The Groundfish Subcommittee of the Scientific and Statistical Committee (SSC-GS) met in Seattle during September 26-30, 2011 to review stock assessments for three groundfish species (widow rockfish, bocaccio, and darkblotched rockfish) and rebuilding analyses for six overfished groundfish stocks (Pacific ocean perch, petrale sole, canary rockfish, yelloweye rockfish, bocaccio, and darkblotched rockfish). The full Scientific and Statistical Committee (SSC) reviewed the assessment documents (Agenda Item E.1.a, Attachments 1-3), the rebuilding analyses (Agenda Item E.1.a, Attachments 5, 6, 8, and 10 and Supplemental Revised Attachments 7 and 9) and the Groundfish Subcommittee report (Agenda Item E.1.a, Attachment 4). The SSC also reviewed the document “An Alternative View of Widow Rockfish Productivity” (Agenda Item E.1.a, Supplemental Attachment 11) prepared by the Groundfish Analysis Team of the Southwest Fisheries Science Center at Santa Cruz.

Bocaccio

Dr. Vladlena Gertseva (SSC and National Marine Fisheries Service [NMFS]/Northwest Fisheries Science Center [NWFSC]), chair of the September meeting, summarized the assessment and the SSC-GS report.

The last full assessment for bocaccio was completed in 2009. An update assessment, presented to the SSC in June 2011, did not meet the terms of reference for an update because of changes in model structure and data. The Stock Assessment Team (STAT) made these changes because a strict update estimated that the 2010 year-class was extraordinarily and unrealistically strong, based on length frequency data collected in the 2010 NWFSC shelf-slope trawl survey. The Council decided that the update should receive additional exploration and review based on a limited set of analyses developed by the SSC.

The revised update assessment covers the stock of bocaccio in the Conception, Monterey and Eureka International North Pacific Fisheries Commission (INPFC) areas and differs from a strict update in the following aspects: (1) it includes a new data source, an index of age-0 abundance based on power plant impingement data, and removes very small fish from the NWFSC data series, and (2) the major axis of uncertainty in the decision table is based on recruitment strength rather than the relative emphasis given to the different biomass indices.

The revised update assessment estimates that depletion in spawning output was 26 percent at the start of 2011, above the 25 percent minimum stock size threshold for rockfish but below the 40 percent management target. If harvests are consistent with the current rebuilding spawning biomass per recruit (SPR) of 0.777, the assessment projects that the stock would rebuild to the 40 percent management target by 2020 under both the base model and the pessimistic alternative, which is based on average strength for the 2010 year-class. The stock would rebuild by either 2016 or 2017 under the optimistic alternative, which allows a very strong 2010 year-class.
The SSC endorses the use of the 2011 bocaccio revised update assessment for status determination and management in the Council process.

The SSC-GS noted that additional fishery and survey data will be available by the March or April 2012 Council meetings. These data could be used to better evaluate the strength of the 2010 year-class. However, these new data cannot be evaluated in isolation. They should be evaluated only within the context of all the other data that inform the assessment model. In any event, a new update, if conducted and approved by the SSC, could be used for setting annual catch limits (ACLs) or annual catch targets (ACTs) for 2013 and 2014 but it should not be used for setting the overfishing limits (OFLs).

The SSC recommends that the next assessment of this stock should be a full assessment so that the strength of the 2010 year-class can be evaluated more rigorously, and to explore the conflicting indices that are currently part of the assessment structure.

Because the bocaccio assessment is based on a fully developed age-structured model, the SSC recommends that bocaccio be treated as a Category 1 stock.

**Darkblotched rockfish**

Dr. Vladlena Gertseva (SSC and NMFS/NWFSC), chair of the September meeting, summarized the assessment and the SSC-GS report.

The last full assessment for darkblotched rockfish was completed in 2007 and an update was conducted in 2009. A new update assessment was reviewed by the SSC in June 2011. This update’s estimate of depletion at the start of 2009 was 15.1 percent, whereas the comparable estimate from the 2009 update was 27.5 percent. Such a large change in stock status was unexpected. Further, the cause of the change could not be determined during the limited time available for review of the update. The Council therefore decided that the update should receive additional exploration and review based on a limited set of analyses developed by the SSC.

The revised update assessment covers the stock of darkblotched rockfish in the waters off Washington, Oregon, and California. Although the revised update conducted a thorough step-wise evaluation of the new and modified data used in the assessment, the analyses were not able to pinpoint the new data elements that fully accounted for the large drop in estimated depletion. An analysis of the influence of the stock-recruit steepness parameter indicated that the revised update model would have estimated steepness at an implausibly high value (1). The 2007 full assessment and the 2009 update fixed the steepness parameter at 0.6. For the revised 2011 update the SSC-GS and the STAT agreed to fix the steepness at 0.76, the mean value of the most recent prior probability distribution from the meta-analysis of rockfish productivity conducted by Martin Dorn. Also, the SSC-GS recommended that the decision table be structured with stock-recruit steepness rather than natural mortality as the major axis of uncertainty.

Results from the revised update assessment are reasonably consistent with results from the 2009 update. The estimate of depletion at the start of 2009 is 25.9 percent from the revised update whereas it is 27.5 percent from the 2009 update. The revised update assessment estimates that depletion in spawning output was 30.2 percent at the start of 2011, above the 25 percent
minimum stock size threshold for rockfish but below the 40 percent management target. The estimated spawning output has increased steadily over the past ten years, more than doubling during this period. If harvests are consistent with the current rebuilding SPR of 0.649, the base model projects that the stock would rebuild to the management target by 2017.

The SSC endorses the use of the 2011 darkblotched rockfish revised update assessment for status determination and management in the Council process.

The SSC recommends that the next assessment of this stock should be a full assessment to allow further exploration of selectivity assumptions and how to treat the survey data.

Because the darkblotched rockfish assessment is based on a fully developed age-structured model, the SSC recommends that darkblotched rockfish be treated as a Category 1 stock.

**Widow rockfish**

Dr Vladlena Gertseva (SSC and NMFS/NWFSC), chair of the September meeting, summarized the assessment and the SSC-GS report.

Widow rockfish was declared to be overfished in 2001. The last full assessment for widow rockfish was completed in 2009. The widow rockfish Stock Assessment Review (STAR) Panel, which met during July, did not endorse the base model for management use and recommended that alternative model configurations be investigated. During the September Council meeting the SSC reviewed the assessment document and STAR Panel report and concurred with the STAR Panel recommendation that further exploration of alternative model configurations was needed. The Council agreed and decided that the assessment should receive additional exploration and review based on a set of analyses suggested by the SSC.

The revised assessment covers the stock of widow rockfish in the waters off Washington, Oregon, and California. Compared to the 2009 assessment, the new assessment made several important changes and simplifications to the model structure. The new assessment has one area. Selectivity curves are assumed to be length-based. Survey selectivity curves are forced to be asymptotic. Spawning output was measured in terms of spawning stock biomass. Natural mortality (M) is estimated separately for males versus females and is influenced by the prior probability distribution for M developed by Owen Hamel. Finally, the steepness parameter for the stock-recruitment relationship was fixed at 0.76, the mean value of the most recent prior probability distribution from the meta-analysis of rockfish productivity conducted by Martin Dorn. In the 2009 assessment the steepness parameter was estimated at 0.41.

There were also some changes in the data used in the new assessment relative to the 2009 assessment, including: treatment of the at-sea processing fleet as a separate fleet rather than as parts of the other fleets and use of length composition data. Recent previous assessments of widow rockfish relied on age composition data and did not use length composition data.

The new assessment estimates that depletion in spawning stock biomass was 51.1 percent at the start of 2011, above the 40 percent management target. Further, the estimated spawning stock biomass has increased steadily from a low of 30.6 percent at the start of 2001. The new
assessment estimates that the relative spawning stock biomass never dropped below the 25 percent minimum stock size threshold. The increase in biomass during the past decade was the result of reduced catches rather than strong year-classes. Estimates of recent recruitment have been below model expectations.

The new assessment’s estimate of depletion at the start of 2009 was 50.0 percent, whereas the 2009 assessment’s estimate of depletion at the start of 2009 was 38.5 percent. This large increase in estimated stock status resulted primarily from the decision by the SSC-GS and STAT to fix the steepness parameter at 0.76 due to the lack of information to reliably estimate steepness. If the new assessment had been allowed to estimate steepness, the value of steepness and the estimate of depletion would have been much lower.

The SWFSC Groundfish Analysis Team disagreed with the assertion by the SSC-GS that “no data currently exist to reliably estimate widow rockfish productivity.” The SSC notes that the profile likelihood of steepness for widow rockfish is less informative compared to the steepness profiles estimated for other West Coast rockfish stocks. Furthermore, the magnitude of the likelihood values depends fundamentally on the adequacy of the underlying model structure. Changes in model structure, such as switching from domed to asymptotic selectivity, can produce much larger changes in log-likelihood than 2 units.

The SSC agree with the Groundfish Analysis Team’s conclusion that there is considerable uncertainty regarding the new stock assessment’s finding that the stock has rebuilt. Productivity and status of this stock are highly uncertain because the available biomass indices are not informative. Nonetheless, the SSC considers the base model of the new widow rockfish assessment to be the best available science.

The SSC endorses the use of the 2011 widow rockfish assessment for status determination and management in the Council process.

If the pessimistic state of nature is correct (steepness is equal to 0.41), then only the 1500 mt catch stream shown in Table ES8a of the assessment document results in the estimates of spawning stock biomass remaining above the minimum stock size threshold during the 10-year projection period.

The SSC recommends that the next assessment of this stock should be a full assessment to incorporate reconstructed historical landings data for Washington, to resolve potential inconsistencies in the age-reading data, to evaluate the strength of incoming year-classes, and to explore the utility of several legacy data sets, such as the Oregon bottom trawl catch per unit of effort (CPUE) index, for which complete documentation is lacking.

Because the widow rockfish assessment is based on a fully developed age-structured model, the SSC recommends that widow rockfish be treated as a Category 1 stock.

Rebuilding Analyses

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

Progress towards rebuilding for the rockfish was reviewed in relation to the median times to rebuild ($T_{\text{target}}$) that were adopted in Amendment 16-4 and/or the current $T_{\text{target}}$ that was adopted in 2009 (Table 1, below). Rebuilding is occurring for all species. Figure 1 (below) shows relative population trajectories of overfished groundfish stocks since 1980. The SSC notes the following.

a) Catches of five of the six overfished species stocks have been lower than what was available as a cumulative optimum yield (OY)/ACL during the period of rebuilding. Catch of canary rockfish exceeded the cumulative OY/ACL by 18.5 percent 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. POP catch exceeded the rebuilding OY in 2007 by 4 percent. However the cumulative catch for POP over 2000-2010 is only 52.2 percent of the cumulative rebuilding plan OYs for this period. 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 four cases (petrale sole and yelloweye, bocaccio and darkblotched rockfishes) rebuilding is one to eight years ahead of schedule. For these stocks, progress towards rebuilding is considered adequate, and the SSC recommends that no redefinition of $T_{\text{TARGET}}$ or adjustment to the rebuilding harvest rate is necessary.

d) Two stocks are behind schedule and are very unlikely to rebuild by the current $T_{\text{TARGET}}$: 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 percent probability that the stock will rebuild by the current $T_{\text{TARGET}}$ (2027). For POP, if the current SPR rate in the rebuilding plan (0.864) is maintained, the stock would not rebuild with a 50 percent probability until 2051, which is 31 years later than the current $T_{\text{TARGET}}$. The change is primarily due to a revised estimate of $B_0$ and depletion, rather than the current biomass level. This represents a fundamental revision to our understanding of the status of this species, which in turn warrants revisions to $T_{\text{TARGET}}$.

e) Given the results of the 2011 assessments, new maximum times to rebuild ($T_{\text{MAX(NEW)}}$) 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 POP). Rebuilding will occur for these stocks well before ($T_{\text{MAX(NEW)}}$) if the current target SPR harvest rates are maintained. For this reason the SSC 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.

PFMC
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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</th>
<th>Adopted SPR Harvest Rate</th>
<th>$T_{TARGET}$ Specified in Amendment 16-4</th>
<th>Current $T_{TARGET}$</th>
<th>New $T_{REBUILD}$ At Current SPR</th>
<th>New $T_{REBUILD}$</th>
<th>Difference between Current $T_{TARGET}$ and New $T_{REBUILD}$</th>
<th>$T_{MAX(NEW)}$</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>30% (2001-2010)</td>
<td>88.7%</td>
<td>2016</td>
<td>2016</td>
<td>2013</td>
<td>2013</td>
<td>3</td>
<td>2023</td>
</tr>
<tr>
<td>Canary</td>
<td>23.7%</td>
<td>23%</td>
<td>118.5% (2001-2010)</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>Yelloweye</td>
<td>20.3%</td>
<td>21.4%</td>
<td>63.7% (2003-2010)</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>Bocaccio</td>
<td>28.12%</td>
<td>26%</td>
<td>35% (2000-2010)</td>
<td>62.1%</td>
<td>2011</td>
<td>2025</td>
<td>2016</td>
<td>2017</td>
<td>8</td>
<td>2037</td>
</tr>
<tr>
<td>Darkblotched</td>
<td>27.5%</td>
<td>30%</td>
<td>94% (2002-2010)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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).