the fixed gear fleet will be under mandatory retention of all rockfish. The Team raised concerns that the coupling of full retention and new data with the changing landscape of electronic monitoring that catch estimates may increase for this stock complex. Public comment indicated concern that given the decreasing ABC and OFL and the full retention mandate that the trawl fleet may be hampered in conducting its fisheries.

The Team recommended, as new data is collected based on the 2020 full retention mandate and new EM data, the author may provide an update to the Team in September, especially if there are concerns bycatch amounts approaching ABC levels.

The Team also expressed concern about the disconnect between the survey findings (sporadic catches) and the fleet reports of increasing harlequin numbers.

The Team continues to recommend the Council move forward with Step 2 of the Spatial Management Policy for this complex and cautions potential changes in catch estimates may occur in 2020 due to full retention regulations and the incorporation of EM data.

Atka mackerel

Sandra Lowe presented the GOA Atka mackerel assessment for 2020. There were no changes to the Tier 6 methodology. The trawl survey biomass estimate was low, with a low CV due to consistent small catches. There was a discussion of whether the survey biomass estimate could be used for GOA Atka mackerel. A general decline has been observed in the survey estimates and age comps match what is seen in the Aleutian Islands. However, the lack of biomass seen in the survey is inconsistent with the bycatch observed in the fishery and it was agreed that survey-based biomass estimates are unreliable. The assessment author evaluated the risk table, and did not recommend any reduction from max ABC and noted that the table was difficult to fill out for Tier 6 species.

Skates

Olav Ormseth presented this year's assessment on the GOA skate stock complex, a Tier 5 complex. Recommendations for this complex are based on the AFSC bottom trawl survey. The author used a GOA wide random effects model used for area-wide OFL. As a nontarget stock, catch is influenced by fishing behavior in target fisheries, and catch of skates Gulf-wide is declining. Most of the catch occurs in CGOA. The MRA was reduced to 5% in 2015, which corresponds with the reduction in catch, but even with the reduction, the price of skates has stayed the same. Exploitation rates for big and longnose skate are substantially below OFL, however, because the population of Other Skates is declining, the exploitation rate (as a ratio) is increasing.

Using the random effects model estimate of the bottom trawl survey biomass, big skates occur at shallower depths, and make up about 50% of the 2019 species composition in the surveys. Examining the results from the random effects model, big skate biomass decreased in the CGOA but EGOA and WGOA have increased from 2017. OFL and ABC recommendations increased from 2017. Longnose skates showed a substantial decline in biomass from 2017. Longnose skates are possibly experiencing a shift across areas, as biomass in CGOA and EGOA declined, and WGOA increased. Other Skates, a complex primarily made up of Aleutian skates, have seen a steady decline since 2013. While there does seem to be some level of recruitment of Aleutian skates as there are many smaller skates, it appears there may be a loss of longer skates out of the Aleutian skate population. The ABA (Alaska Aleutian Bering) complex has experienced a substantial decline, however, it is not unprecedented, as biomass is similar to mid-1990s levels.

The assessment is now including information from the AFSC and IPHC longline surveys along with ADF&G trawl surveys in Kodiak and Prince William Sound. Most of the surveys overlap with the NMFS bottom trawl survey area, but the ADFG trawl survey in PWS (which targets tanner crab) provides biomass estimates in an area not covered by the AFSC BT survey and where substantial catches of skates

occur. Kamishak Bay, Kachemak Bay, and PWS have had consistent levels of longnose skates but big skate levels have been variable. In the Kodiak trawl survey, big skates have been steady, while longnose skates slightly increased and Aleutian skates have been decreasing. As the AFSC longline survey does not sample shallower than 150m, it does not generally encounter big skates. However, this survey does reflect the species composition and abundance trends, as it is seeing a much different compositions than the bottom trawl survey. The IPHC survey includes more sampling between 0 and 200 fathoms, which is more representative of big skate habitat.

The author noted the importance of having additional surveys to sample multiple depths. Examining the ecosystem, skates are omnivorous, they are not as affected by the change in environment. WGOA is doing fine with skate populations unlike some of the other species.

The author may bring a preliminary age-structured model next year, depending on SSC response. The author is also considering taking a deeper look at *M*- as part of the age-structured modeling process.

The risk table ranking was a Level 1: Normal for each of the categories. There was no recommendation to reduce the maximum ABC.

Sculpins

Tom Wilderbuer presented the partial assessment for the GOA sculpin stock complex, a Tier 5 complex. Catch has trended down from 1,318 t in 2017 to 721 t in 2018. All of the catch is incidental (e.g. bycatch); there is no directed fishery. 2019 total sculpin complex biomass in the GOA is 33,010 t from a random effects model fit to survey data. This represents a small decrease from the last full assessment in 2015. The decrease is due to decreasing sculpin biomass in the 2019 GOA survey relative to the 2017 survey. Biomass estimates are largely driven by four species in the complex: great, plain, yellow irish lord, and bigmouth sculpin. The recommended 2020 and 2021 ABC is 5,199 t and the 2020 and 2021 OFL is 6,932 t. There are no ecosystem concerns associated with the stock. This is the last year sculpins will be assessed as a target species as recent Council action recommended moving sculpins to the ecosystem component category.

Octopus

Olav Ormseth presented the full octopus assessment. The octopus complex is Tier 6 because of unreliable biomass estimates from the bottom trawl survey. Biomass estimates from the bottom trawl survey have been highly variable since 2013.

The Team recommended that the author investigate bottom trawl survey catch by numbers as well as frequency of occurrence in hauls.

Catch as well as CPUE of octopus have decreased since 2014 and is driven by pot fisheries. The low catch and CPUE of octopus may be correlated with decreased Pacific cod catch and effort. The catch in the historical time period used to determine OFL and ABC has changed due to updates in the catch accounting system used to estimate catch. Currently, the author computes maximum catch from 2003 to the current assessment year.

The Team recommended that the period for which maximum catch is computed be fixed.

Using the risk table, the author ranked the octopus complex as a level of 1 and noted the difficulty in applying the risk table to Tier 6 stocks such as this one.

Specifications approval

The Teams noted the compilation of the 2020 and 2021 specifications, and **recommended their adoption by the SSC.**