PRIORITIZATION OF SPECIES AND NMFS FINAL RECOMMENDATIONS FOR STOCK ASSESSMENTS IN 2017

I. Overview:

At the April Council meeting, NMFS presented a prioritization analysis to support the Council's selection of stocks for assessment in 2017. Following presentations and discussion, the Council adopted a preliminary list of groundfish stock assessments that included:

Full Assessments
Blue/Deacon rockfish, Lingcod, Yelloweye rockfish, Yellowtail rockfish

Update Assessments
Bocaccio, Darkblotched rockfish

The Council also identified the following species for further 2017 consideration based on available resources: arrowtooth flounder (update), blackgill rockfish (update), bank rockfish (full), Pacific ocean perch (full), cabezon off Oregon and Washington (full), and California scorpionfish (full or data-moderate).

Since the April Council meeting, NMFS has worked to develop an additional factor in the assessment prioritization analysis (unexpected biomass trends), evaluate available resources to effectively complete 2017 groundfish stock assessments, and develop a proposed schedule for the 2017 STAR Panels. The results of the analyses and evaluation of resources are provided below.

II. Prioritization Analysis: Unexpected biomass Trends

One element of NMFS's proposed prioritization process that had not been incorporated in the analysis by the April Council meeting was an examination of abundance trends, particularly with regard to indications that significant unexpected increases or decrease in abundance may have occurred since the last assessment (where the stock had been assessed). Information on trends is now included in the Excel file summarizing Prioritization Factors [Agenda Item G.8, Attachment 2: Final Excel Workbook of Data Informing 2017 Stock Assessment Prioritization, 'Trends' tab]. Primarily due to uncertainties as to how trend information should be scored, this factor has not been included directly in the scoring. Instead, for all species not assessed in 2015, bottom-trawl survey abundance estimates and trends are shown, along with estimated/projected abundance trends from the last assessment, where available.

For stocks with a prior assessment, the assessment's estimated and projected biomass time series was compared to a trend line for swept-area biomass from the West Coast Bottom Trawl Survey. The assessment trend line was derived using the biomass time series in the most recent assessment, beginning 3 years before the terminal year (i.e., year conducted) to account for the greater uncertainty in the terminal year estimate. The trend line for swept-area biomass from the survey was derived using the same start period and through the most recent survey information (e.g., 2015). For all species, survey biomass was calculated using a simple swept-area method. This is

in contrast to the General Linear Models used to model survey biomass trends for inclusion in most assessments.

For many species, a large proportion of a year's abundance estimate may result from a few survey hauls containing relatively large amounts of fish. This is frequently seen for species with schooling behavior, patchy distributions, or distributions that do not extend significantly into trawlable areas. In addition to creating large uncertainty within a single year's biomass estimate, sporadic and highly-variable survey encounters can produce biomass time-series that reflect highly implausible (or impossible) increases and decreases over several years. Sharp increases and decreases in estimated biomass are characteristic of many rockfish, over some or most of the survey's duration. These patterns stand in contrast to most flatfish, which have smaller and more consistent variance estimates over time. Importantly, these survey biomass estimates do not take into account a stock's availability to (or catchability by) the survey gear, protocols, and design; whereas most of our benchmark assessments estimate selectivity and catchability. Given the high variability in estimated survey biomass (thick, black line) and uncertainty across species, all estimates are accompanied by upper (green) and lower (red) 95% confidence intervals.

For species assessed using the data-moderate approach (2013), a comparable time-series of biomass estimates/projections was not readily available from those assessments, and survey trends are shown from 2010 to 2015. For unassessed species, survey trends are calculated over the entire 2003-2015 period.

In each of the figures, the trend line fitted to the survey estimates (for time periods, as described above) is shown as a dotted blue line. Where applicable, assessment biomass estimates are plotted as pink dashes. Where a stock's 'summary' biomass was reported for both the estimated (past) and projected (future) portions of the plotted period, it was used to represent assessment biomass. In most cases, however, only 'spawning' biomass (or spawning output) was available for both periods. Finally, the scale of the assessment biomass amounts was adjusted so that the initial point had the same value as the survey biomass trend, in order to facilitate easier comparison.

The annual rate of change in the survey trend line (both in mt and as a percentage of the mean trend amount of the period) is reported in a box with blue text on each of the figures. Where applicable, the annual rate of change for a trend line fitted to the assessment time series is reported in a box with pink text (as a percentage of the mean biomass amount for the period). Positive rates of change are presented in black, while declines are reported in red text.

In the first example (arrowtooth flounder), since 2004, the survey trend has increased 4% per year. The catch-only (C-O) update that was conducted in 2015, which added only 2007-14 actual catches to the 2007 assessment model, produced a trend over the same period which only increased by 0.1% per year. Roughly one-quarter of the species plotted (7 of 29) had declining survey trends, but only 3 of those reflected decreases of more the 2% per year. With the exception of Dover sole, survey trends for all of the plotted flatfish species increased, and by an average of 8.5%, annually. And even for Dover sole, the survey trend declined considerably less than would be expected, based on the 2011 assessment.

The three species exhibiting declining survey trends and the largest differences between the rates of changes in survey and assessment biomass are greenspotted rockfish, splitnose rockfish, and Pacific ocean perch. Two figures are included for greenspotted, the upper showing the most recent period (as for other species), with the figure below it focusing on trends in the data included in the 2011 assessment. Survey estimates of greenspotted biomass have tended to be rather noisy, particularly through the 2011 assessment, although survey and assessment trends both show small to moderate annual increases. The assessment's 2008-15 biomass amounts indicate continued increase, but at a somewhat slower rate (3%). Survey biomass estimates since 2008; however, have been falling at an annual rate of 11%. This decline is not due to fishing, since fishing mortality has generally been less than 12% of the estimated ABC contribution. The declining trend could reflect a real decline driven by environmental factors, a change in the availability of the stock to the trawl survey, or a combination of the two. It may also reflect a random sequence of survey locations and conditions that have tended to resemble the low points in the earlier time series. Splitnose rockfish is similar, with small catches relative to the ABC, a survey biomass trend declining by nearly 6% since 2006, and the 2009 assessment predicting that the biomass should be increasing at an even faster rate, due to the expectation of low catch rates.

Due to extremely high foreign catches in the 1960s, POP has, nominally, been the subject of rebuilding efforts since the initiation of the groundfish FMP. Although we now see that catch levels in the 1980s and 90s were insufficiently low to promote rebuilding, subsequent catch amounts have been far lower. Over the past decade, in particular, fishing mortality has generally been less than 16% of each year's ABC, and less than 10% of that amount over the last 5 years. The 2011 assessment anticipated that those low harvest levels would lead to continued slow increases in biomass; however, the survey biomass trend since 2008 has declined 3% per year. At the bottom of this tab, the rates of trend change are summarized for all included species.

Although this trend information has not been directly included in the Factor Scoring process, it can still help identify where need for an assessment may be comparatively greater, or less urgent. It is encouraging that such a large percentage (90%) of these species that are well-sampled by the trawl survey have trends that are relatively flat (great than -2% annual change) or increasing. All of the species that have larger survey declines have fishing mortalities that represent very low percentages of their ABCs.

III. Evaluation of NMFS Resources

The process of developing benchmark assessments of west coast groundfish, and fully supporting the review process is time-consuming and complex. This is particularly true for species where data availability, biological stock structure and/or management needs warrant a multiple-area approach to be explored and/or used as the basis for the assessment. In these cases, each area-model requires nearly as many resources as a single assessment. Species that are heavily reliant on recreational catch data and index development also present additional challenges, and require additional resources.

Because of the time and resources needed for model exploration, development, and validation, as well as the compressed strain of responding to the anticipated number of STAR Panel requests (20-30 per model) with clear, correct presentations, each benchmark assessment, or at least those with multiple area models, is being proposed to be conducted using a STAT-team comprised of at

least two people. This will increase the overall quality of assessments, reduce introduction of accidental errors into late-night modeling, and reduce burnout of our assessment scientists. The production of higher-quality assessments in the short term will allow more updated assessments (with lesser resource demands) to be conducted in the future. Unfortunately, even with some authors working on multiple species, the realities of the current process result in the number of higher quality benchmark assessments that can be developed and reviewed being considerably less than the number of available assessment scientists.

Between the two Science Centers, there are currently about 8 or 9 experienced stock assessment scientists available to lead assessments and 2-3 others who can assist on benchmarks or lead updates. The NW Center is in the process of backfilling a current vacancy (Dr. Hicks' former assessment slot), but it is never clear how long that will take nor how experienced the individual who is hired will be. In some past years, we have been successful in identifying talented PhD. candidates who can contribute as co-authors, but it is nearly impossible to predict who will be at a suitable place in their program and interested enough to serve in that capacity. Also, in addition to the list of assessments selected by the Council for 2017, two of the NW staff will be actively engaged in the assessment and review process for Pacific hake, which runs from November through March. In addition to the benchmark and update assessments, there are also likely to be catch-only updates requested as well as DB-SRA assessments that could be updated.

IV. Recommendations

Based on these considerations, the NOAA assessment programs recommend that 3 STAR Panels be held in 2017, where 5-6 species would be reviewed, depending on whether an entire Panel is devoted to the multi-area blue/deacon rockfish assessment (Table 1). All four of the species identified in April for full assessments are likely to include multiple, area-specific models. With either 5 or 6 total species, one Panel will still have to review two multi-area assessments, and both the yellowtail and lingcod assessments will have considerable new information relative to their last benchmark assessments. Of the four species from which 1 or 2 will be chosen, bank rockfish presents the most challenges. It has not been successfully assessed with an age/length-structured model previously, it is very challenging to age, and the trawl survey has averaged just 12 hauls per year that contained bank, over the last decade. Pacific ocean perch and blackgill rockfish would likely be the most straightforward to assess. Although greenspotted rockfish exhibits an unexpected decline in survey biomass, given its low fishing mortality, it is proposed for reconsideration for re-assessment during the 2019 cycle.

Along with these benchmark assessments, we would propose conducting 3 updates of prior assessments for previously-assessed species: bocaccio and darkblotched, which are expected to complete rebuilding, and arrowtooth flounder, which has the potential to become constraining and has had an increasing survey biomass trend since the last major assessment, in 2007.

With regard to STAR Panel timing, a calendar of possible dates is presented in Table 2. The option that would provide the most time for assessment development and write-up would have Panels begin on June 26, July 10, and July 24. Other options would be to schedule one Panel early, and have the last two begin June 26 and July 17, June 26 and July 24, or July 10 and July 24. The choice of April 24 or May 1 for the first Panel would determine whether those assessments would be reviewed by the SSC in June or September.

Table 1. Proposed Species for Assessment in 2017, and workload considerations.

Benchmarks	**Expected # of Areas Modeled**	**Assessors needed**
Blue	2 areas + WA DCAC	2-3
Yelloweye	2 areas	2
Yellowtail	2 areas, or more	2
Lingcod	2 areas	2
CA Scorpionfish	1 area	2-4 (max. of two, if the blue/deacon panel includes a 2nd species)
and/or Blackgill	1 area	
and/or POP	1 area	
and/or Bank	1-2 area	
		10-13
Pacific Hake	*1 area*	*2*
		12-15
Updates		
Darkblotched	1 area	1
Bocaccio	2 areas	1
Arrowtooth	1 area	1
		3 (less time)
Assessment staff available now:		
# of experienced assessment leaders		8-9
# of co-authors		2-3
# of additional assessors that may be available		2-3
		12-15

Table 2. Potential 2017 STAR Panel Dates

Notes: Available weeks highlighted in red
Council meetings highlighted in blue
Anticipated (approximate) briefing book deadlines highlighted in yellow