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Refining Candidate Reference Points and Harvest Control Rules for Pacific Bluefin Tuna

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The United States of America

REFINING CANDIDATE REFERENCE POINTS AND HARVEST CONTROL RULES FOR PACIFIC BLUEFIN TUNA

Proposal by the United States of America to the Eighth IATTC and WCPFC-NC Joint Working Group Meeting on the Management of Pacific Bluefin Tuna

Explanatory Note

In 2019, the Northern Committee at its 15th Regular Session adopted candidate reference points and harvest control rules (HCRs) for management of Pacific bluefin tuna with the intent that these may be used in a future management strategy evaluation (MSE) (see Attachment G of [NC15 Summary Report](#)).¹ Since then, the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) has begun the MSE process and, in 2022, recommended reducing the number of candidate reference points and HCRs because it is infeasible to evaluate the full suite in the 2019 recommendation.

Additionally, in 2022, the IATTC and WCPFC, adopted harvest strategies that referenced a harvest control rule for North Pacific albacore that is similar to HCR 1a because it contains limit, threshold and target reference points (LRP, ThRP and TRP, respectively).

In March 2023, the ISC Pacific Bluefin Working Group (PBFWG) reviewed [Tommasi et al. \(2023\)](#) which conducted a preliminary examination of the performance of the candidate model-based HCRs for Pacific bluefin tuna. The results indicate that

- The greater the distance between the TRP and the ThRP and LRP results in a smaller likelihood of breaching the ThRP and/or LRP, respectively.
- Some HCRs are able to maintain a decrease in median catch between management periods of 15% or less, but due to high variability in recruitment, all HCRs saw at least one management period with greater than 15% decrease in catch
- There is no single best performing HCR as there are tradeoffs in management objectives
 - HCRs with higher F_{target} performed best in terms of safety and stability, but resulted in lower annual catch
 - HCR shapes 1a and 1b performed similarly in terms of safety, status and yield metrics, but HCR shape 1b had lower stability than HCR shape 1a
 - For the same F_{target} , HCR shapes 1a and 1b performed better than HCR shape 2 in terms of yield and safety, but worse in terms of stability.

¹ For clarity, this paper uses the same names for the HCR shapes as those in Attachment G of the [NC15 Summary Report](#).

- In comparing performance of HCR shapes 1a and 1b which include a minimum fishing level (F_{\min}), the value of F_{\min} did not generally have a large impact on performance

The United States is proposing the following changes to the 2019 recommendation:

- Remove HCRs 1b, 2 and 3. Tommasi et al. (2023) found HCR1a and 1b had similar results, but the HCR 1b had lower stability than HCR1a with TRPs of F10, F15, and F20, and for some F30 HCRs. HCR 2 does not comport with the HCR shape referenced in the harvest strategies agreed to by the WCPFC and IATTC in 2022 in that it does not use two control points. HCR 3 was not evaluated in Tommasi et al. (2023), but with recently uncertain indices of abundance for small fish, it may not be feasible in the near future. The United States would encourage the ISC to explore potential for an empirically-based HCR after review of available indices during the 2023 data preparatory meeting.
- Adding text to HCR1a that limits the risk to a level consistent with WCPFC decisions on acceptable risk for breaching an LRP.
- Test the HCRs with and without a built-in limit to ensure that any change in total allowable catch (TAC) between consecutive management periods is no more than 20%.
- Test the HCRs with an allocation based on the recent exploitation pattern and with an allocation tuned to reach the WCPO: EPO fishery impact ratio of 70:30.
- Remove candidate limit reference points (LRPs) $5\%SSB_{F=0}$, $7.7\%SSB_{F=0}$; remove candidate ThRPs $15\%SSB_{F=0}$; remove candidate TRPs FSPR10%, FSPR15%, and FSPR20%; and remove candidate F_{\min} of $5\%F_{\text{target}}$. The United States does not want to retain LRPs of $5\%SSB_{F=0}$ and $7.7\%SSB_{F=0}$ as they represent levels of the stock that are lower than the reference point used in U.S. domestic legislation, below which a stock would be considered overfished. Removing $5\%SSB_{F=0}$ and $7.7\%SSB_{F=0}$ has implications on the ThRP and TRP candidates as if LRPs are potentially $15\%SSB_{F=0}$ or higher—it would not make sense to have a ThRP $15\%SSB_{F=0}$ or less because HCR 1a requires a ThRP higher than the LRP, and the TRPs of FSPR 10%, 15% and 20% would result in depletion levels likely at or below the candidate LRPs and ThRPs. Add FSPR35% because based on the chosen TRP for albacore, it may be helpful to evaluate a TRP between FSPR30% and FSPR40%. Tommasi et al. (2023) found minimal differences in HCR 1a performance between the candidate F_{\min} of $5\%F_{\text{target}}$ and $10\%F_{\text{target}}$, so the United States is proposing to move forward with one candidate F_{\min} of $10\%F_{\text{target}}$.

Candidate HCRs

The HCR is illustrated in Figure 1 where fishing mortality is controlled depending on stock status relative to the defined reference points. The F_{target} rate applies when the stock is larger or equal to the $SSB_{\text{threshold}}$ with a probability of at least 50%, while F_{min} rate applies when the stock is at or smaller than SSB_{limit} with a probability greater than [5-20%] as specified in the management objectives, and there is a linear transition in F for stock sizes between SSB_{limit} and $SSB_{\text{threshold}}$. F_{min} would be defined as an F rate that is less than the F rate corresponding to the SSB_{limit} . This HCR shall be tested with and without a limit that constrains changes in TAC between consecutive management periods of no more than 20%. This HCR shall also be tested with an allocation based on the recent exploitation pattern and with an allocation tuned to reach the WCPO:EPO fishery impact ratio of 70:30.

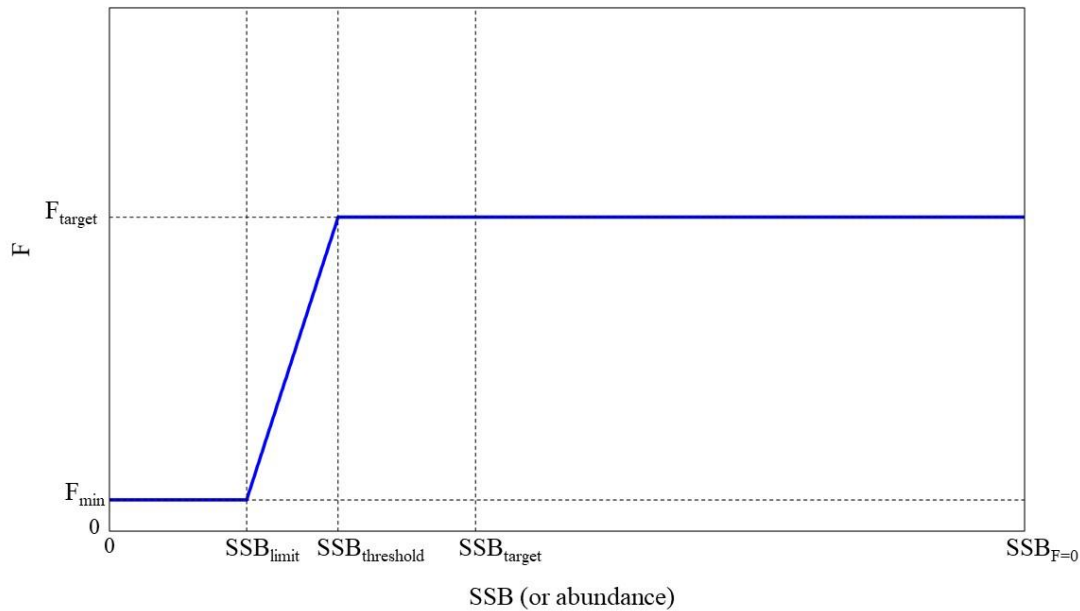


Figure 1. Candidate HCR

Candidate Reference Points

Candidate Limit Reference Points: 15% $SSB_{F=0}$, 20% $SSB_{F=0}$

Candidate Threshold Reference Points: 20% $SSB_{F=0}$, 25% $SSB_{F=0}$

Candidate Target Reference Points: FSPR30%, FSPR35%, FSPR40%

Candidate F_{min} : 10% F_{target}

These new candidate HCRs and reference points replace those from the 2019 recommendation.