




U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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April 10, 2020

MEMORANDUM FOR: Michael Tosatto
Administrator, Pacific Islands Regional Office

FROM: Michael Seki, Ph.D. 
Director, Pacific Islands Fisheries Science Center

SUBJECT: Determination of Best Scientific Information Available for
Oceanic Whitetip Shark in the Western and Central Pacific Ocean

In 2019 the Western and Central Pacific Fisheries Commission (WCPFC) completed a benchmark stock assessment of the oceanic whitetip shark in the Western and Central Pacific Ocean. The Pacific Islands Fisheries Science Center (PIFSC) concludes that the referenced stock assessment is the best scientific information available (BSIA).

BACKGROUND

The stock assessment of the oceanic whitetip shark in the Western and Central Pacific Ocean was finalized in 2019. Oceanic whitetip shark is a large species, found in tropical and warm-temperate waters across all oceans, with a marked preference for oceanic waters distant from the continental shelf. The species was previously considered one of the most common sharks in offshore tropical waters, and it was reportedly frequently caught in tuna-target fisheries, but its population size is considered to have declined in recent decades.

The current assessment improves upon a previous stock assessment by Rice and Harley (2012). It includes seven years of additional data and a revised assessment model using the same modeling framework (Stock Synthesis). In addition, the current assessment model includes new methodology to predict historical catches and updates key biological parameters of this species. Stock status was obtained by summarizing reference points over 648 model runs accounting for assumptions about life-history parameters and the impact of fishing underpinning the assessment.

This assessment was discussed, reviewed, and approved by the Scientific Committee of the WCPFC in August 2019, and by the WCPFC in December 2019. This stock assessment included participation by NMFS scientists. Based on this review, PIFSC concludes that this assessment meets requirements under National Standard 2 of the Magnuson-Stevens Fisheries Conservation



and Management Act (MSA), and is applicable for judging the status of the oceanic whitetip shark stock in the Western and Central Pacific Ocean and for use in management of this stock.

Table 1 and Figure 1 provide relevant information on the assessment for oceanic whitetip shark stock in the Western and Central Pacific Ocean.

STOCK ASSESSMENT SUMMARY

- For this stock assessment the following reference points were used as indicators of stock status, noting that the WCPFC has yet to adopt reference points for sharks:
 - SB/SB_0 : The unfished spawning biomass (SB_0) can be calculated from the estimated recruitments via the Beverton-Holt stock recruitment relationship. SB/SB_0 is a useful metric of stock status that is also used for other stocks managed by the WCPFC. Under this metric, an increase in depletion is linked to a lower value for SB/SB_0 and a worsening in stock status. Conversely, a decrease in depletion is linked to a higher value for SB/SB_0 and an improvement in stock status.
 - In this assessment, ‘recent’ is the average of the metric over the period 2013–2015, and ‘latest’ is 2016.
 - SB/SB_{MSY} is the ratio of the spawning biomass to the spawning biomass predicted to result in the Maximum Sustainable Yield (MSY). The stock would be considered to be overfished if $SB/SB_{MSY} < 1.0$.
 - F/F_{MSY} is the fishing mortality over the assessed stock across all fleets divided by the fishing mortality predicted to result in MSY. The stock would be considered to be undergoing overfishing if $F/F_{MSY} > 1.0$.
- The median values of relative recent and latest spawning biomass (SB_{Recent}/SB_{MSY} and SB_{Latest}/SB_{MSY}) and relative recent and latest fishing mortality (F_{Recent}/F_{MSY} and F_{Latest}/F_{MSY}) over the structural uncertainty grid were used to measure the central tendency of stock status.
- The values of the upper 90th and lower 10th percentiles of the empirical distributions of relative spawning biomass and relative fishing mortality from the uncertainty grid were used to characterize the probable range of stock status.
- For this assessment, the key conclusions are that overfishing is occurring, and the stock is in an overfished state relative to MSY and depletion-based reference points for both recent and latest time periods. This conclusion is robust to uncertainties in key model assumptions.
- Status determination criteria (SDC) are designated by the Western Pacific Regional Fishery Management Council (WPRFMC)’s Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region (Pelagic FEP) as a maximum fishing mortality threshold (MFMT) = F_{MSY} , and a minimum stock size threshold (MSST) = $c * B_{MSY}$, where c is the maximum of either 0.5 or 1-natural mortality, so the lowest MSST would be $0.5 * B_{MSY}$.
- Under the Pelagic FEP, the stock would be considered to be overfished if $SB_{Latest}/c * SB_{MSY} < 1.0$, where c is 1-natural mortality. The natural mortality in the

assessment was fixed at 0.18 and median $SB_{MSY} = 3,245$ mt, so the domestic MSST is 2,661 mt. Median SB in 2016 is 298 mt, and the $SB_{Latest}/c*SB_{MSY}$ is 0.11, so the stock would be overfished under domestic SDC.

- Under the Pelagic FEP, the stock would be considered to be experiencing overfishing if $F_{Latest}/F_{MSY} > 1.0$. The model-derived median $F_{Latest}/F_{MSY} = 3.35$, so the stock is experiencing overfishing under domestic SDS.
- This assessment can be found at:
Tremblay-Boyer, L., Carvalho, F., Neubauer, P., Pilling, G.. 2019. Stock assessment for oceanic whitetip shark in the Western and Central Pacific Ocean.
<https://www.wcpfc.int/node/42932>

Table 1: Summary of reference points from the 648 model runs in the structural uncertainty grid (Source: Table 6 from the stock assessment report).

| | Mean | Median | Min | 10% | 90% | Max |
|---|-------------|---------------|------------|------------|------------|------------|
| MSY | 6755 | 5790 | 1774 | 2808 | 11668 | 19122 |
| SB₀ | 9641 | 7880 | 1510 | 3228 | 19842 | 34572 |
| SB_{MSY} | 4038 | 3245 | 523 | 1157 | 8398 | 15593 |
| SB_{Latest} | 367 | 298 | 43 | 86 | 779 | 1217 |
| SB_{Latest}/SB_{MSY} | 0.09 | 0.09 | 0.05 | 0.06 | 0.13 | 0.16 |
| SB_{Recent} | 387 | 310 | 36 | 93 | 789 | 1616 |
| SB_{Recent}/SB₀ | 0.04 | 0.04 | 0.02 | 0.03 | 0.05 | 0.08 |
| SB_{Recent}/SB_{MSY} | 0.10 | 0.09 | 0.05 | 0.07 | 0.13 | 0.17 |
| F_{MSY} | 0.060 | 0.057 | 0.026 | 0.031 | 0.091 | 0.116 |
| F_{Latest} | 0.216 | 0.177 | 0.096 | 0.115 | 0.362 | 0.473 |
| F_{Latest}/F_{MSY} | 4.03 | 3.35 | 1.09 | 1.82 | 7.18 | 12.07 |
| F_{Recent} | 0.229 | 0.215 | 0.136 | 0.164 | 0.316 | 0.395 |
| F_{Recent}/F_{MSY} | 4.24 | 3.92 | 1.81 | 2.57 | 6.27 | 9.88 |

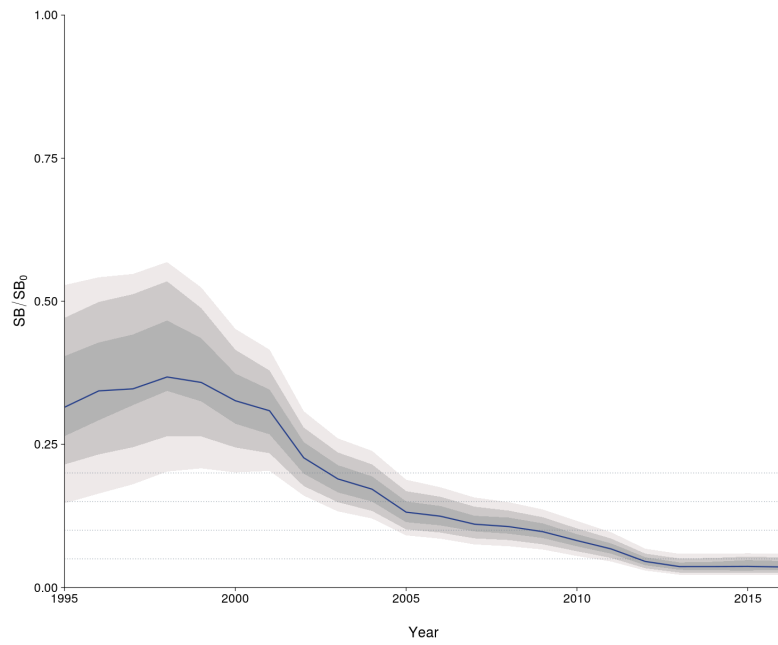


Figure 1: Median estimates of depletion in spawning biomass over all grid runs, with 2.5th -97.5th, 10th-90th and 25th -75th quantile intervals. Horizontal grey lines are placed at intervals of 5% in the lower part of the graph to aid visualization (Source: Figure 30 from the stock assessment report).