

Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission



Evaluación de estrategias de ordenación (EEO) para el atún patudo en el OPO:
Informe de avances [SAC-15-07](#)

Management strategy evaluation (MSE) for bigeye tuna in the EPO: Progress
report [SAC-15-07](#)

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15th Meeting of the Scientific Advisory Committee – 10-14 June 2024
La Jolla, California, USA-EE.UU.



¿Que son las Estrategias de Ordenación?

What are Management Strategies?

- Combination of monitoring, stock status evaluation, control rule and management actions **designed to achieve fisheries objectives.**

*Combinación de monitoreo, evaluación stocks, regla de control y acciones de manejo diseñadas para lograr **objetivos de ordenación***

- Strategies can't be properly evaluated without **specific** management objectives, data, analyses, control rule, uncertainty, other components

*Estrategias no pueden ser evaluadas sin **especificar** objetivos, datos, análisis, regla de control, incertidumbre y otros componentes*

- Development and success of Management Strategies benefit from **involvement of all stakeholders** in the planning stage

*El desarrollo y éxito de Estrategias de Ordenación se benefician con el involucramiento de **todas las partes interesadas** en su planificación*

- Management Strategy Evaluation components/*Componentes de EEO*

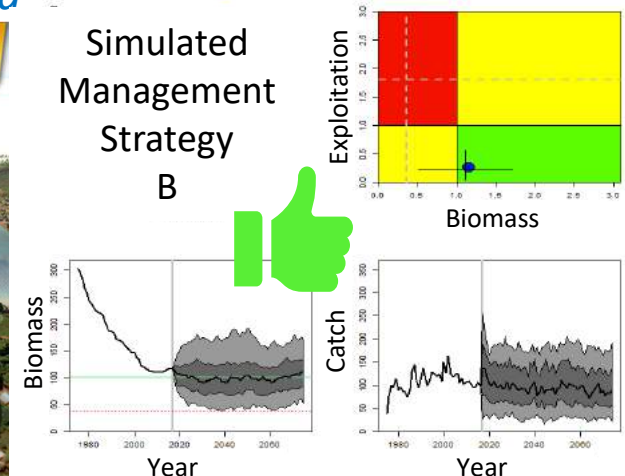
- **Dialogue:** define alternative strategies to evaluate/*Diálogo: definir estrategias a evaluar*

- **Technical:** evaluate strategies via simulations/*Técnico: evaluar estrategias con simulación*

Evaluación de Estrategias de Ordenación (EEO)

Management Strategy Evaluation (MSE)

- Used to evaluate management alternatives via computer simulations:
Usadas para evaluar alternativas de ordenación vía simulación con computadoras
 - Quotas / *Cuotas*
 - Closures (time, spatial) / *Vedas (temporales, espaciales)*
 - Fishing effort limits (number of sets, FADs, etc) / *Límites de esfuerzo (núm. lances, FADs, etc)*
 - New data (tagging, ageing, genetics, etc) / *Nuevos datos (marcado, edad, genética)*
 - Alternative harvest control rules / *Reglas de control alternativas*



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 workshops (2015-2019), 3 IATTC MSE workshops (2019-2022) ([WSMSE-1](#); [WSMSE-2](#); [WSMSE-3](#))

- 2021-2023 MSE funding from the European Union

- Two components:

- Consultative/dialogue process (e.g. series of MSE workshops)

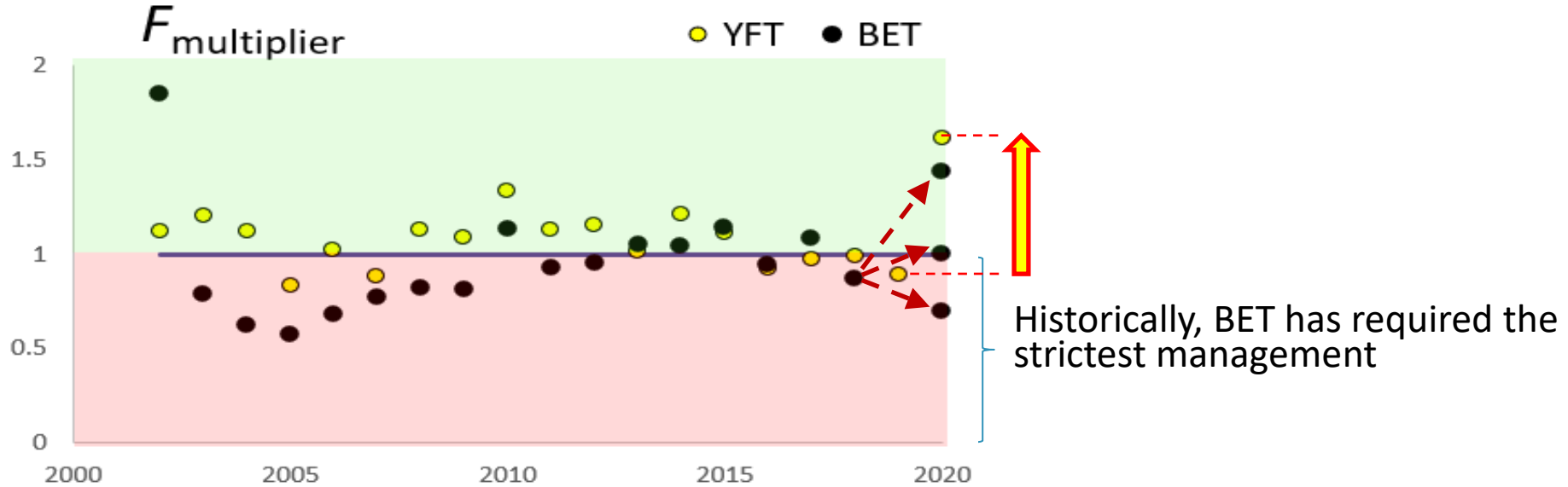
- Technical implementation of MSE

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



Species focus (BET), rationale

Initial MSE technical focus on BET, moving to other species towards the end of current work plan

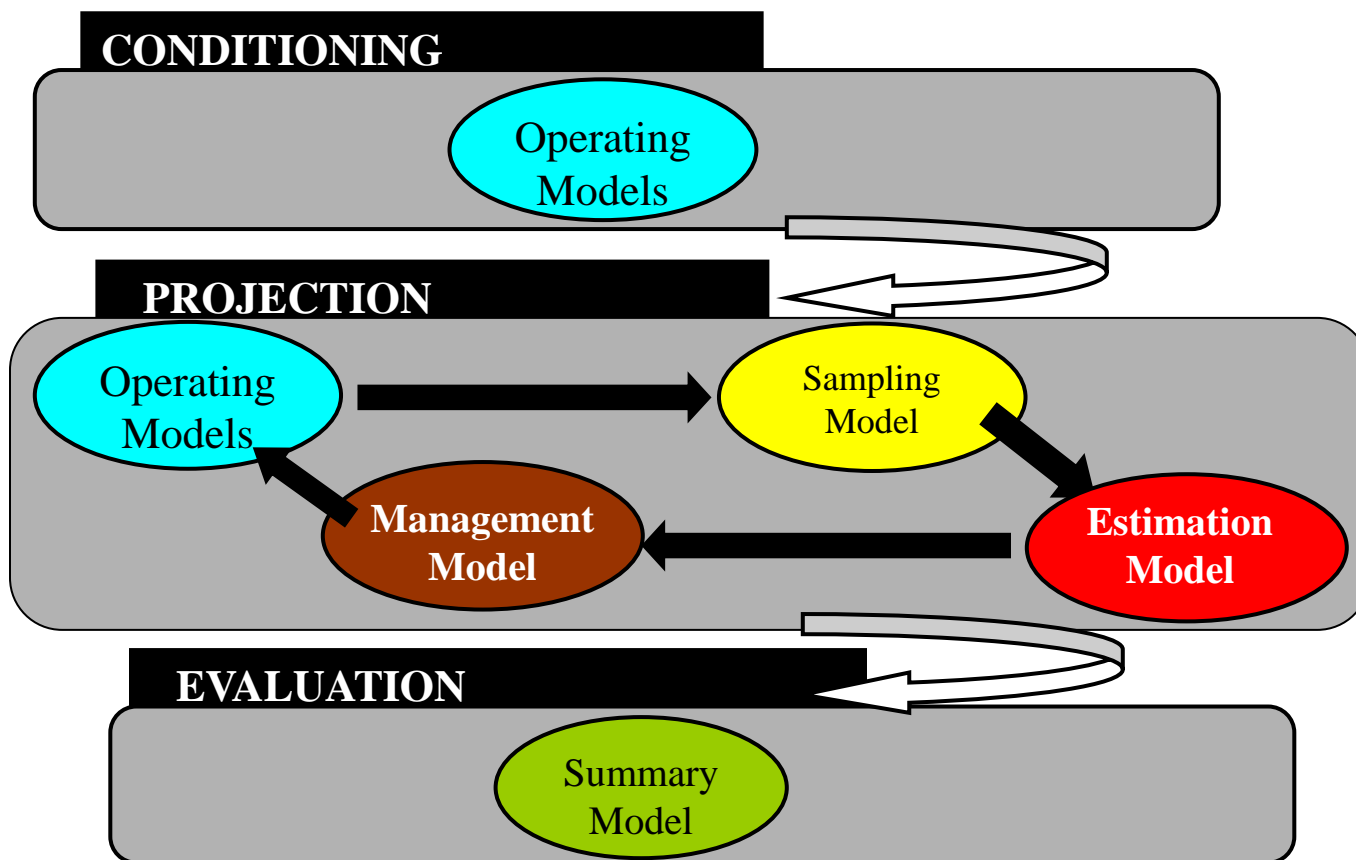


Historically, BET has required the strictest management

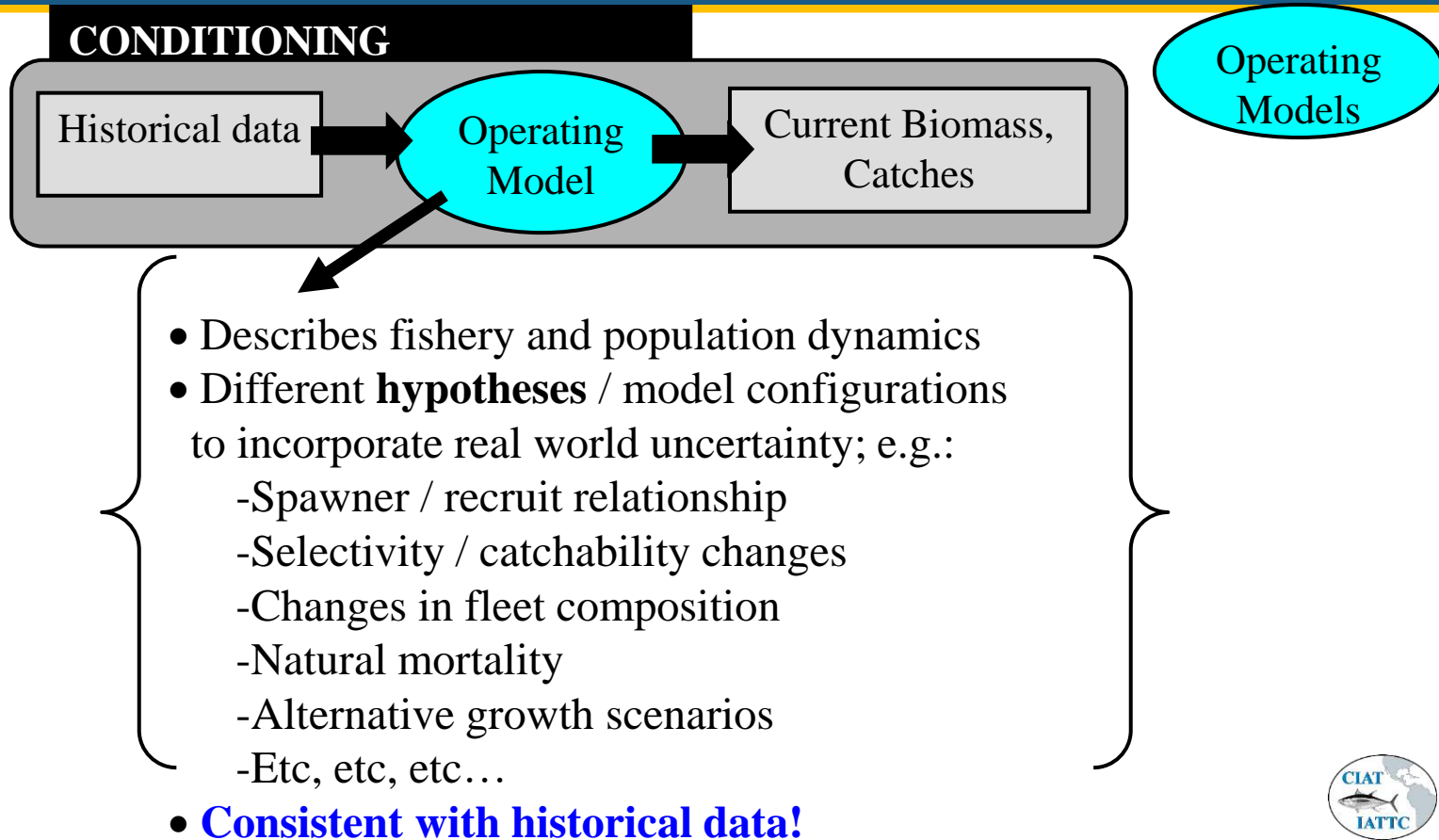
- Recent work to improve YFT modeling
- Recent lack of assessment models (or operating models) for SKJ (although recent assessments in 2022, 2024)
- Ongoing YFT and SKJ modeling work to incorporate hypotheses for assessment and operating models
- As further SKJ and YFT models are developed, they will be included in the MSE work

Evaluación de Estrategias de Ordenación: Componentes

Management Strategy Evaluation: Components

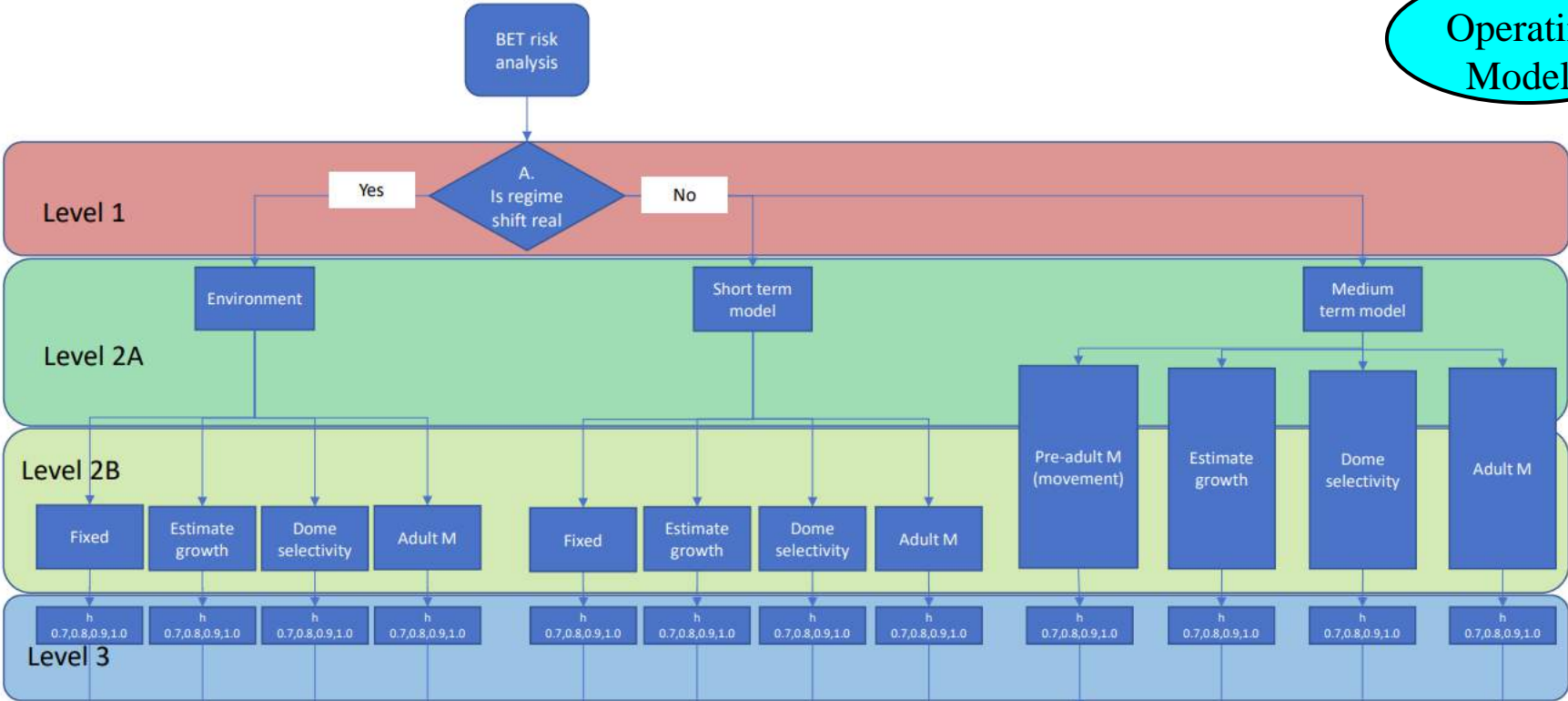


Operating Models and Conditioning



Hypotheses for conditioning BET Operating Models

Operating Models

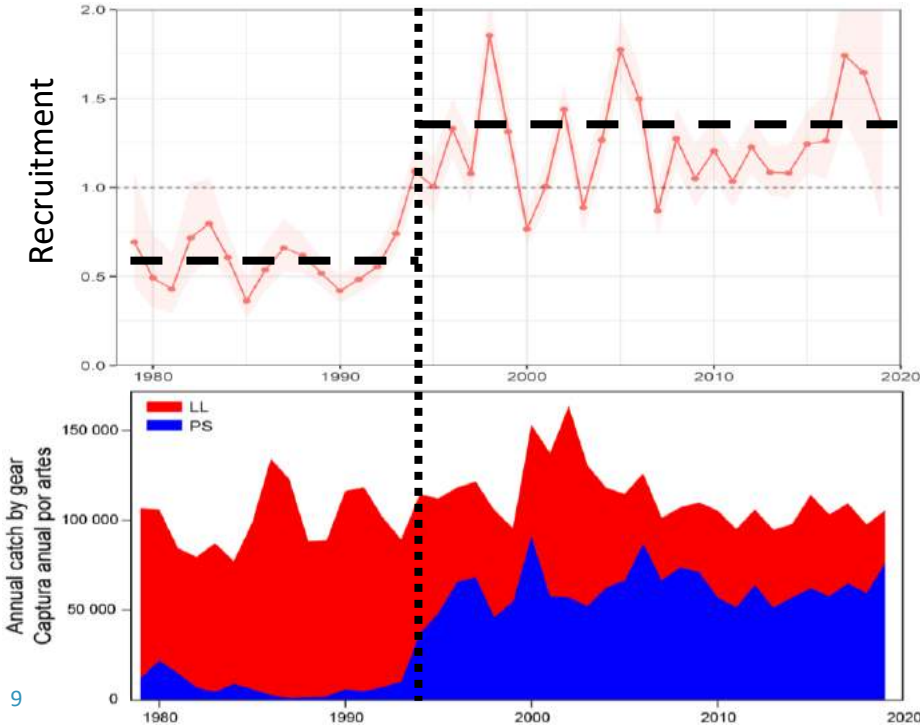


Issues with OMs from 2020 BET reference models

Large recruitment shift coincidental with increase of PS FAD catches in 1990s

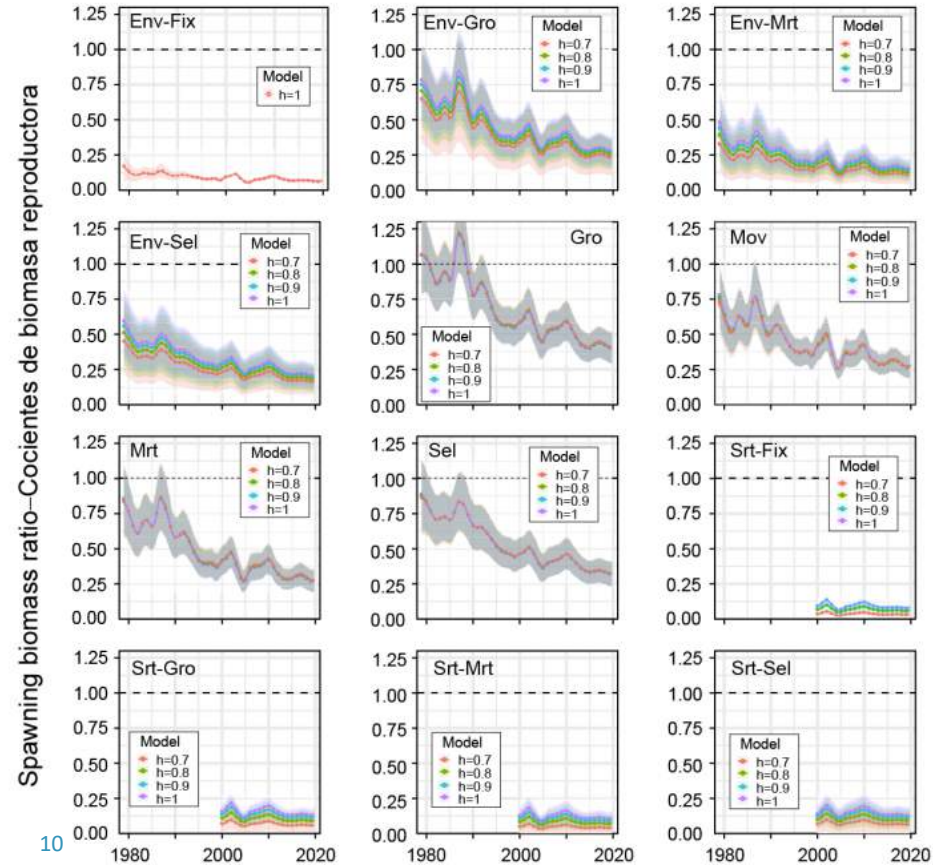
Operating Models

2020 BET Benchmark Assessment

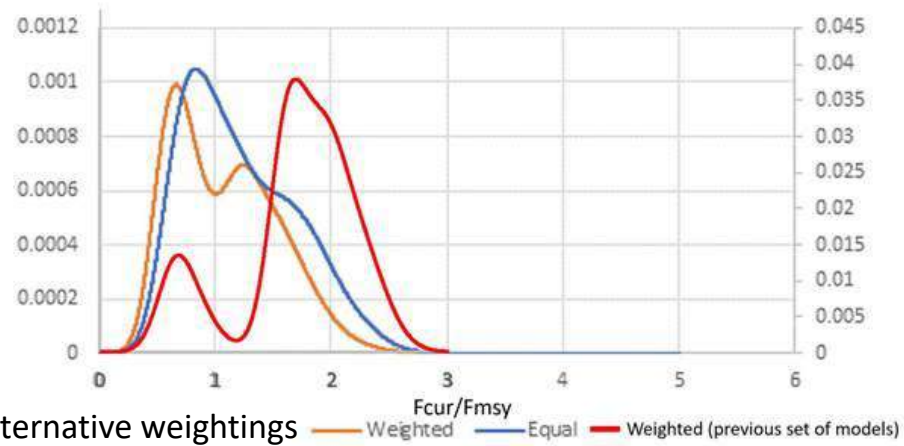


Issues with OMs from 2020 BET reference models

Operating Models

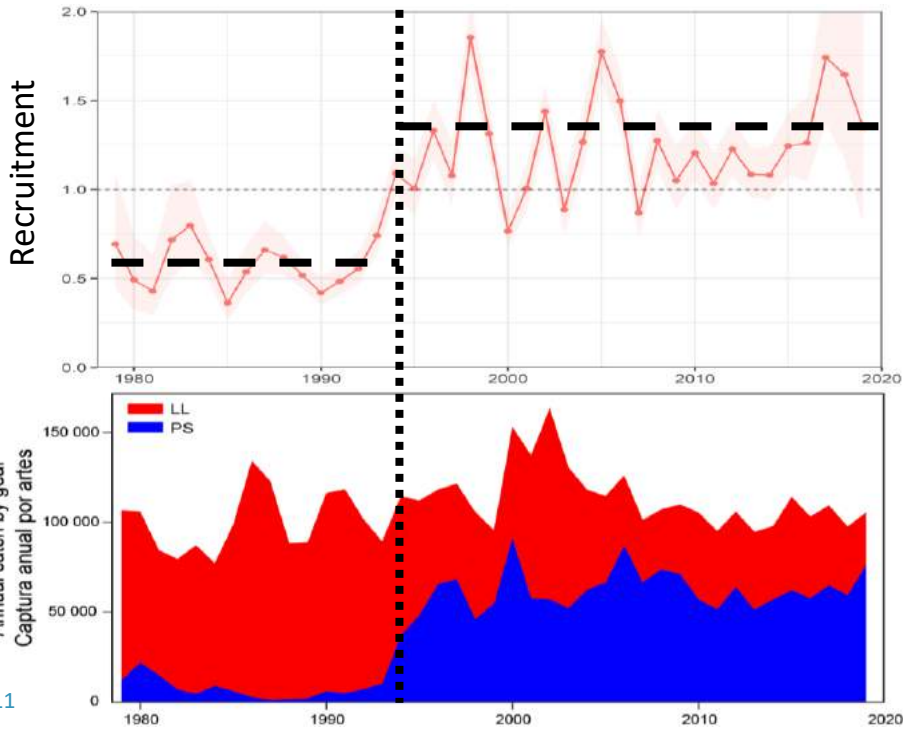


Bimodal distribution of Operating models
Based on 2020 BET Assessment

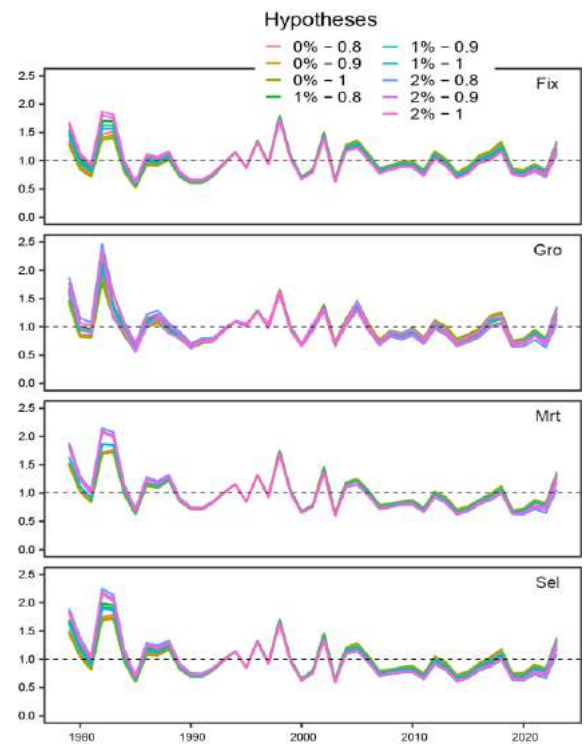


Changes from 2020 to 2024 BET reference models

2020 BET Benchmark Assessment



Recruitment shift removed 2024 BET Assessment



Operating Models

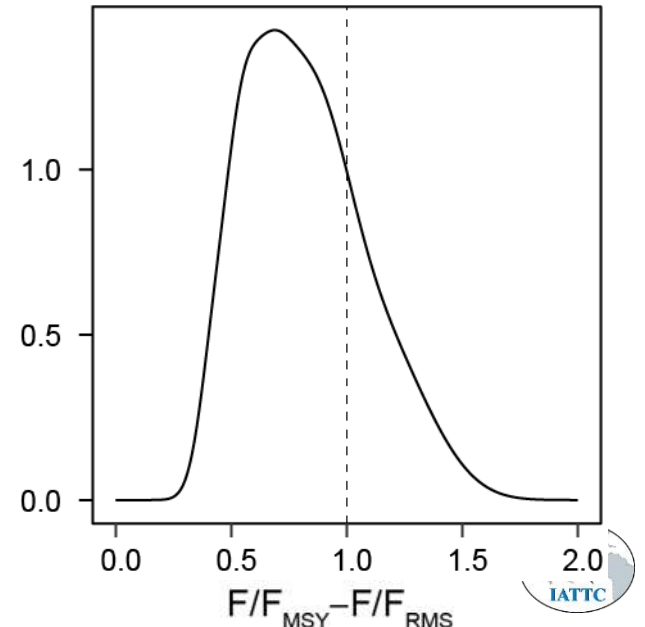
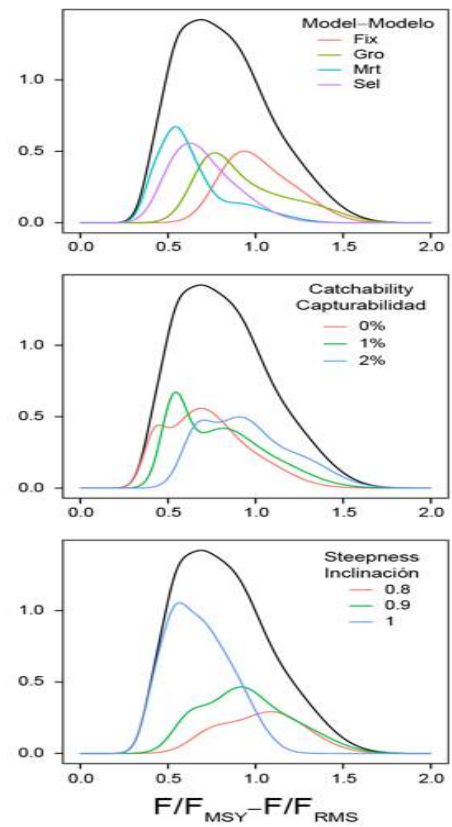
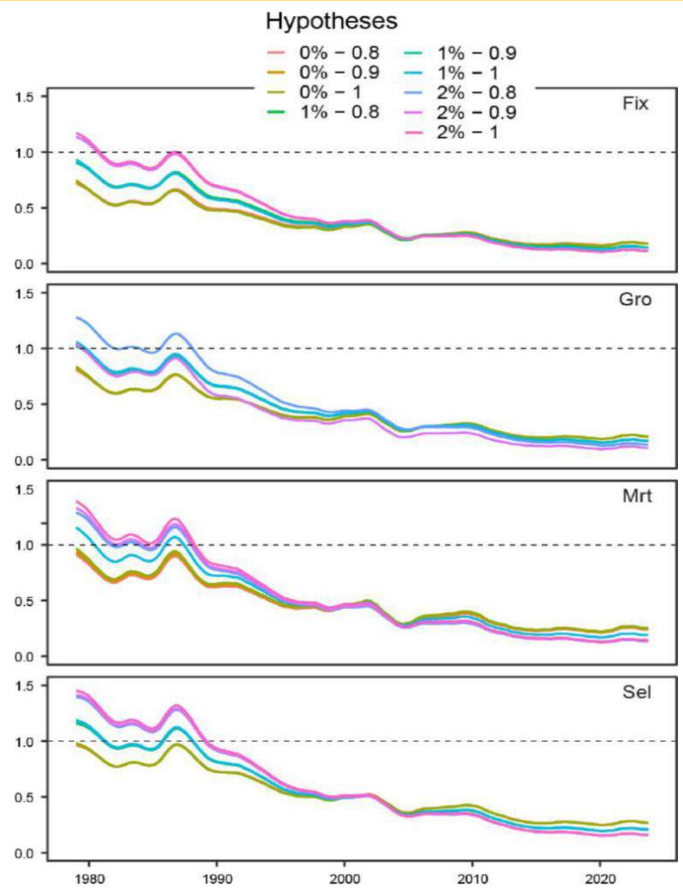


New OMs from 2024 BET reference models

Operating Models

New Operating Models 2024 BET Assessment

Spawning biomass ratio - Cociente de biomasa reproductora



Sample design for OMs from BET reference models

Operating
Models

Level 1 hypothesis:

- 1) Model Fix,
- 2) Gro (estimate growth),
- 3) Sel (all selectivities dome-shape),
- 4) Mrt (Natural mortality M values for adult male 0.1, 0.12, 0.125, 0.13)

Level 2 hypothesis: Annual increase in longline catchability (effort creep) **0%, 1%, 2%**

Level 3 hypothesis: Steepness of the Beverton-Holt stock-recruit relationship (h) of **1.0, 0.9, 0.8**

- The combination of the three hypothesis yields $4 \times 3 \times 3 = 36$ **models**
- **Models will be given equal weights in the MSE**

Sampling model

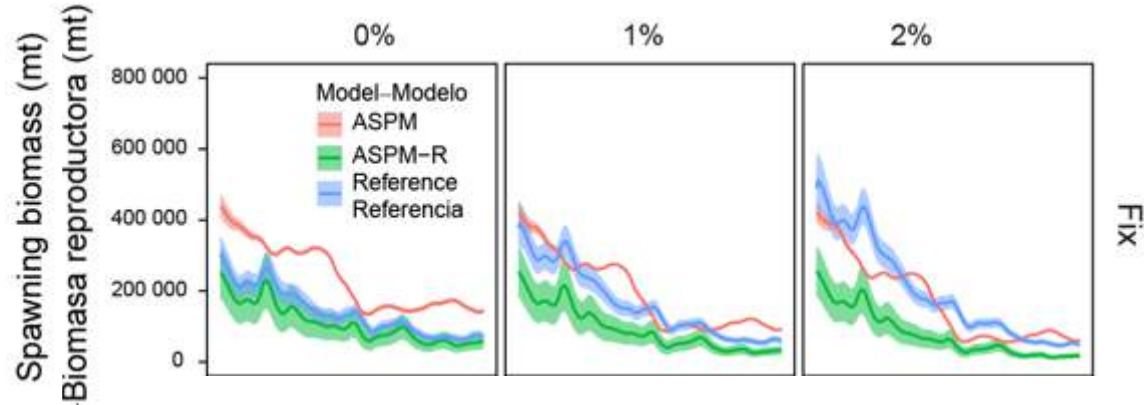
Sampling Model

- Define how data (e.g., catches, size compositions, CPUE) are collected from the simulated “true” population (including observation uncertainty, the effect of measurement error and bias).
- The bootstrap functionality of Stock Synthesis is used to generate the observed data.
 - Standardized Japanese longline index of abundance and total catches

Alternative EMs for BET (simpler assessment model)

- ASPM-Rdevs in *Stock Synthesis*

Estimation Model



- Gear-aggregated simpler integrated model in Stock Synthesis

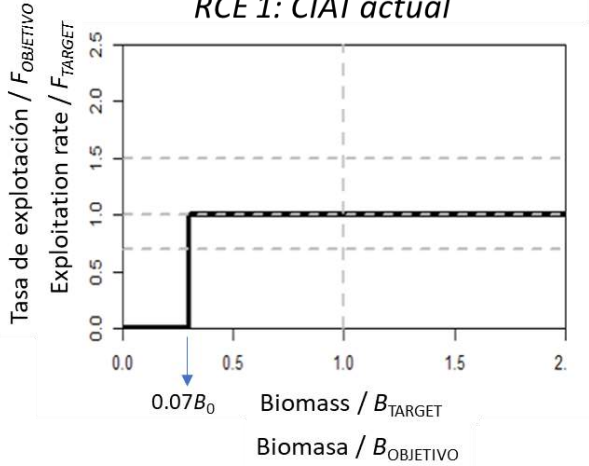
Management Model / Modelo de Ordenación

Management Model

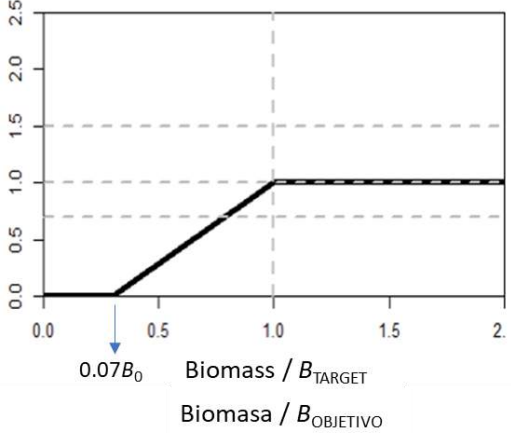
Use the perceived stocks status and trends to derive management action

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

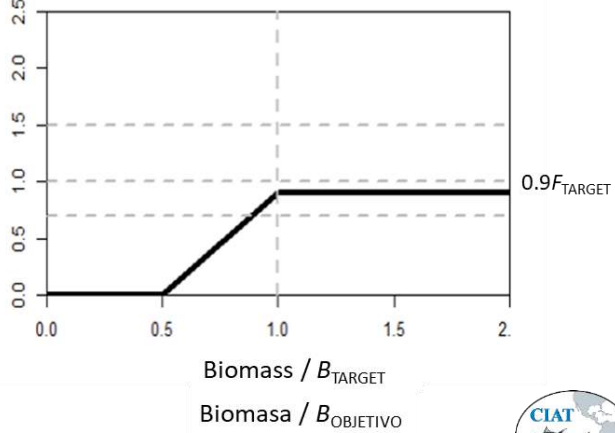
HCR 1: IATTC-like
RCE 1: CIAT actual



HCR 2: Moderate
RCE 2: Moderada



HCR 3: Conservative
RCE 3: Conservativa



Management Model / Modelo de Ordenación

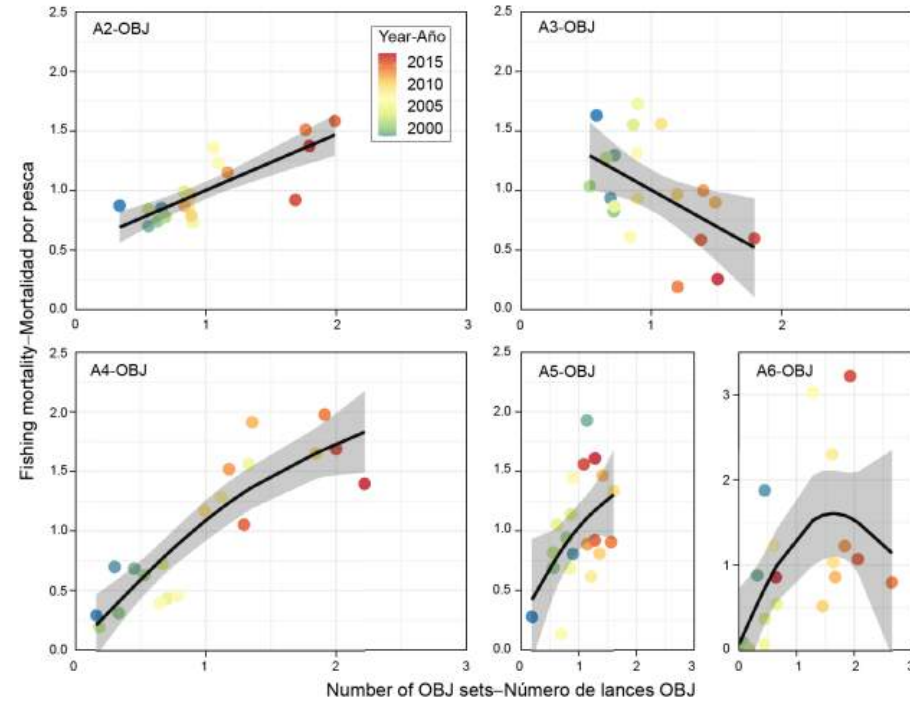
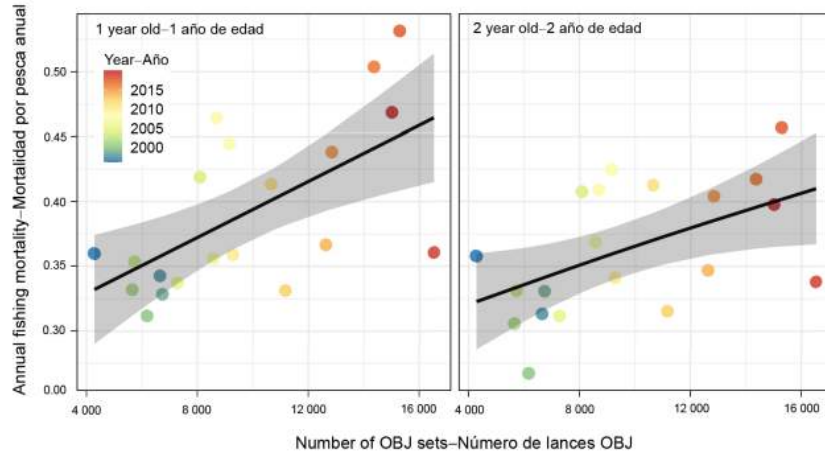
Management Model

- Applied on a 1-year to 3-year cycle
 - Effort controls (days of closure, F) for surface fleets
 - Catch limits for longline fleets or keep F at previous historical 3-year average F
- Data inputs for Model-based HCR:
 - Standardized Japanese longline index of abundance and total catches for ASPM-R

Implementation error

- Rick Deriso's formula between Fishing mortality (F) and closure days
- Other relationships (e.g. F & OBJ sets) and their uncertainty could be included if more information about their relationships with F is available
- Implementation error between intended and realized changes in F (0%, 10%, 20%) to represent the different approaches to implement the HCR (e.g. closure days, IVT, active FAD limits).

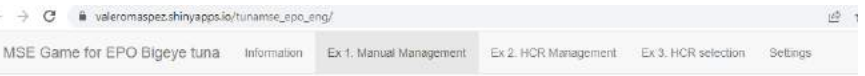
Management Model



Expand MSE Shiny app to illustrate OMs and MSE results

https://valeromaspez.shinyapps.io/TunaMSE_EPO_ENG/

Summary Model



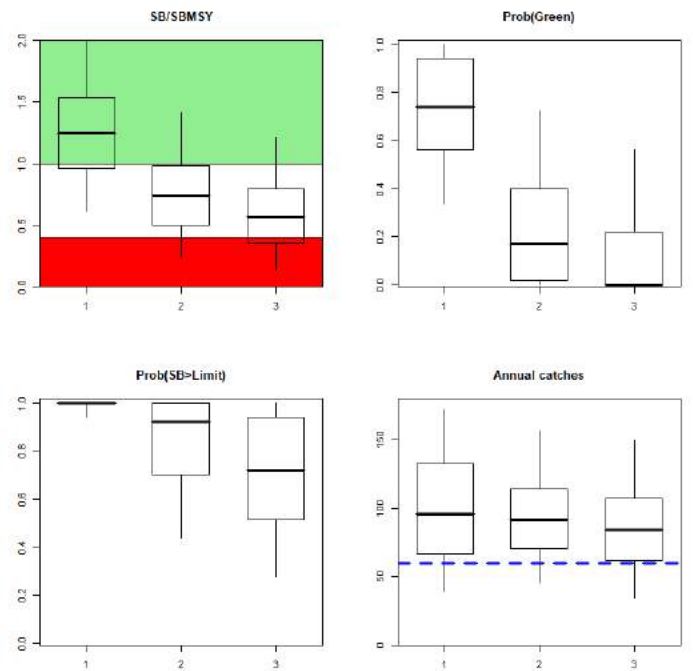
Manage the fishery 'manually' by changing the catch limit each year. Each time you change the catch limit, discuss amongst the group why you are making the change. Your aim is to get the highest overall catch while maintaining stock status, avoiding overfishing and keeping catch variation low.

Catch limit (tons):

Catch limit variation (pre):

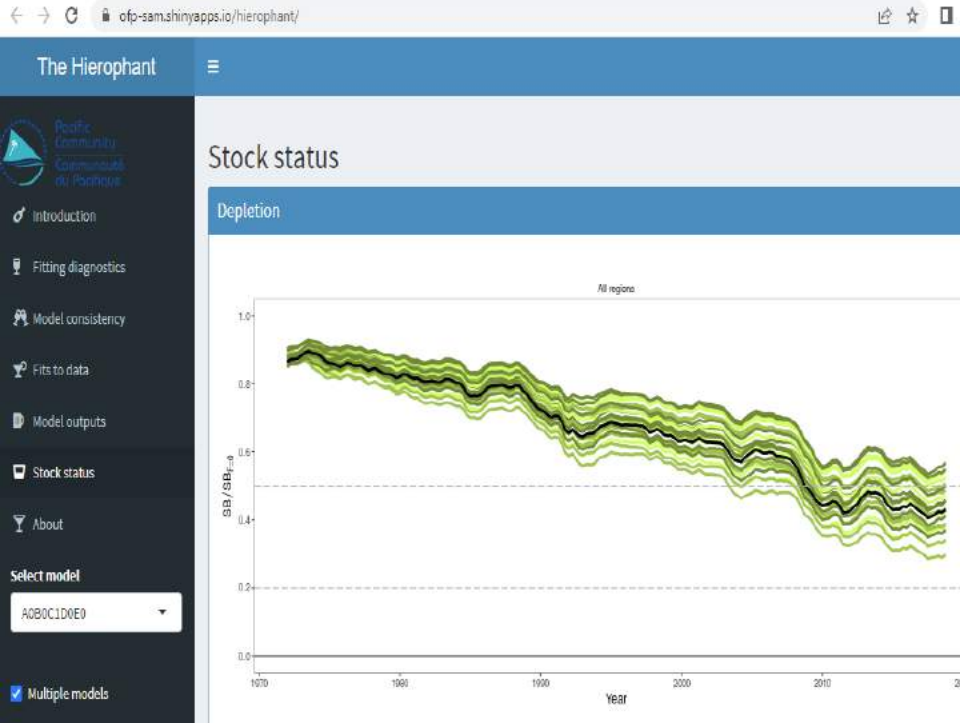
Apply management

Restart



Alternative strategies

<https://ofp-sam.shinyapps.io/hierophant/>



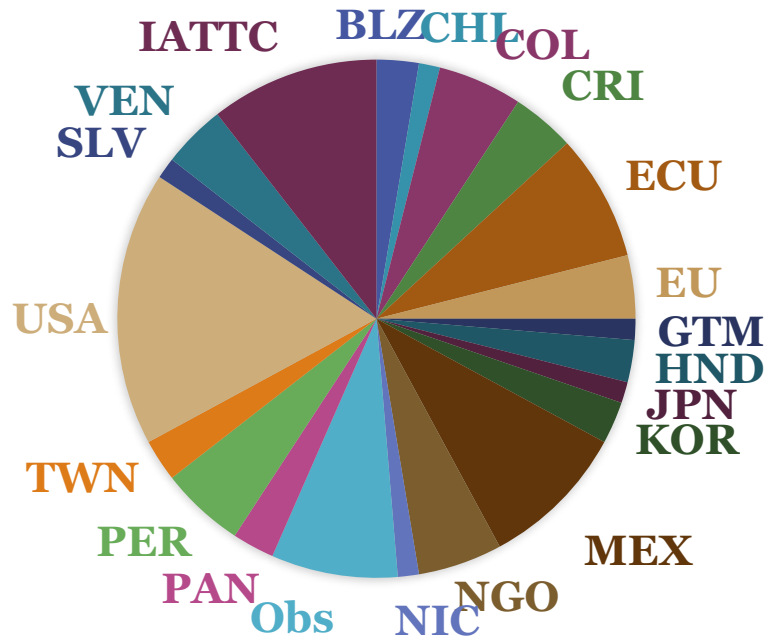
MSE dialogue and stakeholder input

- 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
- MSE Workshops Terms of Reference ([Resolution C-19-07](#))
- Intro HS workshops (2015-2019), 3 IATTC MSE workshops (2019-2022, [WSMSE-1](#); [WSMSE-2](#); [WSMSE-3](#))
- Recent requests by stakeholders for the establishment of a dedicated dialogue Working Group (WG), to enhance or replace the MSE workshops.
- 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.

3rd IATTC Tropical Tuna MSE Workshop, December 2022, participants

3er Taller CIAT sobre EEO, Diciembre 2022, participantes

80 participants / *participantes*



	1st MSE WS	2nd MSE WS	3rd MSE WS
Cooperating Non-Members	FALSE	FALSE	FALSE
	FALSE	TRUE	TRUE
	FALSE	FALSE	TRUE
	FALSE	FALSE	FALSE
	FALSE	FALSE	FALSE
Members	TRUE	TRUE	TRUE
	FALSE	TRUE	FALSE
	FALSE	FALSE	FALSE
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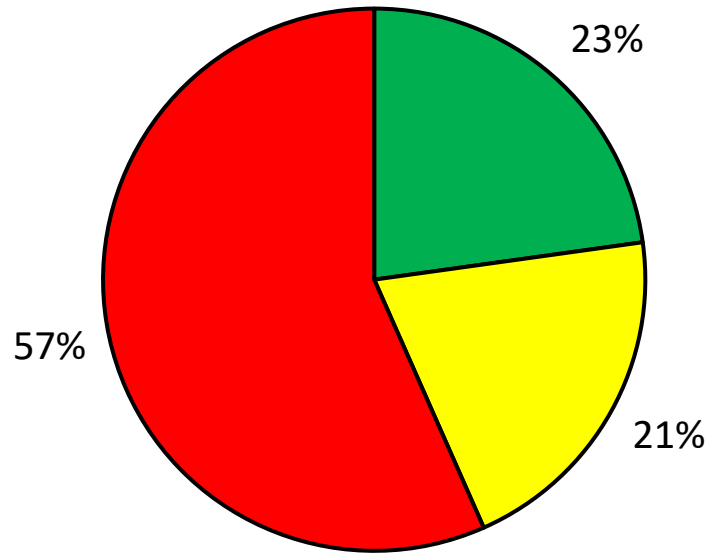
Participants	44	97	80
Members (%)	13 (62%)	15 (71%)	16 (76%)



Participation in previous EPO tropical tuna MSE workshops

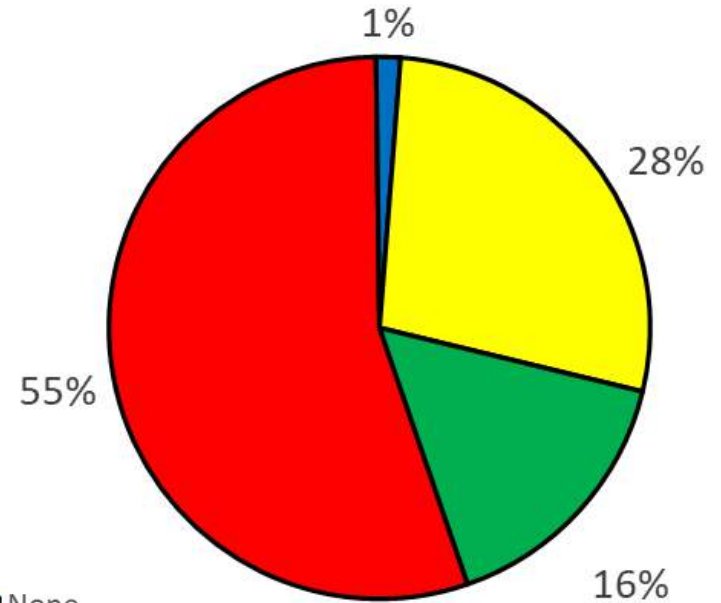
Participación en talleres previos de EEO de atunes tropicales en el OPO

2nd Workshop / 2^{do} Taller



■ 1st IATTC MSE WS ■ Other EPO MSE WS ■ None
1er Taller CIAT EEO *Otro Taller EEO en OPO* *Ninguno*

3rd Workshop / 3^{er} Taller



■ None ■ 1st IATTC MSE WS
■ 2nd IATTC MSE WS ■ Both IATTC MSE WS

Objectives, quantities, performance indicators

OBJECTIVE	Quantity	Performance Indicators
Safety Maintain stock above limit reference points	Equilibrium virgin spawning biomass SB_0 <ul style="list-style-type: none"> < 10% probability SB below 7.7% of SB_0 < 5% probability SB below 7.7% of SB_0 $< 10\% P SB < SB_{msy}$ $F_{lim} (< 5\% P F > F_{msy})$	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	$SB \geq \text{dynamic } SB_{MSY} \text{ and } F < F_{MSY}$ <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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)

Challenges / *Desafíos*

- **COVID-19 pandemic / *Pandemia de COVID-19***
 - Limitations of virtual workshops, changes to workplan timeline
Inhabilidad de tener talleres en persona, cambios en el cronograma de trabajo
- **Limited-representation** by some CPCs, high turnover of representatives
Representación limitada de algunas CPCs, alto recambio de representantes
- Multiple extraordinary meetings during 2020-2021
Múltiples reuniones extraordinarias durante 2020-2021
- Some challenges expected to ameliorate/*Algunos desafíos se espera que mejoren*
 - End of COVID pandemic
 - Full time harvest strategies position at staff since January 2024
 - 2024 BET assessment resolved structural issues of previous BET assessments, new OMs to update MSE should result in a better strategy being selected

IATTC BET MSE work for 2024 and beyond

- Recent large changes in the modeling of BET in the EPO
 - 2020 benchmark BET assessment issues (bimodal results, recruitment shift)
 - Review of data and modelling for tropical tuna assessments (Oct-Nov 2023)
 - Substantial changes and improvements on modelling for BET assessment (2024)
- Revisiting Tropical Tuna reference points ([SAC-15-05](#))
- Continue technical work on BET MSE during 2024
 - Preliminary work with OMs based on last benchmark assessment (2020)
 - Updated runs with OMs from current benchmark assessment (2024)
 - Incorporate stakeholder feedback between preliminary and updated results
- Finalize BET MSE and plan to present results during 2025
- MSE work has been institutionalized at IATTC by establishing a permanent harvest strategy staff position in 2024

Potential chromogram of harvest strategy implementation for EPO bigeye tuna

Cronograma tentativo, implementación estrategia de ordenación para patudo en el OPO

2024: **SAC-15** and Annual Meeting: Report on revised MSE plan.

Workshop/s to show MSE updated results, gather feedback on harvest strategy elements (e.g. TRPs), plan additional evaluation work.

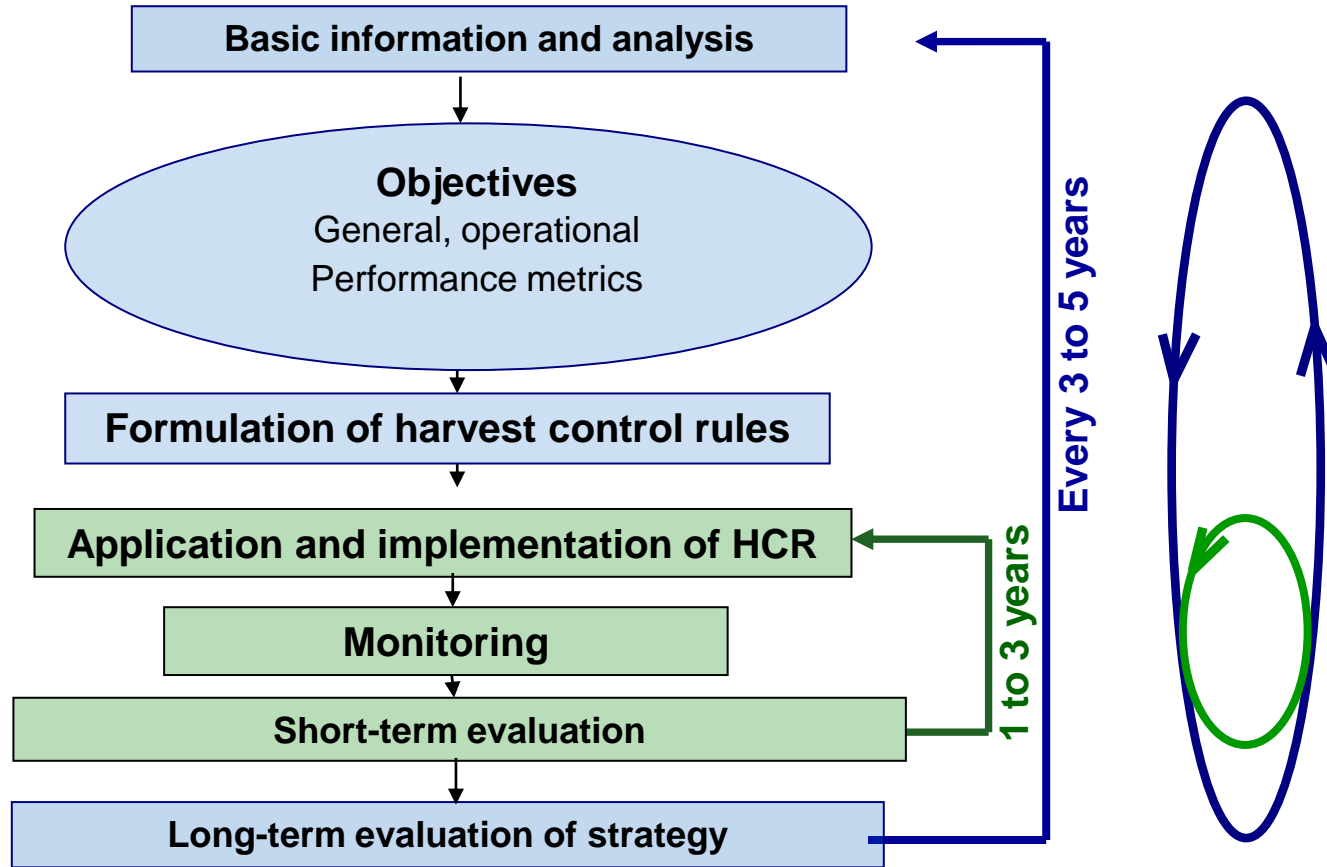
Technical implementation of revised MSE with new OMs, evaluation.

2025: Workshop/s to discuss MSE results, plan for other tropical tunas.

SAC-16 and Annual Meeting: Report / presentation of MSE results and plan for other tropical tunas.

	2024	2025	2026	2027	2028
SAC	Assess stock status	Second run of MSE			
AM	Initial run of MSE	Select/Adopt BET MP Set Measures (2026-2028)			Set Measures (2029-2031)
Staff work	Update MSE, new OMs	Start MSE for SKJ or YFT Check Excep. Circumst.	Collate data for MP Run MP Check Excep. Circumst.	Collate data for MP Run MP Check Excep. Circumst. Assess stock status	Check Excep. Circumst.

Feedback cycles / Ciclos de retroalimentación





Questions? / ¿Preguntas?

