Report on the Special Meeting on Groundfish Stock Assessment Prioritization in the North Pacific

Joint BSAI and GOA Groundfish Plan Teams of the
North Pacific Fishery Management Council
605 W 4th Avenue, Suite 306
Anchorage, AK 99501
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Summary

In September 2015, the National Marine Fisheries Service provided a report to the Joint Groundfish Plan Teams (JPT) on a national stock assessment prioritization initiative (described in Methot 2015) which serves as a guide for how a Region's stock assessments could be prioritized each year. The guide considered five themes: Fishery Importance, Stock Status, Ecosystem Importance, Assessment Information, and Stock Biology. Subsequently, a stock assessment prioritization process (SAPP) was developed and applied to the NPFMC Groundfish stocks based on input from relevant scientists. The result of this activity was the focus of convening this special meeting and undertaking a careful evaluation of results relative to Council objectives. Participants (listed in the last section of this report) mostly comprised members of the JPT and met at Alaska Fisheries Science Center in Seattle, Washington (the schedule/agenda is available at goo.gl/7UPTNp). Other background documents were posted to the Groundfish Plan Team page on the Council's website (npfmc.org).

The SAPP generated target frequencies for conducting assessments and "Scenario 4" (S4) was selected by the JPT for evaluation relative to status quo frequency. Specifically, the JPT members developed recommendations independently and, for some stocks, these differed from S4. For these cases, the Teams discussed the relevant issues and developed rationales considering: 1) alignment with survey frequencies, 2) low Catch/ABC ratio, 3) a current management concerns, and/or 4) the relative stability of abundance estimates across years. Where author recommendations, status quo, and S4 were consistent, the Teams recommended no change in assessment frequency.

For assessments recommended to be other than annual, the Teams recommended even year (divisible by 2) target frequencies. This was based on the biennial periodicity of the AI and GOA trawl surveys. In keeping with this, the Teams set the maximum time between assessments to 4 years, compared to the S4 maximum of 5 years.

Additionally, the JPT recommended how to proceed during stock assessment "off-years" to ensure that stocks would be appropriately monitored. The JPT characterized the types of analysis that would be required for the SAFE report as a function of the Tier for each stock (i.e., stocks that are categorized as being in one of the six tiers). The type of assessments included full, partial (exec. summary with updated catch only), and none; the following schedule summarizes the JPT's recommendations:

Assessment frequency	Tier	Type and timing of assessments
Annual	1-3	Full assessment each year
Every 2 years	1-3	Full in year 1, partial in year 2
	4-5	Full in year 1, none in year 2
Every 4 years	1-3	Full in year 1, partial in years 2-4
	4-6	Full in year 1, none in years 2 and 4, partial in year 3

The JPT recommended decreasing the frequency of stock assessment for 13 stocks. One annual assessment (Greenland turbot) was recommended to become 2 years, one annual assessment (AI Pollock) was recommended to become 4 years, and the remaining 11 stocks changed from 2-year to 4-year frequencies (see Table 1 for details).

Two other main outcomes/recommendations from the meeting were:

1) To revisit assessment frequency again (say after 5 years) for evaluation recognizing that special requests and cases may cause for changes in assessment frequency;
2) To emphasize the importance to maintain (or increase) survey frequency and other multi-species data collection programs. The frequency of SAFE report chapter production was considered assuming the current level of fishery independent survey sampling effort.

Meeting notes and recommendations

In September 2016, the Teams were provided with a joint AFSC and NMFS S&T discussion paper (included separately) which applied the prioritization methods to assessments conducted in support of the NPFMC. According to NMFS HQ representatives, this issue and adjustments to Regional funding are unrelated. However, if funding were to change, a developed assessment prioritization plan could be a useful tool for regional science centers to have available. Additionally, adopting less frequent assessments for some species may free up time for analysts to explore further model development or devote their time to other issues. Following September Plan Team review, it was decided that thorough consideration of this issue would require a special Plan Team meeting. Teams' recommendations on assessment prioritization are provided to the Council and SSC for their consideration at the February 2017 Council meeting.

The meeting began with a discussion of its purpose and of the needs of the Council as a Regional "consumer" of stock assessment products, as well as the NMFS national vision for application of the prioritization process to serve as a tool for considering alternative assessment frequencies. The Council perspective, as articulated by Diana Stram and Jim Armstrong, was that any changes in assessment frequency resulting from this exercise should not diminish the ability of the Council to continue to manage fisheries in the North Pacific to achieve optimum yield (NS1) with confidence that the information they use to make decisions consists of the best scientific information available (NS2). Additionally, in terms of the Council's ongoing management of its fisheries through an ecosystem-based approach, the information needed to continue that approach as well as to expand and improve that effort should not diminish in availability or quality.

The meaning of "best scientific information available" was discussed in the context of the relationship between assessment frequency and the availability of new data. Specifically, does the availability of new data necessarily require the production of a new assessment during the year in which the new data became available? It was generally agreed that "best scientific information available" refers to the quality of both the data inputs and the assessments based on those data, and does not imply an obligation to conduct an assessment every time any new data become available.

Definitions

To avoid confusion about the meaning of "stock assessment" when discussing stock assessment frequency, Grant Thompson provided a short presentation on what constitutes an assessment. The definitions below are those used in NMFS' Species Information System (SIS).

The main assessment types considered here are:

New ..... Never assessed before
Benchmark..... Substantially different than previous
Full Update ..... No substantial changes to methods or interpretation
Partial Update ..... Executive summaries, updating catch data only

Reference assessment frequencies: Status quo and "Scenario 4"

The Teams discussed the evolution of the current frequency for assessments, noting that it was tied to considerations of survey frequency, fish longevity, Steller sea lion prey importance, and fishery importance. Full stock assessments are currently conducted either annually or biennially. Annually assessed stocks are generally those with the greatest commercial interest (pollock, Pacific cod, sablefish, major Bering Sea flatfish species, and Atka mackerel). Biennially assessed stocks generally follow an on-year/off-year cycle relative to the availability of data from the trawl survey.

Kalei Shotwell provided an overview of the national process for stock prioritization and the results as applied to North Pacific groundfish stocks. The Stock Assessment Prioritization Plan (SAPP) proposes a weighted scores approach that generates alternative assessment frequencies. This approach has been applied to NPFMC stocks to generate a range of *scenarios* (see attached discussion paper, "Stock Assessment Prioritization for the North Pacific Fishery Management Council: Methods and Scenarios").

While the SAPP functions to assist some Regions in ranking managed stocks due to insufficient resources to update all managed stocks in each year, all NPFMC-managed stocks are addressed in annual SAFE reports, with off-year stocks getting simple updates. Therefore, the target frequencies generated by the SAPP would essentially give the Council the opportunity to consider less frequent updates which would correspond to less frequent updates to the specification of OFL/ABC/TAC for some species.

The SAPP proposes a multivariate weighting scheme to generate target assessment frequencies based on scores assigned under four factors: Fishery Importance, Stock Status, Ecosystem Importance, Assessment Information, and Stock Biology (Methot 2015). An example of how the scoring system works is provided in Table 1 of the attached discussion paper. A team of economists, fisheries managers, and stock assessment scientists were consulted to gather the relevant information needed to develop scores for each of the four factors. The exercise generated five target frequency scenarios, with a given scenario including all of the managed stocks for a given region (GOA or BSAI).

From the exercise, Scenario 1 (S1) provided the base case where the SAPP algorithm was applied, unconstrained. S2 constrained minimum frequency at 5 years; S3 was S2 with greater weight on "fishery importance"; S4 was S2 with high-value fisheries being ensured at annual frequency; and finally, S5 was a combination of S3 and S4. At the Teams' September meeting, the Teams noted that S4 seemed to be "more in line with regional priorities" and looked "reasonable."

In S4, the commercial value metric was used as an alternative proxy for estimating a "regional scalar". Methot (2015) noted that the "*scalar acts as a region-specific "dial" to allow each NMFS Science Center to work with its management partners to adjust target frequencies to within a reasonable range of currently available regional assessment capacity*."

For S4, the total ex-vessel values of all the groundfish stocks being evaluated in this prioritization round were sorted. The stocks considered the "highest value stocks" were those that made up 75% of the cumulative catch value. These stocks, in descending order, were EBS pollock, BS Pacific cod, AK sablefish, and BSAI yellowfin sole. The scalar was then set to make sure that the target frequency was annual for all these stocks, also considering the standard adjustments (+/- 1 fishery, +/- 1 ecosystem, +/- 1 recruitment) as used in the base case.

Prioritization poll results

Prior to this Special Meeting, a poll was circulated to assessment authors and Team members to gather the range of opinions on assessment frequency for each stock or stock complex in each area. The lead authors of each assessment were asked to enter a recommended frequency for their stock(s), while the PT members were asked to rate all stocks. Dana Hanselman provided a summary of the results of the poll (see figure below). The authors and Plan Teams (on average) agreed on what the absolute frequency should be for the larger more valuable stocks, but tended to show less agreement for lower tier and less valuable stocks. Nevertheless, the authors and the Plan Teams, on average, recommended a lower frequency than the status quo.

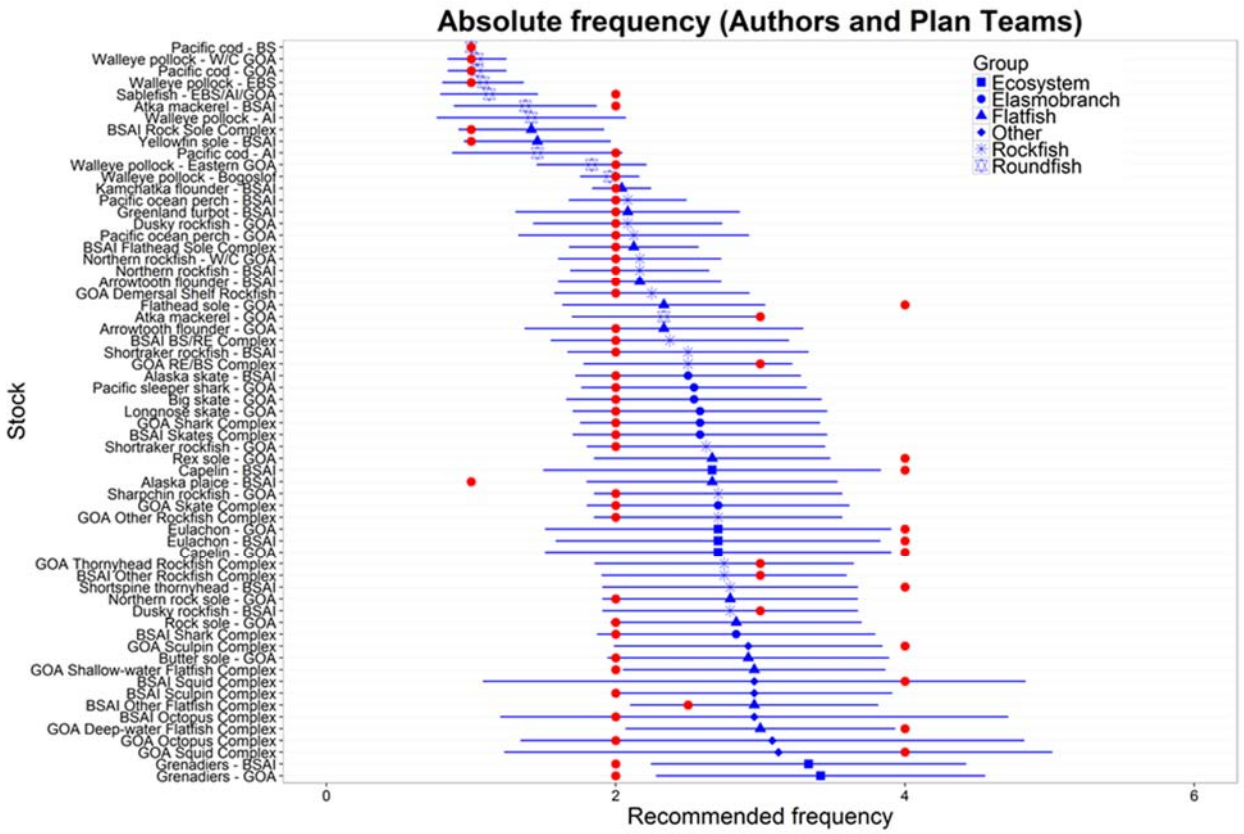

Figure 1. The recommended assessment frequency for all AK stocks. The blue dots with error bars are the mean and +/- one standard deviation of the Plan Team recommendations. The red dots are the lead author's recommendation.

Supplemental metrics for prioritization considerations

A table of metrics (shown below) was developed by Grant Thompson for detailed prioritization considerations with values calculated follows:

- Root-mean-squared-change (RMSC) in relative biomass (spawning biomass for Tiers 1-3, survey biomass for Tiers 4-5, not used for Tier 6). Changes were measured as proportions. Grant used the time series from 1977-present or the longest time series available from the assessment, whichever was shorter.
- Mean catch-to-ABC ratio. Grant used the average of the ratios over the last 20 years or the longest time series available from the assessment, whichever was shorter.
- Fishery importance. Grant used the same values used to produce Scenario 4.

Tiers 1-3 Metrics			RMSC		Mean C/ABC		Fishery Imp.		
FMP	Ch.	Stock/complex	Raw	Relative	Raw	Relative	Raw	Relative	Mean
BSAI	2	EBS Pacific cod	0.202	2.356	0.927	1.742	14.540	1.366	1.821
GOA	1	W/C/WYK pollock	0.193	2.256	0.936	1.757	12.946	1.217	1.743
BSAI	1	EBS pollock	0.189	2.211	0.884	1.660	13.115	1.233	1.701
GOA	2	Pacific cod	0.100	1.170	0.846	1.589	15.313	1.439	1.399
BSAI	17	Atka mackerel	0.130	1.516	0.752	1.412	10.768	1.012	1.313
BSAI	9	flathead sole	0.209	2.444	0.235	0.442	9.690	0.911	1.266
GOA	9	Pacific ocean perch	0.081	0.945	0.848	1.592	12.030	1.131	1.223
Both	3	sablefish	0.055	0.640	0.815	1.531	13.798	1.297	1.156
BSAI	4	yellowfin sole	0.106	1.233	0.587	1.102	11.733	1.103	1.146
BSAI	12	Pacific ocean perch	0.042	0.493	0.868	1.629	12.766	1.200	1.107
GOA	10	northern rockfish	0.067	0.781	0.812	1.525	10.561	0.992	1.100
GOA	12	dusky rockfish	0.053	0.624	0.640	1.201	14.165	1.331	1.052
BSAI	5	Greenland turbot	0.083	0.975	0.713	1.338	8.408	0.790	1.034
BSAI	18	skates	0.062	0.721	0.735	1.380	10.018	0.941	1.014
BSAI	8	northern rock sole	0.108	1.263	0.225	0.423	10.694	1.005	0.897
BSAI	1.1	AI pollock	0.111	1.300	0.178	0.333	10.895	1.024	0.886
BSAI	14	blackspotted/rougheye	0.059	0.686	0.620	1.164	8.569	0.805	0.885
BSAI	7	Kamchatka flounder	0.055	0.639	0.628	1.180	8.628	0.811	0.876
BSAI	13	northern rockfish	0.032	0.376	0.461	0.867	10.272	0.965	0.736
GOA	13	rougheye/blackspotted	0.015	0.176	0.398	0.748	9.999	0.940	0.621
BSAI	6	arrowtooth flounder	0.067	0.778	0.122	0.229	7.813	0.734	0.580
GOA	7	arrowtooth flounder	0.062	0.720	0.120	0.226	8.440	0.793	0.580
BSAI	10	Alaska plaice	0.056	0.654	0.180	0.338	7.798	0.733	0.575
GOA	4	shallowwater flatfish	0.039	0.459	0.115	0.217	8.093	0.761	0.479
GOA	8	flathead sole	0.035	0.409	0.066	0.123	8.369	0.786	0.440
GOA	5	deepwater flatfish	0.015	0.172	0.134	0.251	7.240	0.680	0.368

Tiers 4-5 Metrics			RMSC		Mean C/ABC		Fishery Imp.		
FMP	Ch.	Stock/complex	Raw	Relative	Raw	Relative	Raw	Relative	Mean
GOA	16	other rockfish	0.391	3.633	0.243	0.601	13.107	1.361	1.865
BSAI	1.2	Bogoslof pollock	0.370	3.441	0.132	0.326	8.998	0.934	1.567
GOA	14	Dem. shelf rockfish	0.170	1.581	0.670	1.655	13.851	1.439	1.558
BSAI	2.1	AI Pacific cod	0.079	0.730	0.613	1.514	12.748	1.324	1.189
GOA	11	shortraker rockfish	0.058	0.541	0.621	1.534	11.694	1.214	1.097
GOA	15	thornyheads	0.069	0.644	0.484	1.194	9.217	0.957	0.932
GOA	18	skates	0.022	0.206	0.548	1.354	11.265	1.170	0.910
BSAI	16	other rockfish	0.038	0.352	0.558	1.378	7.835	0.814	0.848
BSAI	15	shortraker rockfish	0.020	0.188	0.583	1.440	8.477	0.880	0.836
GOA	6	rex sole	0.051	0.478	0.327	0.808	8.417	0.874	0.720
BSAI	11	other flatfish	0.053	0.492	0.149	0.367	7.328	0.761	0.540
BSAI	19	sculpins	0.062	0.579	0.127	0.313	5.928	0.616	0.503
GOA	19	sculpins	0.015	0.135	0.208	0.515	6.311	0.655	0.435

Tier 6 metrics			RMSC		Mean C/ABC		Fishery Imp.		
FMP	Ch.	Stock/complex	Raw	Relative	Raw	Relative	Raw	Relative	Mean
GOA	22	octopus	n/a	n/a	0.600	1.668	10.280	1.117	1.393
BSAI	21	squid	n/a	n/a	0.540	1.500	8.951	0.973	1.237
BSAI	22	octopus	n/a	n/a	0.392	1.090	10.194	1.108	1.099
GOA	17	Atka mackerel	n/a	n/a	0.464	1.291	7.689	0.836	1.063
GOA	20	sharks	n/a	n/a	0.225	0.626	10.782	1.172	0.899
GOA	21	squid	n/a	n/a	0.186	0.518	8.184	0.890	0.704
BSAI	20	sharks	n/a	n/a	0.110	0.306	8.321	0.904	0.605

Approach for identifying target frequencies

The headquarters representatives clarified that it would be helpful if the Teams could justify any recommended frequencies that differed from those of Scenario 4. Following the discussion of the poll results, there was considerable deliberation on whether the overall results from authors and Team members could be used to compute a recommended set of target frequencies. The headquarters representatives suggested that the poll results would not constitute a sufficient rationale for departing from Scenario 4. Therefore, the Teams decided to move forward on a stock by stock basis, using the poll results as a reference to guide discussion for each stock. At that point, the Teams decided to evaluate the current frequency of each stock and compare it to S4 and the author recommended frequency and provide a rationale for any recommended deviations from either status quo or Scenario 4.

Stocks were arranged in descending order based on the difference between status quo and S4 frequency. In general, for assessments not recommended for annual review, the Teams recommended even year (divisible by 2) target frequencies. This was based on the biennial periodicity of the AI and GOA trawl surveys. In keeping with this, the Teams set the maximum time between assessments to 4 years, compared to the S4 maximum of 5 years. The Teams' preference for aligning the assessment frequencies with the survey frequencies accounts for many of the differences between the Teams' recommendations and S4.

For those assessments where there was complete agreement between author, status quo, and S4 frequency, the Teams recommended maintaining that frequency. For all other assessments, the Teams' recommendations reflect disagreement with one or more of the reference frequencies (status quo, S4, author). As stated above, a rationale is provided for all recommended target frequencies.

Table 1 provides the status quo, S4, and Team-recommended assessment frequencies as well as the Teams' rationale. One of the common themes in the Teams' rationale was the catch/ABC ratio, which in some cases caused the Teams to recommend less frequent assessments than either status quo or S4 (e.g., GOA flathead sole), and in other cases more frequent assessments (e.g., BSAI skate complex). Other stocks had offsetting issues such as potential distributional shifts (BSAI Alaska plaice), concerns about subarea catches (GOA thornyhead complex, GOA longnose skate), issues with a species within a complex (GOA skate complex), among others. Another common theme was the stock's average relative interannual change in biomass (see table at end of previous section).

Assessment products for cycles greater than 1 year

The Teams discussed how to proceed during full stock assessment "off-years" to ensure that stocks would be appropriately monitored. The JPT characterized the types of analysis that would be required for the SAFE report as a function of the Tier for each stock (i.e., stocks that are categorized as being in one of the six tiers). The type of assessments included full, partial, and none; the following schedule summarizes the JPT's recommendations.

Tiers 1-3

The Teams recommend the following for stocks/complexes managed under Tiers 1-3:

4-year cycle

- Year 1: full assessment
- Years 2-4: partial assessment (see definition below)
- Year 5: full assessment

Partial assessments for Tiers 1-3 should be an expanded version of the current off-year executive summaries, including catch/biomass ratios for all species in addition to re-running the projection model with updated catch information, and also including updated survey biomass trends when available (note that partial assessments for Tiers 1-3 *do not* involve re-running the assessment model; only the projection model). Authors would be expected to respond to Team/SSC comments during full assessments only, unless the comments pertain to features that are normally included in partial assessments.

2-year cycle

- Year 1: full assessment
- Year 2: partial assessment (see definition under "4-year cycle" above)
- Year 3: full assessment

Tiers 4-5

The Teams discussed at length the following two options for stocks/complexes managed under Tiers 4-5 with 4-year cycles:

4-year cycle, Option 1

- Year 1: full assessment
- Year 2: none
- Year 3: partial assessment (see definition below)
- Year 4: none
- Year 5: full assessment

Partial assessments for Tiers 4-5 should be an expanded version of the current off-year executive summaries, including catch/biomass ratios for all species in addition to re-running the random effects model. Authors would be expected to respond to Team/SSC comments during full assessments only, unless the comments pertain to features that are normally included in partial assessments.

4-year cycle, Option 2

- Year 1: full assessment
- Years 2-4: partial assessment similar to the current off-year executive summaries, meaning that ABC and OFL would be left unchanged unless:
    - a mistake in the ABC or OFL computed in the previous full assessment is found
    - new survey data are available, in which case the random effects model would be re-run but a full assessment would not be produced
    - new information (other than new survey data) suggests that ABC should be revised, subject to the maximum permissible ABC computed in the previous full assessment
- Year 5: full assessment

For stocks/complexes managed under Tiers 4-5 with a 4-year cycle, the Teams recommended Option 1 (note that several Team members preferred Option 2).

For stocks/complexes managed under Tiers 4-5 with a 2-year cycle, the Teams recommend the following:

2-year cycle

- Year 1: full assessment
- Year 2: none
- Year 3: full assessment

Tier 6

The Teams recommend the following for stocks/complexes managed under Tier 6:

4-year cycle

- Year 1: full assessment
- Year 2: none
- Year 3: partial assessment (see definition below)
- Year 4: none
- Year 5: full assessment

Partial assessments for Tier 6 should be an expanded version of the current off-year executive summaries, including catch trends for all species. Authors would be expected to respond to Team/SSC comments during full assessments only, unless the comments pertain to features that are normally included in partial assessments.

2-year cycle

- Year 1: full assessment
- Year 2: none
- Year 3: full assessment

Other issues related to changes in assessment frequency

The Teams noted that the reduction in frequency of some assessments will result in fewer data available for ecosystem models and other external analyses. For Tiers 4-5, partial updates will provide interim estimates of total biomass, but total biomass and recruitment updates for Tier 1-3 species will not be available during interim years between assessments (i.e., annually or bi-annually based on surveys).

Anne Hollowed provided an overview of some additional off-cycle assessment considerations and in discussion the Teams added to that list, which varies in terms of potential availability of information in off-cycle years, and implications for triggering assessments.

- Change in spawning biomass (perhaps standardized by +/- xx standard deviations)
- Evidence of a new environmental link to time trends in growth, recruitment, or mortality
- Evidence of a marked change in retrospective bias or residuals
- Availability of new information on vital rates (M, maturity, growth)
- Availability of new information on survey performance (selectivity, Q)
- Change in catch suggesting targeting a member of a complex
- Evidence of stock structure and possibility of overharvest of a sub-population
- Change in catch to ABC ratio
- Change in halibut bycatch
- Distributional shifts

The Teams briefly discussed the paper distributed from the Mid-Atlantic Council SSC on the development of "rumble strips" for considering whether an off-cycle stock assessment may be triggered in light of some issues of concern. The Teams discussed the development of a list for use in the North Pacific assessments building upon the draft list presented, with authors contributing additional items as applicable throughout the process.

The Teams noted that a reduction in frequency does not indicate that a stock is not important; it is only indicating that more frequent updates to specifications of ABC and OFL are not needed (e.g., because the specifications are not currently constraining). The purpose of reducing some assessment frequencies is to allow more resources to be directed toward researching the stocks and methods used to assess the stocks. The Teams also emphasized that a recommendation for a reduction in *assessment* frequency absolutely should not be interpreted as a recommendation for a reduction in *survey* frequency. First of all, the Teams are recommending that many assessments continue to be conducted annually, and these will not require any fewer survey data than they do at present. Second, although there are several cases where a reduction in full assessment frequency is being recommended, the purpose of these recommendations is to facilitate a net increase in the quality of the management advice that comes out of the overall assessment process, which cannot be achieved if the data inputs for the assessments are degraded.

Regardless of whatever assessment frequency schedule is adopted, the Teams recommend that it be revisited after one full cycle has been completed (e.g., after four years, if the Teams' recommended set of frequencies is adopted).

CIE review frequency in relation to stock prioritization

Anne Hollowed provided an overview of the west coast process of stock prioritization and how CIE reviews are structured in conjunction with this. The Teams discussed the utility of CIE reviews for model innovation purposes and to what extent the Teams and SSC should comment on which stocks should be selected for a CIE review. The following were among the questions addressed during this discussion, e.g.: Should major model changes be implemented prior to a CIE review? Should there be some form of alternate external review to facilitate implementation of a new model from September to November? Can

this stock prioritization process help to inform which stocks should be prioritized over others for CIE review purposes?

The current AFSC/Team/SSC review process has been criticized by some due to the large size of documents presented each year. Modifying the assessment frequency may allow additional time for in-depth review of some models. The Teams discussed the current 5-year target frequency for CIE review, which seems reasonable albeit subjective. However, it was noted that CIE reviews vary considerably in how useful and in-depth they are. Other venues within and external to NMFS may be beneficial for in-depth reviews of some assessments, such as inviting outside experts to participate in a Team review. One additional possibility would be to hold a workshop (similar to the NPFMC crab modeling workshops) to provide an in-depth review of specific assessment models during assessment off-years.

Full stock prioritization ranking

In the discussion paper, the AFSC chose not to pursue the final step of the prioritization plan, which is to use a system of weights for different management goals, using most of the data collected for the target frequency calculations and some additional data to rank stocks in order of their need to be assessed in each year. The PFMC used this part of the SAPP to support decisions regarding the assessments that will be conducted in the upcoming years. Since the AFSC already has a schedule for annually and biennially assessing stocks and all stocks have been assessed at least once, this was of less utility than for the NW region. However, it was pointed out that it may be worthwhile at some point to pursue this to think about how resources may be distributed across stocks, particularly if there are changes in available resources. These strategic decisions could concern survey planning, sample processing, the use of the CIE for reviewing particular assessments, or improving stock assessments in general.

Kalei Shotwell provided preliminary attempts to demonstrate how this final step may play out for Alaska stocks by calculating some scenarios that resembled the scenarios produced for the Pacific Council. These included a sort of baseline or even weighting of factors, one that leaned toward socioeconomic benefits, one weighted toward conservation/ecosystem, and one that prioritized stocks with high degrees of change (in biomass or data). The Teams appreciated the work that went into the example scenarios, but expressed concern regarding the utility of pursuing the full expert weighting exercise, understanding the degree of effort that would be needed in order to make this a valid tool, and also expressed concern as to whether the benefits would be worth the effort. Nevertheless, in the event that AFSC resources are substantially increased or decreased, some kind of planning tool that helps synthesize multiple variables and priorities among multiple user groups would be useful, given the different priorities exhibited just among Team members during the meeting.

As indicated by Patrick Lynch, NMFS is continuing to refine the prioritization process in concert with developing a new Stock Assessment Improvement Plan. Thus, the Teams can evaluate the application and utility of this complete exercise once a new version becomes available.

Target frequency recommendations and rationales

The tables below are presented in SAFE chapter order showing

Bering Sea and Aleutian Islands (BSAI) FMP stocks

Stock or complex	Status Quo	Scenario 4	Recommended	Difference from S4	Difference from SQ	Rationale
pollock – EBS	1	1	1	0	0	
pollock - AI	1	1	4	3	3	Author recommendation was 5 years due to the lack of a substantial directed fishery since 1998, stable population, no plans for a fishery. If one were to develop there should be more frequent assessments. Currently TAC is only lightly exploited (10%) and substantially below the ABC. Scenario 4 results are the result of the ecosystem importance and short-lived of this species. SSL issues might preclude the ability to lengthen the assessment frequency. The amount that can be caught is already fixed in regulation due to SSL measures thus there is limited, if any, conservation concern. The RPAs due not require annual assessments of SSL prey.
pollock - Bogoslof	2	2	2	0	0	
Pacific cod EBS	1	1	1	0	0	
Pacific cod EBS - AI	2	2	2	0	0	
Sablefish	1	1	1	0	0	
Yellowfin sole	1	1	1	0	0	
Greenland turbot - BSAI	1	5	2	-3	1	Only have surveys every 2 years and no reason to assess annually. 71% ABC caught. Propose moving to 2 year cycle to provide best use of available data when the shelf survey data are available. Shelf survey only captures juvenile fish and slope captures adults. Without slope survey the model has to be re jiggered annually and better results would be available by doing the assessment biennially. Note that the scenario 4 results are driven by the long-life of the species and the teams do not agree that this is relevant enough to have such a long lag between assessments.
Arrowtooth flounder	2	2	2	0	0	
Kamchatka flounder	2	2	2	0	0	
Northern rockfish - BSAI	2	3	2	-1	0	Catch to ABC 46%, SSB changes are moderate. Some targeting which requires additional monitoring, some evidence of spatially segregated populations and potential for localized depletion. Some sub-areas have higher exploitation rates which is a cause for sufficient concern to retain the Status quo target frequency.
flathead sole	2	2	2	0	0	
Alaska plaice - BSAI	2	5	2	-3	0	Low ratio of catch/ABC, concern that there could be a change in the distribution of the stock (moving to northern Bering Sea), this stock would be a candidate for a longer (4 year) assessment time line in the future should there be sufficient justification.

Stock or complex	Status Quo	Scenario 4	Recommended	Difference from S4	Difference from SQ	Rationale
BSAI Other Flatfish Complex	2	4	4	0	2	This complex could be broken out in the future. Lightly exploited stock. Change in SSB is very low, catch/ABC 15%.
Pacific ocean perch	2	2	2	0	0	
northern rockfish	2	2	2	0	0	
BSAI Blackspotted/Rougheye Rockfish Complex	2	4	2	-2	0	Given current management issues with respect to catch by area and relatively low ABCs and MSSCs by area this is not recommended for a 4 year time frame at this time but could be reconsidered in the future. There are also issues with uncertainty in estimates of year-class strength that would further the need for more frequent assessments than 4 years as well as two species in an assessment.
Shortraker rockfish - BSAI	2	4	4	0	2	Catch/ABC ~58%, average change in biomass is low ~2%.
BSAI Other Rockfish Complex	2	4	4	0	2	Aggregate of many species and some could be over-exploited by longer lapses in assessments. Consistency with GOA arguments for thornyheads as comprising the bulk of the complex. Some rationale for going longer would be that it is difficult to assess the trend in the minor components of the complex (especially dusky rockfish) thus assessing with additional data points is also desirable.
Atka mackerel	1	1	1	0	0	
BSAI Skates Complex	2	3	2	-1	0	No compelling reason to move away from current frequency based on scenario 4. Catch to ABC is very high 74%.
BSAI Shark Complex	2	4	2	-2	0	Observed decline in sleeper shark CPUE and potential for conservation concern. Multiple issues in development with respect to shark stocks, investigating use of catch by numbers, evolving assessment model. Potential to move to longer frequency in the future as appropriate.
BSAI Squid Complex	2	1	4	3	2	Specifications based upon average catch and no additional information which influences specifications available on an biennial basis.
Octopus	2	2	2	0	0	
Grenadiers - BSAI	2	4	4	0	2	Low exploitation, though PT discussed Tier 5 assessment, so workload for author not significantly affected.

Gulf of Alaska FMP stocks

Stock or complex	Status Quo	Scenario 4	Recommended	Difference from S4	Difference from SQ	Rationale
pollock WC GOA	1	1	1	0	0	
pollock - Eastern GOA	2	2	2	0	0	Team recommends SQ as opposed to scenario 4. SC4 driven by long-lived for more frequent assessments but biennial data do not support this change in assessment frequency.
Pacific cod GOA	1	1	1	0	0	
Sablefish	1	1	1	0	0	
GOA Shallow-water Flatfish Complex	2	4	4	0	2	Catch/ABC low, complex with rocksole
Northern rock sole - GOA	2	4	4	0	2	Catch/ABC 12% for combined rocksole. SSB does not change much.
GOA Deep-water Flatfish Complex	2	5	4	-1	2	Age-data is provided the year following the GOA survey and should be incorporated into the assessment. Catch/ABC ratio is 2-3%. ABC for the other species in the complex are very low.
Rex sole	2	2	2	0	0	
Arrowtooth flounder	2	2	2	0	0	
Flathead sole - GOA	2	2	4	2	2	The author recommended a longer time frame, catch/ABC is very low 6%, catch is limited by halibut bycatch, SSB changes are very low. Scenario 4 likely driven by fishery importance due to higher market value as well as potential for ecosystem importance.
Pacific ocean perch	2	2	2	0	0	
northern rockfish	2	2	2	0	0	
Shortraker rockfish - GOA	2	4	2	-2	0	Catch > ABC by area, part of the catch share plan, high catch/ABC 62%.
Dusky rockfish - BSAI	2	5	2	-3	0	Dusky primarily occurs in the AI thus at least a 2 yr survey timing is recommended, duskies are fished harder relative to their natural mortality but thornyheads are fished. Future recommendation would be if split out then SST would be recommended at 4 years but dusky should be retained at 2 year frequency
GOA Rougheye/Blackspotted Rockfish Complex	2	5	4	-1	2	Catch/ABC ~50%, two surveys used LL and BTS, abundance is relatively stable. This stock is part of a catch share program which would be a rationale for retaining the Status quofrequency. Scenario 4 is not recommended due to being biased long from long-lived species considerations but the catch share and catch/ABC issues are more compelling for more frequent assessments. Could reconsider this at a 4 year interval later or more frequent if/when species are broken out of the complex.
Demersal shelf rockfish	2	2	2	0	0	
GOA Thornyhead Rockfish Complex	2	5	2	-3	0	More frequent assessment than would be indicated by Scenario 4 are recommended due to the availability of biennial surveys, the fact that ABC have been exceeded in the past in the WGOA and it is part of the catch share program.
GOA Other Rockfish Complex	2	4	2	-2	0	High catch/ABC. Concerns with disproportionate exploitation of individual species, yelloweye contribution in the CGOA, evolving assessment to break additional species out of the complex.

Stock or complex	Status Quo	Scenario 4	Recommended	Difference from S4	Difference from SQ	Rationale
GOA Skate Complex	2	3	2	-1	0	Concerns with species and area ABC being exceeded. MRA issues for this stock. Catch to ABC overall high 55%. If the longnose, big and other area assessed separately could consider differential frequencies (other at 4 years and longnose and Big at 2 years)
Longnose skate - GOA	2	4	2	-2	0	Area-specific ABC has been exceeded in recent years in WGOA. Managed through MRAs. Consistency with skate complex frequency
GOA Sculpin Complex	2	3	4	1	2	Issues with bigmouth sculpin decline potential and the current need for assessment and monitoring. Catch to ABC is low in both areas. For consistency in frequency of assessments with the other stocks for which 4 years are recommended we recommend less frequent assessment then scenario 4 would suggest.
Pacific sleeper shark - GOA	2	3	2	-1	0	same issues with sleeper sharks as with BSAI. Sufficient evidence of sleeper shark decline.
Squid	2	2	2	0	0	
Octopus	2	2	2	0	0	
Capelin - GOA	2	1	4	3	2	Rationale = no specifications for these stocks as with grenadiers.

Participants

Plan Teams

Grant Thompson, Dana Hanselman, Jon Heifetz, Patrick Lynch, Kirstin Holsman, Cindy Tribuzio, Chris Lunsford, Allan Hicks, Paul Spencer, Obren Davis, Mary Furuness, Jim Armstrong, Sandra Lowe, Diana Stram, Jim Ianelli; **Via WebEx:** Chris Siddon, Ben Williams, Jan Rumble

Others

Kristan Blackhart, Steve Barbeaux, Carey McGilliard, Ron Felthoven, Anne Hollowed, Liz Connors, Olav Ormseth, Martin Dorn, Ingrid Spies; **Via WebEx**: Kalei Shotwell, Tom Wilderbuer