

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

FULL STOCK ASSESSMENTS

Petrale Sole

Dr. Melissa Haltuch presented the petrale sole assessment to the Scientific and Statistical Committee (SSC). Mr. Allan Hicks was also present to respond to questions. Dr. Theresa Tsou summarized the report of the Stock Assessment and Review (STAR) Panel review of the petrale sole assessment, held in Newport, Oregon, May 4-8, 2009.

The previous petrale sole assessment was conducted in 2005. The Stock Assessment team (STAT) successfully addressed many of the issues that were raised during STAR Panel review of the 2005 assessment. The most significant change was that a single coast-wide model was used, rather than independent assessments of northern and southern components of the stock. Other changes included incorporation of discard data in the model, addressing problems with petrale sole age data and ageing error information, and estimation of different natural mortality rates for the females and the males.

Despite these changes, the new assessment estimates of stock size and trend are highly consistent with the previous assessment. The most notable exception is that the previous assessment showed a strong increase in stock size in the last years of the assessment. The current assessment now shows a recent decline in stock size that is driven by four consecutive years of decline in the Northwest Fisheries Science Center (NWFSC) survey index since 2005. Stock size is estimated to be at a depletion level of 11.6 percent in 2009.

Assessment results indicate that according to Council's proxy reference points, fishing mortality on petrale sole has continually exceeded the target of $F_{40\%}$ since the 1940s, and that the stock has been below the $B_{25\%}$ overfished threshold since about 1953. These results are to a large degree driven by two basic pieces of information: 1) the high landings of petrale sole during the 1940s and 1950s, and 2) age and size composition data that are consistent with a high exploitation rate (e.g., the recent age composition data show that very few old fish are present in the population). Sensitivity analyses with different modeling assumptions consistently showed this pattern, suggesting that it is a relatively robust result of the assessment.

While the petrale sole assessment appeared to be technically sound and thoroughly reviewed by the STAR panel, the SSC was concerned that certain assessment results were so extreme that the overall plausibility of the assessment was called into question. Attention focused primarily on the estimated catchability of the NWFSC survey, the estimate of stock-recruit steepness (0.95), and confounding of estimated model parameters.

The petrale sole assessment used two indices of abundance, the Alaska Fisheries Science Center (AFSC) triennial survey from 1980 to 2004, and NWFSC survey from 2003 to 2008. The estimated catchability of the AFSC survey was 0.52 and 0.72 for early and late periods, while the estimated catchability of the NWFSC survey was 3.07. A catchability of 1.0 would imply that

the survey net captured all the fish in front of the net, and that fish density is the same in trawlable and untrawlable areas. A catchability greater than 1.0 could be a result of two general processes: herding of fish into the net, and lower densities of fish in untrawlable areas. Although it is reasonable to expect that these factors may be important for petrale sole, it is difficult to reconcile a catchability of 3.07 with likely magnitude of these factors inferred from studies of flatfish herding by research trawls in other areas, and initial estimates of trawlable and untrawlable areas off the west coast. Higher catchability of the NWFSC survey compared to the AFSC triennial survey is to be expected, given differences in survey design, survey procedures, and net configuration. Additional information on specifications of the NWFSC trawl net, such as the arrangement of discs on the trawl sweeps, may help to address this issue.

Although flatfish are, in general, productive stocks, the model-derived estimate of steepness for petrale sole (0.95) is at the 99th percentile of the distribution of steepness based on a meta-analysis of Pleuronectids stocks (the family of right-eyed flatfish), indicating that the estimate of steepness for petrale sole is very high compared to other flatfish. The SSC recommends that the STAT consider including a prior for steepness in the assessment model based on the meta-analysis of steepness for Pleuronectids. This would have the effect of constraining steepness so that it is within the range for other flatfish. Information presented to the SSC suggests that adding a prior for steepness would also have the effect of reducing the estimate of NWFSC survey catchability, though the amount of reduction is unclear.

The STAT and STAR Panel recommended that the model estimate of B_{MSY} be used for status determination. The SSC does not consider that a strong enough case has been made that the estimate of B_{MSY} is sufficiently reliable to be used for fisheries management. The STAT team reported that changes in fisheries selectivity blocking adopted during the STAR Panel lead to an increase in steepness, which would have a large influence on the estimate of B_{MSY} .

The SSC requests additional information to evaluate the reliability of the model estimate of B_{MSY} . Specifically, the SSC requests an analysis to evaluate whether changes in fishery selectivity have an influence on the estimate of B_{MSY} . The SSC also requests further evaluation of the uncertainty in the estimate of B_{MSY} , and will provide a list of specific analyses to the STAT. The requested analyses and model changes are relatively limited in scope, so the SSC does not recommend addressing these issues during the mop-up panel meeting. Instead, the SSC recommends that these analysis and model changes be reviewed by the SSC Groundfish Subcommittee at a short meeting during August. This meeting would also provide an opportunity for the Groundfish Subcommittee to develop criteria for evaluating whether species-specific B_{MSY} and F_{MSY} estimates should be used for status determination and applying the ABC and optimum yield (OY) control rules, rather than current proxies. The Groundfish Subcommittee may also consider whether a single proxy could be used for west coast flatfish stocks, since other assessed flatfish show the high productivity characteristics of petrale sole.

Splitnose Rockfish

Dr. Vladlena V. Gertseva presented the assessment of splitnose rockfish to the SSC. Dr. Jason Cope was present to respond to questions. Dr. Theresa Tsou summarized the report of the STAR Panel review of the splitnose rockfish assessment, held in Newport Oregon, May 4-8, 2009.

This was the first full assessment of splitnose rockfish; a preliminary assessment of the splitnose rockfish status was conducted in 1994. Splitnose rockfish have not been a target of commercial fisheries; rather they have been taken incidentally as bycatch in fisheries for Pacific ocean perch, mixed slope rockfish and other deepwater targets.

Splitnose rockfish were relatively lightly exploited until the 1940s, when the trawl fishery for rockfish first became important. Biomass and spawning output began to decline gradually then dropped rapidly for 3 years in the 1960s due to take by foreign trawl fleets. A more gradual decline then continued until 1998, and biomass has increased since then.

The current estimated status exhibits no cause for concern. Spawning depletion is currently at 66 percent of its unexploited level, hence this stock is not overfished or in the precautionary zone. It dropped below the 40 percent threshold for the 8 years prior to 2003. Values of spawning biomass per recruit (SPR) have been greater than 50 percent since 1999.

The STAR Panel registered some concern that tuning of σ_R during the estimation, while it produced similar trends in spawning output, also resulted in larger differences in scale between the various runs. They concluded that the model is heavily influenced by the recruitment assumptions in the analysis and the effects of tuning. They were confident that the assessment had demonstrated the population was not overfished and that overfishing was not occurring, but cautioned against allowing catch to increase until the next assessment could identify yield reference points better.

Drs. Gertseva and Cope noted there are existing otoliths from several hundred fish taken off California between 1981 and 1985, which could be aged for the next assessment, and would likely improve the confidence in the assessment. Reliable age data are particularly important for this species since length distributions are uninformative because they reach maximum size relatively more quickly than other species.

The SSC endorses the use of the splitnose rockfish assessment for status and management in the Council process, but agrees with comments by the STAR Panel that caution be used in the use of results in management actions such as setting annual catch limits (ACLs).

UPDATED STOCK ASSESSMENTS

According to the terms of reference for stock assessment reviews (TOR), updates are appropriate in situations where a “model” has already been critically examined and the objective is to simply incorporate the most recent data. To qualify, a stock assessment must carry forward its fundamental structure from a model that was previously reviewed and endorsed by a STAR Panel. Any new information being incorporated into the assessment should be presented in enough detail that the review panel can determine whether the update satisfactorily meets the Council’s requirement to use the best available scientific information. The SSC’s review focused on two crucial questions: (1) did the assessment comply with the TORs for stock assessment updates and (2) are new input data and model results sufficiently consistent with previous data and results that the updated assessment can form the basis of Council decision-making. Generally, if either of these criteria were not met, a full stock assessment (rather than an update) would be recommended.

While an update assessment is clear in concept, in practice there are often special issues that make it difficult to determine whether an assessment qualifies as an update. For the update assessments reviewed by the SSC, several such issues needed to be considered, e.g. when “new” data were added to early years in the assessment. Despite these considerations, it was generally clear that all of this year’s update assessments were acceptable as updates.

The SSC acknowledges the efforts of the STATs in preparing complete and timely assessment documents, and for the summary presentations made at this meeting. Without these high-quality documents, informative presentations, and general cooperativeness, the SSC could not have completed its work in the available time.

Canary Rockfish

Canary rockfish is a North American transboundary rockfish species distributed from central California to Alaska. The species is patchily distributed and difficult to sample well using bottom trawl gear. From the mid-1940s until it was declared overfished (1999), the average annual harvest was 2,500 t. Since 1999, harvest has been greatly reduced with annual catches only in the range 172-287 t.

Canary rockfish was last assessed in 2007. At that time, the depletion percentage (SSB_{2007}/SSB_0) was estimated to be 32.4 percent with 95 percent confidence bounds of 24-41 percent. The stock was under a Council rebuilding plan with recent year and projection estimates of spawning stock biomass (SSB) indicating an upward trend.

As per the *Terms of Reference for Groundfish Stock Assessments (TOR)*, fishery and survey data were updated to include the years since the last assessment. Data updates for earlier years were also made. Most of these were minor with the exception of the use of a revised historical California catch time series (1916-80). The SSC concurred with the STAT that (i) the revised catches reflected the best available data, and (ii) incorporation of the revised catches was consistent with the update assessment TOR in that the process for catch estimation had not changed (rather additional raw data became available after the last assessment).

The Stock Synthesis model, Version 3 (SS3) was used for this assessment update, whereas Version 2 (SS2) was used for the last assessment. However, the SS3 assessment model formulation was essentially the same as that used for the SS2 model used in 2007. Further, the STAT carried out comparative runs (SS2 vs. SS3) using data from the last assessment. The results were nearly identical.

The update assessment results indicate that the current depletion percentage (SSB_{2009}/SSB_0) is 23.7 percent with 95 percent confidence bounds of 9-40 percent. Stock projections show a slight increase in 2010 (24.5 percent). The STAT noted and the SSC concurs that there is a high degree of uncertainty in the parameter estimates – especially steepness. Under the range of alternatives examined by the STAT, recent-year depletion percentage is highly dependent on steepness – hence the broad confidence interval on depletion level.

Given that canary rockfish are already under a Council rebuilding plan, the management implications of the updated assessment are not qualitatively different from those of the 2007 assessment. The principal difference lies in the estimate of SSB_0 . While the overall SSB trends

(over the past 50 years) are not greatly different, the updated assessment estimated a smaller SSB_0 with concomitantly lower depletion percentage in recent years.

The canary rockfish updated assessment meets the TOR for an assessment update. It represents the “best available science,” and can serve as the basis for Council management decisions.

Another update assessment is recommended for the next assessment cycle (i.e. in 2011). In conjunction with the 2011 update, the STAT should conduct sensitivity analysis to (i) examine the effects of incorporating Canadian catch (and perhaps survey data) into the assessment; and (ii) further investigate estimates of steepness since they appear to be quite influential on depletion percentage estimates. Neither of these lines of investigation would affect the base case but may demonstrate the need for a full assessment in 2013.

Darkblotched Rockfish

Darkblotched rockfish is a long-lived (60-105 years) member of the slope rockfish assemblage. There were large removals by foreign fisheries during 1966-68, followed by moderate landings of 200-1000 t per year thereafter. The species was first fully assessed in 2000, and declared overfished as a result of that assessment.

In the previous stock assessment in 2007, darkblotched rockfish was estimated to be gradually rebuilding from a low of 10 percent of unfished stock size in 2000. The stock was estimated at 22 percent of unfished stock in 2007.

As per the *Terms of Reference for Groundfish Stock Assessments (TOR)*, fishery and survey data were updated to include the years since the last assessment. Minor updates for earlier years were also made. In contrast to the updates of cowcod and canary rockfish, the revised historical California landings were not used in the darkblotched rockfish update assessment. The SSC was concerned about this lack of consistency between updates and requested that the STAT: 1) compare the time series of total landings used in the assessment with total landings when the revised historical California landings are incorporated; and 2) provide a comparison model runs with and without the revised California landings. Total landings increased, but the percentage change in the aggregate removals was much lower than for either cowcod or canary. Comparison of model runs with and without the revised historical California landing indicated that that change in estimated stock trend and current status was miniscule (~0.1 percent). Nevertheless, for consistency with other updates, the SSC recommends that this change be incorporated in the final draft of the update.

The SS3 was used for this assessment update, whereas SS2 was used for the last assessment. However, the SS3 assessment model formulation was essentially the same as that used for the SS2 model used in 2007.

The fishing mortality rate on darkblotched rockfish has been greatly reduced, and darkblotched rockfish appear to be rebuilding gradually at close to previous rebuilding projections. In this update assessment, stock status in 2007 was estimated to be 21 percent of the unfished stock size, which is consistent with the previous assessment (22 percent). The estimate for the depletion percentage of the spawning output at the start of 2009 is 27 percent, indicating that the stock has increased by a factor of 2.7 since 2000. However, recent survey trends are noisy and relatively

flat. The estimated increase in stock size is driven primarily by the assumption that darkblotched productivity is analogous to that of other similar species, and not on survey and fishery data indicating an upward trend.

The darkblotched rockfish updated assessment meets the TOR for an assessment update. It represents the “best available science,” and can serve as the basis for Council management decisions.

Another update assessment is recommended for the next assessment cycle (i.e. in 2011). When the next full assessment is conducted, the SSC suggests that the following items be addressed.

The AFSC slope survey was strongly domed-shaped, while the NWFSC slope survey was estimated to be asymptotic. There appeared to be no obvious reason for such a large difference in selectivity for two surveys with similar nets and depths of operation. The SSC recommends that the next full assessment for darkblotched rockfish consider whether estimated selectivity patterns are consistent with known differences and similarities between the different surveys used in the assessment.

Additional ageing work should be carried out. Older darkblotched rockfish collections should be re-aged and ageing error for the full age range should be re-evaluated.

Darkblotched rockfish habitat preferences should be quantified. Information from the STAT indicated that adult darkblotched rockfish association with rock ledges may affect the ability of survey to monitor this component of the population.

Pacific Ocean Perch

Pacific Ocean perch (POP) were harvested almost entirely by U.S. and Canadian vessels in the Columbia and Vancouver International North Pacific Fishery Commission (INPFC) areas prior to 1965. Large factory trawlers from the Soviet Union and Japan began fishing for POP in the Vancouver area and in the Columbia area in 1965 and 1966, respectively. Intense fishing pressure by these foreign fleets occurred from 1966 to 1975. Catches from all fleets peaked in 1966-67. Passage of the MSA in 1976 ended foreign fishing within 200 miles of the U.S. coast. NMFS formally declared POP overfished in March 1999.

In the previous stock assessment in 2007, POP was estimated to be gradually rebuilding. The estimate of depletion percentage in 2007 was 27.5 percent.

As per the *Terms of Reference for Groundfish Stock Assessments (TOR)*, fishery, survey, and observer data were updated to include the years since the last assessment. Minor updates to the data from earlier years were also made.

The last full assessment was conducted in 2003. The 2005, 2007, and this assessments were updates using the same forward projection, age-structured model as used in 2003.

Results of the updated assessment indicate that the stock continues to rebuild albeit slowly. The updated estimates of the depletion percentage are 25.2 percent, 27.4 percent, and 28.6 percent in

2007, 2008, and 2009, respectively. Exploitation rates remain at a low level. There were no significant changes in the view of stock status between the 2007 and 2009 assessment updates.

The POP updated assessment meets the TOR for an assessment update. It represents the “best available science,” and can serve as the basis for Council management decisions.

A full assessment is recommended for 2011 to incorporate reconstructed historical catches from Washington and Oregon; and to explore use of the NWFSC shelf survey index, a different survey selectivity function, and different time blocking for fishery selectivities. A full assessment would also allow consideration of the Stock Synthesis modeling platform.

Key research recommendations for the next assessment are:

1. Research on the relationship of individual female age and weight to maturity, fecundity and survival of offspring.
2. Research on the relative density of POP in trawlable and untrawlable areas and differences in age and/or length compositions between those areas.
3. Research on the relative status of the British Columbia stock of POP and sensitivity of including Canadian catch in the U.S. assessment.
4. Consider expanding the assessment area south.
5. Historical catch reconstruction mainly in WA and OR.
6. Potential use of the NWFSC shelf survey index.
7. Age the Washington Department of Fish and Wildlife samples from the 1980s.

Cowcod

The cowcod is a long-lived, large, heavily overfished species with a large conservation zone in the Southern California Bight (SCB). The species extends to the north, but is concentrated in SCB. In 1999, the first assessment of cowcod indicated that the stock was overfished.

The 2007 assessment estimated the depletion percentage at 3.8 percent for the base model bounded by 3.4 percent (low state of nature) and 16.3 percent (high state of nature). The trend in spawning biomass was increasing slowly mainly due to assumed low catch.

No new data sources were available for this update assessment. Catch reconstructions were done for both the commercial (1900-1968) and recreational fleets (1928-1980). However, the commercial reconstructions while slightly larger than those used in the assessment, were also for a larger area than the SCB, and therefore not directly comparable. The reconstructed recreational catches were lower than those used in the 2007 assessment and were adopted for the current update. There were no changes to the assessment model in this update.

The 2009 update assessment estimated the depletion percentage at 4.5 percent for the base model bounded by 3.8 percent (low state of nature) and 21.0 percent (high state of nature). The stock continues to display a slow upward trend but given that no new data are available, this result is little more than a stock projection. Cowcod remain on a multi-decadal rebuilding timeline.

There is little change in the view of stock status as a result of the 2009 update assessment. However, the change in historical recreational catches did lower the estimate of B_0 and partly gave rise to the increase in the 2009 estimate of depletion percentage.

The cowcod updated assessment meets the TOR for an assessment update. It represents the “best available science,” and can serve as the basis for Council management decisions.

The next time an assessment is conducted, it should be a full assessment. However, this need not be in 2011. Rather a simple check of the catch information to see if it is still in the current range should suffice. If needed, standard stock projection software can be used to update depletion percentages. There will be no new information in the indices currently used in the assessment to warrant the effort of an update assessment.

The next full assessment, when conducted, should include an evaluation of Mexican catch data and the catch north of Pt Conception; an evaluation of the time series excluded in the 2007 full assessment (and therefore this update); and a re-evaluation of commercial passenger fishing vessel (CPFV) logbook data used to create the index of abundance. Enhanced biological sampling should also be carried out to improve estimates of the population vital rates.

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