

THE SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON THE
CENTRAL SUBPOPULATION OF NORTHERN ANCHOVY ASSESSMENT AND
HARVEST SPECIFICATIONS

The Scientific and Statistical Committee (SSC) reviewed the 2021 [stock assessment](#) for the Central Subpopulation of Northern Anchovy (CSNA), and the associated Stock Assessment Review (STAR) [Panel Report](#). Dr. Peter Kuriyama, National Marine Fisheries Service (NMFS) Southwest Fisheries Science Center (SWFSC) presented the assessment and Dr. André Punt (University of Washington) presented the STAR Panel Report.

This is the first assessment of CSNA in over 25 years. As with most stock assessments of PFMC-managed stocks, the assessment was performed using Stock Synthesis. Key features of the model include:

- Acoustic Trawl (AT) survey biomass as the main abundance index, split by season, with catchability (q) estimates based on the assumption of full catchability within the AT survey area (including various methods to account for nearshore biomass), and overall q set to account for seasonal estimates of the proportion of CSNA biomass inside U.S. waters;
- Age-composition data from the AT survey and from the fishery;
- Combined catches from the Mexico plus California fisheries, with seasonal, age-based, and time-varying selectivity patterns;
- AT survey assumed to be fully selective for age-1+ and with time-varying selectivity for age-0;
- Beverton-Holt stock-recruitment relationship with steepness fixed at 0.6 and total recruitment variability (σ_r) fixed at 1; and
- Natural mortality (M) estimated (but assumed constant across time and age).

It was the STAR Panel's understanding that the summer 2021 AT survey report would be officially finalized by the time the assessment was adopted by the Council, but that was not the case, in part because it is being prepared as a joint report with Mexico. Nevertheless, the assessment using the preliminary 2021 AT survey estimate remains the best scientific information available.

The SSC endorses the 2021 CSNA Assessment as the best scientific information available for management of this stock. Under the Council Operating Procedure [\(COP\) 9 framework](#) for anchovy management, an estimate of E_{MSY} and a 10-year mean biomass (B_{LT} , to be taken from the assessment) are required to calculate the OFL and default ABC (ABC_d), and a 3-year mean biomass estimate (B_{ST} , ideally from surveys) is required to calculate a candidate ABC that is to be adopted if it is smaller than 60% of ABC_d . Although COP 9 does not specify the units of biomass to be used, the supporting analyses for adoption of the framework were based on age-1+ biomass ([November 2019 Agenda Item D.4, Supplemental Attachment 2](#)), and E_{MSY} was calculated based on age-1+ biomass (Appendix E of the assessment report).

The SSC endorses the E_{MSY} value (labeled F_{MSY} in the assessment) of 0.493 estimated within the assessment, where E is expressed as annual total catch divided by summary age-1+ biomass, while

noting that the value of E_{MSY} remains a major uncertainty. COP 9 specifies that the uncertainty buffer (Q , not to be confused with catchability q) is equal to 0.25.

Although COP 9 calls for B_{LT} to be based on a 10-year mean of age-1+ biomass estimates, the assessment only presents biomass estimates for seven years (2015-2021, Table 14) along with a biomass forecast for 2022 (page 18). Because forecasts are dependent on highly uncertain recruitment projections and natural mortality, the SSC determined that 2021 should be the most recent year included in the B_{LT} calculation. Although the assessment does not estimate biomass for 2012-2014, the information presented in Figure 45, along with Appendices B through D, indicate that age-1+ biomass was low and comparable for the period from 2012-2015. Due to concerns about the 2015 AT survey and its impact on the 2015 biomass estimate, the SSC decided to average the 2015 and 2016 assessed biomasses (mean = 118,236 mt) to serve as a yearly proxy biomass for 2012 to 2014. The SSC then calculated B_{LT} from 2012 to 2021, resulting in $B_{LT} = 603,025$ mt.

The stock-wide OFL is equal to 297,291 mt ($E_{MSY} \times B_{LT} = 0.493 \times 603,025$ mt) and the default stock-wide ABC_d is 74,323 mt ($Q \times OFL = 0.25 \times 297,291$ mt). The FMP calls for applying a DISTRIBUTION term of 0.82 to obtain OFL and ABC values for U.S. waters, resulting in U.S. waters OFL = 243,779 mt and $ABC_d = 60,945$ mt.

COP 9 specifies that B_{ST} , used to determine the candidate ABC, should be calculated as a recent 3-year mean of AT survey biomass estimates. However, no AT survey was carried out during calendar year 2020, and survey results for 2019 and 2021 were publicly reported as total biomass but not summary age-1+ biomass. Given these constraints, for this management cycle, the SSC calculated B_{ST} based on assessment estimates of stock-wide age-1+ biomass (Table 14 of the assessment), yielding a 2019-2021 mean stock-wide $B_{ST} = 1,412,553$ mt and resultant candidate U. S. waters ABC = 142,760 mt ($0.82 \times 0.25 \times 0.493 \times 1,412,553$ mt). The SSC had to apply the DISTRIBUTION term since the assessment biomass estimates include biomass in Mexico. Since this candidate ABC value is larger than 60% of the ABC_d , the U.S. waters ABC should be set equal to the default ABC_d value of 60,945 mt. In the future, AT survey reports to the Council should include estimates of age-1+ biomass to facilitate direct calculation of B_{ST} . Ideally, the AT survey age-1+ biomass estimates would be reported for U.S. waters, alleviating the need for a DISTRIBUTION term in calculating B_{ST} and candidate U.S. waters ABC values.

Several important data and research needs remain for this stock. In particular, there is substantial uncertainty in E_{MSY} due to uncertainty in selectivity, steepness, and natural mortality (which also have implications for other aspects of the assessment). The best treatment of nearshore biomass when nearshore AT observations are unavailable remains an important consideration, as is the proportion of CSNA biomass in Mexico at various times of year. Anchovy dynamics are rapid and involve spawning and growth year round, which may be better captured by a continuous-time or monthly model. Ecosystem considerations might be predicted to drive variation in M , but M is assumed to be age- and time-invariant in the assessment. Stock structure and the boundary between the Central and Northern Subpopulations are also important uncertainties. An assessment, potentially conducted as a research assessment, in the near future (i.e., sooner than the 8 years called for in COP 9) might address some of these issues and could provide a full 10 years of biomass estimates for calculation of B_{LT} .

PFMC
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