APPENDIX 3. Draft alternative reference points, harvest control rules submitted by the USA, modified from those discussed during the 3rd IATTC tropical tuna MSE workshop.

USA recommendations for revisions to objectives, harvest control rules, and reference points 12/9/2022

Objective	Quantity	Performance Indicator
Safety: Maintain stock above LRP	Equilibrium virgin SB0; < 10% of SB below 7.7% of SB0 and < 5% probability of SB below 7.7% of SB0 < 5% probability of exceeding Fmsy and < 10% probability of being below SBmsy	Ratio of SByr over SB0; Probability calculated over projected 30 years (all years, any years by replicates)
Status: Maintain stock in green quadrant of Kobe plot [with a high probability]	SB >= dynamic SBmsy and F <fmsy; 50,="" 60,="" 70%,="" 80%<br="" and="">probability</fmsy;>	% of simulated runs falling within Kobe green quadrant; probability calculated over projected 30 years
Stability: Maintain low variability of catch and effort limits, gradual changes in management measures	Standard deviation of annual catch, effort; average interannual proportional change in catch, effort	Percent change in catch and/or effort between years; Calculated od projected 3, 15, and 30 years
Yield/Abundance: Maintain catches/effort/CPUE above historical ranges	Average catch/effort/CPUE by longline, purse seine (FADs, non-associated, and dolphin fishery) 1994-2019 (after expansion of FAD fishery) and 2017-2019 (latest status quo)	Ratio of projected 3, 15, 30 year average catch/effort/CPUE by fishery over historical period

Harvest strategy

-have a gradual change in F once the target biomass reference point (or a threshold point is passed) rather than the abrupt change in F once the limit is crossed as is now the case -Ideally the target would be high enough that the limit is not often crossed

Target RP	Threshold	Limit RP
F40 SSB40% (dynamic)	SSBmsy (dynamic)	Fmsy; 0.5*SSBmsy; If M<0.5, MSST=(1- M)*SSBmsy;
F40 or F45	SSB40% (dynamic)	Fmsy; SSBmsy (dynamic)
F40	SSB30% or SSB20% (dynamic)	(<i>interim</i>) $F_{0.5R0}$ and $S_{0.5R0}$, where $h = 0.75$ ($S_{0.5R0}$ is equivalent to 7.7% SSB ₀)