

Minutes of the Gulf of Alaska (GOA) Groundfish Plan Team

North Pacific Fishery Management Council
1007 West Third, Suite 400
Anchorage, Alaska 99501
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Administrative

The GOA Groundfish Plan Team (“Team”) convened on Tuesday, November 17, 2020 at 09:00am PST. Participation was remote via Adobe Connect. 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](#).

General Assessment Recommendations

The Team recommended that authors of assessments with fishery data that have EM participants meet with existing EM committees to determine which biological data would need to be collected to inform assessment.

Ecosystem Status Report

Bridget Ferriss presented the Ecosystem Status Report for the Gulf of Alaska, noting the numerous collaborators and contributors to the ESR. The key messages for the Gulf of Alaska (GOA) ecosystem in 2020: Overall, there were no major departures of what was expected this year; SSTs were more similar to long-term means compared to heatwave years and there were positive trends in forage conditions and higher-level trophic level species; some species showed continued negative responses to heatwave years. Some of the ecosystem data collection did not occur this year due to COVID-19, though data loss was limited in the GOA because it was an off-year for surveys. Local annual NOAA surveys and existing partnerships were able to complete data collection and analyses to inform this report.

Oceanography: After a warm year in 2019, (December 2019 was end of heat wave), SSTs cooled to the long term mean through April in both the Western and Eastern Gulf. In the spring, the Western Gulf of Alaska (WGOA) warmed above the mean, oscillating around the marine heatwave threshold for much of summer and fall. The Eastern Gulf of Alaska (EGOA) warmed in the fall, a return to more average thermal conditions at the surface in general, with warmth in the latter half of the year. Ocean temperature at depth from the Seward Line reflected residual heat from previous years. The Shelikof Spring Wind, which indicates direction of coastal flow in that region, was northeasterly which favors downwelling and pushes larvae to shore. The result is a prediction of good recruitment for the 2020 pollock year class, as it may enable retention of larval and juvenile pollock in favorable habitat. For the 2021 climate and SST predictions, indicators of cooler SST in spring of 2021 and for La Nina, an uncertain response in North Pacific. GOA coastal waters are predicted to have near normal SST. Team discussion included that the PDO declined in the winter of 2020 reflecting cooling SST in the GOA.

Forage conditions: limited data this year but there is information from Middleton Island, diet data from rhinoceros auklets. Capelin are remaining scarce after the heatwave, hexagrammidae is increasing in diet, and sand lance are becoming more prevalent in diet. There was a more diverse diet in the last 6 years, which may be because of the lack of typical diet. New herring data was

summarized in the ESR, including the Sitka Sound and Craig spawning stocks; an increase in populations exposed to ocean influence with a large recruitment of age 3 herring. PWS herring populations remain low with a slight increase. Herring may have had increased survival from heatwave. Chlorophyll-a 2020 levels are back to the long-term mean, an increase from 2019. Timing of blooms in both the east and west the bloom was about a month earlier. The Team inquired about whether the copepod biomass difference between May and September is due to distribution or productivity. It seems that as the large copepods descend more into offshore waters, they may be sampled less, so this difference is likely due to distribution. Salmon: Juvenile pink and chum salmon increased to long-term average, sockeye and coho salmon decreased from 2019, 2017 was a low recruitment year for all salmon with lengths at a 24-year average. There were low commercial chum and sockeye salmon catches in GOA. In Southeast Alaska, the commercial season for pink, sockeye, and chum salmon was the lowest in 1976. Increasing juvenile abundance since 2017 indicates harvests will increase in coming years but may still be below average.

Seabirds: To mitigate the loss of the USFWS seabird surveys, the authors worked with new partners and collaborators to synthesize qualitative and quantitative information to gain a sense of trends and conditions. While the planktivorous seabird surveys were cancelled, working with collaborators such as the Coastal Observation and Seabird Survey Team (COASST) yielded data that provided a general idea of trends. Information came from Kodiak, Middleton Island, and Cook Inlet. Reproductive success was fair to good for fish-eating birds. Black-legged kittiwake represent surface feeders, and murre, tufted puffins, pelagic cormorant, and rhinoceros auklet represent diving seabirds. Most of the indicators were fair to good but there was low colony attendance and no large-scale mortality events, some mixed trends with spatial variation.

Mammals: In Prince William Sound, there was a low encounter rate of humpback whales, and few calves. In Glacier Bay, there was an increased number of calves and these calves were in good condition, which may be related to increased availability of herring, as a prey species.

For harmful algal blooms, 29 partners collaborated in this group, monitoring phytoplankton and shellfish, mostly testing for PSP. Testing shows a consistent presence of these toxins with high bivalve PSP levels in Southeast Alaska and Kodiak.

The Team liked the presentation format and appreciated the development of new indicators. The Team had questions about 2021 survey plans. Scheduled surveys are still to be determined, they will depend on funding and COVID. The plan is to conduct the late summer EcoFOCI on the R/V Oscar Dyson and conduct both the summer and winter acoustic surveys.

GOA pollock ESP

Kalei Shotwell presented an update to the GOA pollock Ecosystem Socioeconomic Profile (ESP), which was initially developed in 2019. The ESP document includes several new inclusions, including 1) ecosystem indicators of satellite chlorophyll biomass, wind direction from National Data Buoy Center, New competitor, predator biomass (POP, sablefish), and an updated SST time series, and 2) new socioeconomic data including updated socioeconomic processes section with new economic data and community engagement discussion and a new community engagement suite of regional quotient. The current suite of ecosystem indicators for pollock include 25 different data series. The socioeconomic indicators include several indices in each of three categories, including fishery performance, economic, and community sectors.

The ecosystem indicators showed improvement in overall conditions for pollock. Socioeconomic indices showed reductions in fishery CPUE and ex-vessel price, and new analyses of community engagement show an increase for harvesting and processing regional quotient for the Kodiak community, and mixed values for smaller communities of Sand Point, King Cove and Akutan.

GOA pollock

Martin Dorn presented the GOA pollock stock assessment, which had no modelling changes from the 2019 assessment. The 2021 ABC is reduced 3% relative to last year and is expected to drop further in 2022. Main concerns for the population were the reduction in biomass estimate from the 2020 Shelikof Strait survey, and specifically low abundance of the 2018 year class.

New data for the 2020 assessment included biomass, length and age composition from the AFSC Shelikof Strait 2020 acoustic survey, 2019 summer acoustic and 2019 NMFS bottom trawl survey age composition, The 2020 ADF&G survey Delta-GLM biomass index, and the 2019 fishery total catch and age composition.

Two surveys sampling GOA pollock were conducted in 2020. The Shelikof Strait acoustic survey showed a 64% decline in biomass, while the ADF&G bottom trawl survey showed a 16.5% increase in biomass. Abundance-at-age showed a large decrease in 2 year old fish (2018 year) relative to the abundance of this year class in 2019. Martin also indicated that this year has also not appeared in the 2020 fishery size composition data. Julie Bonney noted that perhaps the apparent reduction in the 2018 year class strength will be resolved with next year's full slate of surveys in the Gulf of Alaska.

Lauren Rogers presented work on the difference between Shelikof Strait survey timing relative to peak spawning as determined by EcoFOCI larval surveys, and its correlation to the assessment model fit to the survey. The patterns indicate that recent high survey biomass (2017-2019) may be related to earlier peak spawning, which in turn resulted in a less time between the pre-spawning survey and the peak spawning estimate. Although data for the 2020 peak spawning were not available (off year for larval survey), an alternative modeling estimate of peak spawning suggests the time gap with the 2020 Shelikof Strait survey would be much larger than in 2019, and longer than the long term mean, corresponding to the smaller residual value of the 2020 survey results with the model in the current assessment. It was mentioned that the 2021 survey is also not likely to happen aboard the NOAA ship Oscar Dyson due to schedule changes caused by COVID-19, but charter possibilities may be pursued. The Plan Team indicated that it supports ongoing larval pollock survey work, and would like to see this research continue.

The 2012 year class is a dominant component of the catch, and earlier maturation, lower weight at age, and apparent lower mortality relative to the overall population.

Kresimir Williams presented an alternative approach to estimating age at 50% mature (A50) by fitting a model to individual cohorts as opposed to using annual survey-specific data. The results indicate that the recent patterns in survey-based A50, such as a large reduction in 2017, may be due to gaps in specimen data of fish aged 2-4, as several year classes that followed the 2012 year class were of extremely low abundance. A cohort-based approach results in much more stable estimates, but also showed a slow decline in A50 as a function of year class birth year, with the recent year classes of 2011 and 2012 well below the long term mean, while the 2003 and 2004 year classes were higher than the mean. The Plan Team generally viewed the long-

term or five-year average of A50 as a suitable metric in order to provide stability for SSB reference points.

The weight at age from the Shelikof Strait survey has continued to decline with the latest survey. Female SSB was sharply reduced in 2020, but still above the B40% reference point. Retrospective analysis shows a slight positive bias, but not a significant concern. As expected from last year's observations of age-0 pollock, the 2019 year class was well below average. Projected 2021 female SSB is projected to fall slightly below B40% at ~ 91 thousand tons, and Martin noted this is an optimistic case if the 2018 year class does not appear in next year's surveys. This declining trend is expected to stabilize over the next 5 years according to projections at the authors' recommended F.

The risk matrix was presented with all categories set at a level 1. While the unexpected reduction in abundance of the 2018 year class presented a potential population/demographic concern, it was not sufficient to elevate concern at this time as these fish will not be recruited to the fishery for two more years. The authors recommended the maximum permissible ABC.

The Author discussed the new fishing season structure, where the current *A*, *B*, *C* and *D* seasons were collapsed into two seasons (*A* and *B*). For apportionment, the same approach was used as before, with summer apportionment unchanged from 2019. Winter apportionment also continued last year's approach, with the former *A* season TAC allocation in 630 based on an average of winter and summer proportions. This step was applied before aggregating the former *A* & *B* seasons into the new single *A* season. Winter apportionment continued the trend of reduced proportional allocations in area 610 and 630.

The Plan Team recommended investigation into the status of the 2018 year class by potentially looking at any available diet data of potential predatory fishes such as sablefish or any other data sources that may support a displacement of this cohort from the Shelikof Strait survey area.

GOA Pacific cod ESP

Kalei Shotwell presented the ESP for GOA Pacific cod. This was the first full ESP compiled and was completed because this species has high commercial and ecosystem importance of this species. The ESP uses data from multiple sources and includes life history tables, ecosystem tables, and socioeconomic processes. There are 14 ecosystem indicators and 7 socioeconomic indicators for Pacific cod. Highlighted indices include the strength of oceanographic eddies, spawning habitat suitability (near average for 2020), Juvenile condition (small increases in 2019), VAST outputs (center of gravity for geographic distribution; more NW in 2019 with population expansions since 2009), and socioeconomics (low ex-vessel values and revenues in recent years). The Team had some clarifying questions and questions of interest about some of the indicator values, and noted that it was reassuring that many indices showed trends as expected. Most attention was paid to the spawning habitat suitability index which is a thermal index and is similar to the type of data being used by the assessment author in experimental models. This was because the stage 2 indicator analysis showed that this indicator had the largest inclusion probability when related to recruitment estimates. The Team noted that consideration of expanding the spawning habitat suitability index using ROMS and potentially including wind information should be discussed at the ESP workshop in the spring. While discussion was focused on indices related to recruitment, it was noted that exploration of indices towards informing other assessment model parameters such as natural mortality would also be good to explore.

GOA Pacific cod assessment

Steve Barbeaux presented the GOA Pacific cod assessment. The stock is projected to be at $B_{22\%}$ in 2021 and $B_{28\%}$ in 2022. The author presented last year's model with updated data (19.1). Model 20.1 was also presented and is an ecosystem-linked model but was not recommended for use for specifications. Within this model growth is modeled with a temperature influenced LVB curve and recruitment is scaled with the marine heat wave index. The AFSC longline survey RPN index for 2020 increased but was the second smallest in the time series. There was no AFSC bottom trawl survey in 2020 and the IPHC longline survey didn't cover the western gulf, and no length data was included. The ADF&G trawl survey increased in 2020 compared to 2019.

The Team recommended looking at the ADF&G trawl survey as to whether it would be a useful index in the model as well as the overlap with state and federal fisheries to possibly provide information about population demographics.

The spatial distribution of EM in the 2019 longline and pot fishery was presented and showed that EM was being conducted primarily in the CGOA while observer data was occurring in the western gulf. The Team noted that selectivity could become biased if length information wasn't being collected from the EM.

The Team recommended that authors of assessments with fishery data that have EM participants meet with existing EM committees to determine which biological data would need to be collected to inform assessment.

Model 19.1 generally fit the data well, it was noted that lack of fit to 2019 mean length data in catch could be due to shifting of length collections from federal to state fisheries. Model 19.1 was consistent with the assessment from 2019, and had low retrospective bias in spawning biomass.

The risk table set assessment-related and population dynamics concerns at level 2 due to the high uncertainty in historical recruitment and that the 2019 year-class could be lower than ancillary data suggests. Environmental/ecosystem and fishery performance considerations were set at level 1. The apportionment adopted in the 2019 assessment was recommended for 2020 and the Team agreed. The Team looks forward to new trawl survey data to inform apportionment in 2021.

The Team recommended the AFSC continue to pursue avenues to ensure IPHC surveys provide readily available information on Pacific cod.

The climate enhanced model, Model 20.1, was presented and showed similar results to model 19.1 in spawning biomass trends. The Team encourages the author to continue to research this model. It was noted that research models like this could benefit from discussion at the ESP workshop.

Shallow water flatfish

Meaghan Bryan presented the assessment for the shallow-water flatfish (SWF) complex in the Gulf of Alaska. This was a partial assessment; this complex is being assessed on a 4-year cycle with the last full assessment done in 2017. The complex includes northern and southern rock sole, which are Tier 3 stocks; the rest of the species in the complex are Tier 5. The OFL and ABC are calculated as the sum of these Tier 3 and Tier 5 stocks.

For northern and southern rock sole, the standard projection model was updated with the final 2019 catch and estimated 2020-2022 catches. For Tier 5 species, the random effects model was used to fit the GOA bottom trawl survey information (1984-2019, no survey in 2020) to generate biomass estimates for each species. The ABC and OFL recommendations for SWF, not including rock sole, are the same as the previous year. The changes and slight decrease in ABC and OFL were driven by the rock sole. Catch-biomass ratios have been low for all species with butter sole having the highest exploitation.

Apportionment by area was estimated by using the random effects model applied to survey biomass with no changes from last year. The Team supports the ABCs and OFLs of the SWF complex recommended by the author.

The Plan Team recommended checking why the projections show a higher SSB while total biomass decreases.

Deepwater flatfish

Due to Covid-19 and the necessity of re-prioritizing staff time, the deepwater flatfish complex assessment is a rollover of the 2021 specifications (from 2019) for 2021 and 2022. The last full assessment was conducted in 2019, an updated partial assessment will be conducted in 2021, and the next full assessment is scheduled for 2023. Area apportionments from the 2019 assessment are also being rolled forward for 2021.

The Plan Team discussed the value of updating the assessment with 2019 and 2020 catch data but concluded that it was unnecessary given that catch is consistently well below the ABC. Updating catch data in the assessment could decrease the ABC slightly but not to the point where catch would be likely to exceed it. There is no conservation concern for this stock complex.

In 2019, the author highlighted that Kamchatka flounder catch has been accruing towards the deepwater complex since 2011 but has been excluded from any ABC/OFL calculations. The Team noted this and recommended that the SSC consider developing a Tier 6 approach for including this species going forward. Presently, the ABCs are not constraining catch levels so the Team noted that implementing this change (which would increase the ABC slightly, perhaps between 10 and 50 t) could be done during the next partial assessment in 2021. The Team also recommended the author examine area apportionment relative to Kamchatka flounder and consider whether it's appropriate to apportion across the entire GOA or just WGOA.

Rex sole

This assessment was slated for an updated run of the projection model (i.e., a partial assessment). Due to time constraints, the projection model from last year was used without updating the catches (the differences were minor). Consequently, the Team examined the catches and determined that the available projection for 2021 specifications (from 2019) was suitable for advice on 2021 and 2022 OFL and ABC specifications. The Team noted that a full assessment will be conducted in 2021. The catch for this stock is well below OFL and ABC, so available information indicates no conservation concern for this stock.

Arrowtooth flounder

Kalei Shotwell presented a partial assessment for arrowtooth flounder. The next full assessment for arrowtooth flounder will be in 2021. The standard projection model was updated with the final 2019 catch and estimated 2020-2022 catches.

The estimated catches are 23,224 t for 2020 and 18,662 t for 2021 so the projected catch to biomass ratio remains very small. The adjustment to the ABC calculated for 2021 is 2% higher than the 2019 assessment's ABC value. The recommended area apportionment percentages were the same as last year's assessment.

The author briefly discussed past Team and SSC recommendations related to evaluating lower recruitment in recent years, the potential of using the AFSC longline and IPHC survey data, and investigating whether opportunistically collected length data could be used in the assessment. The authors' intend to investigate and evaluate these recommendations in the next full assessment.

Flathead sole

Cole Monnahan 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 2019 catch and estimated 2020-2022 catches. The stock is in Tier 3a and the projected spawning biomass for 2021 was slightly higher than projected from last year's assessment. Apportionment was based on the random effects model using bottom trawl survey biomass through 2019 and the majority of biomass is estimated to be in the Western and Central GOA. The catch to biomass ratio is low for this species.

Pacific ocean perch

Pete Hulson presented the GOA POP assessment. Although GOA POP were originally scheduled for a partial assessment in 2020, a full assessment was conducted in order to incorporate recent model developments which have been developed within an assessment internal review team formed in 2020. Modeling changes include updating the mean of the prior distribution for survey catchability from 1.0 to 1.15 based on recent field work on densities in untrawlable grounds, and updating the mean of the prior for natural mortality from 0.05 to 0.0614 based on recent life-history models. The data used for estimating the ageing error matrix was updated to include data through 2017, and fishery age compositions were estimated with an age-length key. The 2019 survey age compositions are new input data for the model.

A bridging analysis indicated that each modeling change resulted in similar trends in spawning stock biomass as the trend from the 2019 model.

Trawl survey biomass has been at a high level for the past 4 years, with the 2019 survey having the smallest CV (14%) of the time series. Catch has been increasing over time in general with a small decrease in 2020. Age composition data shows a relatively strong 2016-year class in the 2019 data. This year-class is not fit well by the model, but the overall fit to the survey age composition is relatively good. The trawl survey biomass fit is not as good, slightly worse in recent 4 years compared to 2019 assessment.

There were minor differences with data fit between the 2019 and 2020 models, and larger differences with penalties and priors. The 2020 model showed reduced penalties for survey catchability and natural mortality, which is expected due to the change in the prior distributions.

The estimate of catchability decreased whereas the estimate of natural mortality increased in the 2020 model relative to the 2019 model. Recruitment estimates were higher in the 2020 model than in the 2019 model. The 2020 model shows a large estimate of the 2016 year class with large uncertainty.

The estimated total and spawning biomass and spawning biomass in the 2020 model has increased compared to the 2019 assessment, and the time series of estimated biomass shows a decrease in recent years due to the influence of the composition data. The retrospective pattern has improved since the 2019 assessment, with the Mohn's rho of -0.15 in the 2020 assessment and -0.27 in 2019

For the risk table, there were no changes from 2019; the assessment-related considerations and population dynamics considerations were both Level 2 (substantially increased concerns), and the environmental/ecosystem considerations and fishery performance considerations were both Level 1 (no apparent concern).

The Team discussed research being conducted by Madison Hall, who is exploring the feasibility of developing a biomass index from fishing vessels to conduct surveys in untrawlable grounds in a minimally standardized way. This research has the potential to improve the survey estimates for GOA POP, and the Team is interested in hearing updates on this project in future years.

There is evidence of behavior changes of pollock because of water temperatures so that they are more available for trawl nets, but it is unknown if this behavior exists for POP. **The Team recommended that assessment authors work with the MACE group to examine acoustic survey data to see if there are vertical shifts for POP related to water temperature.**

The Team supports the ABC recommendations (table) and apportionment (which did not change from last year). The Team agrees with recommendations and did not weigh in on the risk table.

Pete indicated that future work includes continuing to work with internal review team to further examine: 1) selectivity; 2) the VAST model; 3) data weighting for compositional data; 4) using the hydroacoustic index; 5) re-evaluate the plus age group; and 6) examine how fishery-dependent ages are being collected (i.e., the degree to which spatial discretion of fishery otolith samples are consistent with the spatial distribution of the catch). The Team supports research into these topics.

Northern rockfish

Ben Williams presented a full assessment for northern rockfish. No changes were made to the previous 2018 model. Three model versions were presented this year: the 2018 model using updated data and the "bridge" Vector Autoregressive Spatio-Temporal (VAST) model-based survey biomass index that closely matched the VAST model settings used in 2018(18.2); last year's model with updated data and VAST estimates of survey biomass generated by AFSC's GAP Program (18.2a) using alternative settings and assuming a gamma distribution for catch rates; and last year's model with updated data, VAST survey biomass estimates generated by GAP, and an updated ageing error matrix (18.2b). The author recommended model 18.2b uses the GAP produced VAST survey index which represents a substantive increase in survey estimates due to the VAST model configuration. This results in corresponding increases in total and spawning stock biomass and a 24% increase in ABC.

The VAST model used previously for estimating survey biomass used a lognormal distribution that “smoothed” the survey index but the author recommended model uses a gamma distribution, which makes the survey index more variable. This variability may be better representative of the survey estimates considering how poorly the survey samples northern rockfish. The Team discussed the implications of these settings changes in the VAST model. Some suggestions for identifying the best VAST settings were to examine variability in catchability using an MCMC approach and estimate process error variances in the model.

The Team recommended that both northern rockfish and dusky rockfish utilize the GAP VAST estimates of survey biomass and encourage GAP and the authors to continue to collaborate on producing model -based estimates of abundance.

The model provides a reasonable fit to the biological data, with some poor fits in the age compositions. The Team discussed these fits, and noted the model is fitting the plus groups in the survey but not in the fishery. Why the fleet doesn’t encounter the older portion of the population is unknown.

The Plan Team recommended the authors examine the high proportion of survey and commercial catch that are being assigned to the plus group age bin and investigate why fits to the fishery plus group are so poor.

Risk table categories were all set to one. The Team generally agreed with the author’s rationale for scoring and agreed with the author’s recommended model and ABC.

Area apportionment was based on the random effects model and resulted in a shift in biomass to the WGOA for 2021 in response to an increase in 2019 survey biomass in the WGOA. It was also noted that the fleet had a difficult time catching northern rockfish in 2020. The Team discussed the potential for environmental drivers influencing movement or distribution changes and suggested these should be investigated to help understand the poor catch rates observed.

Dusky rockfish

Kari Fenske presented the GOA Dusky Rockfish assessment. The Authors addressed past SSC requests for the risk assessment table and concerns related to VAST models. The three most recent surveys show good coverage in habitat down to 700 m.

GOA Dusky rockfish uses a geospatial estimator (i.e., VAST) for trawl survey abundance. The VAST model parameterization has changed over time and each change has been documented through ‘bridging’ models to show the effect of changes as they have been made. Three models were presented: the 2018 model, the 2020 model with fewer VAST knots (both of these assume delta lognormal observation model), and the authors recommended model (15.5a) which is the 2020 model with a delta-gamma observation model. The choice of the different observation model in 15.5a is because of the recommendations of the VAST GAP group.

The authors’ preferred model results in a 93% increase in ABC from 2020. Team discussion centered the sources for the change and also the extent that strong year classes may affect reference points (e.g., B40%). The Team and authors noted that model results showed serious retrospective positive bias, indicating that as more data were added, estimates are revised down. The Team inquired on the extent that catchability changes in retrospective runs.

Plans for future research included that the VAST GAP group examine increasing the number of knots in the model. It was noted that the major changes to this assessment is the delta gamma

observation model rather than the delta lognormal (and not the number of knots in the VAST model).

The Team recommended continuing to evaluate treatment of survey data.

Specifically, the Team suggested that the authors examine survey index and age composition weighting relative to the retrospective patterns. How does catchability change in different retrospective runs? From the data side, how are age (and length) composition sample sizes impacted by patchiness of samples (frequency of occurrence)?

Rougheye/Blackspotted rockfish

Jane Sullivan presented a partial assessment update for rougheye and blackspotted rockfish which are assessed biennially in order to coincide with survey data. Updated 2019 catch data was added to the projection model inputs as well as projected current year catch. Catches have averaged 48% of ABC since 2017, although catch decreased in all areas compared to 2019. The majority of the RE/BS rockfish catch remains in the rockfish and sablefish fisheries, with some increase in the flatfish fisheries. Last year's projected 2021 ABC was within 1 t of the updated estimate for 2021. The apportionment percentages are the same as in the 2019 full assessment. This year's assessment uses the two survey random effects model, which was first used in 2019. The Plan Team noted that the author may want to track RE/BS catch in the pot sablefish fishery since this gear type has increased in recent years and RE/BS catch estimates may be lower since they likely aren't caught by pot gear. The author responded that catch by all gear types was included in the catch estimates, and would continue to be in the future.

Demersal shelf rockfish

Kellii Wood presented the SEO Demersal Shelf Rockfish stock assessment for 2021. This assessment uses the most recent survey data for the density estimates (usually from the year prior) and then the average weight of yelloweye rockfish for the current year. Due to COVID and the closure of the commercial and recreational fisheries in Southeast Alaska in 2020, average weight from 2019 was used instead of 2020.

The regional estimate of yelloweye rockfish density increased due to the increase in density within the EYKT between 2017 and 2019. Consequently, yelloweye rockfish biomass estimates increased from 2020 to 2021. While an increase, this species remains at low values within the time series.

The SSC and Plan Teams have both expressed a desire to see alternative formats for this stock assessment be presented such as the inclusion of risk tables to account for uncertainty and the use of an age-structured assessment. The author's noted that ADF&G continues to meet with its Statewide Rockfish Initiative group and this group has been exploring alternative models. However, there is insufficient support from biometric staff to complete this activity in 2020 and potentially 2021. The authors will create and present a risk assessment for the full DSR assessment, and explore their methods on habitat assessment, survey stratification, and plan to conduct a full programmatic review in the coming years. No recommendations were provided from the Team.

Thornyheads

Katy Echave presented the GOA thornyhead complex assessment. This is the first full assessment since 2018, a partial assessment was completed in 2019. The accepted model (18.1) from 2018 was used for this assessment with no changes. Model 18.1 is a random effects model fit to the AFSC Longline Survey RPW index as well as the AFSC bottom trawl survey biomass index. The addition of the longline RPW indices reduces the random effects model's sensitivity to the bottom trawl index, and further smooths the biomass estimates as well as apportionment across time.

The most recent 2019 trawl survey estimate was 4% lower than the 2017 estimate, whereas the longline survey RPW increased 15% between 2018 and 2019, and then decreased by 27% in 2020. The random effects two index model results in an exploitable biomass of 86,802 t, which is a 3% decrease from the 2020 estimate. Apportionments are also based on the two index random effects model. For 2021, the WGOA apportionment increases 8%, CGOA remains relatively unchanged, and EGOA decreases 11%. The majority of catch occurs in the Central GOA and is consistently below the TAC.

The Team noted the recent decrease in commercial catch and in both survey indices. Potential causes that were discussed include:

- Increase in hook competition with sablefish as the current large cohort grows in size and becomes more aggressive to the hook,
- Increase in commercial sablefish operations switching from longline to pot gear,
- Decrease in commercial operations in thornyhead habitat (deep stratum), and/or
- Decrease in thornyhead relative abundance.

The Plan Team recommended the authors investigate hook competition with sablefish on the longline survey and, if appropriate, develop a correction factor either by using existing data or conducting a hook timer study.

This work could also have implications on other assessments that use longline survey indices (e.g. rougheyeye/blackspotted rockfish, northern rockfish, etc.).

The Plan Team also recommended the authors investigate potential shifts in gear or fishing behavior in thornyhead habitat as a possible cause of the decrease in catch.

Forage fish

Olav Ormseth provided a report on forage fish in the GOA. The report included a description of which species are considered forage fish, how they are managed, results from the bottom-trawl and acoustic-trawl surveys, and catch data.

Population trends for capelin come from the bottom trawl survey (BTS) and the acoustic trawl survey. Because capelin are small and pelagic, they are not sampled well by the BTS. However, the BTS does provide an index as it tracks with general trends of abundance, and the acoustic trawl survey indicates the same trends. Prior to the marine heat wave (MHW), capelin were increasing in abundance. The MHW was detrimental to the population and capelin are starting to recover, which is consistent with what is known about capelin as a cold-water species. Frequency of occurrence from the bottom trawl survey is used as a metric, in addition to population information from the acoustic survey conducted by MACE group. The MACE surveys are conducted biennially in the odd years; producing biomass estimates since 2005. In 2013, there was a large abundance of capelin observed in the MACE survey, but then the marine

heatwave arrived and they disappeared in 2015 and 2017. They were observed in 2019 and may be starting to recover. This is consistent with the predator diet information that has been reported in the ESR.

Catches of osmerids (eulachon) remain low. Eulachon are easier to sample using trawl surveys, as they are larger and more associated with the bottom of the ocean. They are sometimes hard to identify in the catch because they are so small. They are caught in the pollock pelagic trawl fishery, primarily in Shelikof Strait. There were some years when the fleet could not stay away from eulachon but levels have been lower recently.

The herring biomass estimates are associated with large confidence intervals but biomass has increased, particularly in 2019. There is a hard cap for herring in the Bering Sea based on Togiak estimates. The GOA does not have a hard cap, but catches can be compared to the mean and the median of historical herring catches.

Squid are a new component in the ecosystem category. There was one big catch event in 2006 and since then catch has been low and there is no evidence of overharvesting.

Pandalid shrimps catch has been high for 2019 and 2020. To examine trends, the author used the long term mean and the standard deviation from the mean; this gives recent catch patterns to compare to the historical record. There is no obvious reason for the increase in shrimp catches. The Team discussed whether this could be due to fewer cod feeding on shrimp as prey.

Sharks

Cindy Tribuzio provided a report on GOA sharks, and acknowledged the work of her new co-author Beth Matta. The report highlighted some of the recommendations from the Plan Team and SSC. Research on genetics and stock structure of Pacific Sleeper Sharks (PSS) is ongoing, as the lab was unavailable due to COVID-19. Catch by numbers from 2010-2019 has been updated but this information has not yet been analyzed. There are a number of analyses that are ongoing to help estimate age and improve catch estimation: pilot PSS ageing (NPRB proposal), and multiple projects to improve catch estimation. The working group which was recommended to examine biomass, catch estimation and catch accounting in Areas 649/659 is on hold pending results of the work of a MS student exploring the incorporation of multiple surveys using VAST or other techniques. This project would allow expansion of biomass estimates into other areas. For spiny dogfish, the use of VAST is being explored and the uncertainty around catchability (q) was addressed in the 2018 SAFE.

There were no changes to the assessment methodology for the shark complex. Changes to the input data included updated catch through 2020 and updated bottom trawl survey biomass estimates through 2019. In addition, supplemental data from the AFSC longline, IPHC longline, and ADF&G surveys were updated. For spiny dogfish, the random effects model estimated biomass from the bottom trawl survey is adjusted by a catchability parameter to get exploitable biomass. Recommendations for the Tier 6 sharks are determined by average historical catches in the years 1997–2007. The recommended ABC is a 54% decrease from last year, due to a low 2019 bottom trawl survey biomass for dogfish. The author noted that the ABC is unlikely to inhibit other fisheries. The Team noted that the recommended ABC is similar to the catch seen in 2018 but the OFL is higher.

The author described the shark catch by target fisheries. PSS catch is different in BSAI and GOA, but in the GOA they are caught by flatfish and halibut fisheries. Salmon sharks are caught

in the pollock fishery, and other sharks (mainly blue sharks) are caught in the sablefish fishery typically in Southeast.

The Team inquired about a potential “observer effect” in the fisheries that are sampled more, and recommended that the author look at data from pre- and post-observer restructuring.

The author noted that she discussed this in an appendix few years ago and could expand on this in the future assessment.

The AFSC bottom trawl survey is the only survey index that is used for the spiny dogfish model. Shark catches are uncommon in the AFSC longline survey and longline survey data are not used. Other survey information that has been reviewed but not used are: ADF&G SEAK Longline Survey, and the IPHC Longline survey. The IPHC survey is a coastwide survey and currently collects length data on female and male spiny dogfish. The author commented on the value of the IPHC survey for both dogfish and PSS and hopes to continue receiving lengths from this survey.

For the risk table, the author graded the entire complex but noted some differences between Tier 5 and Tier 6 species in the complex for the risk table. She chose the highest risk level for each of the categories. This highlights the challenges in scoring a complex when different species score differently. The author noted that there are a number of projects ongoing to inform risk table categories and improve assessments.

For assessment related considerations, Level 2 was chosen because the Tier 6 species have no biological or trend information and sharks exhibit low productivity, and have a potentially high vulnerability to overfishing. For population dynamics considerations, the author recommended Level 2. Although the spiny dogfish population index trends are highly variable with no apparent trend with a Level 1 recommendation, the PSS indices are trending downward and remain at low levels, which warrant Level 2. For environmental and ecosystem considerations, the author recommended Level 1 for all species because the forage conditions are average and if water temperatures change, these highly mobile animals can move to other areas.

The Team inquired if there is any indication that there may be a vertical change in distribution depending on ocean temperatures and marine heatwaves. There was also discussion about thermal regimes that are preferred for each of these species; the author noted that we have very little information about temperature preferences for sharks.

2021 and 2022 Harvest Specification Recommendations

The Team noted the compilation of the 2021 and 2022 harvest specifications, and recommended their adoption by the SSC. The Team also recommended that the Council and its committees consider two options for sablefish apportionments: these are provided in the Team’s table of its recommended OFLs and ABCs for groundfish in the GOA.

Adjourn

The meeting adjourned at 1:00 PST on Friday, November 20.