The Groundfish Subcommittee of the Pacific Fishery Management Council’s Scientific and Statistical Committee (SSCGS) met on September 26-30, 2011 at the Alaska Fisheries Science Center in Seattle, WA to review stock assessments for three groundfish species (i.e., widow rockfish, bocaccio and darkblotched rockfish), and rebuilding analyses for six overfished groundfish stocks (i.e., Pacific ocean perch (POP), petrale sole, canary rockfish, yelloweye rockfish, bocaccio and darkblotched rockfish), all managed by the Council. One reviewer from the Center for Independent Experts (CIE) was also in attendance and participated in the review.
WIDOW ROCKFISH ASSESSMENT REVIEW REPORT

Overview
This year, a full assessment was conducted of widow rockfish (*Sebastes entomelas*) in the waters of the U.S. west coast. The widow rockfish STAR Panel, which met on July 11-15, 2011, did not endorse the base assessment model for management use and instead recommended alternative model configurations be investigated. The issues raised by the 2011 STAR Panel were similar to concerns expressed by the 2009 widow rockfish STAR Panel.

The SSC reviewed both the widow rockfish assessment document and the STAR Panel report and agreed that it would be beneficial to explore alternative model configurations prior to endorsing a base model for use in this management cycle. Further, the SSC developed a list of analyses for the widow rockfish stock assessment team (STAT) to perform. These requested analyses focused on the set of issues identified by the 2011 widow rockfish STAR Panel. The STAT conducted the requested runs and developed a revised draft of the assessment document. This revised draft assessment was reviewed by the SSCGS. During the SSCGS review, a number of additional analyses were requested to better understand model performance and to converge on a single base case model, which both the STAT and SSCGS agreed upon.

The new base model estimates that the stock of widow rockfish off the U.S. west coast is currently at 51.1% of its unexploited level, which is above the management target of SB₄₀% and, therefore, successfully rebuilt. The SSCGS agreed that this widow rockfish assessment constitutes the best available scientific information on the status of the species in the assessed area and recommends it to be used for status determination and management decision-making in the Council process.

Summary of data and assessment models
The last full assessment of widow rockfish was conducted in 2009, which estimated the stock to be at 38.5% of its unfished level. Major changes made in this assessment, compared with the previous one, are listed below:

- This is a one-area assessment. Previously, the assessment area was divided into two sub-areas to reflect differences in growth. The results of the growth variability study (conducted in the early 1990s) were re-evaluated and found insufficient to support the two-area assumption for the assessment.
- Selectivity curves are assumed to be length-based (instead of the previously used age-based assumption).
- Survey selectivities are assumed to be asymptotic (instead of dome-shaped as in the previous assessment).
- Selectivities of fishing fleets are blocked between 2002 and 2003 to account for implementation of the Rockfish Conservation Areas (RCAs).
- Steepness of the stock-recruitment curve \((h)\) is fixed at 0.76 (based on the most recent meta-analysis of rockfish productivity, Martin Dorn, pers. com.) since the assessment is unable to estimate this parameter reliably. In the previous assessment, \(h\) was estimated.
- Natural mortality \((M)\) is estimated for females and males separately using the \(M\) prior (Owen Hamel, pers. com.), instead of being fixed as in the previous assessment.
The assessment uses the Stock Synthesis (SS) modeling framework (version 3.22b) and incorporates a variety of fishery-dependent and fishery-independent data sources. The resource is assumed to be a single stock within the assessment area. The fishery-dependent data are distributed among five fisheries, including a Washington fishery (all gears combined), an Oregon bottom trawl fishery, an Oregon midwater trawl fishery, a California fishery (all gears combined) and the domestic at-sea Pacific hake fishery (where widow rockfish is a bycatch species). Fishery-independent data sources include two bottom trawl surveys: the Northwest Fishery Science Center’s (NWFSC) shelf-slope survey (which has operated annually since 2003) and the Alaska Fishery Science Center (AFSC) triennial survey (which operated historically, but is now discontinued). The assessment also utilizes data from the Southwest Fisheries Science Center’s (SWFSC) pelagic juvenile survey, performed with midwater trawl gear, and uses three CPUE indices from the at-sea Pacific hake fishery as well as an Oregon bottom trawl logbook CPUE index.

Requests by the SSC and Responses by the STAT
The following analyses were requested by the SSC prior to the SSCGS meeting to be conducted by the STAT.

Request 1: Develop a one-area model and provide a detailed comparison of results assuming a one-area model with results from the pre-STAR two-area model. The one-area model should use the assumptions of the pre-STAR model with respect to fishery delineation, selectivity, and natural mortality. Growth parameters should be representative of the population as a whole, rather than of northern and/or southern areas. Fishery-independent data (i.e., the NWFSC slope-shelf and AFSC triennial surveys) should be reanalyzed using the GLMM approach to provide appropriate stock-level indices.

Rationale: The two-area assumption was based on results of a dated and noisy study of widow rockfish (Pearson and Hightower 1991), which found significant differences in growth between genders, area, and among years. The age data used in the study were generated by different readers, labs, and ageing methods. Although everything tested in the study produced significant differences, those differences among years were dismissed, but those among areas were embraced, while common reasons existed to doubt the biological significance of both. No other information on spatial variability in life history parameters in widow rockfish is currently available.

STAT Response: The STAT compared models with one- and two-area assumptions following the SSC suggestions. While the model outputs are not drastically different, the one-area model is simpler and more stable. The use of all length and age data within a one-area model allowed (for the first time) the estimation of growth parameters within the model (instead of fixing two sets of growth parameters at externally estimated values in the two-area model). The use of a one-area model relieved the need to (subjectively) assign a percentage of recruits between two areas in the two-area model. Combining relatively sparse survey biological samples (previously divided between two areas) allowed more reliable estimation of selectivity parameters. Both the STAT and the SSC GS agreed to retain one area model for the “new” base case.

Request 2: Explore the use of length-based vs. age-based selectivity. Compile length compositions for all fisheries and surveys. Evaluate the relative merits of assuming that the
selection process for fisheries and surveys is primarily length- or age-based from a theoretical perspective, considering the characteristics of widow rockfish biology and relevant features of the fishery. Compare models with length-based and age-based selectivity (for each individual fishery and survey, then for all fisheries and surveys at the same time). Evaluate differences in model fit, overall plausibility of the selectivity patterns, and whether parameters are robustly estimated.

**Rationale:** Currently, there is no information available that would suggest the presence of age-specific aggregations in widow rockfish. The use of length-based selectivity is considered a simpler and more realistic way to model selectivity.

**STAT Response:** The model with length-based selectivity produced reasonable selectivity curves (unlike the model with age-based selectivity). Also, the model with length-based selectivity was found by the STAT to be more stable. This change was retained for the “new” base case model.

**Request 3:** Explore asymptotic vs. dome-shaped selectivity assumptions. Provide results from a structured stepwise approach, beginning with an asymptotic selectivity assumption for all surveys and fisheries, and moving incrementally to more complex models with dome-shaped selectivity. Survey selectivity patterns should be considered asymptotic unless a plausible biological justification can be provided. Criteria for evaluating fishery selectivity patterns are less rigorous, but should include improvements in model fit, overall plausibility, and whether parameters are robustly estimated. A common rule of thumb is that at least one fishery should be assumed asymptotic to ensure stable model behavior.

**Rationale:** The pre-STAR model assumed all fishery selectivities to be dome-shaped without explaining why that would be the most appropriate assumption. The STAR Panel requested to provide more information on population distributions and fishing locations to justify the use of a particular selectivity pattern.

**STAT Response:** The STAT provided a comparison between two models – one with all selectivities allowed to be dome-shaped (pre-STAR model) and one with all selectivities fixed asymptotic. At the SSCGS meeting, selectivity assumptions were explored further.

**Request 4:** Compare model runs with and without the prior for natural mortality ($M$), developed by Owen Hamel. The value of $M$ (when estimated) is confounded with the downward slope of (dome-shaped) selectivity, and therefore sensitivities should include estimating $M$ in models with one or more asymptotic selectivity patterns.

**Rationale:** To utilize the most up-to-date information available to inform natural mortality.

**STAT Response:** Priors for natural mortality ($M$) were provided by Owen Hamel (pers. com.) for females and males. Comparison of models with natural mortality estimated with and without $M$ priors were conducted using the model with stock-recruit steepness ($h$) fixed at 0.76. The estimated $M$ values were very close when priors were and were not used. Differences of estimated $B_0$ and depletion differ between the runs by less than 0.3%. In the “new” base model, it was agreed to estimate naturally mortality (for each gender separately) using the Hamel priors.

**SSCGS panel requests**
At the meeting, the SSCGS requested a number of additional model runs to further explore model behavior and identify the major axes of uncertainty to formulate alternative states of nature. The runs requested, the rationale, and the STAT responses are listed below.
Request 5: For the model with fishery selectivities estimated (before re-weighting) plot length-based selectivity patterns for all fisheries.
Rationale: To evaluate which selectivity pattern (asymptotic or dome-shaped) is more reasonable for widow rockfish fisheries.

STAT Response: When selectivity parameters were freed up, the selectivity curves are estimated to be dome-shaped for all fisheries, except for the at-sea Pacific whiting fleet (ASP), which is estimated to have an asymptotic selectivity pattern. The start of the descending limb for dome-shaped selectivity curves corresponds to sizes much smaller than asymptotic length (≈51cm). The analysis did not provide evidence for asymptotic selectivity in Washington, Oregon and California trawl fisheries. For the “new” base mode, it was agreed to allow selectivity curves to be estimated for all fisheries, except for ASP (fixed asymptotic). ASP is an offshore fishery, which might explain the fact that it tends to be asymptotic (due to possible ontogenetic movement of larger (older) organisms to deeper waters observed in many rockfish).

Request 6: Plot the likelihood profiles by component (age composition, length composition, etc.) as detailed as reasonable (by fleet) across \( h \) and \( M \) (with one of these two parameters being estimated) for two model configurations: 1) with fishery selectivities fixed asymptotic, and 2) with fishery selectivities estimated, without reweighting.
Rationale: Evaluate whether the model has data to inform steepness and natural mortality (which is confounded with selectivity).

STAT Response: The model consistently estimates the natural mortality of females and males (treated in the model separately) to be close to the Hamel priors. The model, however, is very uninformative about the level of stock-recruit steepness. Model runs with steepness fixed at values from 0.25 to 0.95 differ in less than 2 likelihood points (even though the depletion varies considerably in those runs). It was agreed to fix the steepness at the mean of the prior (0.76) from the meta-analysis of rockfish steepness (Martin Dorn, pers. com.) for the “new” base model and define low and high states of nature (for the decision table) based on alternative values for stock-recruit steepness.

Request 7: Use spawning stock biomass as a measure of a productive portion of the stock (instead of spawning output).
Rationale: A recent meta-analysis of rockfish fecundity (Dick 2009) found no significant relationship between body weight and fecundity in widow rockfish.

STAT Response: The switch to spawning stock biomass (from spawning output) did not produce noticeable changes in model output.

Request 8: Remove the male offset in fishery selectivities.
Rationale: There is no a priori biological reason for differences in selectivity between sexes.

STAT Response: Male selectivity offsets were removed.

Request 9: Block fishery selectivities (all but ASP) between 2002 and 2003.
Rationale: To account for changes in selectivities due to implementation of the Rockfish Conservation Areas (RCAs).

STAT Response: For the early time block (≤ 2002), all selectivities were estimated to be strongly dome-shaped. Between 2003 and 2010, Washington and California fisheries were
estimated to be much less domed while Oregon fisheries went asymptotic, possibly due to the shift of fishing efforts to more offshore areas after implementations of the RCA (offshore ASP fishery is consistently estimated asymptotic). The time block in fishery selectivities was retained for the “new” base model.

**Request 10:** Provide details on what ageing methods were employed to generate age data from different sources (especially for the early time period).

**Rationale:** To explore the reliability of a signal in the age data for the extremely high year class in 1970.

**STAT Response:** All California widow rockfish were aged using the break and burn technique for all years going back to the 1978 sample year. All Oregon ages from at least 1982 forward were aged using the break and burn technique. It is possible that 1979, 1980 and 1981 otoliths were surface-aged given the lack of older fish. For Washington samples, ages were determined using the break and burn technique since the late 1980's. Prior to about 1988, they were surface read. The strong year class can be tracked in age composition data through time in every fishery indicating that the data from different sources are in agreement in regards to a strong 1970 recruitment event.

**Request 11:** Evaluate the reliability of the discard rate used in the assessment for the mid-1980s.

**Rationale:** The GMT provided recent discard estimates from the Pikitch study (Pikitch et al. 1988) suggesting that, under a particular range of trip limits, discard rates of widow rockfish might have been much higher (up to 54% of total catch) than assumed in the assessment (16%).

**STAT Response:** When averaged within a year, the discard rates in bottom and midwater trawl fisheries were consistent with the rate used in the model (16% of the total removals for the period of 1984-2006). It was agreed to retain the current discard assumption in the model, but explore it further for the next assessment.

**Description of the base model and alternative models used to bracket uncertainty**

Start year of the model =1916; unfished equilibrium in 1915;
One area; two genders; plus group age =35 years.
Discard incorporated with landings into total removals (for all fisheries, discard rate of 6% is assumed for 1916-1983, 16% for 1983-2006, and WCGOP total mortality estimates are used for 2007-2010).

\[ M = 0.119 \text{ yr}^{-1} \] (for females) and \[ M=0.12 \text{ yr}^{-1} \] (for males), both estimated using the Hamel priors;
Von Bertalanffy growth model, all parameters are estimated for both genders;
Beverton-Holt stock-recruitment model, \( h \) fixed at 0.76 (Dorn prior), \( R_0 \) estimated, recruitments deviations estimated;
Length-based selectivity for all fleets, selectivity for all fisheries, except ASP, is blocked between 2002 and 2003 to account for implementation of the Rockfish Conservation Areas (RCAs).

**Fisheries:**
- Washington fishery (all gears combined)
- Oregon bottom trawl
- Oregon midwater trawl
- California fishery (all gears combined)
Abundance indices:
- NWFSC shelf-slope bottom trawl survey (2003-2010)
- Midwater trawl pelagic juvenile survey (2001-2009)
- Oregon bottom trawl logbook CPUE index (1984-2002)
- At-sea Pacific whiting foreign fishery CPUE bycatch index (1977-1988)
- At-sea Pacific whiting joint venture fishery CPUE bycatch index (1983-1990)

Length data:
- Washington fishery (all gears combined)
- Oregon bottom trawl
- Oregon midwater trawl
- California fishery (all gears combined)
- At-sea Pacific whiting fishery
- NWFSC shelf-slope bottom trawl survey
- AFSC triennial shelf bottom trawl survey

Age data:
- Washington fishery (all gears combined)
- Oregon bottom trawl
- Oregon midwater trawl
- California fishery (all gears combined)
- At-sea Pacific whiting fishery
- NWFSC shelf-slope bottom trawl survey

The SSCGS and the STAT agreed that stock-recruit steepness is the single greatest source of uncertainty in the assessment (see Request 6). In the base model, steepness was fixed at the level of 0.76 (i.e., the Dorn prior). The decision table was developed to bracket model uncertainty in widow rockfish productivity with alternative values of steepness. The 12.5% and 87.5% quantiles from the prior distribution on $h$ translate into steepness values of 0.54 and 0.95 respectively. This range was considered reasonable to account for the uncertainty associated with steepness. It was, however, agreed to shift this range to lower steepness values to (a) take account of the data which, while not greatly informative, did provide some evidence for a lower steepness value, and (b) provide continuity by considering the value of steepness used in the 2009 assessment (0.41). As a result, steepness values of 0.41 and 0.90 were used for the low and the high states of nature.

Technical merits
This assessment has a simplified model structure (one area) and a reduced number of parameters, compared to previous assessments for this stock. The assessment also uses the most up-to-date external analyses to inform key life history parameters (such as steepness and natural mortality), including the most recent Dorn prior on $h$ and sex-specific Hamel priors on $M$.

Technical deficiencies
The assessment is unable to produce a reliable estimate of stock-recruit steepness. The model, therefore, uses a fixed value that represents an average value for all rockfish and therefore the extent of uncertainty in model results is underestimated.
Areas of disagreement regarding SSCGS recommendations
There were no disagreements among SSCGS members, and the SSCGS and the STAT.

Unresolved problems and major uncertainties
Stock-recruit steepness is the single greatest source of uncertainty in the assessment, since no data currently exist to reliably estimate widow rockfish productivity. In the assessment, steepness was used as the major axis of uncertainty, and the decision table was developed based on the alternative assumptions about this parameter.

Discard assumptions in the assessment are based on the very limited discard data, which contributes to the uncertainty in the time series of fishery removals. Also, the assessment does not include removals by the foreign and joint-venture at-sea Pacific hake (ASP) fisheries, even though it utilizes ASP data to develop CPUE indices.

Recommendations for future research and data collection (not prioritized)
The SSCGS recommends devoting additional efforts to reconstructing historical landings. This recommendation also applies to most groundfish species on the U.S. West Coast (and not only widow rockfish). In addition to providing the best reconstructed catch histories by species, this effort should develop alternative catch streams that would reflect differences in data quantity and quality available for different time periods. Such (more realistic) alternative catch streams would be very useful while exploring model sensitivity to uncertainty in catch history (rather than applying a simple multiplier to the entire catch time series, which is currently the case for most groundfish assessments).

The SSCGS also recommends further exploration of historical discards, especially given that more detailed (trip limit specific) historical discard information (GMT discard rate estimates from the Pikitch study) has become available.

The SSCGS suggests revisiting the fleet structure used in the assessment, particular exploring the option of splitting bottom and midwater trawl fisheries in Washington and California, and/or evaluating the need of treating bottom and midwater Oregon trawl fisheries separately.

The assessment includes a number of “legacy” data sources (for example, Oregon bottom trawl logbook CPUE index); however, those sources lack proper documentation on the how the data were collected and analyzed. The SSCGS recommends revisiting those “legacy” sources and considering whether these data sources still contribute to the assessment. If the “legacy” data sources are still considered valuable, detailed information should be provided for each.

The assessment utilizes age data from six different sources (state agencies and NOAA Fisheries’ science centers). These data were generated by different age readers, labs, and through different methods in some cases. However, only one ageing error matrix is used in the assessment (developed based on double reads form the most recently collected otoliths). The SSCGS recommends generating additional double reads (and age error matrices) to more accurately account for ageing error associated with data from different sources.
At the review meeting, efforts were devoted to exploring different assumptions regarding fishery selectivity patterns (dome-shaped and asymptotic). The SSCGS recommends further investigation of the theoretical basis for selecting particular patterns for different fisheries and evaluation of data (biological and fishery-related) which would provide information on this issue.

References
Dick, E.. 2009. Modeling the reproductive potential of rockfishes (Sebastes spp.). Doctoral dissertation, University of California, Santa Cruz, USA.
The update assessment of bocaccio rockfish (*Sebastes paucispinis*) in the Conception, Monterey and Eureka INPFC areas was conducted this year. This update assessment was reviewed by the SSC at the June 2011 Council meeting in Spokane, WA. The assessment was found by the SSC not to meet the terms of reference for an update, as significant changes in the model structure and data were made (in order to avoid what the STAT found to be unrealistic results from the traditional update assessment). The unrealistic result was an extremely strong 2010 year class, inferred from the length frequency data collected in the NWFSC shelf-slope trawl survey. Although other data sources also suggest that the 2010 year class may be well above average, the magnitude of the 2010 recruitment estimate (from the traditional update assessment) was unprecedented. A year class of this magnitude has a large influence on bocaccio stock dynamics, and would result in the stock reaching the rebuilding target in 2013 (regardless of catch levels (up to OFL)), when this year class would become mature.

The STAT proposed a base model that uses a time series of pre-recruit (age 0) abundance data from the power plant impingement dataset. This index was not included in the 2009 base model; however, it was re-evaluated following the 2009 stock assessment, when updated data became available. It was subsequently found to have a strong correlation with the model estimates of recruitments. The STAT considered this index a more reliable indicator of impending year class strength than the NWFSC shelf-slope trawl dataset.

In a full assessment, alternative approaches would typically be evaluated to deal with sensitivity to exceptional data, but this is not possible with an update assessment where no changes in the model or data sets used in the full assessment are allowed. At its June 2011 meeting, the SSC recommended that the bocaccio assessment be revisited at the SSCGS meeting in September to consider a narrow set of data issues related to the estimated strength of the 2010 year class. The SSC developed a list of analyses for the STAT to undertake prior to the SSCGS meeting. These requested analyses (listed below) as well as STAT responses to these requests were reviewed by the SSCGS.

**Request 1a**: Evaluate models with time-varying selectivity for the NWFSC trawl survey.
**Response**: Estimating separate year-specific selectivity for 2010 did not reduce the size of the 2010 year-class to any great extent.

**Request 1b**: Evaluate models where the selectivity of the NWFSC trawl survey for young-of-the-year bocaccio is decoupled from that for the older fish.
**STAT Response**: This was done and became part of the new base case.

**Request 2**: Evaluate models in which the abundance of young-of-the-year bocaccio is modeled as a separate recruitment index with an estimated catchability coefficient.
**Response**: A recruitment index was developed but was not used in any model testing. There were several years with no observations of young-of-the-year bocaccio and abundance in 2010 far exceeded any previous value, so it was not feasible to develop a recruitment index that would be useful for stock assessment.
**Request 3:** Evaluate models where the newly updated power plant impingement data set is included as a recruitment index (as the STAT proposed within the current update).

**Response:** This was done and became part of the new base case.

**Request 4:** Consider other time series (e.g. sport fishery length data) that may be informative about bocaccio recruitment strength.

**Response:** Length data from the sport fishery through April 2011 were examined. No indication of a strong 2010 year class was yet apparent as of April 2011.

The SSCGS agreed that the assessment model presented at the SSCGS meeting (STAT model in the revised assessment document) constitutes the best available scientific information on the status of the species in the assessed area, and recommends it to be used for status determination and management decision-making in the Council process.

The SSCGS requested the STAT revise the decision table using potential recruitment levels as the major axis of uncertainty (rather than continue to use the decision table from the 2009 full assessment, based on uncertainty in indices of abundance). Alternative states of nature for the revised decision table were defined by up-weighting and down-weighting the influence of the impingement survey. For the low state of nature, the weight given to the impingement survey was increased ($\lambda = 10$) relative to the base case ($\lambda = 1$), leading to a more optimistic estimate of the strength of the 2010 year class. For the high state of nature, the weight given to the impingement survey was decreased ($\lambda = 0.1$), leading to a more pessimistic estimate of the strength of the 2010 year class. The choice of the optimistic and pessimistic levels for the strength of the 2010 year class is data-driven to a reasonable extent, and is generally consistent with the weighting scheme used by the STAT to develop the states of nature for the decision table used in 2009.

The SSCGS noted that this year’s bocaccio assessment could be considered neither an update nor a full assessment according to strict compliance with the groundfish terms of reference for stock assessments.

Finally, it should be noted that by the March or April 2012 Council meetings, additional fishery and survey data will be available that may help to better evaluate the strength of the 2010 year class. If the Council would like to incorporate this information in the assessment to set 2013-14 harvest specifications, the SSC would be willing to discuss at the March 2012 meeting the potential for a process – short of an assessment update – that could analyze and interpret the new data, and advise the Council as to whether these data qualitatively change the perception of the strength of the 2010 year class presented in the bocaccio assessment.
The SSCGS reviewed the revised assessment document for darkblotched rockfish (*Sebastes crameri*) in the waters off Washington, Oregon, and California. The last full assessment of darkblotched rockfish was conducted in 2007, and it was subsequently updated in 2009. Another update assessment was conducted this year, and this update was reviewed by the SSC at the June 2011 Council meeting in Spokane, WA. In 2011, the update assessment that was presented at the June 2011 Council meeting estimated the 2009 depletion to be 15.1%, which is lower than the depletion of 27.5% reported in the 2009 update assessment. Such magnitude of change in perceived stock status is greater than would normally be expected for an update assessment. Therefore, the Council recommended the darkblotched assessment be revisited at the SSCGS meeting in September. Following the Council recommendation, the SSC developed a list of analyses for the STAT to undertake prior to the SSCGS meeting. These requested runs focused on the narrow set of issues related to the data and methods used in the 2011 update assessment, to allow investigation of factors that caused the changes in stock status. The STAT conducted the requested runs and developed a revised draft of the assessment document. This revised draft assessment was reviewed by the SSCGS. The SSC requests and the STAT responses (presented at the SSCGS meeting) are listed below.

**Request 1:** Conduct a thorough step-wise evaluation of new and modified data used in the assessment.

**Response:** Results from nine model runs were presented to demonstrate the impacts of incremental additions of data to the model. None of the data sources was identified as a single source contributing to the difference in stock status caused by adding 2009 and 2010 data.

**Request 2:** Evaluate models with the NWFSC shelf and slope surveys combined, rather than modeling them separately.

**Response:** A more depleted status of the stock was estimated from this run, which suggests that the treatment of survey data is influential. It was agreed to retain the survey structure as in the latest full assessment, but explore an alternative option (such as combining slope and shelf portions of the survey) for the next assessment.

**Request 3:** Reconsider the assumed value of stock-recruit steepness given the results of more recent meta-analysis suggesting higher steepness for rockfish (Martin Dorn, pers. com.).

**Response:** Steepness of 0.7 was used in the revised 2011 assessment (instead of the value of 0.6 used in the 2007 full assessment and 2009 update).

**Request 4:** Conduct an analysis of the spatial pattern of large (>30 cm) darkblotched rockfish in the NWFSC slope-shelf survey. Compare patchiness for different survey years.

**Response:** Results of the requested analysis indicated that darkblotched rockfish exhibit a highly patchy distribution, and the NWFSC slope trawl survey might not be very effective in sampling darkblotched rockfish. However, in the assessment survey data were properly weighted to account for patchiness of the species distribution.

At the meeting, the SSCGS decided on a number of additional model runs for the STAT to undertake. These runs were designed to further explore data sources that drive the change in
estimated stock status and identify the major source of uncertainty in the assessment. The runs requested by the SSCGS and the STAT responses are listed below.

**Request 5:** Explore the incremental effect of adding 2009-2010 composition data (by source) from fishery and NWFSC surveys:
- a) Remove age composition data from fishery and discard sampling, and then those from survey sampling;
- b) Remove length composition data from fishery and discard sampling, and then those from survey sampling.

**Response:** Removal of age composition data (by source) has little effect on recruitment estimates of and spawning output depletion. Removal of length compositions together with age data (due to the use of conditional age composition data) in NWFSC slope survey accounted for about 30% of the difference in recruitment estimates and depletion status.

**Request 6:** Explore the effects of recent survey indices on model outputs:
- a) Remove 2008-2010 CPUE estimates from the NWFSC shelf survey;
- b) Remove 2009-2010 CPUE estimates from the NWFSC slope survey

**Response:** Removal of latter yeas from NWFSC shelf and slope surveys has no effect on model outputs.

**Request 7:** Explore fishery and NWFSC slope survey selectivities:
- a) For fishery selectivity, evaluate the use of time blocks to account for implementation of the Rockfish Conservation Areas (RCAs) at the end of 2002. Use asymptotic selectivity prior to 2003 and allow a dome-shaped selectivity curve for the recent period starting in 2003;
- b) For the NWFSC slope survey, allow dome-shaped selectivity (in the 2007 full assessment, the survey selectivity was estimated and then fixed to be asymptotic).

**Response:** a) Post 2002 fishery selectivity has only a slight drop at the descending limb and had little impact on the model outputs; b) NWFSC slope selectivity estimated to be dome-shaped and not asymptotic as in the 2007 assessment and had a modest effect on model output. It was agreed not to use time blocks for fishery selectivity, but allow dome-shaped selectivity for the NWFSC slope survey in the “new” base model.

**Request 8:** Provide a likelihood profile on stock-recruit steepness with and without selectivity patterns specified in the previous request (Request 7).

**Response:** Changing survey and fishery selectivity patterns has little effects on likelihood and stock depletion levels. About 90% of the change in depletion is due to the changes in stock-recruit steepness. The 2007 full assessment assumed a steepness of 0.6 (estimated and then fixed in the model). In the 2009 update assessment, the value of steepness was kept unchanged (fixed at 0.6). In the 2011 assessment, when steepness is estimated within the model, estimated values tends to be high (hitting the upper bound). It was agreed to fix the steepness at the mean of the most recent Dorn prior (0.76) from the meta-analysis of rockfish productivity for the “new” base model, to take into account new data in the model that suggest higher steepness than used in the last full assessment (based on the estimate from the data through 2006).
The new base model estimates that the stock of darkblotched rockfish off the U.S. west coast is currently at 30% of its unexploited level. Depletion for 2009 estimated by the base model (26%) is comparable to the depletion level estimated by the 2009 update (28%). The SSCGS agreed that the revised darkblotched rockfish assessment constitutes the best available scientific information on the status of the species in the assessed area and recommends it to be used for status determination and management decision-making in the Council process.

The SSCGS recommended the STAT revise the decision table using alternative values of stock-recruit steepness as major axis of uncertainty rather than continue to use the decision table from the 2007 full assessment based on natural mortality. Alternative steepness values were calculated as the 12.5% and 87.5% quantiles from the prior distribution on $h$, which resulted in steepness values of 0.54 and 0.95 for the low and the high states of nature, respectively.

The SSCGS suggests conducting a full assessment next time the species is assessed to allow further exploration of survey data treatment (use of the combined shelf-slope survey vs. treating shelf and slope portions of the survey separately), as well as changes in selectivity assumptions.
REBUILDING ANALYSES

The SSCGS reviewed rebuilding analyses for six overfished groundfish stocks managed by the Council, including Pacific ocean perch (POP), petrale sole, canary rockfish, yelloweye rockfish, bocaccio, and darkblotched rockfish.

Current rebuilding harvest rates, expressed as spawning potential ratio (SPR), and median times to rebuild (T\text{TARGET}) for the overfished stocks are directly linked to one another and individually they reflect specific decisions the Council has previously made concerning rebuilding in as short a time as possible, while taking into account the appropriate factors from the Magnuson-Stevens Fishery Conservation and Management Act. Amendment 16-4 to the groundfish FMP adopted specific SPRs and T\text{TARGET} values for each stock. From a regulatory basis, maintaining stability in current harvest rates (SPRs) would be desirable, presuming there have been no fundamental changes in perceptions about stock productivity. However, all SPRs and T\text{TARGET} values were modified last year by the Council given the results of the 2009 rebuilding analyses.

The SSCGS reviewed: (a) whether cumulative catches during the period of rebuilding exceeded the cumulative OY/ACL that was available, (b) whether the proper data and software were used to satisfy all the technical requirements for accuracy, (c) whether the biological parameters in the stock assessment had been revised to such an extent as to warrant a change in T\text{TARGET}, (d) whether progress towards rebuilding is deemed to be adequate, (e) whether there is a discrepancy between the current T\text{TARGET} and the median time to rebuild under the currently adopted rebuilding harvest rate (T\text{REBUID}), and if so, what a new maximum time to rebuild (T\text{MAX(NEW)}) should be, given the National Standard 1 guidelines and, secondarily, if the currently adopted SPR harvest rate will likely rebuild the stock before this T\text{MAX(NEW)}.

Figure 1 (below) shows relative population trajectories of overfished groundfish stocks since 1980. Table 1 summarizes the deliberations of the Panel in regard to issues (a) – (e). Based on this table, the Panel notes the following:

a) Catches of five of the six overfished species stocks have been lower than what was available as a cumulative OY/ACL during the period of rebuilding. The only exception is canary rockfish, which exceeded its cumulative OY/ACL by 18.5% over the period of 2001-2010. However, the percentage has steadily decreased (which is evident from changes in the running four year average), reflecting active management. In four of the six other cases, catches have been below the available OY/ACL. The estimate of the 2007 POP catch from the 2007 West Coast Groundfish Observer Program (WCGOP) total mortality report indicated the rebuilding OY in 2007 was exceeded by 4%, but the cumulative catch estimated in the assessment model for 2000-2010 is only 52.2% of the cumulative rebuilding plan OYs for this period, indicating that in-season management has been successful in implementing the POP rebuilding plan. In general, management has been quite effective at curtailing fishing mortality on the overfished stocks in order to rebuild them as quickly as possible.

b) All rebuilding analyses met the appropriate technical requirements by utilizing the latest version of the rebuilding program and by using the appropriate outputs from the rebuilding program.
c) In three cases (yelloweye rockfish, bocaccio and darkblotched rockfish) rebuilding is one to eight years ahead of schedule. For these stocks, progress towards rebuilding is considered adequate, and the Panel recommends that no redefinition of T_{TARGET} or adjustment to the rebuilding harvest rate is necessary.

d) Two stocks are behind schedule and are very unlikely to rebuild by the current T_{TARGET}: canary rockfish and POP. Canary rockfish rebuilding is three years behind schedule. Although this deviation is relatively minor due to the sensitivity in the estimated median time to rebuild at different SPR rates, results indicate that even if all harvest is eliminated from 2013 onwards, there is slightly less than 50% probability that the stock will rebuild by the current T_{TARGET} (2027). For POP, if the current SPR rate in the rebuilding plan (0.864) is maintained, the stock would not rebuild with a 50% probability until 2051, which is 31 years later than the current T_{TARGET}. The change is primarily due to revised estimates of $B_0$ and the depletion arising from the change in the modeling platform used in this year’s assessment. These changes represent fundamental revisions to our understanding of the status of these species, which in turn warrants revisions to T_{TARGET}.

e) Given the results of the 2011 assessments, new maximum times to rebuild (T_{MAX(NEW)}) were calculated for each stock based on the most recent assessment models and National Standard 1 Guidelines. These are needed for the two stocks which are behind schedule (canary rockfish and Pacific ocean perch). Rebuilding will occur for these stocks well before (T_{MAX(NEW)}) if the current target SPR harvest rates are maintained. For this reason the SSCGS suggests that considering status quo harvest rates for all overfished stocks is a reasonable starting point for the Council’s deliberative process when developing ACLs for the 2013-2014 biennial cycle.

![Figure 1. Relative population trajectories of overfished groundfish stocks, 1980-2011.](image.png)
### Table 1. Projected rebuilding target dates for overfished groundfish at current harvest rates

<table>
<thead>
<tr>
<th>Species</th>
<th>2009 Assessment Depletion</th>
<th>2011 Assessment Depletion</th>
<th>Total Catch/Total OY During Rebuilding(^1)</th>
<th>Adopted SPR Harvest Rate</th>
<th>(T_{TARGET}) Specified in Amendment 16-4</th>
<th>Current (T_{TARGET}) (^2)</th>
<th>New (T_{REBUILD}) At Current SPR (^3)</th>
<th>New (T_{REBUILD}) At Current SPR (^4)</th>
<th>Difference between Current (T_{TARGET}) and New (T_{REBUILD})</th>
<th>(T_{MAX(NEW)}) (^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific ocean perch (POP)</td>
<td>28.6%</td>
<td>19%</td>
<td>52.2% (2000-2010)</td>
<td>86.4%</td>
<td>2017</td>
<td>2020</td>
<td>2043</td>
<td>2051</td>
<td>-31</td>
<td>2071</td>
</tr>
<tr>
<td>Petrale sole</td>
<td>11.6%</td>
<td>18%</td>
<td>NA</td>
<td>30% 25-5 rule</td>
<td>2016</td>
<td>2016</td>
<td>2013</td>
<td>2013</td>
<td>3</td>
<td>2021</td>
</tr>
<tr>
<td>Canary</td>
<td>23.7%</td>
<td>23%</td>
<td>118.5% (2001-2010)</td>
<td>88.7%</td>
<td>2063</td>
<td>2027</td>
<td>2028</td>
<td>2030</td>
<td>-3</td>
<td>2050</td>
</tr>
<tr>
<td>Yelloweye</td>
<td>20.3%</td>
<td>21.4%</td>
<td>63.7% (2003-2010)</td>
<td>76%</td>
<td>2084</td>
<td>2074</td>
<td>2045</td>
<td>2067</td>
<td>7</td>
<td>2083</td>
</tr>
<tr>
<td>Bocaccio</td>
<td>28.12%</td>
<td>26%</td>
<td>35% (2000-2010)</td>
<td>77.7%</td>
<td>2026</td>
<td>2022</td>
<td>2018</td>
<td>2021</td>
<td>1</td>
<td>2031</td>
</tr>
<tr>
<td>Darkblotched</td>
<td>27.5%</td>
<td>30%</td>
<td>94% (2002-2010)</td>
<td>64.9%</td>
<td>2011</td>
<td>2025</td>
<td>2016</td>
<td>2017</td>
<td>8</td>
<td>2037</td>
</tr>
</tbody>
</table>

1. The years considered are the years since the stock has been under rebuilding.
2. Current \(T_{TARGET}\) is the value adopted, or not modified, by the Council in 2009.
3. \(T_{REBUILD}\) is the new time to rebuild at the adopted SPR harvest rate.
4. Positive values reflect rebuilding being ahead of schedule, while negative values reflect delays. Values which are bolded and underlined indicate a substantial difference indicating a low probability of rebuilding by \(T_{TARGET}\) (<40%).
5. \(T_{MAX(NEW)}\) is the new maximum time to rebuild based on the NEW stock assessment and rebuilding analysis. In the case of petrale sole, the maximum rebuilding time is defined by the 10-year rule which is interpreted here as being 10 years beyond the year the stock was declared overfished (i.e., 2011).
Pacific Ocean Perch (POP)
The new POP rebuilding analysis was based on the full assessment prepared in 2011. The new assessment used the stock synthesis (SS) modeling framework, while previous POP assessments since 2003 used a standalone model built in AD model builder. Assessment improvements included use of length-based selectivity, and estimation of growth, natural mortality, and stock-recruit steepness, with estimation of the last two quantities facilitated by the use of Bayesian priors. The new assessment resulted in a substantial increase (~40%) in the estimate of unfished stock size, a result driven primarily by the change in the modeling platform and a concomitant change in weighting of the various data components, such that what was previously estimated to be a single large recruitment event in the early 1950s is now considered to be a larger initial biomass. Since estimates of stock size in recent years are similar to those estimated in previous assessments, the net result is that the stock is now estimated to be more depleted than previously estimated (19% of unfished biomass in 2011 compared to 29% in 2009 in the previous assessment). In addition, the estimate of stock-recruit steepness in this assessment is 0.4, which is lower than the value used in the 2009 assessment (0.51). This change implies that the stock is less productive, which will result in a slower rate of stock rebuilding.

POP was declared overfished in 1999, and a rebuilding plan was implemented in 2000. The cumulative catch estimated in the assessment model during 2000-2010 is 52.2% of the rebuilding plan OYs during this period, indicating that in-season management has been successful in implementing the rebuilding plan. The estimate of annual POP catch from the total mortality reports for 2004-2009 indicate the rebuilding OY was only exceeded in 2007 (by 4%). The stock is estimated to have increased by 36% since 2000. However, because the rebuilding target is now higher, it is impossible to rebuild by the existing T\_TARGET of 2020 even if fishing mortality is set to zero. If the current SPR rate in the rebuilding plan (0.864) is maintained, the stock would not rebuild with 50% probability until 2051, which is 31 years later than the current T\_TARGET. These results indicate a revision of rebuilding plan is needed to reflect the current estimates of stock status relative to the rebuilding target. The SSCGS notes that the current SPR rate of 0.864 is still a viable rebuilding harvest rate because the new T\_REBUILD associated with this rate (2051) is less than T\_MAX(NEW) of 2071.

Note to author: Include a table with OFLs, ACLs, and total estimated catches. Also include the total mortality estimates in the table for comparison.

Petrale Sole
A full assessment for petrale sole was completed in 2011. The new assessment used the latest version of SS to implement an annual model with seasonal fleets and included standardized commercial winter CPUE index (1987 – 2009), use of a new prior on natural mortality, revised age composition data, and aging error following new inter-lab ageing-error analysis. The major axis of uncertainty was identified as natural mortality. The assessment estimates that petrale sole was at 18% of the unexploited equilibrium spawning biomass at the start of 2011, which is below the rebuilding target of SB\_25% set for this species under Amendment 16-5. The assessment also estimates a large 2007 year class and, as this year class ages and matures, the spawning biomass is expected to increase rapidly.
From 2004 to 2009, the cumulative catch was on average 9% less than the cumulative OY/ACL. The OY was exceeded by less than one tenth of one per cent in 2005 but catches have otherwise been below the OY/ACL. A variety of rebuilding analyses were conducted assuming catches of 976 mt and 1160 mt in 2011 and 2012, respectively. The current $T_{TARGET}$ for petrale sole is 2016. Because of the incoming large year class, and the use of the standardized winter commercial CPUE data in the assessment, the spawning biomass is expected to exceed the rebuilding target with a probability of 75% by the start of 2013. From 2014 onwards, applying a wide range of SPRs from 0.300 to 0.600, as well as application of the 25-5 rule or the OFL rule, is expected to maintain the spawning biomass above the $SB_{25\%}$ target with a probability of 100%.

**Canary Rockfish**

An update assessment for canary rockfish was completed in 2011. The assessment included the revised Oregon historical catch from 1916 to 1981, an update to the NWFSC trawl survey index (2009 and 2010) and new data from the WGCOP (2009 and 2010). Of these additions, the revised Oregon catch series had the most effect, resulting in an estimated increase in $SB_0$ from 25,993 mt (in the 2009 assessment) to 33,512 mt (in the 2011 assessment). The updated estimate of depletion at the beginning of 2011 is 23.0%, which is marginally less than the 2009 estimate of 23.7%.

Canary rockfish was declared overfished in 2000, and a rebuilding plan was implemented in 2001. As previously reported in 2009, canary rockfish management performance under rebuilding has not been as successful as that for other overfished rockfish stocks. From 2001 to 2010, the cumulative catch was 18.5% over the cumulative OY/ACL. However, the percentage has steadily decreased; the running four year mean in 2003 was 135% of OYs, rising to about 170% in 2004 through 2006, before steadily decreasing to a cumulative level of 118.5%. In 2008 and 2009 the running four year cumulative catches were 77% and 70%, respectively of the four year running cumulative OY/ACL, reflecting improved active management. As in 2009, the 2011 rebuilding analysis integrates over three states of nature relating to stock productivity; specifically, values of stock-recruit steepness of 0.345, 0.511, and 0.720. A variety of analyses were conducted assuming catches of 102 mt and 107 mt in 2011 and 2012 respectively. Results show that, even if all harvest is eliminated from 2013 onwards, there is slightly less than 50% probability that the stock will rebuild by the current $T_{TARGET}$ (2027). Eliminating all harvest from 2013 on would result in greater than a 50% chance of rebuilding to the target level by 2028, one year later than the current $T_{TARGET}$. Further rebuilding runs illustrate the effects of maintaining the current $SPR_{TARGET}$ or of varying SPR to achieve rebuilding in 2029, 2030, 2031 or 2032. If the current $SPR_{TARGET}$ of 0.887 is maintained, the stock will rebuild by 2030.

**Yelloweye Rockfish**

An update assessment for yellow rockfish was completed in 2011 (the last full assessment was conducted in 2009). The assessment is based on a spatially-explicit model that tracks fishery removals and stock dynamics in waters off each of the three west coast states separately. The 2011 update assessment retained all the model assumptions of the 2009 assessment, but added additional age and length composition data and extended and recalculated the indices of abundance. Estimated quantities from the update assessment were very similar to the those estimated in the 2009 assessment, with very small increases in the estimated equilibrium
spawning output (from 994 to 1028 million eggs), in the stock-recruit steepness parameter (from 0.417 to 0.441) and in the stock status (from 20.3% to 21.3% in 2009). The estimated current (2011) status from the 2011 update assessment is a depletion of 21.4%.

As in the 2009 assessment, uncertainty in this year’s update was expressed jointly along two independent dimensions (the time series of historical catch, which scales population size, and spawner-recruit steepness, which governs rebuilding rate), which together result in nine states of nature integrated in the rebuilding analysis.

For the rebuilding analysis, which pre-specifies the 2011 and 2012 ACLs of 17 mt to be removed, various management options for 2013 and beyond were considered ranging from zero fishing mortality to the largest removal that could occur without overfishing (OFL catches). In the absence of any future fishing mortality (beginning in 2013 and assuming a 2011 and 2012 ACL of 17 mt) the yelloweye rockfish stock is projected to have a 50% probability of recovery to the rebuilding target (SB40%) by 2045, slightly sooner than the estimate of 2047 from the 2009 rebuilding analysis. The current NMFS-preferred alternative rebuilding harvest rate (SPR = 76%) would produce an ACL of 17.8 mt in 2013 and 18.1 mt in 2014 and has a 50% probability of rebuilding by 2067. This is a slightly faster rebuilding rate under the updated model parameters than the current T_{TARGET} of 2074, which has an associated SPR of 72.7% and would produce ACLs of 21.0 mt and 21.4 mt in 2013 and 2014, respectively.

In the yelloweye assessment model, recruits are taken deterministically from the stock-recruit curve (year-specific recruitment deviations are not estimated), which makes yelloweye rockfish fit a definition of a Category 2 species.

Bocaccio
The new bocaccio rebuilding analysis was based on the new assessment conducted in 2011 (the last full assessment was completed in 2009). The section on the SSCGS review of the bocaccio assessment (above) provides assessment details, including an in-depth discussion of the strength of the 2010 year-class, which is the major axis of uncertainty in the assessment. The assessment results are generally consistent with those from the previous full assessment, albeit slightly more pessimistic with respect to spawning output depletion. Depletion in 2011 is now estimated to be 27% compared to 30% as projected from the last full assessment.

Bocaccio was declared overfished in 1999, and a rebuilding plan was implemented in 2000. The estimated total catch of bocaccio has been well below the OY since 2004. Rebuilding is projected to continue at a rate somewhat greater than previously estimated. The rebuilding analysis indicates that the median time to rebuild if the current SPR rate (77.7%) is maintained is 2021, which is one year earlier than the current T_{TARGET} of 2022. Given these results, the Panel concludes that progress to rebuilding is adequate and that existing management measures are effective and do not need to be changed. Further, the magnitude of the 2010 year class will have a strong influence on progress towards rebuilding in the near future. Rebuilding could potentially take place at a considerably faster pace if this year class is larger than currently estimated.

Note to author: Several modifications should be made when preparing the final document:
1. The rebuilding analysis shows $T_{\text{TARGET}}=2026$. While the computations are correct, $T_{\text{TARGET}}$ is a management-determined quantity, and the Council has set $T_{\text{TARGET}}=2022$ for bocaccio rebuilding. To avoid potential confusion, the final document should reflect the Council decision (i.e. $T_{\text{TARGET}}=2022$).

2. Compute and show the SPR corresponding to $T_{\text{TARGET}}=2022$.

3. The catch stream used in the analysis is different than the GMT total mortality reports. The differences are not large, and both catch streams are well below the ACLs established for the respective years. However, to avoid confusion, both should be shown in the final rebuilding document.

4. The catch south of 40°10’ N latitude (~94% of the total assessed area catch) should be displayed in the final document so as to conform to the established Council management area.

**Darkblotched Rockfish**

The new darkblotched rockfish rebuilding analysis was based on the new assessment completed in 2011 (the last full assessment was conducted in 2007). The section on the SSCGS review of the darkblotched assessment (above) provides details on the new assessment, including a change in assumed stock productivity and the selectivity assumption. The new assessment results are generally consistent with those from the previous full assessment. Depletion in 2011 is now estimated to be 30% of the unexploited equilibrium spawning output compared to 32% as projected from the last full assessment; however productivity is estimated to be higher than in the previous assessment.

Darkblotched rockfish was declared overfished in 2001, and a rebuilding plan was implemented a year later, in 2002. The current adopted $T_{\text{TARGET}}$ for this species is 2025 and the $S_{\text{PR TARGET}}$ is 64.9%. This assessment estimated the $S_{\text{PR TARGET}}$ of 64.9% would yield a 50% probability of rebuilding by 2017. This is a faster rebuilding rate under the new model parameters than in the currently adopted rebuilding plan.
Notes for the SSC

Revisions to Rebuilding Terms of Reference

1) List of rebuilding runs is overly long and several scenarios are no longer germane. New runs that reflect the OFL/ABC/ACL framework may be needed. Overall the list needs to be shortened.

2) Rebuilding analyses settled on a standard approach for generating future recruitments and defining rebuilding targets. There is considerable discussion in the TOR concerning alternative approaches that are no longer best practice and can be deleted.

3) It needs to be made clear that the rebuilding SPR and the $T_{TARGET}$ are Council policy decisions and are not established by the rebuilding analysis. The term $T_{REBUILD}$ should be used rather than $T_{TARGET}$ for rebuilding scenarios that have not yet been formally adopted by the council.

4) A required element of rebuilding analyses is a table showing a comparison of actual catches with OYs since the stock was first declared overfished. In many cases, rebuilding species are discarded, placing greater emphasis on discard rates to produce estimates of total removals. Recent catches can be obtained in several ways: a) from total mortality estimates produced by the observer program, b) using landed catch from PacFIN and applying a discard rate or model-based estimates for models where discard is explicitly modeled. It is not necessary to be prescriptive about which method is best to use, but whatever estimates are used, they need to be justified as being the most reliable. The table should include both model estimates and estimates from the total mortality report.

5) The rebuilding analysis TOR should clarify the rebuilding plans with non-constant fishing mortality are viable alternatives as long as catch is below the ABC. There is no scientific reason why flexibility in designing rebuilding plans should not be allowed.

6) The TOR should include an example of a rebuilding analysis that represents best current practice. Tables in the rebuilding analysis should be standardized to the extent possible.

7) The rebuilding software should be expanded to provide economic information such as revenue streams and net present value of rebuilding scenarios. The rebuilding analyses should extend long enough so that potential future benefits of rebuilding are adequately measured.

Issues with respect to Stock Assessment Updates

There were pervasive issues with data and model changes that are permissible for an assessment to be considered an update. Often these problems occurred because the TOR for assessment updates sets out general principles, but are not specific about what changes cross the line. The SSC should discuss whether it is worthwhile to include additional specificity in TOR. Examples from this year’s updates included:

1) Changing the error assumptions in GLIM analysis for survey indices.

2) Using the latest version of SS rather than using the version used in the assessment. There are advantages and disadvantages to using the latest SS version. An advantage is that errors in the computer code can be corrected, while a disadvantage is that inexplicable changes in results can occur when the most recent version of SS is used.
3) Use of an updated steepness prior, rather than the prior that was used in the original assessment. It is unclear why this is not allowed in the TOR.

4) Nearly all updates used the revised historical catches for Oregon and California that have recently become available. While an update assessment should incorporate the latest catch information, extensive revision to historical catch streams was not anticipated as being appropriate for an update. The TOR are vague about this issue, probably because it had not been anticipated. This may not be as important next time, since further revisions are likely to be more incremental.

5) In all cases where potentially questionable changes are made to data inputs, “bridgework” needs to be done to evaluate the impact of the change. Typically this involves an incremental approach, where the changes are evaluated one by one, rather than making a single before and after comparison.

All Stock Assessments
A better approach is need for dealing with assessment data issues, since there is insufficient time during the STAR panel review to adequately address them. Data issues are often broader than single assessments and can be dealt with more effectively prior to and independently of the review of individual stock assessments. We need to think more carefully about how to ensure that assessment data inputs receive adequate review. Examples from this year include GLIM survey indices, historical catch revision, and historical discard estimates.

The SSC should also discuss whether projections in assessments and rebuilding analyses should be done based on OFLs rather than ABCs.
List of Participants

Technical Reviewers
Vladlena Gertseva  NMFS Northwest Fisheries Science Center, SSC, Meeting Chair
Martin Dorn  NMFS Alaska Fisheries Science Center, SSC
Owen Hamel  NMFS Northwest Fisheries Science Center, SSC, POP STAT
Tien-Shui Tsou  Washington Department of Fish and Wildlife, SSC
Dave Sampson  Oregon State University, SSC
Ray Conser  NMFS Southwest Fisheries Science Center, SSC
Vidar Wespestad  Research Analysts International, SSC
Kevin Stokes  Center for Independent Experts

Stock Assessment Team (STAT) Members
Xi He  NMFS Southwest Fisheries Science Center, Widow STAT
John Wallace  NMFS Northwest Fisheries Science Center, Canary STAT
John Field  NMFS Southwest Fisheries Science Center, Bocaccio STAT
Andi Stephens  NMFS Northwest Fisheries Science Center, Darkblotched STAT
Kotaro Ono  University of Washington, POP STAT
Melissa Haltuch  NMFS Northwest Fisheries Science Center, Petrale STAT
Ian Taylor  NMFS Northwest Fisheries Science Center, Yelloweye STAT

Others in Attendance
John DeVore  Pacific Fishery Management Council
Jim Hastie  NMFS Northwest Fisheries Science Center
Gerry Richter  Point Conception Groundfishermen's Association, GAP
Corey Niles  Washington Department of Fish and Wildlife, GMT
Jim Likes
Richard Carroll  Ocean Gold Seafoods