GROUNDFISH MANAGEMENT TEAM REPORT ON GROUNDFISH MANAGEMENT SCIENCE IMPROVEMENTS AND METHODOLOGY REVIEW TOPICS

The Groundfish Management Team (GMT) reviewed the materials under this agenda item and received additional information from Mr. John DeVore, during a joint discussion with the groundfish advisory (GAP) regarding these recommendations. The GMT discussed science activities in preparation for the 2017 stock assessment cycle, as well as projects to resolve significant scientific issues related to groundfish management. Overall, the GMT recognizes that the efforts of the National Marine Fisheries Service (NMFS) Science Centers provide the fundamental science used for conservation and management policies. The GMT recognizes the efforts to improve the accuracy and reliability of stock assessments as one of the most important tasks that can be done. Many of the recommendations put forth below were also recommended as part of the 2011 and 2013 cycles, but have not yet been resolved.

1. Recommendations of High Priority with Major Logistical Needs (not in order of priority)

Review and Synthesis of Stock-recruitment Parameters and Resulting Harvest Proxies

The current proxy F_{MSY} harvest rate that forms the basis for harvest control rules varies by species or species group with $F_{50\%}$ applied to rockfish and elasmobranchs, $F_{45\%}$ for roundfish like lingcod and sablefish, an $F_{40\%}$ harvest for whiting, and an $F_{30\%}$ for flatfish (http://www.pcouncil.org/wp-content/uploads/GF15_16_SpexFEISJanuary2015.pdf, Section 4.3). Generally speaking, higher proxy F_{MSY} values are associated with lower productivity stocks while lower values are associated with higher productivity stocks, since a stock with low productivity is more vulnerable to overfishing and vice versa. Productivity is reflected by the shape of the stock-recruitment curve, e.g., steepness in the Beverton-Holt curve, used in stock assessments. The accepted steepness prior for *Sebastes* species is estimated through an update to a meta-analysis of Tier 1 stocks (Dorn/Thorson prior, Table 1).

Table 1. Mean of the steepness prior for *Sebastes* species by assessment year.

Year	2007	2009	2011	2013	2015
Steepness	0.51	0.51	0.754	0.78	0.773

Given the increase in the steepness prior from 2009 to 2011, the GMT recommends that both the shape of the productivity curve and resulting F_{MSY} proxy for groundfish be reexamined during the off year if not within the 2017-2018 regulatory specification. With a greater number of assessed stocks contributing to the meta-analysis, it may now be possible to conduct the meta-analysis independently for rockfish species with differing life histories, e.g., black rockfish maturing at ~seven years of age vs. yelloweye rockfish maturing at age 22, for which differing SPR harvest rates may be justified. For example, during the Oregon kelp greenling STAR panel, it was

acknowledged that the stock is relatively productive compared to other species of roundfish (mature at two years old), which may justify an SPR harvest rate proxy closer to $F_{45\%}$. The same consideration also arose at the black rockfish STAR panel. **Therefore, the GMT recommends a synthesis of the stock-recruit productivity parameter and reconsideration of SPR harvest rates for these and other groundfish be analyzed as part of the off year science endeavors.** This is similar to the SSC's recommendation for a workshop on the shape of the stock productivity curve (also recommended in 2013).

Reconstruction of Historical Landings Time Series

Time series of historical landings are a key element for stock assessments, including the data-poor assessments, and have been a limiting factor in the ability to assess some West Coast fish stocks. California and Oregon have both produced reconstructions of historical landings time series for a number of species and fisheries. Washington projects that it will have a historical reconstruction by the summer of 2016. Once Washington completes its historical catch reconstruction, the **GMT recommends a workshop to review the historical reconstructions for all three states.** In addition to historical catch reconstruction efforts, the GMT also supports organization of a workshop focusing on the identification and utilization of historical databases (e.g., discard studies) not commonly provided for use in stock assessments. The workshop will depend heavily on the involvement of state agency representatives and those with expert knowledge of the fisheries and their histories. **The GMT also recommends the workshop review analyses available to provide estimates of uncertainty and discard in these fisheries.** Both the GMT and SSC have recommended this task since 2011.

Standardization of Recreational Fishery Data and CPUE Indices

Many of the recent stock assessments, especially for nearshore species, depend heavily on fishery-dependent recreational indices of abundance. It has been common for each STAT team and stock assessment analyst to data mine the available fishery-dependent recreational dockside data sources from each state. This results in each stock assessment treating the data in a different manner, where consistency among data sources and stock assessments is preferred.

The databases include the historical Marine Recreational Fisheries Statistics Survey (MRFSS in all three states), the California Fisheries Recreational Survey (CRFS), the Oregon Recreational Boat Survey (ORBS), and the Washington Ocean Sampling Program (OSP). For the historic MRFSS survey, dockside interviews need to be properly aggregated to the trip level (in the current database, multiple interviews from the same trip are separated). Efforts have been made to aggregate the data to the trip-level in California and need to be reviewed, and similar efforts need to be completed for Oregon and Washington. In addition, each database should be checked for errors with changes well documented, i.e., (1) remove or flag computed biological records; (2) remove erroneous biological samples. **The GMT recommends that there be a collaborative effort between the state agencies and NMFS to develop the reconstructed databases across all fishing modes sampled (i.e., private boats, charter boats, shore mode, etc.).** All such effort should be well documented, including survey design changes, computed vs actual data. **The GMT then recommends a workshop to review the trip-level databases, which will depend heavily on state agency participation. The approved databases should be made available to all analysts for future stock assessments and incorporated into RecFIN. The GMT also recommends that the workshop provides guidelines on best practices for analyzing the data for CPUE indices, such as data filtering.**

B_{MSY} and B_0 workshop

The idea of this type of workshop has been mentioned previously, by both the GMT, GAP, and SSC. We continue to support the idea. As we understand it, the focus involves a look at the Council's harvest policies to inform several outstanding questions (e.g., the appropriateness of the Fishery Management Plan's (FMP's) B_{MSY} and F_{MSY} proxies). Also, such analysis will help explore considerations of additional flexibility and conservation objectives that are being discussed nationally (e.g., "pretty good yield" and the mixed stock exception). **The GMT recommends a B_{MSY}/B_0 workshop to advance the Council's harvest policy framework.**

Natural mortality

Natural mortality is a difficult parameter to estimate for any fish species, and is often the axis of uncertainty for decision tables. Assessments accordingly are often sensitive to the choice of life history parameters (when fixed). Some assessments incorporated an increase in natural mortality for post-maturity females (e.g., canary rockfish in 2015), and such assessments can be extremely sensitive to the choice of natural mortality parameters and the increase in female natural mortality rate. While natural mortality was incorporated as an axis of uncertainty, it is not one-dimensional in the case of these females (depending on the pre- and post- maturity values of natural mortality, the slope of the ramp between the two values, and the age at which natural mortality begins to increase). **The GMT recommends that further investigation be conducted on the effects of age-specific natural mortality and the absence of females in the data above a given age.**

2. Recommendations of Lower Priority (not in order of priority)

Workshop on transboundary stocks

The GMT recommends a workshop on transboundary stocks. We understand there is a limit to the improvement on scientific research and stock assessments that cannot be made without international cooperation. Therefore, the GMT recommends such a workshop only with participation of Canadian and/or Mexican scientists.

Research and exploratory analyses related to ecosystem considerations

We continue to support efforts by the Ecosystem Work Group to develop ecosystem analyses (e.g., integrated ecosystem assessments) that inform stock assessments. The GMT strives to connect our understanding of ecosystem impacts within the context of management decision-making, stock status, etc. This will provide greater context for the effect of various Council actions and policies on the marine environment.

3. Summary Recommendations (not in priority order)

1. **Explore data moderate assessments and methods and their applications.**

2. **A workshop on stock-recruitment relationships, including reconsideration of proxy SPR harvest rates.**

3. **A workshop to review the historical catch reconstructions for all three states. There should be analyses available that provide estimates of uncertainty in these catch estimates, including the amount of discard in these fisheries.**

4. **A collaborative effort between the state agencies and NMFS to develop recreational databases across all fishing modes sampled (i.e., private boats, charter boats, shore mode, etc.).**

5. **A workshop to review the trip-level recreational databases, which will depend heavily on state agency participation. The approved databases should be made available to all analysts for future stock assessments and incorporated into RecFIN. The GMT also recommends that the workshop provides guidelines on best practices for analyzing the data for CPUE indices, such as data filtering.**

6. **A B_{MSY}/B_0 workshop to advance the Council's harvest policy framework.**

7. **A further investigation on the effects of age-specific natural mortality.**

PFMC
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