Starry Flounder

STAR Panel Report
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Introduction

This stock assessment review (STAR) panel was assembled to review new assessments for US West Coast stocks of English sole, petrale sole, and starry flounder. All three assessments used the new Stock Synthesis 2 software (SS2, version 1.18) for their analyses. Several significant changes in the forecasting module were made to SS2 during the weeks just prior to the STAR panel review (upgrades from version 1.16 to 1.18). Consequently, the STAT teams were using a program that they were not fully familiar with, which sometimes impeded their ability to develop the model reformulations, alternate runs, and forecasts requested by the Panel. Furthermore, in light of the newness of the software, the Panel and STAT teams sometimes had difficulty interpreting results and model diagnostics. This problem should not be a factor in the future as the software stabilizes, and user familiarity improves. In general, the SS2 program is a major improvement over its predecessor and its author, Rick Methot, has done an excellent job at developing, documenting, and revising this software. Also, the STAT team members are to be commended for forging new ground with SS2, while operating under considerable pressure from scheduling deadlines.

General comments on the flatfish assessments

The STAT teams undertook considerable effort to reconstruct the catch histories for petrale and English sole. The catch histories were taken much further back in time than had ever previously been considered in assessments for these stocks. The Panel felt that this was useful because starting from zero or very small catches seemed to provide more consistent estimates of unexploited spawning stock biomass (B_0), which is an important reference point for management purposes. However, analyses requested to evaluate sensitivity to the longer catch time series (detailed below) indicated that the catch reconstructions apparently had little effect on current status. In general it might be useful to conduct sensitivity analyses that vary the start-years for the catch time-series to confirm that assessment results are robust to variation in assumed or estimated historical catches.

Where model (SS2) estimates of B_{MSY} were available, these tended to indicate that the Council's default reference points were more conservative, with the default minimum stock size thresholds (MSST; 25% of B_0) being much larger than the MSST values corresponding to the estimated B_{MSY} levels. For example, the English sole assessment estimated that MSY occurs at a relative biomass level of only 19% of B_0, which implies that this stock would be declared overfished (under current procedures) if it were reduced to the level that produces MSY.

The Panel found that the current projection capabilities of the SS2 software were limited in how future harvest levels could be specified. This became particularly apparent when compiling the decision tables for English sole, where it would have been useful to have had the facility to specify that the catch level in a single year should be the minimum of the 40-10 optimum yield (OY) catch or the average recent catch. Further, the software requires the user to input the future stream of landed catch, whereas the total catch (landings plus discards) is the more relevant quantity for management.

Recent Canadian flatfish assessments for British Columbia should be reviewed as a simple check on stock status; the possibility of integrating Canadian results into the current assessment should also be explored.

During reviews of the stock reconstruction tables Mr Peter Leipzig observed that the stock biomass estimates always fell during the initial years, even during periods when there were essentially no removals by fishing. The causes and interpretations of this phenomenon were discussed and explained. The initial stock size in the model is the equilibrium value that results from constant recruitment at the average level of annual recruitment, whereas during the modeled period, but prior to when the catch-at-age data have any influence, the recruitment each year is the median value, which is lower than the expected value due to the assumed lognormal recruitment variability. The modeled stock therefore undergoes a transition as it adjusts to the lower recruitment, even if there is little or no fishing. This highlighted a perceptual problem with presenting model output based on median levels for one period and expected values for other periods. The panel found that the important assessment results (e.g., the current spawning biomass relative to B_0) were calculated appropriately. Captions to the plots of biomass versus time should indicate that the initial stock size represents the expected value based on average lognormal recruitment.

Another scenario in which transient changes in biomass could occur, even though there are no changes in the rate of fishing, is if the fish growth rates changed over a period of time. For example, if growth slowed then stock biomass would decrease relative to the virgin level and fishing might be misinterpreted to be the cause of this "depletion". The issue of changing growth patterns and their impacts on stock reference points raises a general concern.

Overview of the Assessment

The starry flounder (*Platichthys stellatus*) is distributed along the Pacific Coast from Point Conception, California, to Alaska, with 93% of reported catches on the U.S. west coast taken in shallow waters (< 32 fathoms). This is the first stock assessment of the starry flounder population residing on the U.S. west coast. For management, this stock previously has been included in a general "other flatfish" category. Separate assessments were made for the southern area (California) and northern area (Oregon and Washington) because of substantial differences in relative abundance trends in the two areas, as estimated from commercial logbook data. Abundance indices were based on CPUE analysis of commercial logbook data for both assessments. The southern area model was enhanced by including a fisheries independent pre-recruit survey from the Sacramento & San Joaquin River estuary (the IEP-CDFG survey). Historic trawl landings in the northern area, where no landings data were available prior to 1980, were reconstructed by extrapolating reported landings in the southern area, which were available back to 1915. It was assumed that the ratio of catches from north and south for starry flounder followed the same historic pattern as for English Sole. Basic life-history parameters were largely based on a study by Orcutt (1950). The natural mortality coefficient was estimated based on data on maximum age from collections taken in Monterey Bay during 2001 to 2004.

Both assessments predicted periods of five to six years when spawning biomass exceeded the average unexploited level (B_0), which is a feature not usually observed. In the northern area this super-normal abundance occurred from 1989 to 1994 and in the southern area it occurred from 1986 to 1990. In the model this high abundance resulted from having relatively light exploitation coupled with several years of unusually strong recruitment. The models assumed a very high level of natural variability in recruitment ($\sigma_R = 1.0$).

Due to the lack of fisheries independent survey data and poor information on the composition of commercial catches this stock assessment is subject to greater uncertainty than is implied by the 95% confidence intervals of spawning biomass from the SS2 model runs. Nevertheless, the results provide evidence for a healthy stock, with biomass estimates for both the northern and southern sub-populations being well above the precautionary thresholds and recent landings being less than 20% of the calculated ABC in both areas.

I. Analyses Requested by the STAR Panel

Note: all requests were fulfilled to the satisfaction of the STAR Panel.

1. Try computing natural mortality using the maximum age values observed in the study by Don Pearson of otoliths from fish collected from Monterey Bay during 2001 to 2204.
2. Try using the length composition data to estimate the total mortality coefficient (Z).

   This was done and found to produce values around 0.68 per year. Interpreting this value was difficult given that the length frequencies were collected at unknown times, areas, and depths.
3. Check the ratio of catch in the north to catch in the south that was used to reconstruct some of the northern historical catches. The data shown in Figure 6 and Table 3 in the review draft of the assessment appeared to be inconsistent, but this turned out not to be the case.
4. Investigate whether pooling of the effort data may have had some adverse effects on the starry flounder CPUE. For example, in Oregon logbooks the adjusted hails of starry flounder are distributed across all tows on a trip if starry flounder are landed but not hailed. If there were substantial numbers of unhailed starry flounder tows, then the spatial distribution of starry flounder CPUE could be highly inaccurate. Also, clarify whether some of the landings in Oregon were actually caught off of WA.
5. For the logbook data, replace Table 4, which listed logbook data file names and sizes, with summary statistics by year and by area (i.e., two tables) showing the catch, effort, the total number of tows, the number of tows that caught starry flounder (or percentage), and, if possible, the number of vessels.
6. Display more SS2 output estimates of uncertainty based on the Hessian approximation. The MCMC integration is unnecessary.
7. Attempt to extend the model back in time so that the historical catch level (currently assumed) is linked to the stock-recruitment estimates. The object of this exercise is to evaluate how having an assumed historical catch influences the estimates of uncertainty for R_0.

8. Given the changes that occurred in the transition from SS2 version 1.16 to version 1.18, do problems exist with the σ_R specification for the northern stock in terms of the convergence properties of the model?

For a preliminary decision table, the panel suggested including a row with catch set to the 40-10 rule OY, then another row with catch equal to the recent 3-yr catch average, then some multiple of this average (~3 x = 100 mt). For the alternative states of nature, the panel suggested taking the base-case estimate of fishery CPUE catchability (q) and developing two alternatives, one based on 75% of current q and the other based on 133% of current q.

II. Comments on the Merits or Deficiencies of the Assessment

Compared to most assessment used by the Council, the stock assessment for starry flounder is unusual in that no fisheries independent abundance indices for post-recruits were available, and because there were very limited data on the population or catch characteristics (e.g., size and age distributions). Estimates of the catch history were derived from English sole reconstructions and are thus uncertain. Further, the assessment relies solely on CPUE trends from commercial or sports fisheries data for abundance indices, which can be very problematic. The spatial cells used in the GLM analysis of the logbook CPUE data were not weighted by area and were fairly coarse. Vessel standardization should also have been considered. Hence, given the data limitations and the relatively large number of assumptions underlying this assessment, the estimates of uncertainty derived by the model are undoubtedly lower than the true uncertainty.

Due to time constraints, the Panel was not provided with full assessments and the Panel left the STAT team with instructions for completing the assessments, including specifications for the decision table. Specifically, to bracket the estimated uncertainty a set of specified q values (relative to the best estimate) was used to provide a reasonable range of abundance levels, similar to the procedure that was recommended for developing decision tables for the petrale sole stocks. During the week of the STAR the Panel reviewed the results of the analyses needed for the starry flounder base-case runs and the runs used to bracket perceived uncertainty. The decision table produced by the STAT team following the STAR was reviewed subsequently and found to be adequate for management purposes.

The Panel accepted the final assessments of the starry flounder stocks as adequate and useful for management purposes. The Panel commends the STAT team for pursuing a number of innovative ways to evaluate natural mortality and make creative use of the very limited data that were available.

III. Areas of Disagreement Regarding STAR Panel Recommendations

There were no major disagreements among the STAR Panel members nor between the Panel and the STAT team or other participants.

IV. Unresolved Problems and Major Uncertainties

As discussed above, the current assessment is heavily based on assumed population parameter values and the results, consequently, are highly uncertain. For developing the decision tables the main axis of uncertainty was the catchability coefficient of the fisheries, but the magnitude of the natural mortality coefficient and the degree to which it differs between the sexes are also major sources of uncertainty.

V. Recommendations for Future Research and Data Collection

1. The implementation of a fishery-independent abundance survey, and improved sampling of catches to estimate length and age composition would clearly reduce the uncertainty in the starry flounder assessment. Also, data are needed on discard rates and the size composition of the discards.
2. Explore the possibility of using all ages from the IEP-CDFG monthly surveys of the Sacramento & San Joaquin River estuary.
3. While the recreational fishery may not represent a large component of total catch, the data may be useful for detecting characteristics of the spatial distribution and recruitment and should be explored. The recreational fishery data might provide useful information to corroborate the IEP-CDFG survey, especially in years when the survey caught very few starry flounder.
4. The length and age data from fish collected in Monterey Bay provided very useful information, even though they were from a very limited geographical region and a short time period. This type of work should be expanded to other areas, or at least continued in Monterey Bay, to provide additional data for the next assessment. In particular there should be additional length and age data collected for males, which were very scarce in the current set of data.
5. It was noted that the level of documentation for the GLM analysis of logbook CPUE was inadequate for full review. Documentation should include summary statistics of catch effort at some level of spatial aggregation, and diagnostics such as: coefficients for components and partials sums of squares.
6. The starry flounder is distributed from California to Alaska. Potential shifts in the spatial distribution of starry flounder and its impact on the stock on the U.S. west coast could be assessed by review of Canadian assessments. This should be pursued as a simple check for status and the possibility of integrating their results into the current assessment should be explored.