Discussion on candidate harvest strategies for the bigeye MSE

Discusión sobre estrategias de ordenación candidatas para la EEO de patudo

EPO tropical tuna Management Strategy Evaluation

- Tropical Tuna Harvest Control Rules (Resolution C-16-02, Resolution C-23-06)

"…management strategy evaluation (MSE) is necessary to evaluate the HCR; and alternative HCRs should be considered that include hard and soft limit reference points, that use reference points based on biomass, and that establish well-defined scientific management recommendations"

- Workshops Terms of Reference (Resolution C-19-07)
- SAC Recs. supported staff's MSE workplan
- 5-year IATTC staff MSE Workplan (SAC-12-01)
- Intro HS workshops (2015-2019), 4 IATTC MSE workshops (2019-2025) (WSMSE-1; WSMSE-2; WSMSE-3; WSMSE-4)

Online

- 2021-2023 MSE funding from the European Union
  - Two components:
    - Consultative/dialogue process (e.g. series of MSE workshops)
    - Technical implementation of MSE

European Commission

- 2024 new permanent harvest strategy IATTC staff position, securing MSE work

CIAT IATTC

MSE dialogue and stakeholder input

- Training and enhancing dialogue / communication among scientists, managers, and other stakeholders regarding harvest strategies and the MSE process
- Input and feedback on important elements to use in the MSE process
- Requests by stakeholders and Recommendations from SAC-14 and from staff in SAC-15 for the Commission consider a Science-Management Dialogue (SMDWG) or informal workshops approach to continue the MSE process.
- Resolution C-24-08: creation of an *ad hoc* Working Group to strengthen the dialogue among scientists, managers and other stakeholders on Management Strategy Evaluation (meeting on May 31, 2025)

Objectives, quantities, performance indicators

OBJECTIVE	Quantity	Performance Indicators
Safety *Maintain stock above limit reference points*	*Equilibrium virgin spawning biomass* SB_0 • *< 10% probability SB below 7.7% of* SB_0 • *< 5% probability SB below 7.7% of* SB_0 < 10% P SB < SBmsy Flim (< 5% *P* F > Fmsy)	Ratio of SB_{yr} over SB_0 Probability calculated over projected 30 years (All years, any year by replicates)
Status Maintain stock in green quadrant of Kobe plot	SB≧ dynamic SB_{MSY} and $F<F_{MSY}$ • *60% probability* • *75% probability*	% of simulated runs falling in Kobe's green quadrant Probability calculated over projected 30 years
Stability Maintain low variability of catch and effort limits, gradual changes in management measures. Caps at 10% (effort), 15% (catch)	Standard deviation of annual catch, effort Average interannual proportional change (catch, effort)	% change in catch and/or effort between years Calculated over projected 3, 15 and 30 years
Yield/Abundance Maintain catches/effort/CPUE above historical ranges	Average catch/effort/CPUE by fishery (PS and LL) • *1994-2019 (since FAD expansion)* • *2017-2019 (latest status quo)*	Ratio of projected 3, 15 and 30-year average catch/effort/CPUE by fishery over historical period
Status quo Maintain the stock at levels near the (2017-2019) status quo	Spawning biomass, Index (LL CPUE)	Ratio of projected 3, 15 and 30-year average SB, Index (LL CPUE) over status quo period (2017-2019)

Discussed during previous IATTC MSE workshop (from WSMSE-4 RPT)

Objectives, Ref. points, Probabilities, Timelines

(Working table from WSMSE-05-01)

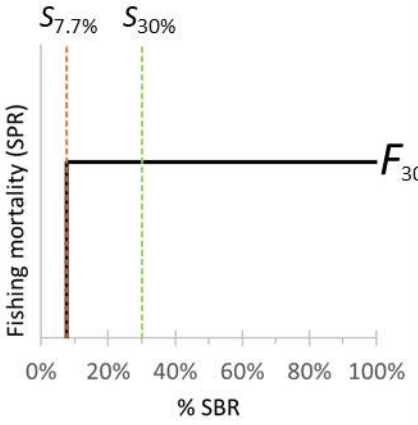
Objective from WS	Conditions	Interpreted from IATTC instruments	Workshop discussions
Safety Maintain above LRP	Define LRP(s) Define probability Define timeline Reduce *F* before LRP	*Resolution C-23-06* P(S< $S_{7.7\%}$) <= 10% P(F> $F_{7.7\%}$) <= 10%	P(S< $S_{7.7\%}$) <= 10% or 5% P(S<S_{MSY}) <= 10% or 5% P(F>F_{MSY}) <= 5% Timeline: Over 20 or 30 years
Status Maintain stock in green quadrant of Kobe plot	Define TRP(s) Define probability F_{max} <= F_{target}	*Antigua Convention* S >= S_{MSY} F <= F_{MSY} (implied) *Resolution C-23-06* F_{MSY} Skipjack $F_{30\%}$	P(S>dS_{MSY}) >= 50%, 60%, 70%, 75% or 80% P(F<F_{MSY}) >= 50%, 60%, 70%, 75% or 80% $F_{40\%}$, $F_{45\%}$ d$S_{40\%}$
Stability Low variability, catch, effort Gradual changes in management measures	$S_{control}$ << S_{target} Limits on management changes		Effort 10% change cap Catch 15% or 20% change cap
Yield Maintain catches above historical ranges		*Resolution C-21-04 (IVT)* Decrease for BET in PS	Average *1994-2019 (since FAD expansion)* *2017-2019 (latest status quo)* *Relative to other historical levels (maximize yield)*
Effort Maintain effort above historical ranges		*Resolution C-24-01* Increase PS OBJ (for other species) Eliminate Corralito	Average *1994-2019 (since FAD expansion)* *2017-2019 (latest status quo)*
Abundance/CPUE Maintain above historical ranges			Average *1994-2019 (since FAD expansion)* *2017-2019 (latest status quo)* *Relative to other historical levels (maximize yield)*

Management Model / Modelo de Ordenación

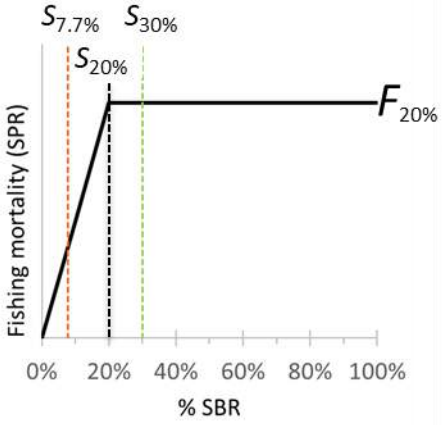
-Model-based Harvest Control Rules, based on surplus production model (ASPM-R, ASPM-R+)

-Evolving staff view on Target Reference Points for tropical tunas (SAC-15-05), from MSY-based quantities to MSY proxies ($0.3B_0$)

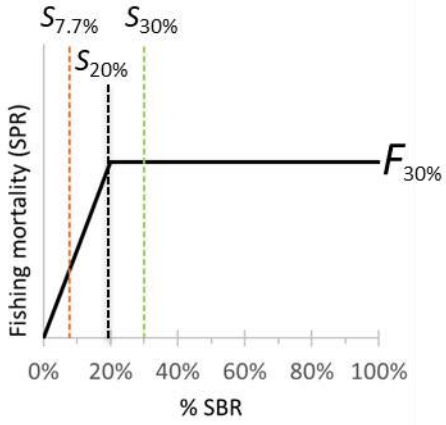
HCR 0: IATTC-like
RCE 0: similar a la CIAT



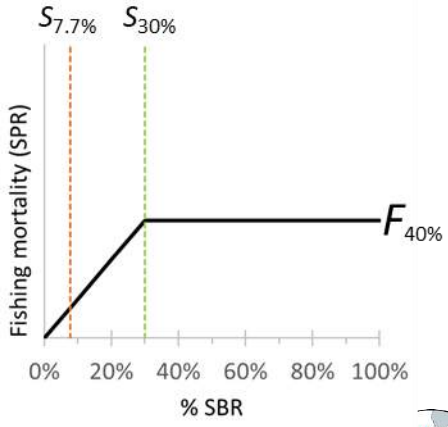
HCR 1
RCE 1



HCR 2: Moderate
RCE 2: Moderada



HCR 3: Conservative
RCE 3: Conservativa



Summarized during the 4th IATTC MSE workshop (from WSMSE-4)

Individual HS elements, harvest control rules (HCR)

(Working table from WSMSE-05-01)

Factorial design

Component of HCR	Staff	Workshops	Options
F_{max}	$F_{30\%}$	$F_{20\%}$, $F_{30\%}$, $F_{40\%}$, $F_{45\%}$, F_{MSY}	$F_{25\%}$, $F_{30\%}$, $F_{35\%}$, $F_{40\%}$
$S_{control}$	$S_{20\%}$	$S_{7.7\%}$, $S_{20\%}$, $S_{30\%}$, $S_{40\%}$, S_{MSY}	$S_{20\%}$, $S_{25\%}$, $S_{30\%}$
$S_{F=0}$	0		$S_{F=0}$
S_{fmin}	NA		
F_{min}	NA		
Stability	10 days		10 days: always, or above $S_{control}$
EM	ASPM-Rdev+ Base reference 2024 / Gear-aggregated SAM		

Candidate HS: combining HS elements, HCR, EM, Data

(Working table from WSMSE-05-01)

Component of HCR	Staff	Candidate 1	Candidate 2	Candidate 3	Candidate 4	Candidate 5	Candidate...
F_{max}	$F_{30\%}$						
$S_{Control}$	$S_{20\%}$						
$S_{F=0}$	0						
S_{Fmin}	NA						
F_{min}	NA						
EM							
Model type	ASPM-Rdev+						
Model	Base reference 2024						
Data	Catch, CPUE, LF index + LL						

Beyond bigeye tuna MSE

- EPO tropical tuna fisheries have multispecies (BET, YFT, SKJ), multi-gear (PS, LL) and fishing modes (FAD, Dolphin, NOA) present several challenges:
  - More difficult to simulate and evaluate
  - Different objectives for different fisheries?
  - Weak-stock management? Or 3 species individually? or two species?
- Very few truly multispecies MSEs in the world, focus on gear interactions
- Need to plan, part of the next 5-year IATTC Scientific Strategic plan (SAC-16-07)

	Species	2026	2027	2028	2029	2030
Stock Assessments	BET	Update	Benchmark			Benchmark
	YFT		Update		Benchmark	
	SKJ			Exploratory	Benchmark	
MSE	BET	Finalize				
	YFT	Start		Finalize		
	SKJ				Start	Finalize

Harvest strategy Chromogram for EPO tropical tunas

(WSMSE-05-01)

	2025	2026	2027	2028	2029	2030	2031	2032
Management Measures	In place, Res. C-24-01		Set in 2026			Set in 2029		
SAC		BET MSE results BET update assessment	BET benchmark assessment YFT update assessment	YFT MSE results SKJ exploratory assessment	YFT benchmark assessment SKJ benchmark assessment	BET benchmark assessment SKJ MSE results		
IATTC	Select/Adopt BET MP	Select/Adopt BET MP Set Measures (2027-2029)			Set Measures (2030-2032)			Set Measures (2033-2035)
Harvest Strategy staff work	BET MSE YFT MSE plan	Collate data for BET MP Run BET MP Check Excep. Circumst. YFT MSE	Check Excep. Circumst. YFT MSE	Check Excep. Circumst. YFT MSE	Collate data for BET MP Run BET MP Check Excep. Circumst. SKJ MSE	Check Excep. Circumst. SKJ MSE	Check Excep. Circumst.	Collate data for BET MP Run BET MP Check Excep. Circumst.

Questions? / ¿Preguntas?