**JOINT IATTC AND WCPFC-NC WORKING GROUP MEETING ON THE
MANAGEMENT OF PACIFIC BLUEFIN TUNA**
FOURTH SESSION

Portland, Oregon, United States of America
3 – 5 September 2019

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

IATTC-NC-JWG04-2019/04

Proposal by the United States of America

The Western and Central Pacific Fisheries Commission (WCPFC) harvest strategy for Pacific bluefin tuna fisheries states that "The Joint WG will start to discuss in 2018, and aim to finalize no later than 2019, guidelines for the MSE, including at least one candidate long-term target reference point (TRP), two candidate limit reference points (LRPs) and candidate harvest control rules (HCRs), which will be provided to the ISC."

The United States strongly supports the MSE process for Pacific bluefin tuna fisheries, and would like the Joint WG to recommend candidate reference points and harvest control rules in accordance with the MSE schedule outlined in the WCPFC's harvest strategy for Pacific bluefin tuna fisheries. The United States considered the reference points guidance from the ISC Pacific bluefin tuna WG (see Appendix 4 in Annex 8 of ISC19) and proposes the following candidate HCRs and reference points for inclusion in the management strategy evaluation (MSE) for Pacific bluefin tuna fisheries.

Harvest Control Rules

The United States also proposes the following candidate HCRs.

Candidate HCRs 1a and **1b** are 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 than $SSB_{threshold}$, while F_{min} rate applies when the stock is smaller than SSB_{limit}, and there is either a linear or sigmoidal transition in F for stock sizes between SSB_{limit} and $SSB_{threshold}$. F_{min} would be defined as an F rate that is less than the F rate corresponding to the SSB_{limit}. **Candidate HCR 1a** has a linear transition between SSB_{limit} and $SSB_{threshold}$ whereas **Candidate HCR 1b** has a sigmoidal transition between SSB_{limit} and $SSB_{threshold}$ and could be viewed as more conservative with respect to uncertainty in underlying biomass/abundance estimates when approaching SSB_{limit}, as well as avoiding abrupt management breakpoints.
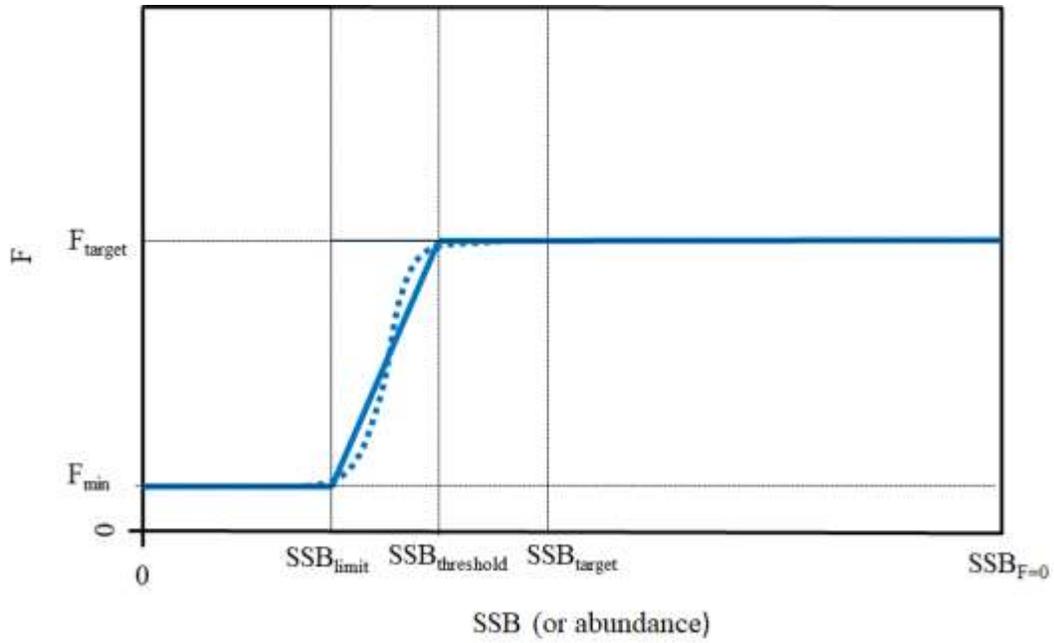
Figure 1. Candidate HCRs 1a (solid line) and 1b (dashed line)

Candidate HCR 2 is illustrated in Figure 2 and is similar to Candidate HCRs 1a and 1b in that F declines once the SSB_{limit} is breached, but unlike Candidate HCRs 1a and 1b, there is no $SSB_{threshold}$ between SSB_{limit} and SSB_{target}.
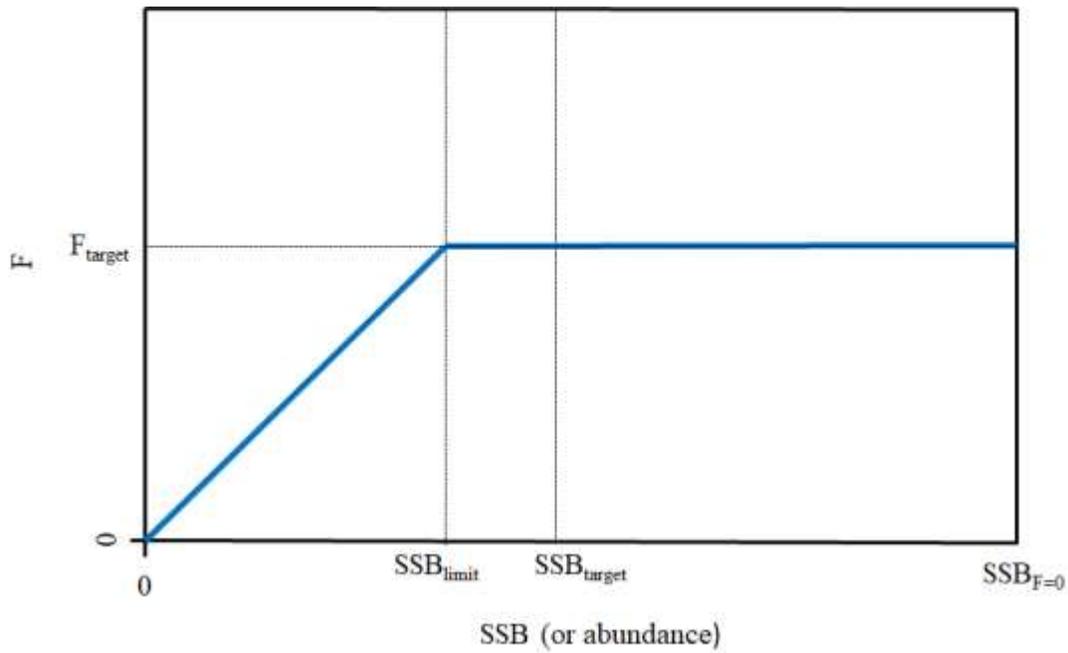
Figure 2. Candidate HCR 2

Candidate HCR 3 specifies two HCRs, one for old-fish fisheries and one for young-fish fisheries. For fisheries that harvest primarily mature Pacific bluefin tuna (e.g., longline fisheries), the HCR could be either Candidate HCRs 1a, 1b or 2 (i.e., fishing mortality is controlled as a function of the size of the spawning stock), and for fisheries harvest primarily immature Pacific bluefin tuna, the HCR would control fishing mortality as a function of recruitment, such as using an index of recruitment based on CPUE in age 0 or 1 fisheries. This approach is similar to that used in Maunder 2014.[1]

All of the above candidate HCRs proposed are general in concept and require further work to address issues such as regional distribution, fishery selectivity and fleet allocation.

Candidate Reference Points

In considering candidate reference points for Pacific bluefin tuna for the MSE evaluation, the United States considered objectives from the Antigua Convention for the Inter-American Tropical Tuna Commission (IATTC) that task the IATTC "to maintain or restore the populations of harvested species at levels of abundance which can produce the maximum sustainable yield..." and objectives from the WCPFC Convention that call for members to apply Annex II of the UN Fish Stocks agreement. Additionally, the United States considered the hierarchical approach that the WCPFC adopted for identifying limit reference points for key target species as well as the approach taken by the IATTC in identifying interim LRPs for tropical tunas. Under the hierarchical approach adopted by the WCPFC, and as indicated in the harvest strategy for Pacific bluefin tuna fisheries, Pacific bluefin tuna is a Level 2 stock, as the stock recruitment relationship for Pacific bluefin tuna is not well known, but key biological and fishery variables are reasonably well estimated. LRPs for Level 2 stocks are identified as either $F_{X\%SPR_o}$ and either $X\%SB_o$ or $X\%SB_{current,F=0}$. In the IATTC, the interim LRP for tropical tuna stocks is the SSB associated with 50% of the unfished recruitment with assuming a stock-recruitment relationship steepness of 0.75. In addition to an LRP and a TRP, each of Candidate HCRs 1a and 1b require identification of a threshold reference point ($SSB_{threshold}$) and an F_{min}. The combinations of LRPs, threshold reference points and TRPs will depend on which of the Candidate HCRs are evaluated. Further consideration is needed for the reference points associated with the recruitment-based HCR in HCR 3 - none are proposed here.

Candidate Limit Reference Points: $SSB_{0.5Ro}$, $15\%SSB_{F=0}$, $20\%SSB_{F=0}$

Candidate Threshold Reference Points (for candidate HCRs 1a and 1b): $15\%SSB_{F=0}$, $20\%SSB_{F=0}$, $25\%SSB_{F=0}$

Candidate Target Reference Points: $F_{SPR20\%}$, $F_{SPR30\%}$, $F_{SPR40\%}$

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[1] Maunder, Mark. (2014). MANAGEMENT STRATEGY EVALUATION (MSE) IMPLEMENTATION IN STOCK SYNTHESIS: APPLICATION TO PACIFIC BLUEFIN TUNA. IATTC Stock Assessment Report. 15. 100-117.