

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
PACIFIC SARDINE ASSESSMENT, HARVEST SPECIFICATIONS,
AND MANAGEMENT MEASURES – FINAL ACTION

The Scientific and Statistical Committee (SSC) reviewed the 2021 stock assessment catch-only projection for the Northern Subpopulation (NSP) of Pacific Sardine. Dr. Peter Kuriyama, National Marine Fisheries Service Southwest Fisheries Science Center (SWFSC) presented the catch-only projection on behalf of the Stock Assessment Team ([Agenda Item E.4, Attachment 1](#)) and Dr. Kevin Hill was also present and answered questions. The catch-only projection was based on the February 2020 benchmark assessment and included updated catches for the model year-semesters 2019-1 (calendar year July-December 2019), 2019-2 (January-June 2020) and 2020-1 (July-December 2020), as well as an assumption about fishing mortality for model year-semester 2020-2 to enable estimation of 1+ biomass for 1 July 2021. The SSC notes that there was an error in Tables 1 and 2 of the documentation, which are corrected in [Agenda Item E.4, Supplemental Attachment 2](#). The error did not affect the model outcome and the catch-only projection was otherwise implemented correctly and followed the Terms of Reference (TOR).

The assessment for Pacific sardine for 2021 is based on a catch-only projection because an acoustic trawl method (ATM) survey did not take place during 2020. Unlike benchmark and update assessments, catch-only projections do not use any new data other than catches and consequently should not update the parameters of the population dynamics model. Instead, a catch-only projection involves updating historical catches and projecting the current model forward with the catches that have taken place since the end of the last assessment. Given the high natural mortality rate of Pacific sardine, most of the fish in the estimate of 1+ biomass on July 1, 2021 are inferred from the stock-recruitment relationship rather than being estimated from data (unlike the case for groundfish stocks, which are generally long-lived).

The catch for the MexCal season 2 fishery (Mexico, Southern California, Central California) for January-June 2020 in the catch-only projection was nearly three times larger than the preliminary catch estimate used in the 2020 benchmark assessment (33,070 mt vs. 11,819 mt; noting that the 11,819 value was assumed from 2018-2). This implies that the total catch for that year was larger than the total population size expected from the 2020 benchmark assessment. This led the model to estimate a fishing mortality rate (F) for January-June 2020 at the maximum allowed by the software. Consistent with the approach used in the 2020 benchmark, this F value was assumed to be constant in the forecast. However, this is considerably higher than the fishing mortality rate from the 2020 benchmark assessment and would have been higher had the model not hit the upper limit assumed for the fishing mortality rate parameter. Moreover, to enable the assumed catches to be taken at all, the model needed to nearly triple the assessment model estimate of 2019 recruitment. This was not expected for a catch-only projection and indicates that updated catches are not consistent with the results of the 2020 benchmark assessment. More importantly, by their nature, catch-only projections are intended to inform how new information on catches impacted abundance following the end of the period modeled in the original assessment. This catch-only projection does not accomplish that objective since inflating unobserved recruitment estimates to account for an increase in the estimated catch is not informative about abundance.

As a result, although the Stock Assessment Team followed the TOR and did everything they could to develop an appropriately implemented model (including considerable sensitivity analyses), the SSC cannot endorse the catch-only projection as the basis for management advice. Consequently, the SSC recommends adoption of the 2020 overfishing limit (5,525 mt) from the 2020 benchmark assessment. The SSC also endorses the use of last year's biomass estimate and E_{MSY} for management purposes. The resulting acceptable biological catch (ABC) values as a function of P^* can be found in row "ABCtier₃" in Table 3 of [Agenda Item E.4, Supplemental Attachment 2](#). The SSC recognizes that the decision to return to the 2020 benchmark values does not fix the challenges associated with the inconsistencies between the 2020 model and the recent catch estimates. Consequently, the SSC recommends that this be considered a category 3 assessment for the purposes of calculating a sigma.

According to the TOR for Stock Assessment Reviews "For CPS, if an assessment is found not to be acceptable for use in management, a full assessment would be considered the following year." By 2022 new survey data should be available from the July 2021 ATM survey, there will be additional aerial survey data by California Department of Fish and Wildlife, and there will be new age compositions from the incidental fishery. However, this new information may not resolve the data conflicts evident in the 2021 catch-only projection. The SSC notes there is an increasingly critical need to revisit many of the assumptions that have been informing sardine assessment and management over the past several years.

There are several urgent research priorities to consider revisiting to better inform the next benchmark assessment. The SSC strongly recommends that these issues be addressed in time for the next benchmark assessment. This includes reconsideration of the model used to assign both catches and surveyed fish to the northern and southern subpopulations, as the SSC notes that the probability of errors in those assignments are likely to change with population size, and the model may be extrapolating beyond the range of the data with which it was created (e.g., calibrated at high northern subpopulation sardine abundance and applied when abundance is much lower). Additionally, the reviews of the ATM survey in 2011 and 2018 identified several research priorities that could potentially better inform survey catchability (q) and the SSC continues to recommend the use of the aerial survey data (as coordinated with the ATM survey and with appropriate biological sampling) to inform the catchability of the ATM survey. The SSC continues to recommend further evaluation of a survey-based assessment approach through a management strategy evaluation, which should include a fallback approach should the survey not occur in a given year. The value for E_{MSY} based on the CalCOFI temperature index suggests a productive stock but this is not evident from recent assessments, suggesting the need to re-evaluate the best way to calculate E_{MSY} for the northern subpopulation sardine stock. Finally, alternative indices of abundance and alternative means of projecting recruitment merit consideration for inclusion in future benchmark assessments. Most of these research items should also inform assessment efforts for the Central Subpopulation of Northern Anchovy.

With respect to progress towards rebuilding the Northern Subpopulation of Pacific Sardine, the SSC notes that U.S. catches are well below both the ACL and the annual catch target and that the U.S. fishery has implemented catch restrictions. However, due to the lack of an accepted updated biomass estimate, the SSC is unable to report further on rebuilding progress in relation to changes in biomass.