

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON  
PART II OF STOCK ASSESSMENTS FOR 2011-2012 GROUND FISH FISHERIES

**INTRODUCTION**

The Scientific and Statistical Committee (SSC) completed a review of seven stock assessments and Stock Assessment Review (STAR) panel reports, including petrale sole, widow rockfish, yelloweye rockfish, greenstriped rockfish, bocaccio, cabezon, and lingcod. With the exception of petrale sole, these assessments were completed over the summer following the Council's June meeting. At that meeting the petrale sole assessment was referred to a SSC groundfish subcommittee meeting to be held later in the summer for further consideration and evaluation. Having now reviewed the entire set of full and updated stock assessments that were scheduled this year, the SSC is very pleased to inform the Council that the process performed very well this year. All the stock assessment teams submitted well-prepared documents in a timely manner and were responsive to all requests during the review process. As witness to that conclusion we note that no assessments were referred to the mop-up panel. For that reason the SSC would like to commend all the personnel and staff involved in this major effort for having performed at such a high level.

**FULL STOCK ASSESSMENTS**

**Petrale Sole**

At its June 2009 meeting, the SSC reviewed the new petrale sole assessment and, based on a number of concerns, was unable to endorse the assessment at that time. The STAR Panel report also recommended that the estimates of  $F_{MSY}$  and  $B_{MSY}$  produced by the assessment be investigated as alternatives to the currently used proxies of  $F_{40\%}$  and  $B_{40\%}$ . The SSC developed a list of analytical requests for the petrale sole Stock Assessment Team (STAT) to address these issues, and the SSC's groundfish subcommittee met with the STAT on August 31<sup>st</sup> to review the response to these requests.

Dr. Melissa Haltuch provided the SSC with a brief overview of the petrale sole assessment, and presented the STAT's response to the SSC groundfish subcommittee requests. Dr. Stephen Ralston presented the report of the SSC groundfish subcommittee, which endorsed the petrale sole model that was approved by the STAR panel, and recommended that proxies of  $B_{25\%}$  for  $B_{MSY}$  and  $F_{30\%}$  for  $F_{MSY}$  be established for west coast flatfish.

The SSC revisited the issues that had already been considered in detail during the subcommittee meeting. The SSC agreed that the base petrale sole model represents the best available scientific information, and endorsed its use for status determination and management in the Council process.

The SSC concluded that there is no basis for rejecting the assessment based on the estimate of catchability coefficient ( $q$ ) for Northwest Fisheries Science Center (NWFSC) trawl survey. However the SSC encourages further investigation of the catchability coefficient of the survey by experimental evaluation of trawl performance, quantification of trawlable and untrawlable

habitat off the west coast, or by synthesis of available information and expert knowledge through development of an informative prior, as had been anticipated from the 2008 survey catchability workshop.

The raw catch per unit of effort (CPUE) presented in the petrale sole assessment suggests a potential discrepancy between the assessment results and the experience of the groundfish fleet. It is important to note that limited conclusions can be drawn from un-standardized CPUE data, and that standardization of these data will be difficult due to the many management changes in the groundfish fishery. Nevertheless, the SSC encourages further evaluation of fishery CPUE data in the next petrale sole assessment, if only to better understand and potentially reconcile these differences.

During its meeting, the SSC groundfish committee addressed the suggestion of the petrale sole STAR Panel to investigate the species-specific estimates of  $F_{MSY}$  and  $B_{MSY}$  as alternatives to the currently used proxies. The SSC endorses the groundfish subcommittee's recommendation to establish new proxies of  $B_{25\%}$  for  $B_{MSY}$  and  $F_{30\%}$  for  $F_{MSY}$  for west coast flatfish. These values are based on a number of considerations, including evaluation of information on flatfish productivity (steepness) for assessed west coast flatfish, published meta-analyses of other flatfish stocks, and recommendations on appropriate proxies for  $B_{MSY}$  and  $F_{MSY}$  in the scientific literature. The SSC does not at this time endorse the use of species-specific estimates of  $B_{MSY}$  and  $F_{MSY}$  for petrale sole because of high variability in these estimates between repeat assessments for other stocks and the sensitivity of these estimates to assumptions concerning stock structure. Instead, the SSC recommends that this issue be dealt with in a comprehensive way, perhaps through development of guidelines during an off-year harvest policy workshop.

Other aspects of the Council's harvest policy, such as the overfished threshold and the point at which the precautionary reduction for optimum yield (OY) becomes zero (40-10), are policy decisions that are at the discretion of the Council. A policy that mimics the Council's default proxies for groundfish would be to set the minimum stock size threshold (MSST) to  $B_{15\%}$ , which is 60 percent of the target stock size, and to implement a 25-6.25 precautionary adjustment for OY. Alternatively, the Council could set the MSST to 50 percent of  $B_{25\%}$ , which is the lowest value recommended by the National Standard 1 guidelines.

Finally, the SSC notes that the process of addressing a STAR panel recommendation with potentially broad ramifications has been less than ideal. Again, addressing harvest policy issues during an off-year science workshop would allow a more comprehensive approach to be developed. Such a workshop would also provide opportunity for outside review, which may be an important consideration given that SSC members are likely to be involved in technical analyses.

### Widow Rockfish

Dr. Xi He presented the widow rockfish stock assessment to the Scientific and Statistical Committee (SSC). Dr. Martin Dorn summarized the report of the Stock Assessment Review (STAR) Panel of the widow rockfish assessment, held in Santa Cruz, California July 13-17, 2009.

The last full assessment of widow rockfish was conducted in 2005, with an update in 2007. The 2009 assessment differed from the previous assessment in several respects: a) the assessment used Stock Synthesis 3 (SS3) rather than a custom-designed model, b) the catch history was revised and extended back to 1916, c) catch, age, and survey data were updated with data from 2007 and 2008, and d) data from the NWFSC trawl survey were included in the assessment. Widow rockfish were modeled as a single stock with two areas and four fisheries. Additional work regarding how to model this species remains a priority given the sparseness of recent fishery data and the need to further explore spatial stock structure.

The STAR Panel considered the current assessment to be the best available scientific information and recommended its use in management. Much attention was given during the STAR Panel to refining the new data sets so that the base model is reasonably well developed. Less time was available to explore alternative model configurations and tuning. For example, the SSC observed that length selectivity patterns were not consistent among data sources and selectivity patterns for the triennial and NWFSC trawl surveys were unexpected. The SSC recommends that the next assessment should be a full assessment because several key problems remain unresolved.

The 2007 assessment identified a large partially-recruited 2002 year class that led to predictions of rapid rebuilding by 2009. This year class was less evident in the recent data and is not now estimated to be a strong year class. Nonetheless, there has been a gradual rise in the modeled depletion rate to 38.5 percent, just short of the 40 percent rebuilding threshold. The SSC endorses the use of the 2009 widow rockfish stock assessment for status determination and management in the Council process.

In general the SSC notes that estimates of recruitment for the most recent years of an assessment are often the most uncertain, yet can have a considerable impact on the outcomes of rebuilding projections. The SSC recommends that the STAT and STAR Panels consider imposing constraints on the estimates of recent year-classes to the extent we have lower confidence in these estimates.

The SSC is also generally concerned about the lack of data to inform the rate of stock rebuilding in recent years for several assessments of overfished rockfish. Specifically, fundamental assumptions about stock productivity are made in these models that will lead to a conclusion of stock recovery if catches are reduced markedly. The SSC notes that in a number of instances, recent predicted increases in abundance of overfished stocks are largely due to properties of the models and not to robust observational data.

### Yelloweye Rockfish

Dr. Ian Stewart presented the yelloweye rockfish assessment to the Scientific and Statistical Committee (SSC). Dr. Stephen Ralston summarized the report of the Stock Assessment and Review (STAR) Panel of the yelloweye rockfish assessment, held in Seattle, Washington, August 3-6, 2009.

The last full assessment of yelloweye rockfish was conducted in 2006 with an assessment update in 2007. The 2009 assessment differed from these previous assessments in terms of assumed population structure and the data used to fit the model. The 2009 assessment was based on three regions (California, Oregon and Washington) under the assumptions that adults are sedentary,

density-dependence is a function of coastwide egg production, and the proportion of recruits settling in each area is constant over time. This spatial structure is consistent with our understanding of the behavior of yelloweye rockfish, and reflects a compromise between a coastwide assessment and separate assessments for each state. This compromise allows for some regional differences to be captured within the model without requiring large numbers of additional parameters.

Even with a large number of changes to data inputs, the results from the 2009 yelloweye rockfish assessment are consistent with those from the 2006 and 2007 assessments. All of these assessments suggest that yelloweye rockfish experienced a substantial decline in abundance between 1980 and 2000, with a best estimate of stock depletion in 2009 from the current assessment of 20.3 percent.

In contrast to the 2006 and 2007 assessments, the 2009 assessment makes use of data from the NWFSC and Triennial trawl surveys as well as data on discarded yelloweye rockfish collected by observers in the Oregon recreational charter fishery. However, the International Pacific Halibut Commission (IPHC) survey data remain the most important index in the assessment, although IPHC survey data are only available for Washington and Oregon and not California where the largest potential biomass of yelloweye rockfish is estimated to occur. Unlike previous assessments, the relationship between fishery-dependent catch-rates and abundance is allowed to be non-linear. The assessment authors also reviewed and updated assumptions regarding growth, maturity and fecundity.

The catch history was revised as part of the 2009 assessment. However, the revised time-series of catches was not markedly different from that on which the 2006 and 2007 assessments were based. Considerable uncertainty regarding the time-series of historical catches remains, and this was identified as a key source of uncertainty in the assessment.

The assessment estimates trends in abundance by region. The SSC cautions against making use of these trends as the sole basis for the spatial allocation of harvest guidelines because the trend in abundance at the coastwide level is much more robust than those at the regional level. Reasons for this include that the time-series of historical catches by region are more uncertain than the coastwide totals and that the catch reconstructions for Washington are still somewhat incomplete. Given that the trends in abundance by region are driven to a considerable extent by the time-series of historical catches, uncertainty in the split of total catches to region will be reflected more in uncertainty in regional depletion than in total depletion.

The SSC endorses the research recommendations of the assessment authors and the STAR Panel, and identified two data sources which, if investigated, could provide additional indices of abundance: (a) the catch and effort data from the Oregon live-fish fishery, and (b) yelloweye rockfish catch rates from the recreational fishery for Pacific halibut. The SSC also highlights the continuing need for an index of abundance that can be used to reliably detect changes in yelloweye rockfish abundance. It also notes that visual survey techniques have the potential to index yelloweye rockfish abundance without inducing mortality which might hinder recovery.

The SSC recommends that the following be considered as potential items for workshops during the 2010 “off-year”: (a) review of efforts to develop stock size indices based on the IPHC

surveys, including how to add stations to augment the survey and, (b) analyses to construct indices of abundance for yelloweye rockfish and other groundfish. Given the potential importance of the IPHC index to the assessment of yelloweye rockfish, the SSC also recommends participation by IPHC scientists at any workshops to review the use of the IPHC data in yelloweye rockfish assessments and at future STAR Panels. Finally, the SSC highlights the value of collecting biological data, such as age-length and maturation information, for yelloweye rockfish during the IPHC surveys.

The SSC recommends that the yelloweye rockfish assessment be an update during the 2011 assessment cycle unless off-year research leads to a marked change to how the IPHC survey data are analyzed or the development of a new index of abundance based on the discards in Oregon recreational charter fishery. The SSC notes that the assessment author plans to refine how the IPHC survey data are analyzed. In principle, changing the analytical method used to summarize survey data falls outside of the terms of reference for an assessment update. However, given that this is a stable assessment, this change can be accommodated within the scope of an assessment update, but this will require extra time for review.

The SSC endorses the use of the 2009 yelloweye rockfish assessment for status determination and management in the Council process. The SSC also endorses the approach used to quantify uncertainty, which will form the basis for the rebuilding analysis for this species.

### Greenstriped Rockfish

Mr. Allan Hicks and Dr. Melissa Haltuch presented the greenstriped rockfish assessment to the Scientific Statistical Committee (SSC). Dr. Stephen Ralston summarized the report of the Stock Assessment and Review (STAR) Panel of the greenstriped rockfish assessment, held in Seattle, Washington, August 3-6, 2009.

This is the first assessment of the greenstriped rockfish off the US West Coast from US/Canada border to US/Mexico border. Greenstriped rockfish is a small, low-value bycatch species found in a wide range of habitats with a preference of mud or sand bottoms. The population is treated as one single stock in the assessment. There have been no fisheries targeting this species, thus discards constitute the main component of total fishing mortality on the stock. There is great uncertainty about historical discarding practices. Five fisheries and three fishery-independent surveys were modeled using Stock Synthesis 3.03a modeling framework.

An error in domestic catches was discovered and corrected after the STAR Panel. Revised results were presented to the SSC. In general, the revised results were very similar to those in the previous version. The estimated 2009 depletion remained the same at 81 percent, which is well above the Council's management target for groundfish (40 percent). Estimated total catches (landings plus estimated discards) in the past five years ranged between 3-78 mt and were substantially lower than the potential catch.

Uncertainty in states of nature was bracketed jointly by natural mortality and fraction discarded. There is only one harvest scenario in the decision table. The SSC noted that discards were not handled appropriately in two of the sensitivity runs (double and half of the landings) due to the fixed fraction of discards in model configuration. However, this does not affect the information

provided in the decision table. It was also noted that the within assessment uncertainty is relatively high compared to other west coast groundfish assessments.

In this assessment, historical WA/OR catches were estimated by applying a fixed proportion to the documented landings of other rockfishes. However, due to the weighed-back issue of greenstriped catches, the historical removal requires further investigation.

The SSC noted that, in contrast to other rockfishes, trawl surveys provide reliable abundance indices for greenstriped rockfish. Given the high uncertainty in landings and discards in the assessment, establishing a tier system that allows a simpler approach for setting harvest control rules for greenstriped rockfish and other data-poor species is desired.

The SSC endorses the use of the 2009 greenstriped rockfish assessment for status determination and management in the Council process.

### Bocaccio

Dr. John Field presented the bocaccio assessment and Dr. Martin Dorn summarized the report of the July 13-17, 2009 STAR Panel. The last full assessment of bocaccio was conducted in 2003, and it was subsequently updated in 2005 and 2007. The 2009 assessment: (a) used the SS3 modeling framework instead of SS1, (b) extended the northern boundary from Cape Mendocino to Cape Blanco, and (c) extended the period modeled from one beginning in 1951 to one beginning in 1892. There is evidence of two demographic clusters off the west coast centered off southern/central California and British Columbia. Although the bocaccio range extends considerably further north of Cape Blanco, abundance is low between Cape Mendocino and the Columbia River. Evidence also exists for a diffusion of young bocaccio from southern California northward as they age.

Major data changes for the 2009 assessment compared to previous assessments included a revised catch history and modeling of the trawl fishery as northern and southern components rather than as a single fishery. The 2009 assessment incorporated the NWFSC shelf-slope trawl survey for the first time, and also revised triennial trawl survey estimates. The 2009 assessment also used the NWFSC Southern California Bight hook and line survey and revised juvenile indices from the recreational pier index and juvenile trawl survey index.

The best estimate of current stock depletion in the 2009 assessment is 28 percent. The results of the 2009 assessment are consistent with those of the 2007 update, except for a smaller estimated starting biomass. The change in the estimated starting biomass resulted primarily from extension of the assessment period back to 1892 when spawning output was estimated to be close to unfished levels.

The SSC endorses the research and data collection recommendations of the assessment authors and the STAR Panel. While there are unresolved issues with the assessment, progress on these problems is likely to be difficult and incremental without additional biological data and information on stock structure. The SSC concurs with the STAR Panel recommendation that the next bocaccio assessment be an update rather than a full assessment.

The SSC endorses the use of the 2009 bocaccio assessment for status determination and management in the Council process.

The SSC supports extension of the assessment north of Cape Mendocino as biologically appropriate given our current understanding of stock structure, but also recognizes that this boundary extension raises issues with respect to area management. Approximately 6 percent of the coastwide bocaccio catch has occurred historically between Cape Mendocino and Cape Blanco while only 1 percent has been taken from the California/Oregon border to Cape Blanco. There is not a conservation issue at this time north of the 40<sup>0</sup>10' management boundary based on these low bocaccio catches in this area. Therefore, the SSC does not recommend changing the area where bocaccio are designated as overfished. Management should be based on a pro-rata allocation using the historical catch distribution north and south of 40<sup>0</sup>10'.

### Cabazon

Dr. Jason Cope presented the cabazon stock assessment to the SSC. Dr. Vidar Weststad presented the report of the Cabazon STAR Panel, held in Seattle, Washington on July 27-31, 2009.

The last full assessment of cabazon was conducted in 2005. The 2009 assessment extends the spatial range of the assessment to include Oregon as a third sub-stock, while retaining the two sub-stocks within California, north and south of Point Conception. Each of these sub-stocks was modeled separately, and a fourth scenario considered California as a single sub-stock. Several stock definition techniques support there being two or more stocks in California.

Notable changes in data from the 2005 assessment include a longer time series of catches and additional RecFIN length composition data prior to 1990. Conditional age-at-length data was used for the first time allowing for growth estimation internal to each model.

The stock assessment team (STAT) considered all available potential indices of abundance, but few were useful for assessment purposes due to a lack of appropriate spatial and temporal coverage. Consequently, only one index of abundance was used for each sub-stock (CPFV for California and the Oregon Recreational Boat Survey (ORBS) for Oregon). The SSC discussed the need for further review of local indices of abundance and their incorporation into stock assessment models.

The results of the 2009 assessment are consistent with the 2005 assessment for the Northern California sub-stock (NCS), but somewhat different for the Southern California sub-stock (SCS) mainly due to additional length composition data from the 1980s for the latter. A California coast-wide model estimated current depletion to be below either of the sub-area estimates. The SSC agrees with the STAT and STAR Panel that the NCS and SCS models best reflect the dynamics in each area, and that the results of the two sub-stock models should be combined in providing management advice for California.

The SSC endorses the use of the 2009 cabazon assessment for status determination and management in the Council process. A full assessment is not recommended in the next few assessment cycles in the absence of additional appropriate survey indices or better estimates of the natural mortality rate and/or growth parameters.

## Lingcod

Dr. Owen Hamel presented the lingcod stock assessment to the SSC. Dr. Vidar Weststad presented the report of the Lingcod STAR Panel, held in Seattle, Washington during July 27-31, 2009.

The assessment utilized data from the entire west coast of the contiguous United States (waters off Washington, Oregon and California). The lingcod population in these areas was modeled as two stocks in two separate assessment models covering [1] waters off Oregon and Washington (northern stock) and [2] waters off California (southern stock). This spatial delineation differed slightly from that used in the last stock assessment (2005) in which the stocks were separated at Cape Blanco (43° N vs. 42° N). The spatial change was necessary to facilitate access to existing databases for an analysis of candidate stock structures that was carried out prior to the assessment modeling.

Notable data differences from the 2005 assessment were (i) inclusion of four additional years of fisheries data (2005-08), (ii) extension of the catch time series back to 1928 (vs. 1956), and (iii) use of two new indices of abundance (NWFSC trawl survey and recreational dockside CPUE). Modeling changes included use of the SS3 software and other model structure refinements.

Key results of the 2009 assessment of the northern stock ( $B_0=33,000\text{mt}$  and depletion=62 percent) are generally consistent with the 2005 assessment. Further, sensitivity analysis demonstrated that these results are quite robust to the inclusion/exclusion of the various indices of abundance and other data sources. In contrast, results of the 2009 assessment of the southern stock ( $B_0=25,000\text{mt}$  and depletion=74 percent) are considerably more optimistic than the 2005 assessment; but are not nearly as robust as results from the northern stock. For example, exclusion of the recreational CPUE index from the southern base case reduced the depletion ratio estimate to 38 percent – a level more comparable to that estimated in the 2005 assessment, while inclusion of the age sampling data increased the depletion ratio estimate to 90 percent. Given these differences in uncertainty of the northern and southern stock results, the SSC concurs with the STAT that the respective decision tables should be structured differently. While natural mortality may serve as a reasonable major axis of uncertainty for the northern stock, the inclusion/exclusion of indices and data sources better characterizes the major uncertainty axis for the southern stock.

The NWFSC trawl survey index is highly variable and could not be well fit in either the northern or southern assessment model. The northern survey index is highly variable and without trend. However, while equally imprecise, the southern index exhibits a consistently declining trend over its six year history. As this trend is inconsistent with the assessment results, future work should investigate whether alternative model structures and/or assumptions can reproduce this trend; or whether re-analysis of the survey data may be warranted.

The considerable set of age sampling data was not incorporated in the base case for either the northern or southern lingcod assessment. The results for the southern stock were sensitive to the inclusion/exclusion of these data. Age validation and possible biases in age reading should be investigated. However, age sampling should continue until these issues can be resolved.

The SSC endorses the use of the 2009 lingcod assessment for status determination and management in the Council process. An updated assessment should be sufficient for the next lingcod assessment unless substantial progress can be made on ageing validation. Finally, the SSC endorses the research recommendations of the STAT and STAR Panel.

PFMC  
09/14/09



## SSC Groundfish Subcommittee Report on Petrale Sole AFSC, Seattle WA – August 31, 2009

### Background

This year an assessment of the petrale sole (*Eopsetta jordani*) stock off the U.S. west coast was conducted and a scientific review was held at a Stock Assessment Review (STAR) panel meeting May 4-8<sup>th</sup> in Newport, OR. The assessment concluded that since 1943 the stock has experienced chronic annual overfishing, defined as fishing mortality rates in excess of  $F_{40\%}$ , which is the rate that would reduce the expected lifetime egg production of a new recruit to 40% of that expected to occur in the absence of fishing. Moreover, the assessment concluded that the abundance of the stock has been below the minimum stock size threshold (MSST) since 1953, which would require the development of a stock rebuilding plan. For all Council groundfish stocks, the MSST is defined to be 25% of the biomass if there were no fishing ( $B_{25\%}$ ). In contrast to these conclusions, the assessment also showed that the stock has supported very steady annual catches in excess of 2,000 mt for the last half century. Moreover, the stock assessment team (STAT) argued that the Council's proxy flatfish reference points ( $F_{40\%}$  and  $B_{25\%}$ ) were inappropriate, given the estimated productivity of the stock. The STAR panel review concurred with the STAT's evaluation and recommended that the reference points ( $B_{msy}$  and  $F_{msy}$ ) developed specifically for petrale sole be used by the Council in developing ABC and OY recommendations for the 2011-2012 biennial management cycle.

The SSC reviewed the stock assessment and the STAR panel report at the Council's June 2009 meeting in Spokane, WA and, based on a number of concerns that were identified at that time, was unable to endorse a re-definition of reference points specific to petrale sole. Instead, the SSC developed a list of analytical requests and asked that the STAT conduct further analysis and report its findings to a meeting of the SSC's groundfish subcommittee to be held sometime later in the summer. This report summarizes the deliberations of the subcommittee meeting, which was held August 31<sup>st</sup> at the Alaska Fisheries Science Center in Seattle, WA and provides several recommendations regarding the petrale sole stock.

### The Problem

The Council has used a harvest control rule for its assessed groundfish stocks since passage of Amendment 11 to the FMP in 1998. The control rule specifies proxy  $F_{msy}$  harvest rates for flatfish and Pacific whiting ( $F_{40\%}$ ), roundfish ( $F_{45\%}$ ), and rockfish ( $F_{50\%}$ )<sup>1</sup>. The Council adopted these three taxon-specific proxy fishing mortality rates, due to perceived differences in the productivity among these groups. However, at the same time the Council has used a single "target" stock biomass as its nominal  $B_{msy}$  proxy ( $B_{40\%}$ ), as well as a single MSST ( $B_{25\%}$ ). The use of proxy estimates of  $F_{msy}$  and  $B_{msy}$  was adopted by the Council due to inherent statistical difficulties in estimating these quantities in any single stock assessment and because of a well-developed scientific

---

<sup>1</sup> Note that an  $F_{40\%}$  harvest rate is greater than an  $F_{45\%}$  harvest rate, which in turn is greater than an  $F_{50\%}$  harvest rate, i.e., flatfish are expected to achieve MSY at greater fishing pressure than rockfish.

literature supporting the use of proxies. Nonetheless, the Council has previously been confronted with peculiarities associated with the use of its proxies. For example, in the case of Pacific whiting where, if fished at the proxy harvest rate, the spawning biomass would be expected to drop below the MSST with some regularity. Fundamentally, as the productivity of a stock increases, the fishing mortality rate that produces MSY increases and, concomitantly, the relative biomass of the stock when fished at that rate decreases. Hence, flatfishes would be expected to have a lower relative  $B_{msy}$  value than rockfishes and logically might have a lower MSST than rockfishes as well. However, all Council groundfish stocks are currently judged identically with respect to being overfished.

### **Requests to the Petrale Sole Analytical Team**

In June the SSC developed a list of analyses for the petrale sole STAT that were divided into two major areas. The first set of analyses was designed to explore the extent of parameter confounding and the influence of Canadian catches on the stock assessment model, including: (1) generating MCMC outputs for key model parameters, (2) evaluating the effect of Canadian removals on stock status, (3) incorporating a new “prior” on spawner-recruit productivity, also termed steepness ( $h$ ), and (4) altering the prior on the natural mortality rate ( $M$ ) to make it more informative. The second set of requests dealt specifically with the use of generalized proxies versus petrale-specific management quantities, including: (1) characterization of uncertainty in estimates of  $B_0$ ,  $B_{msy}$ ,  $B_{40\%}$ , and  $F_{msy}$ , (2) evaluating the effect of time-blocked selectivities on the estimate of  $B_{msy}$ , and (3) providing a clear argument to support the use stock-specific estimates.

### **Response to the SSC Groundfish Subcommittee**

The petrale sole STAT attempted to complete all the requested analyses but was unable to generate a converged MCMC chain from the base model due to a technical difficulty with the Stock Synthesis modeling platform. This precluded a detailed evaluation of parameter confounding and prevented a thorough description of uncertainty in some of the key assessment outputs, including the stock-specific estimates of  $B_{msy}$  and  $F_{msy}$ . The STAT reported that the technical difficulty has now been solved but that there was insufficient time available to conduct an MCMC analysis before the subcommittee meeting. The team did succeed in developing a Canadian petrale sole catch history, but was unsuccessful in its attempt to incorporate those data into the base model, primarily because the Canadian compositional data were unavailable until just before the subcommittee meeting and when reviewed they differed markedly from the lengths and ages from Washington. The subcommittee agreed with the STAT that incorporation of the Canadian data in the assessment would require considerable additional work and should be done in collaboration with Canadian scientists. With respect to incorporating priors on  $h$  and  $M$ , the STAT was successful, but the effect of those analyses on the assessment was minimal, as was the effect of time-varying selectivity blocks on the model’s estimate of  $B_{msy}$ .

Given the information and analyses that were presented, the subcommittee found no fault with the base petrale sole model that was approved by the STAR panel and recommends

that it be used as the basis for setting an ABC and OY. However, in light of the base model's stock-specific estimates of  $B_{\text{msy}}$  (19% of  $B_0$ ) and  $F_{\text{msy}}$  (equivalent to  $F_{20\%}$ ) the subcommittee discussed at some length the wisdom of using the Council's flatfish harvest control rule proxies for petrale sole.

In addition, with respect to survey catchability, during the SSC review of the assessment in June, the catchability coefficient for the NWFSC combined trawl survey was considered. In particular, the parameter estimate was considered high ( $q = 3.07$ ) and reasons for this were discussed. During the groundfish subcommittee meeting the STAT team presented additional information to help the subcommittee interpret the estimate, including video showing the Aberdeen trawl footrope and the response of flatfish and rockfish to the approaching net. Although the subcommittee concluded that there was no basis for rejecting the assessment based on the estimate of  $q$ , the development of a prior for survey catchability, as had been anticipated from the 2008 survey catchability workshop, may have been useful.

The subcommittee also received comment from industry representatives present at the meeting regarding petrale sole fishery-dependent logbook CPUE data that evidently have increased substantially. When petrale sole is next assessed, it would be helpful to document and reconcile this increase in CPUE with the trends estimated by the model.

### **SSC Groundfish Subcommittee Recommendations**

The SSC groundfish subcommittee still endorses the use of proxies as a general practice for two important reasons. First, as noted previously, it is usually quite difficult to obtain reliable stock-specific estimates of  $B_{\text{msy}}$  and  $F_{\text{msy}}$  in any particular assessment (Haltuch *et al.* 2008). From a meta-analytical perspective there is no doubt that useful inference about stock productivity can be drawn by comparative analysis of information drawn from studies of related species in comparable habitats. Second, the use of proxies has a stabilizing influence on stock reference points, which is beneficial to the management process. However, given the marked discrepancies between the Council's existing flatfish proxies and the stock-specific reference points derived from the approved base model ( $F_{20\%}$  and 19% depletion), the subcommittee recommends that new flatfish proxies be developed for Council management. To that end, the subcommittee reviewed an analysis of productivity parameters for west coast flatfish (Dover sole, petrale sole, English sole, arrowtooth flounder, and starry flounder) developed by Dr. Martin Dorn and concluded that steepness was at least  $h = 0.80$ . Moreover, recent results presented in Punt *et al.* (2008) show that for a diverse set of west coast groundfish stocks (Pacific whiting, sablefish, petrale sole, and canary rockfish), a steepness value of 0.80 is associated with an  $F_{\text{msy}}$  value that is roughly equivalent to  $F_{30\%}$  when the stock-recruit relationship has a Beverton-Holt form (see Figure 1). Moreover, the level of stock depletion associated with fishing at  $F_{\text{msy}}$  is approximately  $B_{25\%}$  (see Figure 2). The subcommittee noted that use of the Beverton-Holt stock-recruitment relationship is appropriate in this case because: (a) all stock assessments for west coast groundfish are based on this relationship and (b) the data for petrale sole support the Beverton-Holt curve over the Ricker relationship.

Based on these considerations the SSC's groundfish subcommittee recommends that the Council tentatively adopt those values as new west coast flatfish MSY proxies. In addition, given that the current MSST ( $B_{25\%}$ ) for groundfish is 62.5% of the target biomass ( $B_{40\%}$ ), the subcommittee recommends that for west coast flatfish under Council management, the MSST be set at  $B_{15\%}$ , which is 60% of the target stock size. Because the estimate of petrale sole stock depletion in 2009 from the STAT's base model is 11.6%, if this MSST is adopted the stock would be declared overfished.

The subcommittee also recommends that a more comprehensive analysis of the PFMC's harvest control rule proxies be undertaken as soon as practicable, which may influence and/or supersede these recommendations. In particular, biomass targets and thresholds should be established that are consistent with expected stock productivities and in accordance with expected levels of intrinsic stock variability. The subcommittee recognizes that this will be a major undertaking, which logically should be conducted as a full management strategy evaluation, but these issues and concerns are fundamental to proper utilization, conservation, and stewardship of groundfish resources.

Haltuch, M.A., Punt, A.E. and M.W. Dorn. 2008. Simulation testing alternative estimators of unfished stock size. *Fish. Res.* 94:290-303.

Punt, A.E., M.W. Dorn, and M.A. Haltuch. 2008. Evaluation of threshold management strategies for groundfish off the U.S. west coast. *Fish. Res.* 94:251-266.

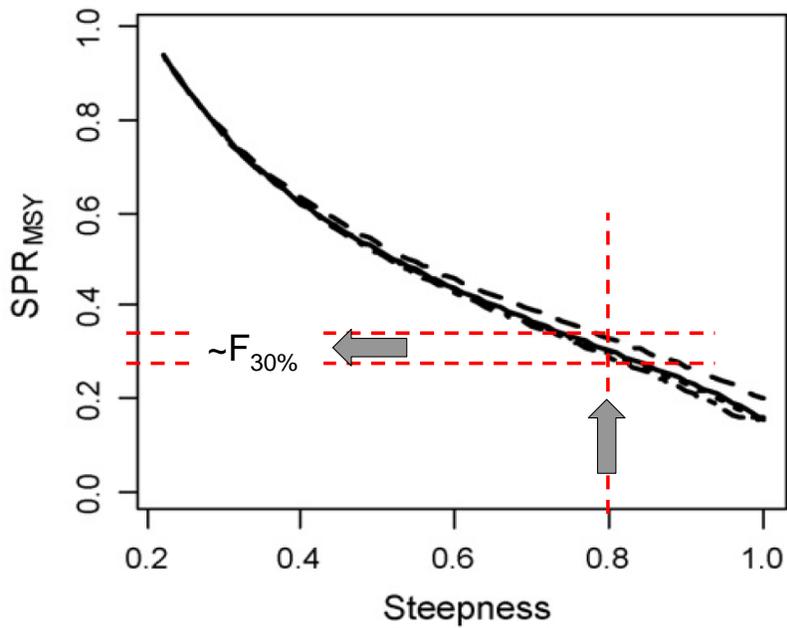


Figure 1. Relationship between spawner-recruit steepness ( $h$ ) and the fishing mortality rate, expressed as spawning potential ratio (SPR), that maximizes sustainable yield among four west coast groundfish stocks (taken from Punt *et al.* 2008).

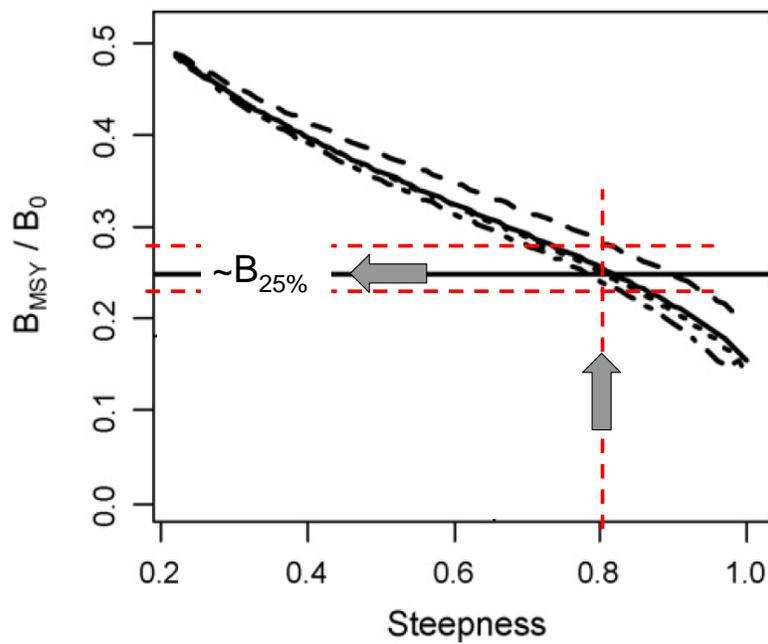


Figure 2. Relationship between spawner-recruit steepness ( $h$ ) and the level of stock depletion that is consistent with attainment of MSY among four west coast groundfish stocks (taken from Punt *et al.* 2008).