

## COASTAL PELAGIC SPECIES MANAGEMENT TEAM REPORT ON THE PACIFIC SARDINE REBUILDING PLAN – FINAL ACTION

In July 2019, the National Marine Fisheries Service (NMFS) notified the Pacific Fishery Management Council (Council) that it declared the northern subpopulation of Pacific sardine (NSP) overfished. The declaration came as a result of the 2019 Pacific sardine stock assessment indicating that the stock had declined below its minimum stock size threshold (MSST). At this meeting, the Council is scheduled to take final action for establishing a rebuilding plan (i.e., a management approach) for the NSP stock. In this report, the Coastal Pelagic Species Management Team (CPSMT) presents its recommendations for a preferred rebuilding management approach, including a target biomass and timeline. The CPSMT notes that a Fishery Management Plan (FMP) amendment will be required to implement the Council's choice for a rebuilding plan and anticipates providing language to accomplish that at the appropriate time.

In June 2020, the Council adopted four rebuilding plan alternatives for consideration ([PFMC Decision Document, June 2020](#)). Subsequently, the CPSMT combined two alternatives given their similarity, and has evaluated and presented the analyses for three alternatives (see September 2020 CPSMT reports). For the purpose of recommending a course of action for the Council, the CPSMT discussed these alternatives as proposed and other ideas to potentially suggest as modifications.

The CPSMT considered several factors:

- Environmental conditions are key to stock rebuilding;
- Between 2015-16 and 2018-19, U.S. fishery catches have averaged 472 metric tons (mt), or less than one percent of the NSP 1+ stock biomass. This is a result of a high proportion of the total catches being designated as southern subpopulation (SSP; Pacific Sardine Rebuilding Analysis Based on the 2020 Stock Assessment, Agenda Item G.1.a, NMFS Report 1; Table 1);
- Rebuilder modeling does not fully capture environmental dynamics because it does not include data from high productivity time periods;
- Stock biomass projections several decades into the future are uncertain due to Pacific sardine being strongly affected by environmental conditions. Environmental conditions are proxied by two different (and overlapping) productivity time periods - both are shorter than the projection period;
- The Rebuilder analysis assumed: 1) full harvest of the acceptable biological catch (ABC), whereas actual catch has been significantly below ABC/annual catch limits (ACLs), and 2) that catch is comprised only of NSP, even though in recent years a high portion is estimated as SSP; and
- Uncertainty in biological projections and the degree to which economic impacts are driven by biological projections, have implications on the evaluation of relative short- and long-term impacts.

The CPSMT did not strictly rely on the Rebuilder analysis to inform its deliberations. Instead, the recommendations and rationales presented below rely on a broader perspective and understanding of Pacific sardine population dynamics, the fishery, and existing management measures.

## MANAGEMENT APPROACHES

The three alternatives are fully described in the CPSMT's Preliminary Environmental Analysis ([Agenda Item G.1 Attachment 1](#), September 2020):

- Alternative 1 – Status Quo
- Alternative 2 – Zero U.S. Harvest
- Alternative 3 – Fixed ACL, 5 percent of 1+ Biomass

### Alternative 1 - Status Quo

The CPSMT recommends that the Council choose Alternative 1 as its final preferred alternative to rebuild the NSP stock.

The harvest control rules (HCR) for Pacific sardine include parameters that protect against overfishing, and link allowable harvest to stock productivity and to transboundary distribution. Updated annually based on Pacific sardine stock assessments, the HCRs adjust allowable harvest as Pacific sardine biomass changes. While not described explicitly as a rebuilding plan in the CPS FMP, the existing management framework for Pacific sardine incorporates automatic actions that are typically accomplished under rebuilding plans.

- The CUTOFF parameter dictates closure of the primary directed fishery when Pacific sardine biomass drops below 150,000 mt. Although considered in some rebuilding plans, rebuilding plans often do not even include a closure of the respective primary fishery. The CPS FMP includes a provision that closed the primary fishery in 2015, six years before the implementation of a rebuilding plan.
- Incidental catch of Pacific sardine in CPS directed fisheries is automatically reduced when biomass falls below 50,000 mt (i.e., the MSST). Thus, even before the implementation of a rebuilding plan, incidental catch is reduced by more than half, from a maximum of 45 percent to 20 percent.

Since the directed fishery closed in 2015, under the status quo management measures outlined above, annual U.S. landings of Pacific sardine have averaged about 2,200 mt ([Agenda Item G.1 Attachment 1: Pacific Sardine Rebuilding Plan Preliminary Environmental Analysis](#)). Had these measures not been in place, annual landings could have approached the ABC annual average of 14,000 mt. While management ascribes all landings to the NSP, of the annual average 2,200 mt landed, only an average of 472 mt of that catch was designated as NSP for the years in which complete data are available (Table 1, G.1.a, NMFS Report 1: Pacific Sardine Rebuilding Analysis Based on the 2020 Stock Assessment). This level of annual NSP average harvest represents 0.6% of the NSP 1+ biomass for those years (management years 2015-16 through 2018-19).

Extending the biological modeling results to the socioeconomic discussion ([Agenda Item G.1.a, Supplemental CPSMT Report 3](#), September 2020) provides additional context and a framework with which to consider the potential relative socioeconomic impacts of management decisions on U.S. fisheries and the communities which they support. Status quo management under the CPS FMP has reduced Pacific sardine fishery removals as the Pacific sardine biomass declined.

As a result of the closure of the primary directed Pacific sardine fishery in July of 2015, non-sardine CPS fisheries have been subject to more stringent incidental catch restrictions for Pacific sardine. The lowering of incidental catch limits has constrained fishing operations and increased operating costs of vessels in non-sardine CPS fisheries due to vessels needing to pass over schools suspected to have higher-than-permitted sardine percentages (Public Comment, September 8, 2020). Although non-sardine CPS fisheries have been able to operate, it is recognized that the lowering of the incidental catch rate limits has a negative socio-economic effect on the fisheries and communities which they support. This tightening of incidental catch constraints has not caused the level of economic hardship expected under a reduction of allowable catch to below the current levels.

While the Rebuilder model (like all models) cannot perfectly capture all the intricacies of the real world, the modeling results have provided valuable insights into the potential relative biological outcomes of three alternative rebuilding approaches under different states of nature. As previously stated the CPSMT focused on how best to utilize modeling results for the 2005-2018 time period with a constant catch rate for the Pacific sardine fishery in Mexico ([Agenda Item G.1, Attachment 1](#)). Current management of the NSP of Pacific sardine has resulted in levels of U.S. NSP harvest that are between the Rebuilder model results for zero U.S. harvest (Alternative 2) and 5 percent U.S. harvest of the total 1+biomass of NSP (Alternative 3). Thus, the model results suggest that the stock should rebuild with a greater than 50 percent probability sometime between the years reported for these alternatives. Knowing that there is variability in the portion of U.S. catch that is NSP, the CPSMT asked the Rebuilder analysts to conduct a constant catch model run for the entire 2,200 mt average U.S. catch to be modeled as NSP. The results project the stock to rebuild in a similar timeline to Alternative 3. Given these insights from the modeling along with the considerations stated above, the CPSMT recommends the rebuilding plan for Pacific sardine as the status quo management measures already included in the CPS FMP without any further refinement.

#### **Alternative 2 - Zero U.S. Harvest**

The CPSMT does not recommend this alternative. By closing sardine fisheries such as live bait and minor directed, and drastically curtailing or disallowing incidental catch, this alternative would cause severe economic hardship to CPS and non-CPS fisheries.

#### **Alternative 3 – 5 percent Fixed Harvest Rate (ACL)**

The CPSMT does not recommend this alternative. Under this alternative the HCR reduces allowable catch at all biomass levels compared to Alternative 1. This alternative may accommodate fishery needs depending on biomass and relative to average catches. However, at biomasses less than 45,000 mt, the ACLs (declining from 2,250 mt) under this alternative are less than recent average catches. Additional actions to reduce harvest across fisheries catching Pacific sardine would need to be taken. Assuming that average catches are ostensibly meeting CPS and non-CPS fishery needs, this alternative will negatively affect fisheries.

## **REBUILDING TARGET**

The CPSMT recommends a rebuilding target of 150,000 mt 1+ biomass. Although this biomass level is not a  $B_{MSY}$  proxy, it represents a biomass level higher than the median  $B_{MSY}$  of 116,374 mt spawning stock biomass (SSB) from modeling the 2005-2018 productivity state of nature. Based on an output from the 2020 stock assessment, the 150,000 mt 1+ biomass is currently equivalent to 121,650 mt of SSB (based on output from Kuriyama et.al., Agenda [Item D. 3](#), April 2020). Part of the rationale for utilizing a 150,000 mt 1+ biomass level as the rebuilding target is that this rebuilding target is the same biomass metric (i.e. 1+ biomass) as both the overfished threshold, and the annual stock assessments, versus spawning stock biomass which is not something typically provided to the Council. This alignment would also likely ease tracking the progress towards the determination of rebuilt status as well as avoid future confusion in comparing different units of biomass. The use of a static value is consistent with static values used for salmon overfished and rebuilt levels and consistent with the use of a static value in the CPS FMP for specifying an overfished NSP population.

## **REBUILDING TIMELINES**

Consistent with the CPSMT's conclusion that the  $SB_0$  (2005-2018) scenario was most applicable for evaluating rebuilding plan analyses, this scenario is used as the basis for determining  $T_{min}$ ,  $T_{max}$  and  $T_{target}$  values.

- $T_{min}$  = 12 years (based on zero U.S. fishing)
- $T_{max}$  = 24 years (based on the doubling  $T_{min}$  method in NS1 Guidelines)
- $T_{target}$  = 14 years (CPSMT proposal)

The recommendation for these values assumes future harvest levels of NSP roughly equivalent to the most recent period of NSP catch which has averaged 472 mt annually. While this observed average catch of 0.6 percent is greater than the U.S. zero harvest (Alternative 2), it is less than the 5 percent U.S. harvest of total 1+biomass (Alternative 3). Based on the modeled results for a target rebuilding biomass ([Table 8, Hill et al. 2020](#)), the target timeline for the actual Alternative 1 (NSP catch) should be longer than 12 years (minimum time to rebuild based on modeling zero U.S. harvest Alternative 2) and less than 16 years (modeled for Alternative 3).

The CPSMT recommends that the Council choose  $T_{target}$  = 14 years, which is halfway between the 12-year minimum for zero harvest and the 16 years from the modeled 5 percent U.S. harvest. The CPSMT has examined two additional scenarios for timelines to rebuild. The first is based on the Rebuilder tool modeling that used a constant catch scenario of 2,200 mt of NSP annually which resulted in the stock rebuilding in 17 years. A second scenario used a simple compound interest model for a more productive stock with a 30 percent annual increase in biomass as was observed in the late 1980s through the early 1990s, which projected the stock could rebuild to over 150,000 mt in 8 years. A  $T_{target}$  of 14 years should provide adequate time to evaluate progress toward rebuilding for a stock whose population dynamics are primarily driven by environmental conditions.

## **REBUILDING STATUS REVIEW**

The CPSMT notes that there is not a pre-specified process for assessing progress toward rebuilding, nor any Terms of Reference for rebuilding CPS. Although the CPSMT does not have a specific proposal on a process for that review at this time, the CPSMT could coordinate with the

CPS Subcommittee of the Science and Statistical Committee on developing an appropriate review process for future reviews.

**In conclusion, the CPSMT recommends:**

Alternative 1 - Status Quo

- $T_{min} = 12$  years
- $T_{max} = 24$  years
- $T_{target} = 14$  years
- Rebuilding Target = 150,000 mt 1+ biomass

PFMC  
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