SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
CENTRAL SUBPOPULATION OF NORTHERN ANCHOVY NEARSHORE ESTIMATION
METHODOLOGY, FREQUENCY OF OVERFISHING LIMIT REVIEWS, AND
ACCOUNTABILITY MEASURES

The Scientific and Statistical Committee (SSC) reviewed the documents "Report of the Joint Meeting of Representatives of the SSC Coastal Pelagic Species (CPS) Subcommittee, the Coastal Pelagic Species Management Team (CPSMT), and the Coastal Pelagic Species Advisory Subpanel (CPSAS)" (Agenda Item D.4, Attachment 1) and "A Further Updated Analysis of the Implications of Different Choices for the Frequency of Updates to overfishing limits (OFLs) and acceptable biological catches (ABCs) for the central sub-population of northern anchovy (CSNA)" (Agenda Item D.2, Supplemental Attachment 2), and received presentations from, and discussed the contents of these reports with André Punt (University of Washington, SSC) and Greg Krutzikowsky (Oregon Department of Fish and Wildlife [ODFW], CPSMT). The SSC discussion focused on three main topics, which are reported below in turn: 1) data for informing harvest specifications and evaluation of the proposed management framework, 2) nearshore biomass estimation, and 3) aerial survey methodology. The SSC endorses the recommendations in Attachment 1 and finds that the analyses described in Attachment 2 were conducted in an appropriate manner.

Data Informing Harvest Specifications, Frequency of OFL and ABC Updates, and Triggers for Accountability Measures

The SSC agrees with the conclusion in Attachment 1 that the acoustic trawl method (ATM) survey (with nearshore correction) provides the best available index of anchovy biomass. Of the remaining sources, ichthyoplankton data analyzed using the full Daily Egg Production Method (DEPM) and the Southwest Fisheries Science Center (SWFSC) juvenile rockfish surveys have the best spatial coverage but the latter requires further evaluation. The full DEPM can be used without further review, but the "DEPM light" that lacks year-specific adult data also requires further evaluation. The SSC deemed several methods of nearshore correction acceptable, while finding direct synoptic observations are preferable. This is discussed in more detail in the following section "*Evaluate Nearshore Biomass Estimation*".

The 2018, ATM Review report (Agenda Item C.3, Attachment 2, April 2018) referred to the need for a Management Strategy Evaluation (MSE) before using the ATM biomass estimate directly in management. The report contains many of the elements of a Management Strategy Evaluation (MSE), and the SSC finds it sufficient to inform choices of frequency of updates to the OFL and ABC based on ATM biomass estimates. A fuller MSE exploring the consequences of relying on potentially biased biomass estimates by including scenarios with alternative levels of survey bias would be desirable in the future.

The SSC agrees that the framework for updating the management reference points described in Agenda Item D.4, Attachment 1, November 2019 is appropriate. The simulations presented in Attachment 2 provide useful guidance on the tradeoffs involved between frequency of updates, triggers for actions (based on comparisons of the ABC to E_{MSY} x recent average biomass, and OFL to E_{MSY} x average biomass over a longer period), and buffers for uncertainty. However, the SSC

cautions that the values for the performance statistics in Agenda Item D.4, Attachment 2, November 2019 should be interpreted in a relative sense rather than treating them as absolute estimates. The results of the simulations are particularly sensitive to, and thus choices are particularly consequential for, Q (the multiplier that determines ABC), whether catch is capped at MAXCAT (establishing MAXCAT can reduce some of the risk associated with large Q), and the number of years used to calculate short-term biomass (the risk of undesirable outcomes is lower when just the most recent biomass estimate is used). The smaller Q is (i.e., the greater the reduction in ABC compared to E_{MSY} x Biomass), the less sensitive the results are to the frequency of OFL and ABC updates. Results are relatively insensitive (at least within the range explored) to the frequency of assessments, to the triggers x_1 and x_2 for whether the OFL and ABC should be updated, or to the number of years used to calculate long-term biomass so long as at least 5 years are used. The frequency of updates to the ABC and OFL present a tradeoff between stability in OFLs and ABCs over a longer time period versus larger changes in those values when they do change.

The sensitivity of the results to MAXCAT highlights that the ability to achieve management goals depends on how ACLs and harvest guidelines are set as well as how often OFLs and ABCs are re-evaluated. In addition, the assumption of 100 percent attainment of the ABC is not realistic, and this assumption introduces an upward bias to the conservation risk statistics. However, the net direction of bias throughout this analysis is uncertain due to possible biases introduced by other model assumptions (e.g., the assumption that the survey biomass estimates are unbiased) and uncertain parameters (notably steepness and natural mortality). A new stock assessment would likely better inform the biological parameters of the simulation and reduce these uncertainties, although it is unlikely to change the qualitative results.

Evaluate Nearshore Biomass Estimation

The SSC agrees with the conclusion in Agenda Item D.4, Attachment 1, November 2019 that methods for estimating biomass in nearshore waters based on direct synoptic observations are preferable to extrapolation, and that acoustic sampling conducted by industry vessels is most comparable to ATM surveys. However, while direct synoptic observations are the preferred approach, any of the four approaches described in the report are acceptable, including extrapolation. Logistical and timing constraints may limit the available options in any given year. Assessment analysts should determine the most appropriate approach in their particular case, so long as the caveats and limitations of different approaches are considered.

Agenda Item D.4, Attachment 1, November 2019 discussed alternative methods for extrapolation that vary in how much of the surveyed transect is used to inform the extrapolation to the unsampled nearshore area. If and when extrapolation is necessary, the choice of extrapolation method should be made and justified by the analysts. Validation exercises comparing various methods of extrapolation against direct observations, and comparing estimates from contrasting methods of direct observation, would be valuable and should be pursued when possible.

The SSC notes that not sampling the nearshore is only one potential source of bias in biomass estimates from the ATM survey. The ATM survey is also subject to biases of unknown directions due to issues such as uncertain target strength, species composition, and size composition. Therefore, regardless of whether a nearshore biomass correction is applied, the net direction of bias in ATM biomass estimates remains unknown.

Evaluate Aerial Survey Methodology

The SSC agrees with the recommendation that aerial surveys be conditionally approved for use to measure nearshore biomass, with an appropriate variance estimator and when conducted synoptically with ATM surveys. Estimates of variance can be obtained from between-transect variance as well as replicate surveys of a stratum. While basing variance estimates on replicates is the preferred approach, use of between-transect variance is acceptable. Variance estimates for a stratum should be based on data for that stratum and not obtained from a relationship between sampling coefficient of variation and mean biomass.

The SSC agrees that the approach for assessing spotter bias and the number of point sets informing this approach for small schools of Pacific sardine is sufficient. Work is underway to validate biomass estimates for larger schools based on packing density and volume. However, substantially more work is needed for northern anchovy. Effort should be made to estimate school biomass for schools of age-0 anchovy. In addition, point sets are still needed across sizes of schools as well as size/age compositions reflecting observed schools.

The SSC agrees that extrapolating aerial survey estimates into unsampled areas is not advisable.

PFMC
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