

## Minutes of the Joint Plan Teams for the Groundfish Fisheries of the Gulf of Alaska (GOA) and Bering Sea Aleutian Islands (BSAI)

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

**September 21 - 24, 2015**

BSAI Team		GOA Team	
Dana Hanselman	AFSC ABL (co-chair)	Jim Ianelli*	AFSC REFM (co-chair)
Grant Thompson	AFSC REFM (co-chair)	Jon Heifetz	AFSC ABL (co-chair)
Diana Stram	NPFMC (Coordinator)	Jim Armstrong	NPFMC (coordinator)
Kerim Aydin	AFSC REFM	Sandra Lowe	AFSC REFM
Lowell Fritz*	AFSC NMML	Chris Lunsford	AFSC ABL
Chris Siddon	ADF&G	Mike Dalton	AFSC REFM
Alan Haynie	AFSC REFM	Kristen Green	ADF&G
Bill Clark	IPHC (retired)	Obren Davis	NMFS AKRO
Brenda Norcross	UAF	Mark Stichert	ADF&G
Mary Furuness	NMFS AKRO	Paul Spencer	AFSC REFM
David Barnard	ADF&G	Nancy Friday	AFSC NMML
Leslie Slater	USFWS	Leslie Slater	USFWS
Liz Chilton	AFSC	Craig Faunce	AFSC FMA
Cindy Tribuzio**	AFSC ABL	Jan Rumble	ADF&G
		Ian Stewart*	IPHC
*partial attendance			
**initial meeting			

### Administrative

**November Team meeting:** The November Team meeting will be held November 16-20, 2015 at the Alaska Fisheries Science Center, Seattle. **PLEASE NOTE:** Beginning October 10th, US Driver's licenses will be accepted for admittance to the NOAA facility only if they are 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>

**Documents and presentations:** All documents provided prior to or during the meeting as well as presentations given during the meeting were posted to the [Council's Granicus site](#) .

**Introductions:** The Joint meeting of the Gulf of Alaska (GOA) and Bering Sea Aleutian Islands (BSAI) Groundfish Plan Teams convened Monday September 21, 2015 at 1:00 PM at the Alaska Fisheries Science Center in Seattle, Washington. Introductions were made. New Plan Team members were

welcomed (Cindy Tribuzio on the BSAI Team). The Joint Groundfish Plan Teams adopted a revised agenda.

**Council activity:** The Teams received updates on the Council actions from the past year. Reductions in PSC limits for Chinook salmon and Halibut in the BSAI were associated with a great deal of public testimony and Council discussion. The Council acted to reduce halibut PSC limits in the BSAI by 21% at its June meeting in Sitka. This will be accomplished by reducing PSC limits by various percentages for different components of the overall BSAI fleet.

The Council took action to expand the gear types for use in the sablefish fishery in the Gulf of Alaska. Longline pot fishing for sablefish fishing in the Gulf of Alaska is now allowed. The Regional Office is developing rulemaking to amend the regulations to allow this to happen. The earliest potential implementation for these changes is June 2016.

The Council is also initiating a ten year review for crab that is needed to evaluate the success and remaining challenges associated with the implementation of the crab rationalization program

**NS1 Guidelines:** Jim Armstrong informed the Plan Teams about the Council's review and comments on NMFS' proposed revisions to the National Standard Guidelines. The Council formed a working group to review the proposed new language. The proposed revisions are intended to improve flexibility; however, if the new language is adopted, regional differences in interpretation may result in unintended or unanticipated new obligations. For example, there may be new expectations about: 1) what species to include in FMPs, 2) how OY is calculated and characterized, and 3) what will trigger review and revisions of FMP objectives.

**IPHC/DMR update:** Jim Armstrong discussed the ongoing need for halibut DMR estimates and that these will no longer be provided by Gregg Williams, who recently retired from the IPHC. Halibut DMR estimates are used for in-season management as well as in the halibut stock assessment. Mike Fey (AKFIN staff) has agreed to conduct the calculations for future years, however, his attempts thus far to replicate Gregg's methods have not been entirely successful. The transition in responsibility was suggested to also be a good opportunity to explore improvements in estimation methods. Although the DMRs are typically applied for three year periods, current methods may be applied only for the upcoming 2016 fishing year while improved methods are worked on.

Council staff (Jim) anticipates, at the upcoming October meeting, the Council will initiate action to identify alternative methods for estimating halibut DMRs. A member of the public commented that public input should be a part of that process, since there are likely policy implications associated with the way DMRs are calculated (e.g., length of time series for averaging) and applied to the different target fisheries. The group was provided with the most recent annual DMR estimates calculated by Gregg Williams working for IPHC on a contractual basis. Current practice is to base DMRs on ten-year averages of annual values.

**The Teams recommend that long-term (ten year) averages (below) be used in 2016 while methods are identified for future DMR estimation.**

*Long term average halibut DMRs based on annual DMR estimates provided to the Plan Teams by IPHC. Numbers in italics represent extension of previous values where no data were available for updated values.*

Non-CDQ					
BSAI			GOA		
Gear/Target	2013-2015	2016	Gear/Target	2013-2015	2016
<b>Trawl</b>			<b>Trawl</b>		
Atka mack	77	82	Bottom poll	60	58
Bottom poll	77	81	Pacific cod	62	62
Pacific cod	71	66	Dpwtr flats	43	43
Other Flats	71	63	Shallwtr flats	67	66
Rockfish	79	83	Rockfish	66	65
Flathead sole	73	72	Flathead sole	65	67
Midwtr poll	88	88	Midwtr poll	71	59
Rock sole	85	86	Sablefish	71	59
Sablefish	75	75	Arr. fldr	73	76
Turbot	64	82	Rex sole	69	71
Arr. Fldr	76	84			
Yellowfin sole	83	84			
<b>Pot</b>			<b>Pot</b>		
Pacific cod	8	20	Pacific cod	17	21
<b>Longline</b>			<b>Longline</b>		
Pacific cod	9	9	Pacific cod	11	10
Rockfish	4	4	Rockfish	9	9
Turbot	13	11			

CDQ		
BSAI		
Gear/Target	2013-2015	2016
<b>Trawl</b>		
Atka mack	86	82
Bottom poll	83	86
Pacific cod	90	87
Rockfish	80	69
Flathead sole	79	79
Midwater poll	90	90
Rock sole	88	86
Turbot	89	89
Yellowfin sole	86	85
<b>Pot</b>		
Sablefish	34	41
<b>Longline</b>		
Pacific cod	10	10
Turbot	4	4

## Team procedures

Grant Thompson provided an overview of existing Team policies on documentation/deadlines and writing minutes. Per request of the SSC, Grant also led a discussion on model naming conventions, including proposals from the SSC and an alternative drafted by Grant (see “Team procedures” document).

Points/questions raised by individual Team members during the discussion included the following:

- If the process for recommending ABCs and OFLs evolves toward an “ensemble” or “model averaging” approach, will/should this have an impact on the model naming convention?
- As noted in the document, the performance-based criterion proposed for distinguishing major changes from minor changes may not reflect the degree of structural differences between models.
- On the other hand, the performance-based criterion removes subjectivity from this distinction and should result in greater consistency in model numbering across SAFE chapters.
- The IPHC has tended to use “code names” for models rather than numeric identifiers.
- At this point in the assessment cycle (final assessments are due in just a few weeks), it is advisable to give authors considerable flexibility.
- It would be handy if authors were to compute the “average difference in spawning biomass” statistic described in the document, regardless of whether each author uses the naming convention described in the document.
- It would also be handy if authors were to compile a complete history of the models that have been explored in the past, along the lines of Appendix 2.3 of last year’s EBS Pacific cod assessment.

**For this year’s final assessments, the Teams recommend that each author of an age-structured assessment use one of the following model naming conventions (“TPA” represents the alternative described in the Team procedures document):**

1. Non-numeric code names (e.g., “Hurricane,” “Lightning,” etc.).
2. A slightly modified version of the SSC’s numbering convention, where Model 0 represents last year’s final model with no new data, Model 1 represents last year’s final model with updated data, and model numbers greater than 1 represent other models (either new or old).
3. Purely numeric model identifiers incorporating two-digit year labels of the form “yy.j,” where the year label indicates the year that the model was introduced and the digit after the decimal (“j”) represents a unique identifier distinguishing a particular model from the others introduced in the same year (e.g., “12.1” and “13.4” might describe two models introduced in 2012 and 2013, respectively).
4. Alpha-numeric model identifiers incorporating two-digit year labels of the form “yy.jx,” where the digit after the decimal (“j”) represents a major model change and the alphabetic character (“x”) represents a minor model change (e.g., “12.1c” and “13.4a” might describe two models introduced in 2012 and 2013, respectively). Sub-options include the following:
  - a. The numbering convention described in the TPA.
  - b. The numbering convention described in the TPA, except that the final model for 2014 is considered to be the original version of the base model in all cases.
  - c. The numbering convention described in the TPA, except that the distinction between “major” and “minor” model changes is determined subjectively by the author on the basis of qualitative differences in model structure rather than the performance-based criterion described in the TPA.
  - d. Sub-options 4b and 4c combined.

Next year, the Teams will evaluate the performances of the various naming conventions used by the authors this year, employing the following criteria:

1. How well does the naming convention achieve the SSC’s goal of ensuring that “the origin of the model can be traced back to the original derivation?”
2. How likely is it that the naming convention can be applied consistently across assessments?
3. Does the difficulty of implementing the naming convention outweigh its usefulness?

### **Species-specific ecosystem considerations**

Dana Hanselman presented the development of Stock-specific Ecosystem Considerations (SEC) being led by Kalei Shotwell (ABL) as a method of refreshing ecosystem considerations sections contained in each stock assessment (separate from the Ecosystem-wide Ecosystem Assessments for the EBS, GOA, AI, and Arctic). A working group was created last year of both stock and ecosystem assessment scientists, per the Plan Team recommendation. This year the SEC working group developed a coordinated effort through Google forms for creating species profiles. Initially the species-specific information collected through the Google form will be used for the initiatives and within the scoring process for climate vulnerability and prioritization. The data may then be used to develop a baseline SEC. Specifically this may include: 1) conceptual models and tables of species life history, 2) process mechanisms for each species, 3) and species-specific report cards. In the future, an ecosystem indicator repository could be developed with on-line, accessible indicators which are updated in a timely manner and time series available by LME. The working group also plans to automate the process of SEC creation.

## Ecosystem monitoring and assessment studies

Ellen Yasumiishi presented updates of survey work from Bering-Aleutian Salmon International Survey (BASIS) surveys including Chinook and chum salmon. BASIS survey data show how chum salmon overlap with pollock fishery locations. Warm versus cold years were evaluated and suggest that, in warmer years, potential for overlap with chum is apparent, with greater prevalence of age-zero pollock. There appears to be a correlation between age-0 density and pollock bycatch in the same year. She also presented work conducted by Jim Murphy (ABL) on BASIS survey data near Norton Sound. In this study he produced a time series of Canadian origin Chinook salmon estimates from the Yukon River. Estimates of out-migrants are predicted to be above for 2015, 2016, and 2017 are above average. The Recruitment Processes Alliance (RPA) will be continuing to evaluate larval and juvenile studies for potential application as ecosystem indicators and as a potential tool for monitoring Chinook salmon runs. Kerim Aydin presented a brief overview of some model work he and some colleagues are conducting. Predicting next year's summer cold pool extent is becoming possible and is available nine months out.

## EFH 5-year review

Matthew Eagleton and John Olson provided an update on the 5-year Essential Fish Habitat (EFH) review. The main goals of the EFH report are to define EFH, assess fishing effects on habitats, assess non-fishing effects on habitats, and to produce a Habitat Assessment Prioritization (HAP). Using the 2010 EFH report as a template, the update will focus effort on 3 (out of the 10) components that exist within the Fishery Management Plans (FMPs). Those components include: 1) a new method to describe EFH, 2) new information that may update existing model parameters, and 3) creating a means to assess stock effects from non-fishing activities. Additionally, they presented a revised timeline for the update over the next year, which includes providing stock assessment authors a review period starting in January 2016.

The new method to describe EFH utilizes GAM models by species that consider a number of datasets to find those parameters that best describe their distributions and abundances. Of all the parameters input to the GAM, generally only 2-3 of them have large influence (e.g., temperature, depth). There was some discussion on how to deal with the fact that temperature changes annually and therefore EFH will likely change and how this should be considered further. Additionally, Drs. J. Pirtle and K. Shotwell are working on a different method to define EFH for more data-poor species.

The EFH group has also been working in collaboration with Alaska Pacific University (APU) to update methods on fishing effects on habitat and is beginning to examine non-fishing effects with APU and the Coastal Geoscience Group. They translated the fishing effects methods from Fujioka's code into *R* and updated parameters to include: fishing intensity, habitat categorization, habitat sensitivity, and recovery rates. The methods for non-fishing effects are currently being developed with a specific example from Norton Sound using geospatial datasets.

## Observer deployment plan

Craig Faunce provided a summary of the 2016 Draft Annual Deployment Plan (ADP) for observer coverage in the groundfish and halibut fisheries off Alaska, as well as information about the 2014 Annual Observer Report. NMFS released the 2014 Annual Report evaluating the second full year of the restructured observer program in June 2015. The program met the expected rates of coverage for the full coverage category, the zero coverage category, and trip selection and four of six vessel selection periods in the partial coverage category. In the Federal fisheries off Alaska, 5,883 trips (43 percent) and 417 vessels (33 percent) were observed. The program did not achieve a random sample of GOA trawl pollock deliveries in partial coverage at expected rates, and coverage rates were especially low in ports with high tendering activity.

The 2014 annual report identified several issues regarding the vessel selection stratum used in 2014. Changes in annual fishing effort and the high level of conditional releases granted to vessels within the vessel selection pool resulted in low sampling rates, substantial data quality concerns, and decreased sampling efficiency. The 2015 ADP was responsive to issues that arose in 2014, and revised coverage protocols so that all partial coverage is based on trip selection, including coverage rates of 24 percent for large vessels and 12 percent for small vessels. The 2015 ADP also specified that temporary exemptions from observer coverage in 2015 would only be granted for small vessels in the trip-selection stratum that did not have sufficient life-raft capacity to accommodate an observer.

Craig also reported on the draft 2016 ADP, as well as information about the evaluation of different sampling designs (Appendix B). For 2016, the trip selection method will again be the sole method to assign observers to fishing activities for the partial coverage category. However, NMFS is recommending an observer allocation scheme that uses gear stratification. This is based on a sampling design for observer deployment that involves two elements: 1) how the population of partial coverage trips is subdivided (stratification); and 2) what proportion of the total observer deployments will occur within these subdivisions (allocation). The proposed 2016 ADP includes stratification by gear for trawl, hook-and-line, and pot gears. Within these categories, preliminary estimates of coverage rates are 29 percent, 14 percent, and 14 percent for trawl, hook-and-line, and pot gears, respectively.

Other elements in the proposed 2016 ADP include: No changes to GOA and BSAI genetic sampling protocols; an end to coverage exemptions due to life raft capacity; and decreasing the number of open trips in ODDS to 2 from 3 to reduce temporal bias.

Six stratification schemes and two allocation methods were considered: proportional and blended optimal weights. Proportional allocation is a strategy where deployment is proportional to the number of fishing trips. Optimal allocation is more complicated. The allocation is the product of the number of trips and the variance. A gap analysis was employed for determining the effectiveness of the new deployment strata options compared to past strata. In the analysis, the allocation methods were illustrated in graphs with retained catch and discards as the units. The total retained catch with the optimal allocation method had lower error. The need to establish stability within the program before too many changes were made was stressed.

A Team member noted that Euclidian distance is an appropriate measure only if the scales are all comparable and the assumption of equal weighting is valid. **The Teams recommended, and Craig concurred, that the analysts verify whether Euclidean distance is being used appropriately.** Craig welcomes feedback on this analysis to improve the draft analysis going forward at this time.

In summary, the authors believe the new approach can improve on 2013-2015 rates. Craig cautioned that, given the analytical work involved, they are not proposing to conduct this type of analysis annually, and that stability in design is also desirable. Proportional allocation is better than optimal for filling gaps, and borrowed data can lead to poor inference. The end result is NMFS' recommendations of 29 percent trawl and 14 percent for Hook and line and pot gears.

Questions were posed by team members and the public regarding how the EM component is factored into the catch accounting system (CAS). Craig noted that the current 56 vessels in 0 coverage (EM) have already been reflected in the analysis and that, as vessels are removed from partial coverage under the same sampling, rates will increase. NMFS cannot incorporate data derived through EM into CAS in 2016.

Questions were posed regarding how variances are to be generated for catch and bycatch and the plan for incorporating these into CAS, stock assessments, and management decisions. The response was that, while progress is being made toward producing such variances, it is not yet clear how they will be used.

Currently catch is accounted for without variance. Stock assessments could accommodate variances, but how CAS will accommodate them is as yet unclear. Greater uncertainty in estimates of OFL and ABC is one likely result. Adjusting ABC to account for greater uncertainty in OFL (other than in Tier 1, where this is already addressed), or adjusting TAC to account for greater management uncertainty, would be possible directions for future consideration.

## Survey Averaging Working Group report

Paul Spencer presented the latest results and recommendations from the Survey Averaging Working Group. A consistent method for averaging (or smoothing) trawl survey biomass is needed. The overall goal is to attempt to remove the observation error associated with survey biomass estimates without removing any underlying information on interannual variation in stock size (i.e., the “process” error).

Paul gave an overview of a spatial simulation model with specified “global” recruitment variability and an added component for “local” recruitment variability. Global recruitment may be autocorrelated over time. Including autocorrelation in recruitment did not make a big difference.

Two species types were compared (POP-like and pollock-like) with increasing, decreasing, and constant trends. POP, in general, can only have so much difference over time because they are long-lived. A question the working group examined was whether there was bias in the estimated distribution by area. In these new simulations, they attempted to make more variation in the difference across areas (proportions).

Lumping and splitting of strata do not result in substantial differences in total biomass estimates. Lumping does result in a negative bias when there are missing strata, so the random effects model could be applied at the level of the missing data to estimate the biomass in those strata. The Teams discussed how to obtain a biomass-weighted M for stock complexes. One Team member suggested running the smoother for each species separately to obtain the proportions (weights), but run the smoother for the complex as a whole to get the total biomass (and confidence interval).

Pete Hulson has made some progress on using multiple surveys together to determine either biomass or apportionment more accurately. The group is going to explore further the use of prior distributions on the process error variance or the ratio of the variances (observation:process). Paul was asked a question about how stability was affected in apportionment. He responded that one of the advantages of using the random effects model is that it can be somewhat flexible and different assumptions can be made.

Because the presentation was unavailable to review ahead of time the Teams discussed whether any recommendations or actions should be made. They decided to revisit the issue later in the week so people could further digest the presentation that was posted during the meeting. The following summarizes the Teams’ subsequent discussions.

**The Teams recommend that the random effects survey smoothing model be used as a default for determining current survey biomass and apportionment among areas.** Possible guidance for several situations for Tier 5 stocks and species complexes, and Tier 3 apportionments, is shown below. In addition to results from the default method, authors may present alternative survey averaging and apportionment strategies that represent an improvement over the default method or have an objective other than achieving the best estimate of current areal distribution of survey biomass. Consideration of alternative methods may involve examination of the estimate of process error variance (the only parameter estimated by the random effects model) and whether it, and the time series of estimated survey biomass, are plausible for their stock. In cases of implausible estimates of process error variance, use of a prior distribution on the ratio of observation error variance to process error variance may be used (an estimate of this ratio can potentially be obtained from an exponential smoothing model). Additionally, the random effects model could be run with a common observation error variance across years, as this would

make the same model assumptions of an ARIMA (0 1 1) model or an exponential smoothing model. A possible outline of procedures (based on situation) is:

1. Tier 5 single species, or complex with common F across species within the complex.
  - With no missing (strata) area/depths*
    - a. Run random effects model for overall biomass.
      - Optionally, the species complex biomass variance could be recomputed as if it were one species (at the tow level) for computing the observation error (e.g., design-based variance)
    - b. Apply  $F_{ABC/OFL}$  to overall biomass
    - c. For apportionment of ABC/OFL by area, run the random effects model with area-specific biomass and compute proportions of biomass by area
  - With missing strata*
    - a. Run random effects model separately by strata at the level of missing data to get biomass by strata, and sum the smoothed estimates to get the overall biomass.
      - Optionally, the species complex biomass variance could be recomputed as if it were one species (at the tow level) for computing the observation error (e.g., design-based variance)
    - b. Apply  $F_{ABC/OFL}$  to overall biomass
    - c. For apportionment of ABC/OFL by area, run the random effects model with area-specific biomass and compute proportions of biomass by area. Note: under this option the author has potentially run the model with area-specific biomass and would simply need to compute the area proportions.
2. Tier 5 complex with different F among species.
  - With no missing (strata) area/depths*
    - a. Run random effects model for overall complex biomass
      - Optionally, the species complex biomass variance could be recomputed as if it were one species (at the tow level) for computing the observation error (e.g., design-based variance)
    - b. Run random effects model with complex level area-specific biomass to get estimates of biomass by area ( $B_a$ )
    - c. Run random effects model with area-specific biomass for each species ( $i$ ) or combination of species that have the same  $F_{ABC/OFL}$  (e.g. species with the same  $M$ ) and compute the proportion of estimated species biomass by area ( $p_{i,a}$ )
    - d. For apportionment, to obtain area-specific ABC/OFL, use  $F_{i,ABC/OFL} \cdot p_{i,a} \cdot B_a$ , summed across species ( $i$ ).
  - With missing strata*
    - a. Run random effects model separately by strata at the level of missing data to get biomass by strata, and sum the smoothed estimates to get the overall biomass.
      - i. Optionally, the species complex biomass variance could be recomputed as if it were one species (at the tow level) for computing the observation error (e.g., design-based variance)
    - b. Run random effects model with complex level area-specific biomass to get estimates of biomass by area ( $B_a$ )
    - c. Run random effects model with area-specific biomass for each species ( $i$ ) or combination of species that have the same  $F_{ABC/OFL}$  (e.g. species with the same  $M$ ) and compute the proportion of estimated species biomass by area ( $p_{i,a}$ )
    - d. For apportionment, to obtain area-specific ABC/OFL, use  $F_{i,ABC/OFL} \cdot p_{i,a} \cdot B_a$ , summed across species ( $i$ ).



3. Tier 3 apportionment
  - a. If available, use spatially explicit assessment model
  - b. For apportionment of ABC/OFL by area, run the random effects model with area-specific biomass and compute proportions of biomass by area.

## Sablefish

The Alaska sablefish presentation was given by Dana Hanselman with contributions from Chris Lunsford, Cara Rodgveller, Kari Fenske (UAF/WDFW), Megan Peterson (NRC), and Brian Pyper (FishMetrics).

Items presented included:

- Survey and abundance preliminary results (sablefish)
- Juvenile tagging
- Whale depredation
- Spatial modeling
- Future prospects

Dana provided preliminary results from the 2015 longline survey. This was a Being Sea year. The Alaska-wide 2015 sablefish relative population number (RPN) was down 21% relative to 2014. The WGOA and BSAI areas were down. The 2015 Alaska RPN is the lowest of the domestic time series. He noted a small increase in the 44-50 cm group for 3-4 year old females. A small increase was also noted for young male sablefish. But overall there were no strong recruitment signals. However, there has been a lot of anecdotal evidence of incoming recruitment. Many reports of YOY sablefish last year and this year in coho salmon stomachs and surface trawls. One year olds have been observed in many areas by sport fishermen. YOYs found in coho and pomfret stomachs on GOA project survey (GOA IERP). More fishermen are reporting YOY in coho stomachs in 2015. There was juvenile tagging in Homer, Seward, and Kodiak in 2015 in addition to St. John the Baptist Bay that is conducted annually. There have been many reports of observations of juvenile sablefish. Acoustic and archival tags were also deployed on one-year-old sablefish in 2015. Additional indices included the 2014 fishery CPUE and IPHC survey data. The 2015 GOA trawl survey for depths <500 m will be available for this year's assessment. The 2014 fishery CPUE for WYAK and EYAK/SEO declined relative to 2013. The WGOA and CGOA areas showed a small uptick from 2013-2014. The Bering Sea fishery CPUE was up and the Aleutian Islands CPUE was down from 2013-2014. 2014 IPHC survey data was stable relative to 2013.

Dana discussed ongoing work on sperm and killer whale depredation. Analyses are using longline survey and commercial fishery data. The data set is a 1998-2015 time series. There were lots whales present in 2015. Killer whales are particularly problematic in the Bering Sea. They are looking to model sablefish CPUE to adjust for whale depredation. Two manuscripts are being developed. They are also looking at environmental and fishery characteristics associated with killer whale and sperm whale depredation. They looked at several factors including average CPUE, number of hooks, and vessel length. Also looked at number of sets per grid, whale cluster, and longitude. They want a better estimate of proportion of sets impacted with the goal of obtaining an absolute amount of sablefish rather than % to use in the assessment. The current assessment takes out killer whale sets. Dana presented results from a study that predicted CPUE reductions with GAM modeling for both killer and sperm whales. Killer whales greatly affect the Bering Sea relative to the GOA where sperm whales are more problematic. Dana presented % reductions in CPUEs and proportion of sets impacted by area.

Dana discussed a study of Spatially Explicit Reference Points for Alaska Sablefish: Movement and the Implications for Management. He is working with Kari Fenske and Terry Quinn (UAF). In the years leading up to 2012, the standard apportionment method had become highly variable, and has been frozen since 2013 while the apportionment strategy was being re-evaluated. The goal/objective is to develop a spatial model to test future apportionment strategies. Currently, sablefish are managed in 6 distinct IFQ

regions. Sablefish is data rich as an all-Alaska assessment, but data became too sparse if more than three regions were considered. The regions they used were 1) Western (Bering Sea, Aleutian Islands, and Western GOA), 2) Central GOA, and 3) Eastern GOA. The 3 area spatial model used externally estimated movement rates between regions. Dana presented preliminary evaluations of spawning and total biomass by area. The question is this: With a highly migratory fish, does it make sense to use spatial reference points? Dana presented  $F_{40\%}$  reference points and fishing mortality rates by areas. Dana made a preliminary attempt to evaluate whether spatial  $F$ s are similar to adding commercial fishery catch rates to survey distribution, as is done in the current assessment. There were some differences, but overall the results were fairly similar.

Dana's outstanding questions:

- Which parameters are affected and which matter?
- What if movement rates are wrong?
- Is it better to apply "wrong" movement rates than to ignore movement?
- Is it important to set spatial targets, or just optimize for the overall target?

Summary:

- Movement and catchability ( $q$ ) matters
- Current apportionment applied to single model does not produce same regional ABCs as spatial model that incorporates movement
- Splitting stocks into small areas when there is movement can cause overestimates of biomass - **Demographic leakage** (new fun phrase Dana coined)
- Next steps are simulations (MSEs and IBMs)

The model and apportionment methods will be the same as last year. A CIE review of the sablefish assessment will be held in April 2016 (response planned for presentation at the September 2016 Team meeting), which will focus on:

- Whale depredation
- Spatial model and apportionment simulations
- General modeling approach (standard)

## Surveys and field work at Auke Bay Laboratories

Chris Lunsford gave a presentation on ABL fieldwork updates. He presented longline survey results other than sablefish, and gave an ABL fieldwork/survey overview. He discussed 2015 highlights from 8 surveys and 1 research station and presented 2015 ecosystem observations.

- Chris presented preliminary 2015 Relative Population Numbers (RPNs) for the following species:
- Grenadiers (GOA up 51%, Bering Sea up 15%)
- Pacific halibut (GOA up 67%, Bering Sea up 27%)
- Pacific cod (GOA up 26%, Bering Sea down 49%)
- Arrowtooth (GOA down 24%, Bering Sea down 56%)
- Rougheye rockfish (GOA down 8%, Bering Sea down 83%)
- Shortraker rockfish (GOA down 2%)
- Shortspine thornyheads (GOA down 1%)

Chris noted that the GOA longline survey data may be useful as an alternative index of abundance to trawl survey data, particularly for Pacific cod. He would like to encourage authors to look at these data and incorporate longline survey results in the stock assessments as appropriate. Chris provided 2015 highlights from ABL fieldwork and surveys:

- Anomalously warm surface water since winter of 2013/2014.
- “Warm Blob” along the west coast of North America.
- Pacific pomfret abundance has increased with surface water temperature in the eastern Gulf of Alaska (2011–2015).
- Pomfret were eating age-0 rockfish and sablefish in the GOA.
- Coho were eating age-0 sablefish

GOA ecosystem indicators included juvenile salmon abundance indices and age-0 juvenile marine fish index. Chris presented 2015 highlights from the following surveys and fieldwork:

- SEAK coastal monitoring survey (warmer water species showing up)
- PWS whale monitoring and herring survey
- SE Bering Sea Survey BASIS (impact of climate change on fish production)
- NE Bering Sea Survey (large numbers of age-0 pollock)
- Yukon Delta Survey
- Arctic Coastal Ecosystem (ACES)
- Auke Creek Research Station (2015 highest adult pink salmon marine survival index)

### Summary

- Warm!
- GOA, Bering Sea, Arctic
- Some potentially unusual observations
- Pomfret predating on age-0 sablefish/rockfish
- Herring scarce in PWS
- Bering Sea warm year observations
- Age-0 pollock abundant near Bering Strait

This information was positively received and generated a lot of interest. The Plan Team would like to continue to receive highlights from all relevant surveys and field work.

## Marine mammal update

Lowell Fritz reported on the 2015 status of Steller sea lions and northern fur seals off Alaska. The eastern stock of Steller sea lions met recovery criteria and was removed from the list of Threatened and Endangered species in 2013. Overall, the western stock of Steller sea lion in Alaska increased at ~2%/yr between 2000 and 2014. However, sea lion abundance in the western and parts of the central Aleutian Islands continue to decline, with the steepest declines observed in the western Aleutians (-9%/yr for pups).

In 2014 and 2015, Steller sea lion distribution in Alaska was well surveyed with a combination of aerial, boat-based, and hexacopter surveys providing pup and non-pup counts. The Aleutian Islands were surveyed in 2014 and the Gulf of Alaska in 2015. Hexacopter technology improved the coverage by enabling NMML to survey remote sites in the western Aleutians that are difficult logistically for the manned aircraft.

Satellite tagging of adult females in the Aleutian Islands will continue in September-October 2015 (as in 2012 and 2014) to determine their fall/winter/spring foraging patterns and movements. Foraging trips of adult females in the non-breeding season range from short/nearshore (1-2 days and 1-10 km offshore), to meso-scale (3-5 days and 30-60 km offshore) to long/offshore (> 5 days and 100s of km offshore). One female's foraging habitat use abutted the edge of an eddy south of Agattu Island that was used extensively in the past by Japanese squid gillnet fisheries. In the non-breeding season, adult females with dependent

young tended to stay within longitudinal zones surrounding their summer breeding locations, and did not make extensive E-W movements. In contrast, adult males can make much longer seasonal movements between breeding locations in the Aleutians, Gulf of Alaska and Russia, and the northern Bering Sea (e.g., St Lawrence Island) by November. Discussion included diets, feeding strategies, and differences in foraging range. Diets of adult females using offshore areas are thought to consist of squid, salmon, myctophids, and possibly bathylagids. Differences in foraging strategies by adult females may simply be individual variation and preference, but more research is necessary to understand reasons behind the large observed differences.

Critical habitat designation for the Western Steller sea lion DPS will be updated using new information on marine and terrestrial habitat use, diets, and distribution. For example, it is now known that western animals breed on rookeries in northern southeast Alaska (Graves Rock and White Sisters). The timeline of completing, reviewing, and finalizing the biological opinion on Steller sea lions was presented. During discussions, population trends outside of Alaska were described: population trends within Russia vary by sub-region; within the eastern DPS, the British Columbia population continues to grow rapidly (similar to southeast Alaska), while those in California through Washington are increasing but at a lower rate than to the north.

Northern fur seal updates focused on pup production; the total Alaskan pup production is down 58% since 1975. Declines continued in the Pribilofs (-2% per year at St. George and -4% per year at St. Paul since 1994). The abundance at St. Paul is larger than at St. George or at Bogoslof so the decline in production at St. Paul dominates the overall trend. Stability in Pribilof pup production seems to occur when young pollock are abundant in waters near these islands (as was the situation in 1980s and early 1990s). As a general rule, fur seals that breed on the Pribilof Islands are pollock specialists in the summer when foraging on the Shelf. As pollock age and grow, they move to demersal habitats; fur seals follow strong pollock year-classes as they move deeper and are not restricted to foraging on small pollock (or other fish species). Pup production at Bogoslof Island has grown at the rate of 10% per year since 1997; a preliminary estimate of 28,000 pups produced there in 2015 was presented. Some immigration into the Bogoslof population occurs from St. George. As the Bogoslof population has increased, density dependent changes in foraging behavior have been noted, with longer foraging trips and deeper dives indicating that foraging requires more effort and prey are more difficult to locate. Fur seals from all Alaska rookeries leave the Bering Sea in fall and overwinter in the North Pacific Ocean, utilizing the North Pacific Gyre to move across the Gulf of Alaska and return to the Bering Sea the following spring.

## **Economic SAFE**

Ben Fissel presented the 2015 economic SAFE report based on 2014 data that will be submitted in final version for the November 2015 Plan Team meetings. The presentation covered standard data tables (e.g., catch, effort, discards, ex-vessel and first-wholesale production, price, and total dollar values) plus supplementary data tables (e.g., Amendment 80 program ex-vessel cost data, Alaska groundfish exports, employment). Electronic (.csv) versions of these tables can be downloaded from the web ([link](#)). These tables aggregate flatfish and rockfish, which may (depending on interest) be disaggregated in future years. Some highlights include increases in total catch and value in 2014 compared to 2013 levels. In addition, pollock catch in the GOA increased to the highest level in the past decade and was accompanied by large increases in GOA flatfish and arrowtooth catches. In contrast, BSAI flatfish catches decreased substantially in 2014 compared to 2013 catch levels. Indices presented in the economic SAFE report decompose changes in economic value for individual species into separate price and quantity effects. Positive price effects were seen in 2014 for Atka mackerel, rockfish, Pacific cod, and sablefish. To address the 1-year lag associated with Alaska fisheries economic data, the economic SAFE presents statistical “nowcasts” for 2015 wholesale prices and work is underway to extend nowcasts for ex-vessel prices. In addition, market profiles were extensively revised. The economic SAFE report also contains

catch share performance metrics, information from Economic Data Reports (EDRs) for the Amendment 80 fleet, and a section on fishing communities. Economic data for 2014 are still being finalized and validated.

Alan Haynie led a discussion on how we can better integrate socioeconomic information into the stock assessment process. Three levels for integration were identified: (1) More extensive use of fishery data (e.g., CPUE, revenue per unit effort) in stock assessments; (2) Development of spatial and bioeconomic models (e.g., analyze effects of catch shares, estimate maximum economic yield); and (3) Longer term analyses (e.g., Management Strategy Evaluation, forecast effects of climate change). For item (2), a stock template was presented to parameterize age/stage structured population dynamics in a proposed bioeconomic model for GOA rockfish (based on related work for Alaska crab stocks). Comments emphasized assessment level strategies and tactics, the potential utility of 1-2 year forecasts for prices and fishing effort, and prioritizing the list of items for stock assessment authors to include or address. The relationship between fishery management, fishing behavior, and selectivity (both among species and among subpopulations for a single species) was a major focus of discussion (e.g., hyperstability in CPUE and the relationship with the spatial distribution of fishing effort). Some suggestions were offered for next steps. There was a request that economic information be provided to stock assessment authors as early as possible (i.e., well before October). One suggestion was to prepare a 1-page summary for each Tier 3 and above stock that could be inserted into each stock assessment chapter, with a follow-up suggestion to develop a single stock (or stock complex) as an example. A second suggestion was based on the fishery performance report used to inform management in the Mid-Atlantic. The purpose of this report was to provide a channel for direct communication with industry to explain variation in catch due to factors independent of the biological assessment (e.g., market forces). Other suggestions included preparing an example of the one page summary to circulate to the Teams for further comments and suggestions on information to include, and to provide this template for SSC review in February.

### **EBS bottom trawl survey**

Bob Lauth provided an overview of the bottom trawl survey conducted in the EBS in summer 2015. He noted that several staff have retired in the last year, representing over 175 years of combined institutional experience. The time series of survey data was re-computed with the fishing power correction (FPC) removed from 1982 through 2005 (no FPCs were used after 2005). He provided reasons (including CIE review recommendation) for removing it and noted that the effect on survey abundance trends are minor.

Studies on the response to vertical distribution of Pacific cod have continued. Based on acoustic signal and trawl height, data indicate that most Pacific cod are within the “dead zone” and apparently rarely above the height of the survey headrope at the time that the survey trawl is deployed (the study by Nichol et al. (2007), which indicated that Pacific cod occur in the water column above the height of the survey headrope about 47% of the time, dealt with fish in an undisturbed state).

2015 was the 10th consecutive year the bottom trawl survey vessels collected acoustic data for the MACE group which have been included in the pollock assessment for the last five years.

### **Squid harvest specification methods**

Olav Ormseth presented a discussion for squid, which he described as “actually a squid *management* discussion” and involves both FMP areas (noting that the management concern arose this year from the BSAI).

There have been long-standing concerns regarding the lack of assessment data for squids and the shortcomings of ABC specifications within Tier 6 assessments which have resulted in management concerns several times in recent years. In 2013 there was a CIE review of non-target stocks. In the middle

of the 2014 summer season squid catch in the BSAI exceeded the TAC and was on track to exceed the ABC and this occurred again in 2015. As of September 19, 2015 the total BSAI squid catch was 2,225 t, considerably higher than the TAC of 340 t and above the ABC of 1,970 t (the OFL is 2,620 t). The issue arises because there is little to no evidence that these catches represent a real conservation concern for squid resources.

There is a lack of information available for the assessment. Squid is currently a Tier 6 species. Management of squid differs between the GOA and BSAI. In the BSAI, squid have been managed as a target or “in the fishery” stock since the FMP was adopted. Harvest recommendations are made using the default Tier 6 approach, with OFL equal to the *average* catch from 1978-1995. Squid in the GOA were managed as part of the Other Species complex until 2011 when the complex was split into 4 species groups. At that time, the SSC selected a Tier 6 approach for squid that specified an OFL equal to the *maximum* catch during 1997-2007 because catch data from the earlier period were unavailable. Since squid are not a target species, catch trends are not necessarily representative of biomass. The NPFMC and AKRO are currently looking for both short- and long-term solutions.

Olav showed a graph of squid catches by year. The older data (1977-1984) show higher catches than recent catches, which might indicate historic targeting, but it is unknown if this is representative of abundance trends and what the impacts (if any) were to the stock. Olav also showed squid catches by week for 2015, peaking during the week of 7/18/2015, then declining again. Olav presented a spatial distribution map of squid catches from 2006-2007. He noted that catches are usually associated with canyons.

Potential approaches presented by Olav (nearly all of these were included in his September 2014 presentation to the joint Teams):

1. Use alternative to current Tier 6 method for harvest recommendations
2. Initiate research to allow better squid assessment
3. Move squid to Ecosystem Component
4. Base harvest specifications on TAC/ABC that allows current level of catch (target); set OFL above this level to allow for management uncertainty (limit)
5. Set ABC with no OFL (OFL “unknown”, e.g., Atlantic deep-sea red crab fishery).

Input from Council Staff and NOAA General Counsel noted that it was unclear whether Option 5 (i.e., no specification of OFL) is tenable. One suggestion was to use Tier 5 methods with a value of  $M$  more consistent with squid biology (i.e., closer to 1) for inclusion in the November assessment. It was noted that squid are generally unsuitable for making fish meal and, for the species of squid that are caught, the main use is as bait.

Adjustments to the Tier 6 methods are allowed, and can be utilized to address a case-specific data situation where the standard approaches are unsatisfactory. The Teams noted that moving squid to the ecosystem component may force discards of all squid catch and emphasized that catch monitoring would need to be retained to evaluate potential future squid conservation concerns, should they arise.

**The Teams continue to recommend that consideration be given to moving squid into the Ecosystem Component, and recommend that the squid assessment for November include, at a minimum: 1) the Tier 6 approach using maximum catch; and 2) an approach similar to the Tier 5 approach, using  $F=M=1$  as the estimate of OFL fishing mortality, and using survey biomass as a “minimal” biomass estimate.**

## Stock assessment prioritization policy

Rick Methot presented the details of the final stock assessment prioritization plan that is going to be implemented gradually across each region. The goal of prioritization is to produce strong advice (not prescriptive) that helps each region determine their assessment frequency. Deviation from this is allowed, but there will need to be a justification for deviations. The prioritization project was developed because of OMB budget inquiries in 2011 and was presented as part of MSA reauthorization. Public comments have been received since February 2014 and a final version was released to the public in August 2015. Because of diminishing returns, perfection is not an option for stock assessments and annual updates are sometimes simply “following the noise.”

There are several objective criteria that can be used to score stock assessments. There are four categories of factors that comprise the scoring system. These categories are related to the importance of the fishery, the status of the stock, the role in the ecosystem, and the status of the assessment itself. The closer a stock is to overfishing limits, the more often a stock should be assessed. The importance of the fishery (ex vessel value), and the importance of the species to the ecosystem are critical to determining assessment frequency. Populations with higher mean ages have more inertia and should be assessed less often. This is a way to look at what stocks need to be assessed annually and which do not. Value is assessed on a logarithmic scale so that the prioritization is not swamped by really large commercial values such as those of scallops and pollock. Nationally, most stocks are in the “good” quadrant of the Kobe plot. The likelihood of those stocks drifting above the overfishing line in just a few years is low.

One of the important issues is how to deal with stock complexes. Should we just prioritize on the indicator stock of the complex?

Plan teams and councils will both play a part in determining the assessment frequency.

There is a lot of overlap between SAIP (Stock Assessment Improvement Plan), HAIP (Habitat Assessment Improvement Plan), and CVA (Climate Vulnerability Analysis); but each part has its own unique features. Prioritization is a multi-factor decision analysis. Regional experts will score these species and come up with a sorted list of the scores and guidance on assessment priorities. Regional managers will weight the scores of the 12 prioritization factors

Rick was asked whether we would get the weighting part figured out in this round. West Coast groundfish is supposed to be done by June. The first step is to get the scores, and then we can think more about weighting.

The data will be collated by NMFS, then the “experts” will populate the scores. NMFS/Council will assign weights to each factor. Once they have the list, NMFS/Council will determine what stocks will be assessed and how often. The implementation steps are, first, to develop a timeline, and then to establish an experts group for scoring, and finally to establish a group that determines weights.

Gaps and prioritizations will guide future investments in capacity. The simple “factor” system will evolve to better determine the best portfolio of assessments to provide the greatest overall benefits. The stock assessment budget has expanded a lot over the last 15 years (from \$2 million to \$70 million). In order to continue to grow, we need a system that shows what the money goes to. The economists at the AFSC have been useful in determining costs and ways to grow.

Rick was asked what criteria would be used to sort within categories when quality was different. If people knew that an assessment was previously very data-limited, a substantially upgraded assessment would be considered “new information”. Some other data quality factors may be introduced later.

The timeline for the prioritization process starts with this meeting, but there probably will be no changes from prioritizations until 2017. This year would be the year to start assembling teams and scores. Determining who the experts are who do the scoring will be the most challenging part to get the best scores.

A related issue is how the data used in stock assessments (e.g., surveys) get prioritized. This will be a big topic in future budget discussions about allocation of large line items. Council staff commented that there will be great interest in this process from the Council and public, so plenty of outreach will be important. It is expected that there will be many informational meetings. Council staff asked that when the results of this are looked at, how can we be assured that the scores will not be used to allocate money among regions?

A Team member suggested renormalizing the scores so the regional scores aren't higher or lower than each other. Rick said that the degree to which regions can achieve their target frequencies may demand different resource allocation.

Rick was asked about how often this prioritization would be revisited. Rick said that it could be partially looked at every year, but perhaps not all of it.

A Team member asked about the weighting process being transparent. Rick said there is quite a range of opinion as to how this should be done (e.g., should the "weighting" group be able to see the scores while establishing the weights, or should the the scores and weights be determined independently?). The process may be different in every region, so it may be difficult to be prescriptive about weights. The document has some guidelines about reasonable weights as an example. Maybe more examples would be useful.

A Team member stated that many of the species we assess in Alaska are long lived, but they are also assessed frequently. The NPFMC has been very successful at managing fisheries and preventing overfishing with these frequent assessments. Rick did not think the high frequency of our assessments in Alaska is helping our successful management, and this is an opportunity to revisit.

Rick was asked about the graph that showed the biomass trajectory of some groundfish stocks over time. A member of the audience suggested that we need to look retrospectively at what actually happened with ABCs, not the biomass trajectory from the current stock assessment.

A Team member asked about model averaging and ensemble weighting. Rick said that we are at the research stage on this issue. He would like to see assessments embrace more of the structural uncertainty, such as assumptions about selectivity and fixed parameters. Can we maintain the strength of our management advice while still admitting considerable structural uncertainties? The weather and machine learning communities are way ahead of us on this, so we could potentially learn from them. There is desire to make sure the way sets of models are selected is done objectively, and not just on the basis of whoever has a model they want to compare. Rick said there is nothing stopping us from doing something about this now.

Rick was asked about the increase in environmental variability that will affect our ability to manage for OY. Rick said we will try to look at it from an objective perspective.



# Minutes of the Bering Sea Aleutian Islands Groundfish Plan Team

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

**September 22 - 24, 2015**

## **Administrative**

The BSAI Groundfish Plan Team convened on Tuesday, September 22, 2015, at 1:00 pm. The Team acknowledged a new member, Cindy Tribuzio. All members are expected to attend the next meeting in November 2015. More than 30 people attended at least one of the sessions.

The Team unanimously elected Grant Thompson and Dana Hanselman as co-chairs. The Team gratefully acknowledges Mike Sigler for his many years of service.

## **EBS pollock stock structure**

Jim Ianelli presented an evaluation of eastern Bering Sea pollock stock structure. A range of comparisons was presented on genetic structure and spatial distribution of pollock.

**The Team and author recommend a determination of “little or no concern” regarding EBS pollock stock structure.**

It was suggested that the stock may actually be less divided than present assessment and management boundaries imply (e.g. with correlations between the Gulf of Alaska and the Bering Sea). It was noted that this analysis did not include the Bogoslof stock, which should be taken up at a later date.

## **Blackspotted and roughey rockfish stock structure/spatial management**

Paul Spencer presented a follow-up report to his 2013 and 2014 reports to the Team. The Team previously determined there to be “strong concern” regarding the fishery’s impact on the structure of this stock complex, and recommended that the report be updated annually for as long as this determination holds.

New in this year’s update is an analysis of mean age by area and an additional exploitation rate reference point, along with some updates on management activities. The 2015 WAI catch was 62 t, which was over the “maximum subarea species catch” (MSSC) of 46 t. Catches in the EBS are also slowly rising. The proportion of catch in the EAI has been increasing.

The mean age and length are declining in the western areas. Paul introduced a new measure in this update, called U\_ABC, which is the exploitation rate that would have resulted from taking the AI ABC for a given year from the *current* estimate of the AI biomass for that year. Since 2009, the WAI and EBS catches have exceeded U\_ABC in all but one (WAI) or two (EBS) years.

Paul reviewed the Team and SSC minutes from 2013 and 2014 indicating, among other things, the need for a “scientifically-based and transparent process for determining subarea harvest recommendations and allow better tracking in meeting the management goals” (SSC, December 2014). Given the complex’s

“strong concern” designation, the Team’s and SSC’s understanding is that steps 2 and 3 of the Council’s process must be implemented.

The maximum subarea species catch is not reported in the harvest specifications table; thus comparisons between MSSC and harvest are not easily available to the public. Concerns were expressed that the Council’s process for spatial management was not adequately followed. Paul stated that he didn’t think we have clarified what tools or actions, if any, are available to us under such a situation because the Council has yet to explicitly define them.

The Regional Office intended to add this MSSC to the weekly catch reports, and is willing to do so in future years. The SSC minutes refer to this number and the industry was aware of it as a guideline limit. The industry may not be able to avoid rougheye. There are currently no additional management measures triggered nor an in-season response mechanism when this MSSC is exceeded. Paul was asked if anything happens if MSSC is exceeded. At this point, there is no effect. If there were an area ABC, there would be an area TAC which, if exceeded, would move the complex to PSC status and the additional catch would be forced to be discarded. If the ACL is exceeded more than once in 4 years it would trigger re-evaluation of accountability measures (in this context, ACLs are evaluated at the OFL scale of management). If catch approaches an OFL, then closures designed to prevent overfishing will be issued. Currently MSSC has no management measures associated with it to prevent it from being exceeded.

Paul stated that it does not seem clear what the management response is or could be when MSSC is exceeded. It is also not clear if everyone would view the MSSC as a management goal. The Team’s role in implementing the Council policy could be better defined and the terminology is problematic as to whether exceeding MSSC is really an overage, since it is not an FMP policy.

Amendment 80 cooperatives that were aware of the MSSC caught only 44 t, which was their lowest since 2008, but other fisheries removed more than usual in 2015. The MSSC for the WAI was obtained by apportioning the recommended 2014 ABC among subareas in accordance with stock distribution (as obtained from applying the random effects smoother to subarea survey biomass estimates). It was suggested that some additional effort may have resulted from re-opening the Pacific cod fishery in the WAI.

A Team member noted that the industry has been taking some steps, but steps 2 and 3 were not fully followed. The Team discussed the possibility that the Council could implement step 2 more fully by establishing additional tools and examining management implications of the options. An SSC member present mentioned the desire for establishment of a group to work on this, consistent with the previous SSC and Team recommendations, but the Council has not formed one yet.

Paul was asked where/when the rougheye were caught, and Paul said that it was quite patchy across time and that any potential rougheye subarea OFL might limit the POP and other fisheries. If there were a sub-area ABC/TAC, there would be an increase in discards if catch exceeds the TAC.

**The Team recommends that the Council process be followed more closely and endorses the SSC’s recommendation that a subgroup of Team, SSC, and Council members be formed to address the questions regarding stock structure and spatial management posed in both the November 2013 and November 2014 Team minutes, as well as to work on additional tools or potential management actions to address findings of “moderate” or “strong” concern.**

## **Ecosystem**

Stephani Zador and Kerim Aydin presented the status of ecosystem indicators updated to 2014, information on new indicators, updates on physical conditions in 2014/early 2015, and introduced a new

multi-species model (CEATTLE) to help implement ecosystem-based fishery management:

- 1) 2014 was a warm year with high productivity, and the maximum ice extent occurred on 15 March and had similar areal coverage as other warm years in the early 2000s.
- 2) Ecosystem indicators newly updated to 2014 are:
  - a) Jellyfish: biomass remained high and similar to recent cool years 2009-2013
  - b) Salmon returns were below average for chinook and above average for coho and sockeye
  - c) Salmon and pollock recruitment: chum growth as proxy for ocean productivity and age-1 pollock recruitment; prediction of below average 2014 pollock year class
  - d) Temperature change index and pollock recruitment: difference between June and August sea surface temperatures positively correlated with subsequent age 1-6 abundance; also predicts below average 2014 year class
  - e) Fall energy density of age-0 pollock declined from recent cold years. Average energy content predicts average recruitment to age-3 for 2014 year class
- 3) New 2014 ecosystem status indicators are:
  - a) Zooplankton rapid assessment: small copepods dominant in warmer waters and large copepods/euphausiids dominant at cooler stations, consistent with oscillating control hypothesis
  - b) Large zooplankton abundance and pollock recruitment: positive correlation with subsequent age 3 abundance
  - c) Multi-species model estimates of time-varying natural mortality of pollock, Pacific cod and arrowtooth flounder: initial take-home points are predation by arrowtooth flounder on age-1 pollock exceeded cannibalism in 2007, and including predation mortality more than doubled estimates of total age 1 pollock mortality
  - d) Early warning indicators: spatial variability in survey catch per unit effort could indicate declining community resilience during recent cold period
- 4) Newly updated 2014 ecosystem-based fishery management indicators are time trends in non-target species catches (jellyfish, HAPC biota (tunicates), and benthic invertebrates (sea stars)), seabird bycatch, discards in the groundfish fisheries, and area disturbed by trawl gear using observer data
- 5) An alternative indicator of bottom contact by fishing gear using VMS data and actual dimensions of the gear is planned for development over the next year.
- 6) Sea surface temperature anomalies indicated a warm 2014/15 winter, spring and summer, and a positive PDO pattern
- 7) Sea level pressure anomalies indicated reduced storminess in 2014/15 winter despite most intense N Pacific storm ever recorded (Nuri in fall 2014)
- 8) Climate indices show strongly positive ENSO (very strong El Nino in fall/winter 2015), highly positive Pacific Decadal Oscillation (PDO in Dec 2014 largest winter value since 1900), and negative North Pacific Gyre Oscillation (correlated with reduced flows in Alaska and CA currents). National Multi-Model Ensemble predicts warmer than normal SSTs through spring 2016 and likely El Nino impacts as far north as Alaska.
- 9) Wind-forcing in the eastern Bering Sea in spring indicates favorable advection of flatfish larvae to inshore nursery grounds in 2015, in contrast to 2012-14.
- 10) Eddy kinetic energy in the Aleutian Islands was low in fall 2012 through early 2015, and was associated with lower than average fluxes of heat, salt, nutrients and water through Amukta Pass into the Bering Sea.
- 11) Multi-species stock assessment model CEATTLE developed to quantify relative effects of climate, trophic interactions, and fisheries on productivity; and utilizes time-varying M to hind- and-forecast abundance of pollock, Pacific cod, and arrowtooth flounder. Climate variability (temperature) affects growth and rates of predation (based on habitat overlap). Inclusion of

trophic interactions and climate variability for these three species increased pollock recruitment and decreased abundance of Pacific cod relative to single species assessments.

**The Team agreed with the presenter that any CEATTLE model results presented in November would be used as supporting ecosystem information only; however, the Team recommends that an initial review of the CEATTLE model be conducted in September 2016 to assess its potential inclusion as a candidate/alternate assessment model for EBS pollock, Pacific cod, and arrowtooth flounder.**

### **Forage fish**

Olav Ormseth presented the draft, 2<sup>nd</sup> biennial report on the status of forage fish. A final report will be presented in November. It will include data from the 2015 BASIS survey. This report is not a formal stock assessment. Some species considered as forage fish have individual assessments or are managed by ADF&G. The two main objectives of the report are to 1) investigate trends in the abundance and distribution of forage populations, and 2) describe interactions between federal fisheries and species that make up the forage base.

Improvements were made to the report format, and a “data gaps and research priorities” section added. One of the top priorities is the continued study of how climate variability influences the abundance, distribution, and energy content of forage species in the BSAI. The analysis of temporal trends in abundance and spatial distribution was enhanced for three important BSAI forage species (capelin, eulachon, Pacific herring). The bycatch section contains more details, especially regarding bycatch of Pacific herring in the Federal groundfish fisheries.

**The Team recommends that the SSC review the draft BSAI forage fish report.**

### **Bering Sea Pacific cod**

Grant Thompson presented the base model and other candidate models for this year’s specifications.

#### *Models*

The model used for stock specifications in 2011-2014, the base model for this year’s discussions, is named Model 0 and has the following main features:

- (i) Natural mortality ( $M$ ) fixed at 0.34.
- (ii) Length-specific fishery selectivity estimated as a double normal for each gear and season by blocks of years, some selectivities forced to be asymptotic.
- (iii) Age-specific survey selectivity estimated as a double normal with some annual variation on the left limb.
- (iv) Survey catchability fixed at 0.77 on the basis of a small number of archival tags.
- (v) Input standard deviations of recruitment and selectivity dev parameters adjusted iteratively to equal output standard deviations in the 2009 assessment; held constant since then.
- (vi) Input composition sample sizes scaled to have a mean of 300 after a complicated preliminary scaling based on year of collection.

An alternative model, called Model 2 last year and this year, differs in several important ways:

- (i) One fishery and season each year.
- (ii) Both survey and fishery selectivity modeled as random walks over age in each year, with priors favoring a logistic where the data are uninformative (SS pattern #17).
- (iii) Both fishery and survey selectivity allowed to vary annually.
- (iv) Survey catchability estimated internally, and allowed to vary annually.
- (v) Natural mortality estimated internally.
- (vi) Age-to-age selectivity standard deviations tuned by iterative adjustment of priors.
- (vii) Year-to-year selectivity standard deviations estimated with the Thompson-Lauth algorithm.
- (viii) Year-to-year survey catchability standard deviations estimated by tuning input sd's such that output standard deviation of normalized residuals = 1.
- (ix) Input composition sample sizes scaled as in Model 1.

The models presented at this meeting, most of which were chosen on the basis of a May meeting of the Joint Team Subcommittee on cod models (JTS), fell into three groups:

**Group A**, consisting of Model 0 and variants, specifically:

- Model 0 itself.
- Model 7, same as Model 0 but with Francis weighting of composition data.
- Model 8, same as Model 0 but with Richards growth.

**Group B1**, consisting of Model 2 and variants suggested by the JTS in May, namely:

- Model 2 itself.
- Model 3, same as Model 2 but with (i) mean input composition sample size tuned to harmonic mean output sample size, and (ii) constant survey catchability.
- Model 4, same as Model 2 but with 20 rather than 10 initial age group abundances estimated.

**Group B2**, consisting of Model 2 variants developed by Grant after the JTS meeting:

- Model 5, same as Model 2 but with (i) mean input sample size set to the lesser of 300 and the harmonic mean of the effective sample size, (ii) 20 rather than 10 initial age groups, (iii) survey and fishery selectivity parameters at ages 9+ forced to equal selectivity at age 8, (iv) priors for age-specific selectivity and year-specific catchability were estimated simultaneously rather than sequentially using methods presently in development by Grant, (v) standard deviations of time-varying selectivity and recruitment were also estimated by methods presently in development by Grant, and (vi) SS runs were accepted even if the final gradient vector had some large values.
- Model 6, same as Model 5 but where SS runs tuned out selectivity parameters that had large final gradients.

## *Results*

The candidate models produced a wide range of present spawning biomass and depletion estimates. In particular Model 0 and its variants, with survey catchability fixed at a low value, produced high biomass estimates. Models that estimated survey catchability produced higher estimates of catchability and correspondingly lower biomass estimates although Model 6 was near Model 0. The retrospective behavior of Models 0 and 8 were bad. Model 7 was better, and Models 2-6 quite good. Models 2, 4, and 6 all fitted the survey data well, with good normalized residuals.

### *Issues*

Grant announced that he could present at most two models in November, of which one would be the obligatory base Model 0. He identified five assessment issues bearing on the choice of the other candidate model, which the Team discussed as follows.

1. Weighting of composition data (i.e., setting input sample sizes). A number of methods have been used. The Team did not have a favorite. Grant reported that in the Pacific Council standard practice is to tune mean input sample size to the harmonic mean of output sample size, as in Model 3. This issue did not affect the team's choice of a candidate model.
2. Setting survey catchability and modeling selectivity. The fixed survey  $Q$  (0.77) based on archival tags, used in Models 0, 7, and 8, has become less and less credible as careful experiments and analysis performed by RACE have produced no evidence that cod in the path of the survey trawl avoid capture by any means (e.g., vertical distribution or outswimming). A higher value of catchability, as estimated by the other models, therefore seems more plausible and prudent. The estimated dome-shaped survey selectivity in all models is also controversial, because of the same RACE work that appears to rule out trawl avoidance by large as well as smaller fish. On the other hand the model estimates of lower survey selectivity at larger sizes/ages result from the subsequent commercial catches of larger fish that must have been present at the time of the survey but were not caught in the survey in proportion to their abundance, so dome-shaped survey selectivity seems inescapable. A possible explanation is that larger fish are simply unavailable in the survey area at the time of the survey, but no one has a good idea of where they might be. Team suggestions for investigating this question included examination of the AFSC longline data and the use of pop-up tags. For the purposes of this meeting, the Team favored having a model for November that included an estimated rather than fixed value of survey catchability (i.e. one of Models 2-6).
3. Temporal variation in survey selectivity. One issue is how much to allow, and the Team generally favors as little as needed. The other issue is how to estimate the standard deviations. Grant uses the Thompson-Lauth method in Models 2-4 but has found it difficult to apply and therefore uses new methods presently in development in Models 5 and 6. The Team is reluctant to adopt a model (i.e. 5 or 6) that relies on the new methods until they have been fully tested and approved.
4. Large gradients. The appearance of large values in the final gradient vector in fits of Model 5 remains a puzzle although there are some suspects. As long as this behavior is not fully understood, the Team prefers to reject Model 5.
5. Review procedure. The cod assessment will get a CIE review in 2016, and with that in the offing it may be reasonable to stay with the base Model 0 for one more year and therefore not consider an alternative to Model 0 and its minor variants 7 and 8. But the Team believes, as it said last year, that the low fixed survey catchability in Model 0 is no longer defensible and an alternative (one of Models 2-6) should be seriously considered this year.

### *Team recommendation*

For November, the base Model 0 is a required candidate despite its highly suspect survey catchability and poor retrospective performance. The Team would reject Model 3 because of its unacceptable U-shaped estimate of survey selectivity, and we would reject Models 5 and 6 because they use untested tuning methods. (Apart from that concern, we have no objection to Model 6, and would probably ask to see it in November if we had the option of requesting three models rather than two.) That leaves Models 2 and 4, and we prefer Model 2 because it is well known and Model 4 is hardly different.

**The Team recommends that Models 0 and 2 be brought forward in November.** The Team does not expect Grant to retune the models after adding this year's data.

If the SSC decides to continue with Model 0 and a variant thereof pending the CIE review next year, we recommend Model 7 as the second model because of its better retrospective performance than Model 0.

## **Aleutian Islands Pacific cod**

Grant Thompson presented the base model and other candidate models for this year's assessments.

### *Models*

Last year's chosen model and this year's base Model 0 is a random effects model of the survey biomass time series, used in a Tier 5 calculation. Two age-structured models were also presented, each one in two variants that differed in respect of the amount of catch data used.

The first age-structured model was similar to Model 2 in the Bering Sea in that the fishery consisted of a single gear and season, fishery and survey selectivity in each year were modeled as random walks over age (SS pattern 17), selectivities were allowed to vary over time, a single von Bertalanffy growth schedule was estimated, and input sample sizes were set the same way. Differences from Model 2 in the Bering Sea were: fixed M and single estimated survey catchability. The two variants presented were:

- Model 3, which uses pre-1991 catch data.
- Model 4, which does not.

The other age-structured model was similar to Model 5 in the Bering Sea. It differed from Aleutian Models 3 and 4 in that it included Richards growth, annual variation in survey catchability, and tuning of mean input sample size to the harmonic mean of effective sample size. The two variants presented were:

- Model 2, which does not use pre-1991 catch data.
- Model 5, which does.

### *Age-structured model results*

All models except Model 3 estimated present female spawning biomass of around 60,000 mt and total biomass more than three times total survey biomass. The Model 3 estimate was even higher. All models except Model 3 had poor mean normalized residuals and poor retrospective performance. All models fitted the survey time series well (except for the mean normalized residuals as noted above), and all except Model 3 fitted the age data well. The estimated survey selectivity in Model 3 was unacceptably U-shaped, as in the Bering Sea. In short, none of the age-structured model fits was credible.

### *Team discussion*

Neither Grant nor the Team were enthusiastic about bringing any of the age-structured models forward in November, but the Team still hopes that an age-structured model can be developed eventually for specifications. Some suggestions for further work for next September were:

- (i) Adding the AFSC longline survey as an abundance index. Unlike the AFSC trawl survey, the longline survey can and does fish rough bottom. In the long term, the IPHC longline survey may also be useful, but at present length composition data are available for only one year.
- (ii) Constraining recent fishing mortality to a value equal to some multiple of the Bering Sea value, if a sensible multiple can be developed.

*Team recommendation*

For November, **the Team recommends three models:**

- (i) Model 0 (random effects).
- (ii) Model 2, also a random effects model but with the IPHC longline survey CPUE added as a second time series.
- (iii) Model 3, same as Model 3 seen at this meeting but with enough equality constraints imposed on survey selectivity to cure the U-shape (e.g., the Bering Sea Model 5 where selectivity is estimated only to age 8).

**2016/2017 Harvest specification recommendations**

**The Team recommends adoption of the proposed 2016/2017 BSAI OFLs and ABCs that were published in the Federal Register for 2016 for the purpose of notifying the public of potential final harvest specifications.**

**Adjourn**

The meeting adjourned at approximately 11 am.



# Minutes of the Gulf of Alaska Groundfish Plan Team

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

**September 22 - 24, 2015**

## **Administrative**

The GOA Groundfish Plan Team convened on Tuesday, September 22, 2015, at 1:00 pm. All members are expected to attend its next meeting in November 2015. The Team unanimously elected Jim Ianelli and Jon Heifetz as co-chairs. The Team gratefully acknowledges Diana Stram for her many years of service on the GOA Team.

## **Ecosystem considerations**

Stephani Zador presented the status of ecosystem indicators newly updated to 2014, information on new indicators, and updates on physical conditions in 2014/early 2015:

1. 2014 was a warm year.
2. Ecosystem indicators updated, or new, for 2014 are:
  - a. Numerous indicators showed an increase in small plankton, such as small copepods, indicating warmer conditions with large plankton, such as euphausiids and large copepods, in areas with lower temperatures.
    - i. The Continuous plankton recorder time series indicated a size anomaly with smaller plankton due to warmer waters.
    - ii. The Icy Strait Zooplankton indicated large copepods anomalies were negative across most of the summer and small copepods were positive.
  - b. Jellyfish: increased abundance, but diversity is still high.
  - c. Ichthyoplankton 1981-2013: Pacific cod, pollock, and rockfish were all high with Rockfish being a record high. Flatfish were moderately high. Increases may be due to eddy activity, high temperatures, and favorable feeding.
  - d. Salmon: 75% of the harvest was Pink and 2014 was 44% of the 2013 record high.
  - e. Forecasting Pink Salmon in Southeast AK: The 2015 forecast is for 54.5M tons. Currently SEAK harvest is at 33.4M tons. Southern SEAK survival seems to be low possibly due to the warm “blob” bringing predators north. However, northern SEAK, Prince William Sound, and Kodiak are experiencing high returns.
  - f. ADF&G large mesh trawl survey: Decreased overall biomass. Flatfish dominate. Increase is halibut, decrease in flathead sole/ATF and inshore cod.
  - g. Sablefish recruitment prediction model: Chlorophyll a and temperature are good predictors.
3. Ecosystem-based fishery management indicators
  - a. Non-targets: jellyfish caught in pollock surveys and HAPC anemones and other invertebrates (mainly sea stars) caught in flatfish and cod fisheries.
  - b. Seabirds: increase in bycatch of black-footed albatross in 2014, but a decrease in fulmars which is the majority of the bycatch.
  - c. Time trends in groundfish discards: discards are declining in trawl fisheries but increasing in fixed gear. However, the increase in discards by fixed gear may be due to increased observer coverage beginning in 2013 on halibut boats.

- d. New habitat disturbance indicator: summarizes bottom contact at a very fine spatial scale and a weekly time scale. Work is progressing to generalize the pattern as an index.
- 4. Physical condition indices
  - a. Climate and oceanography from Nick Bond: warmer water, more spread out over the entire NE Pacific, fewer, weaker cold outbreaks, reduced storminess.
  - b. NINO3.4: Heading into a strong El Nino
  - c. PDO: Last winter had the highest monthly value ever. The PDO usually lags the El Nino, but they are lining up which may create a stronger effect in Alaska.
  - d. Seasonal Projections from National Multi-Model Ensemble (NNME): Moderately strong El Nino with teleconnections to the North Pacific deeper.
  - e. NPI: Negative causing reduced flows in AK coastal current.
  - f. Eddies in the Gulf of Alaska: High energy off Kodiak causing more cross current transport. The eastern Gulf is more influenced by winds and the western Gulf is influenced by propagation and intrinsic variability.
  - g. PAPA trajectory index: The 2014 trajectory was similar to 2013 which is unusual. There may be a northward shift of the subarctic and subtropical boundary which could cause an absence of open ocean lower trophic organisms in Southeast AK.

Stephani will be expanding the Disease Ecology section of the Ecosystem report at the request of the SSC. To start, they will be focusing on Ichthyophonous parasite and Mushy halibut. In November, Zador will present additional 2015 information and a preliminary ecosystem report card.

### Northern and southern rock sole

Teresa A'mar updated the Team on this combined-species assessment. This includes northern and southern rock sole (NRS and SRS). The author reported on her efforts to address comments about the NRS and SRS assessments made by the GOA Plan Team and the SSC. Not all recommendations or suggestions have been incorporated into the assessment models.

The main difference between this model and past assessments is that asymptotic survey selectivity is assumed. Selectivity at age differs from survey selectivity at length mainly for the NRS model (similar for SRS). Undifferentiated rock sole model (URS) scales differ.

The model for NRS was sensitive to specified lambda (lambda values affect recent recruitment estimates) and that the **team recommends that should this pattern remain when the 2015 GOA bottom trawl survey data are added, that options to stabilize the recent recruitment be used.**

The Team **recommends that for presentation purposes for the November meeting, the author favor the asymptotic survey selectivity at length option and provide estimates for each species separately.** The data fit better for these options.

Finally, the Team **recommends that the 2016 rock sole assessment author revisit the PT and SSC comments and suggestions that will not be addressed in the 2015 assessment.**

### Rex sole

Carey McGilliard presented a comparison of the 2011 rex sole stock assessment model, coded directly in ADMB, with an analog using the Stock Synthesis (SS) model platform. This platform has a suite of options for estimating growth in the assessment model using conditional-age-at-length, length-at-age, or weight-at-age, as well as options for alternative selectivity patterns, treatment of ageing error, multiple survey and fishing fleets, etc. These features may allow for efficient exploration of previous recommendations (from the SSC in 2011) including: reanalysis of growth data, including fisheries ages,

exploring length-based and alternate forms of selectivity, and considering environmental effects on recruitment and catchability (temperature).

Two transition models were developed to explore the change in platform. An SS model with fixed parameters designed to match the structure of the 2011 model as closely as possible produced results that were very similar, with some differences attributed to differences in the age-length transition matrix which could not be replicated exactly. The same model, with the parameters estimated, produced a slightly larger difference but similar overall trends. It was noted that the selectivity parameterization differed (ascending limb of the double normal vs. logistic in the 2011 model). The largest differences appeared to be in the single terminal age-3 estimate, perhaps as a function of selectivity as well as the treatment of recruitment deviations. Fits to the size composition data were not appreciably different among these models.

**The Team recommends moving forward with the SS model**, including a run mimicking the structure of the older model and updated with the most recent data available (e.g. trawl index, age and length comps, fishery lengths, etc). This should be brought forward in November.

**In addition, the team recommends one or more alternative models should also be brought forward**, reflecting the author's suggestions for minor changes: inclusion of fishery age composition data (the Team recommends that these data be prioritized and included in this assessment) to help inform fisheries selectivity, re-estimation of survey biomass using the random effects approach to estimate the contributions from the Eastern GOA for years where this area was not surveyed, exploration of age/length compositions to better understand whether they should be treated differently for years when the trawl survey omitted the deep strata, reevaluating effective sample sizes, adding externally estimated ageing error, explore other selectivity curves. Internal estimation of growth parameters could be included for November, unless it produces substantially different results. Major changes (such as exploration of growth morphs) can be explored, but may need to wait until next year for inclusion.

The Team recognized that it is possible that not all of these changes will be completed for the November meeting.

## Pacific cod

Teresa A'mar presented the assessment models for GOA Pacific Cod. In order to allow for exploration of a wide variety of modeling assumptions, in this assessment cycle the author focused on model development rather than application of the same model(s) to multiple data sets. Specifically, the Stock Synthesis model configurations were applied to the data used in the 2014 GOA Pacific cod stock assessment, with fishery and survey data updated through the end of 2014. The subcommittee recommendation that the author examine the utility of including longline survey relative population numbers (RPN) and length frequency data for use within the model. This work is ongoing by Steve Barbeaux in recognition that he will be assuming this assessment next year.

In this assessment cycle there are four model designations. These include:

- Model 0 - The final model from 2014 ,
- Model 2 - The final model from 2011,
- Model 3- Model 0 with a minimum age ( $A_{min}$ ) increased from 1 to 2 and an exploration of initial conditions, and
- Model 4 (Model 0 with the following changes):
  - omission of all age-1 survey data for 1990 on,
  - $A_{min}$  increased from 1 to 2;
  - Early recruits increased from 13 to 16;

- Survey selectivity is 0 for age 1 for 1990 on;
- 3 or 4 blocks of survey selectivity; and
- Non-parametric or double-normal survey selectivity-at-age.

Different model 4 configurations were presented depending on the shape of the selectivity and number of time blocks contained in the model.

An ongoing problem with this assessment is how to treat the 1 year olds and whether to include the 1984 and 1987 survey data. There is no age data for 1984 surveys, so models are fit to length composition data for 1984 and 1987. However, the author noted that the range of ages from 1987 is truncated in the survey relative to later years. Survey length composition data sometimes, but not always contains age 1 fish that is not traced by larger fish in later years (i.e. there no clear modal progression in time-varying length frequency plots).

Model 2 did not fit the 27 plus survey data even though time varying selectivity is included. However, it fits the sub 27 (assumed age 1) data perfectly (each data point has its own parameters in the model). Model 3 did not improve on model 0. Model 4 configurations exhibited similar trends in total biomass. Nonparametric model 4 configurations fit the available data better than the double normal selectivity configurations. Estimates of growth for model 4 configurations and model 2 were similar to each other and were lower than growth estimates from models 0 and 3. The authors preferred model is model 4 with four periods with non-parametric selectivity.

The Team discussed how new survey data (not presented at the meeting) might affect management advice. The Team's preference was for only a few models to be advanced to November in recognition that a new assessment author would be taking over. There was discussion about the historical 1987 ages and whether or not that data should be included. Age 1 data appears to warrant removal but the Team did not have a firm recommendation on this topic. **The Plan team recommends that Model 0 (the 2014 accepted model with new data) and the author's preferred model (model 4 with non-parametric selectivity and four blocks of survey selectivity) be advanced to November.**

## Other rockfish and demersal shelf rockfish

### *Age structured yelloweye rockfish model*

Kray Van Kirk presented on the yelloweye age-structured assessment model in Southeast Alaska Outside waters. For management purposes, the Demersal Shelf Rockfish assessment will continue with the existing Tier 4 methodology but development of an age-structured model is ongoing. A separate model is run for three regions in Southeast Alaska: East Yakutat (EYKT), Central Southeast Outside (CSEO), and Southern Southeast Outside (SSEO). The current model is nearly identical to what was presented in 2014 with updated data, but in this year's exploration natural mortality is fixed rather than estimated. To examine the effects of natural mortality a suite of natural mortality values ranging from 0.01 - 0.06 were input to the model. This range of values was chosen based on available literature. Model estimated yelloweye density trends in all regions are influenced the assumed values for natural mortality (0.01-0.06). Fixing natural mortality improved model performance but overall model accuracy is uncertain.

The Team expressed concern regarding the high level of precision seen in model results considering the quality of input data. The uncertainty appears to be extremely low and cannot be explained by fixing natural mortality alone. The input sample sizes and data weighting should be examined in light of the precise variance estimates. To evaluate appropriate values of M one suggestion was to perform likelihood profiles and examine which penalty aspects would be affected the most. This approach would rely on the data to help inform appropriate assumptions of M based on the relative contribution of error attributable to M. The model estimates of M could also be compared to those obtained from recent research on

empirical estimates of  $M$  (Then et al. 2015, ICES J. Mar. Sci. 72(1): 82-92), in which empirical estimates based on maximum age were recommended over other methods.

**The Team recommends the author evaluate ageing error in more detail. One option is to use existing code developed by Andre Punt. The Team recommends the author continue to work with the established informal working group to further explore model improvements. When appropriate, model outputs should be compared to the existing Tier 4 assessment methods.**

### *Other rockfish and DSR stock structure and management considerations*

Cindy Tribuzio provided an update to Plan Team and SSC assessment tasks for Other Rockfish (OR) and Demersal Shelf Rockfish (DSR) stock complexes in the GOA. The update included progress on: 1) completing stock structure templates for both complexes; 2) evaluating the utility of IPHC survey data for OR and DSR stock assessments; 3) exploring the random effects model approach for Tier 5 OR species; and 4) investigating catch and management alternatives for the seven GOA-wide DSR species.

### *Stock Structure*

Due to overlap of OR and DSR species, a single stock structure document was compiled. Available data is limited for most categories within the template. Overall population trends for both assemblages are generally stable but difficult to discern for individual species. Despite recent ABC overages for OR in the WGOA and CGOA, available data do not suggest that this is a conservation concern. Maps of survey abundance and fishery catch, both aggregated over time, were presented. Research priorities for OR species include improved biomass estimates, validated ageing methods, and additional research on age, growth and life history of all of the OR species (including those species which are also part of the DSR complex). Research priorities for the DSR complex are additional research on life history parameters for non-yelloweye rockfish, better estimation of rockfish habitat, and yelloweye rockfish life history data specific to the East Yakutat/Southeast Outside to inform the age structured assessment. **The Team recommends comparison of exploitation rates (i.e., catch divided by survey biomass) over time for GOA subareas to the reference Tier 5 exploitation rates.**

### *IPHC Survey Data*

Exploration of IPHC survey data identified five OR/DSR species that are commonly caught during the survey. Incorporating IPHC survey data for canary, quillback, redbanded, and silvergray rockfish may be useful in the East Yakutat/Southeast Outside Area and for yelloweye rockfish GOA-wide.

### *Random Effects Model for Survey Averaging*

Due the large number of species in the OR complex, three random effects modeling cases were presented: 1) species specific biomass GOA-wide; 2) total complex biomass GOA-wide; and 3) total complex biomass by region. The process error variance was estimated for each species/region and for all species/all regions combined. Only 17 species with reliable biomass estimates were included in the analysis. Modeling total complex biomass by region provided the best model fit. Based on 2014 assessment information, the ABC from the preferred random effects model would be lower compared to the 4:6:9 survey averaging approach. **The Team recommends that the authors follow the Plan Team guidance for applying the random effects smoother, which are located in the minutes of the September, 2015, meeting of the Joint Plan Team.**

### *Management Alternatives*

The authors examined potential management alternatives for the seven rockfish species managed as DSR in the EY/SEO area but are included in OR in all other regions. Alternatives included: 1) status quo; 2) three options to expand the GOA-wide OR assessment to include all DSR species specific to EY/SEO; and 3) remove the seven DSR species from the OR assessment and include them into a GOA-wide DSR assessment.

Status quo would retain the existing management structure and is the simplest approach although is problematic given that the DSR species currently in the OR complex in the WY, CG, and WG occupy different habitat (DSR species are shallower) and are primarily captured with longline gear. Yelloweye rockfish is the dominant species of DSR and are retained at a high level.

Alternatives for expanding the GOA-wide OR assessment to include DSR species are complex and could result in six separate ABCs (current management has 3 ABCs in the OR complex), with some potentially much smaller than current ABCs. Some ABCs (WY and EY/SEO) could be combined but may require an amendment to the FMP. Dissolving the DSR complex as part of this alternative would also require an amendment to the FMP.

Expanding DSR to a GOA-wide assessment is the author preferred alternative and would afford DSR species greater management oversight. Benefits of this alternative include ease of regulatory implementation and it would allow the existing stock assessment and jurisdictional management structures to remain intact. A GOA-wide DSR assessment could result in small and potentially difficult to manage ABCs, particularly in the West Yakutat area. Additionally, the OR complex catch is dominated by harlequin rockfish, caught primarily by the rockfish trawl fishery whereas catch of DSR species occurs primarily in longline fisheries and is dominated by yelloweye rockfish. Thus, the current management structure creates a situation where species with disparate life histories are grouped into one complex and ABC but are disproportionately caught by major fisheries.

The Team also noted that spatial management decisions may apply under the Council policy on stock structure and spatial management, which appears to pertain to “stock structure separation or other spatial management measures” (NPFMC, Oct 2013 minutes). Additionally, the BSAI Plan Team has requested clarification regarding whether the Council policy applies to only stock structure within a species or also splitting species from a multi-species complex (BSAI Plan Team minutes, Nov 2013 and Nov 2014). Given the trade-offs between biological benefits and management challenges **the Team recommends further evaluation of the author preferred Alternative 3 in coordination with the Council’s process for determining spatial management.**

### **Rockfish modeling (POP, Northern, Dusky, RE/BS)**

#### *General rockfish age-structured models*

Pete Hulson provided an update GOA rockfish stock assessment modeling focusing on three main updates for this year for the POP, dusky, northern, and rougheye/blackspotted models: using a length-stratified design rather than random design for growth estimation, extending the ageing error matrix to more appropriately model the plus age group, and examining the best age for the plus group age bin. In the past trawl survey age samples were treated as random but changes were made so growth estimation is done using a length-stratified design consistent with trawl survey data collections. The average difference in growth estimates between length-stratified versus random design for mean length and weight is minor. However, there are some difference in the estimates of the standard deviation in mean length which has an influence on the size-age transition matrix employed by these models; assuming randomly collected samples results in a higher standard deviation than the estimates from the length-stratified design. For

November, growth estimates will be treated as though the data were collected using a length-stratified design.

For ageing error in rockfish models, there is an issue with consistent overestimation of the proportion of fish in the age classes adjacent to the plus age group due to the current construction of the ageing error matrix. To address this, the preferred alternative was to construct an ageing error matrix that extends the modeled ages compared to the ages fit in the data until >99.9% were in plus age group of data. This resulted in improvements to the fit of age compositions in all four rockfish models and greatly improved the issue of overestimating those age classes adjacent to the plus group. This improvement influences model outputs and therefore the extension of the age error matrix will be implemented for November.

The final task examined how the selection of the plus age group is influenced by the improved ageing error matrix and what the appropriate plus age group age should be. Multiple model statistics, including likelihood components and SDNR (standard deviation in normalized residuals), were examined to determine appropriate age for the plus age group but model analyses were generally uninformative. Suggested age ranges were provided for the four species based on what ages the scaled total likelihoods plateaued or minimized.

The Team discussed the difficulty in determining the appropriate plus age group. A general rule of thumb was suggested that no more than 10-15% of the total samples be in the plus group or that the plus group proportion be smaller than the maximum of any of the other sizes in the age distribution. This should also be balanced by minimizing adding additional age bins with zero samples. Additionally, model fits and residuals could be examined for any useful information from the data. Alternatively, examining selectivity changes while adding age bins may reveal an asymptote that would indicate additional age bins are unnecessary. For November, the plan for these four GOA rockfish assessments is to present a base model that uses last year's model updated with 2015 data. In addition, there will be two alternative models presented: (1) a model that incorporates the updated growth information and the ageing error matrix extension, and (2) a model that also evaluates where to set the plus age group.

**The Team recommends moving forward with these three improvements and encourages the authors to further examine choosing the appropriate plus age groups. To facilitate model evaluation, the Team recommends the authors present the two alternative models suggested.**

### *Rougheye and blackspotted rockfish model*

Dana Hanselman presented two items pertaining to previous SSC (trawl selectivity) and Team (plus age group) comments specific to the rougheye/blackspotted assessment model. For trawl survey selectivity, the SSC was concerned because it seems unusual for age 9-11 rockfish to be selected 20% more than other ages. RE/BS is the only GOA rockfish still using a non-parametric selectivity function so alternative selectivity distributions were explored. The fishery catches much older fish than the survey encounters indicating survey selectivity should be dome shaped to some extent. Multiple selectivity options were explored and likelihood fits across differing plus age groups were presented. Of the options selected, the residual patterns look better in the gamma distribution and the more flexible 3<sup>rd</sup> differences distributions. A final decision hasn't been reached on which selectivity to adopt but candidates will be presented in November.

A simultaneous look at trawl selectivity options along with plus age group determinations was done to help evaluate the best selectivity distribution along with the best plus age group. The proportion of fish in the current plus age group of the fishery is large and likely should be extended. Extending the ageing error matrix resulted in improvements to the fit of age compositions and greatly improved the issue of overestimating those age classes adjacent to the plus group. Examination of the scaled likelihood fits across differing plus age groups indicated the plus age group should at least be above 37. For comparison

purposes age plus bins of 42 and 54 were explored. Approximately 10% of fishery ages fall in the 54 plus group but nearly 25% of ages are in the 42 plus group bin. These percentages are lower in the trawl survey and numerous zeroes appear in the ages adjacent to the 54 plus group because the fishery catches larger fish. Initial explorations indicate 42 may be an appropriate plus age group.

The Team suggests exploring the use of different plus age groups in the fishery and trawl survey age composition to potentially accommodate the different age ranges the survey and fishery encounter.

**The Team recommends the authors present last year's base model with updated data along with an alternative model that explores updated growth information and an extended ageing error matrix, and second alternative model that also incorporates new selectivity curves and new plus age groups.**

### **GOA trawl survey**

Wayne Palsson updated the Team on the 2015 trawl survey. It was the first three boat survey since 2009. The F/V Sea Storm and the F/V Alaska Provider had been used previously while the third vessel, F/V Cape Flattery, had not fished before. The Cape Flattery had some propulsion issues - its Z-drive failed - making its cruising speed slower.

The survey's net configuration and deployment are based on national protocols. Standardization of the net is managed through mensuration, meaning sensors on the trawl send real-time feedback to the vessel so that adjustments can be made to keep the gear oriented correctly. Data on animals caught in the trawl are processed at sea into the Oracle database and a QA/QC routine is performed. They are currently assessing survey "effort" by reviewing the amount of trawl time the net was on or off the bottom. Effort is defined as when the net is on the bottom. The next stage is to estimate abundance, and then make survey data available on the AFSC website and the Alaska Fisheries Information Network (AKFIN).

New this year, rex sole, flathead sole, and dover sole age samples were collected randomly rather than within a length-stratified collection scheme. Other new features included 2 test tows and 1-3 observers on each vessel-leg.

There were 772 successful stations, which was 200 more than in 2013, out of a target of 800 (and 836 attempted). Most of the shortcomings were from the third vessel, F/V Cape Flattery, which was slower by 1 or 2 knots and was unable to achieve all of its assigned stations. The West Yakutat area had the largest deficit from the planned number of target stations.

The survey was able to visit stations in the 1000m depth stratum, which had not been done since 2009. POP was the dominant species in the catch, followed by ATF and pollock. Otolith sample targets were achieved for all species except rex sole and harlequin rockfish. More than 1,100 pollock otoliths were collected. Although cruise scientists were anticipating rare species due to the persistence of the warm blob in the GOA, they didn't really see any big shifts in the number of unusual species collected.

On Monday 9/28 the data from this year's trawl survey will be in the AKFIN system and on Wednesday 9/30 should be available for all users.

### **Arrowtooth flounder**

Ingrid Spies presented an update on developing a generalized assessment model for arrowtooth flounder. Currently, the assessment models for the BSAI and GOA areas differ in the number of surveys used, the modeling of survey catchability as a function of temperature, and the range of ages modeled. The current BSAI model was generalized to incorporate any number of surveys, and the modeled ages are 1-21+. Fits to BSAI data were obtained from the current and generalized model. Additionally, the generalized model



was applied to the GOA data and results were compared to the current GOA model (which models an age range of 3-15+).

In the BSAI, the current and generalized model use the same data and make the same model assumptions, with the only difference between the models being that the generalized model has the flexibility to use a different number of surveys. Ingrid expected that the model runs between the current and generalized model would yield identical results, but slight differences were observed in the estimated recruitment and selectivity. These differences could reveal a lack of convergence of the model runs. Comparison between the generalized and current GOA model in fitting GOA data revealed more substantial differences in fishery and survey selectivity and estimated recruitment, which may be related to the difference in the range of ages fit by the two models. Future work will include investigation of the estimation of selectivity, and verification of inputs such as maturity, individual weights, and the length at age transition matrix.

**The Team encourages further work on the standardization of the models, and recommends running the two BSAI models with all parameters fixed. Differences in model outputs between these two runs would reveal if any difference in model equations existed.**

### 2015 GOA acoustic surveys

Abigail McCarthy presented results of the 2015 winter acoustic trawl surveys for walleye pollock in the Gulf of Alaska. The goal of the survey is to sample pre-spawning aggregations of pollock when biomass is expected to be at an intra-annual peak. The Shumagin and Sanak areas were sampled in late February, the Kenai Bays were sampled in late February – early March, and the Shelikof, Marmot, and Chirikof areas were sampled in mid to late March. The Pavlof and Morzhovoi areas were not sampled. Samples in the Shumagin and Sanak areas were dominated by the 2012 year class (3 year olds; 29-46 cm), and both areas showed increases in biomass estimates from the 2014 survey. The survey in the Sanak area occurred after the peak of the prespawning period (33% of fish were prespawning), and future surveys will attempt to sample more during the prespawning period. The Kenai Bays samples had 93% prespawning fish, with most of the biomass being in Resurrection Bay. The biomass in Kenai Bays was composed primarily of age 4+ fish (46+ cm). High densities were observed in the Shelikof area from Cape Kuliak to the mouth of Shelikof Strait, with strong representation of the 2010 year class. The biomass estimates in the Shelikof was high (845,000 t), similar to the 2013 and 2014 surveys. The Marmot Bay and Chirikof samples contained mostly age 3 fish.

Trawl-resistant bottom-moored echosounders were deployed in Shelikof Strait from February to May. The moored echosounders worked as expected, and revealed that fish appeared to move northward up the Strait during February and March, and then southward from March to April.

Darin Jones presented results of the 2015 summer acoustic-trawl survey in the Gulf of Alaska. The survey was conducted from mid-June to mid-August and produced biomass estimates of walleye pollock and Pacific ocean perch (POP), and estimates of the spatial distribution of euphausiids. Pollock were evenly distributed between NMFS management areas 610, 620, and 630. Pollock were distributed primarily on the shelf and in Shelikof Strait, with a lower proportion in Shelikof Strait in 2015 (19% of biomass) compared to the 2013 survey (48% of biomass). The estimated biomass from the 2015 survey was 1.5 million tons and was composed primarily (88%) of the 2012 year class. The biomass estimate of POP increased from 263 kt in the 2013 survey to 614 kt in the 2015 survey. Most of the POP were between 35-45 cm, although a mode of fish less than 30 cm was observed as well. The POP biomass estimates were based on a general target strength relationship for physoclist fish, and current work is focused on developing a target strength relationship for POP.

## Walleye pollock

Martin Dorn discussed his plans for this year's GOA Pollock assessment. For November, the author is not proposing major changes to last year's model with one possible exception. Two complete summer acoustic surveys were conducted in 2013 and 2014. Although these surveys will likely not be considered as absolute estimates of abundance, they do provide an index of relative abundance. One of the recommendations from the last CIE review was to evaluate this as a Stock Synthesis (SS) model. The author compared the SS model vs. the ADMB model from last year as way to conduct a validation of model code, in accordance with NS2 guidelines on model validation. The author stated that he has achieved a good match between the two models, and presented several metrics for comparison by the Team. The Team agreed that the comparison between the two approaches was an appropriate validation of the current model and that the results were largely identical. Although one of the potential benefits of migration from ADMB to SS is that the assessment will become more transparent and transferable, the author stated that he has no immediate plans to make this transition.

## Sculpins

Ingrid Spies presented some alternatives for estimating the natural mortality rate for the sculpin complex. The current methodology is an average  $M$  across the component species weighted by the survey biomass estimates from the 4 most recent surveys (referred to below as a biomass-weighted  $M$ ). At the November 2013 Plan Team, it was noted that this method responds to declines in less productive species by increasing the target harvest rate for the complex, which could further exacerbate declines in less productive species.

The author identified two alternatives to the current methodology: 1) an unweighted average of species-specific  $M$  values, and 2) a biomass-weighted  $M$  based on biomass estimates from the entire survey time series. The estimated natural mortality rates were 0.222 for the current methodology, 0.265 for the unweighted average, and 0.221 for the weighted average using the entire time series.

The author's recommendation is to use the entire time series for biomass-weighted  $M$ , and this would likely help stabilize the value of  $M$  relative to using the most recent 4 surveys. The issue of biomass declines in the least productive stock may be especially relevant if those stocks are targeted by the fishery, and emphasizes that examination of species-specific biomass, catches, and exploitation rates should be presented in assessments of stock complexes.

**The Team recommended following the Joint Plan team advice on averaging of survey biomass estimates and applying natural mortality rates for a species complex, which are located elsewhere in these minutes.**

## Prince William Sound sablefish

Jan Rumble presented on trends in catch and GHL for the Prince William Sound (PWS) sablefish fishery. Historically, this fishery was prosecuted as follows: 1988-1995 - open access fishery, 1996-2002 - limited entry (with slightly lower harvest), 2003-present - shared quota fishery. Both harvest and CPUE have declined in recent years - the lowest harvest was in 2015 (16,910 lbs). GHL is not survey-based, rather a static value of 242,000 lbs has been used from 1993-2014 and this was reduced to 122,000 lbs in 2015. The Cook Inlet sablefish fishery also lacks an abundance survey, however, since 1997 that GHL has been set proportional to the GOA ABC.

Genetic structure of the PWS population is not well understood; individuals tagged in the PWS have been recovered as far away as the western AI. Distance traveled based on tag recovery (~10% recovery rate)

was similar to that observed in other studies. A recommendation was made to look closely at sablefish tagged by NOAA researchers to evaluate movements into PWS.

Low harvest factors include: declining effort, low abundance, non-target species. Existing data sets were identified and discussed that might aid in improving the GHL. These included: analyzing logbook information to evaluate in-season changes in CPUE, and relationship with targeting other species (e.g., fish tickets will reveal correlation with halibut fishery), killer whale depredation (sperm whales not thought to be present), relative vessel experience/historical success, and size composition of landings (within and among seasons/years). To further account for fishery dynamics, the Team suggested omitting data sets containing mixed-species fishing sets, examining hook spacing, considering a test fishery, and linking GHL to an identified threshold (e.g., CPUE).

### **2016 and 2017 harvest specification recommendations**

**The Team recommended rolling over the 2016 GOA final harvest specifications for OFLs and ABCs (as published in the Federal Register in February 2015 for the proposed 2016 and 2017 OFLs and ABCs.**

### **Adjourn**

The meeting adjourned at approximately 11 am.