History of PBF stock assessment and MSE development

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Objective of the presentation

- To introduce the history of the stock assessment of Pacific bluefin tuna and its MSE development, being conducted by ISC.

- To understand “how we got here” and “what to expect”.

Who is ISC?

- The **I**nternational **S**cientific **C**ommittee for Tuna and Tuna-like Species in the North Pacific Ocean
- Established in 1995.
- To enhance scientific research and cooperation for conservation and rational utilization of tuna and tuna-like species (HMS) of the North Pacific Ocean, and to establish the scientific groundwork for the conservation and rational utilization of the HMS in the North Pacific Ocean.

Member: Canada, Chinese Taipei, Japan, Republic of Korea, Mexico, People's Republic of China, The United States of America (IATTC and SPC)

Who is ISC?

ISC has signed an MOU with WCPFC in 2007, to provide scientific advice to the NC and Commission of WCPFC.

ISC conducts stock assessments for Pacific bluefin tuna, North Pacific albacore, North Pacific swordfish, North Pacific billfishes and sharks and provides scientific advice to RFMOs.

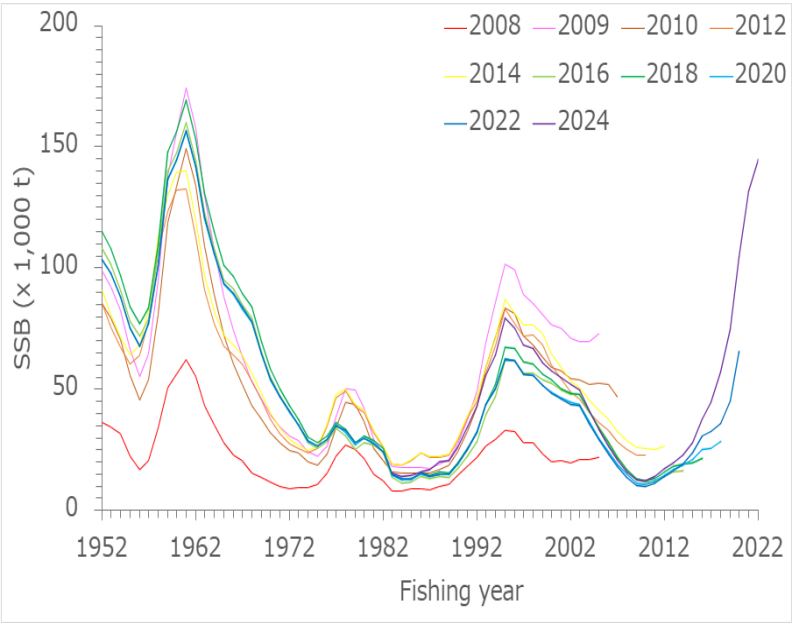
ISC is an independent scientific institution.

Evolution of PBF stock assessment

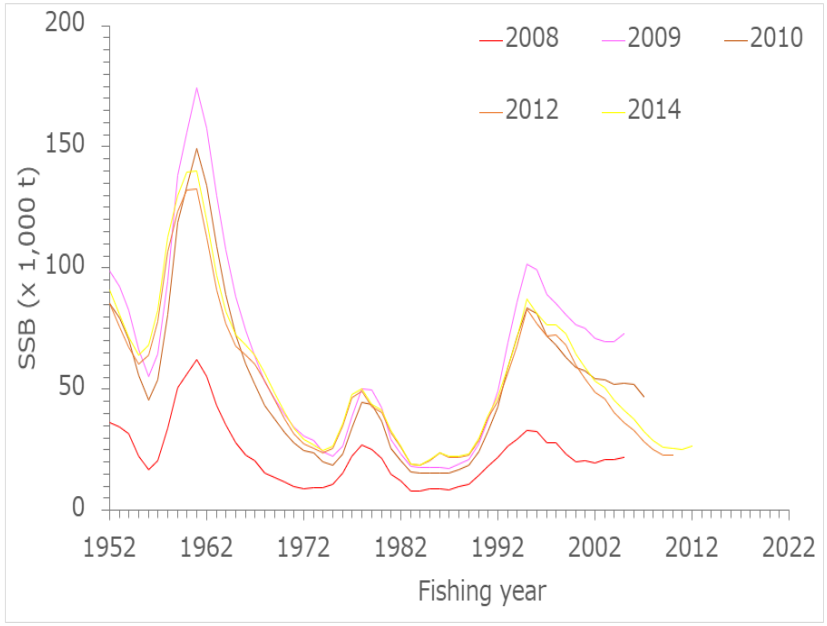
- ISC PBFWG held its first meeting in 2000.
- The first PBF stock assessment was conducted in 2004.
- From 2010 to 2024, stock assessments were conducted every two years by PBFWG. The latest was completed in March 2024, which forms the basis of PBF MSE.
- The latest stock assessment indicated that stock recovered from very low level (2%) to 23.2% of SSB0.

Evolution of PBF stock assessment

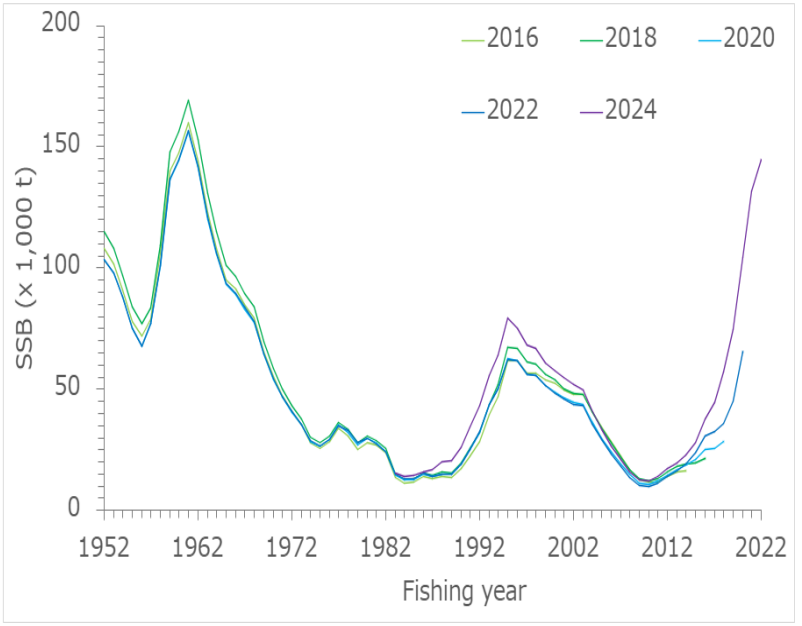
All stock assessment results



results from 2008-2014



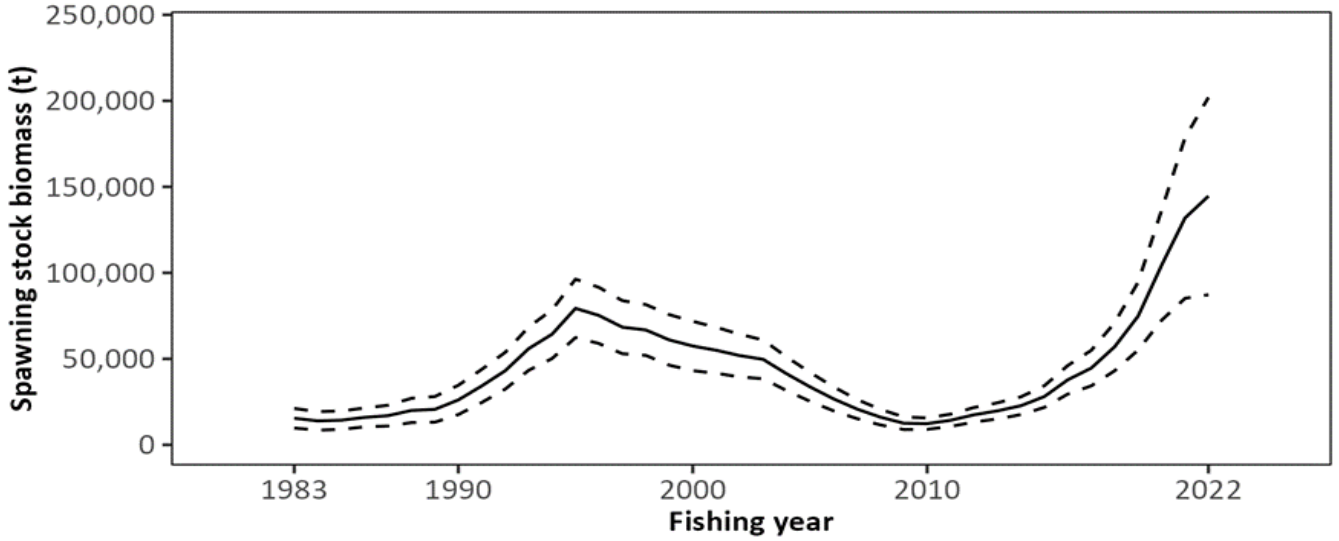
results from 2016-2024



Stock assessment results became more stable since 2016. => This is because more reliable abundance indices and biological knowledge became available, and improvements were made in the stock assessment methodology by ISC scientists.

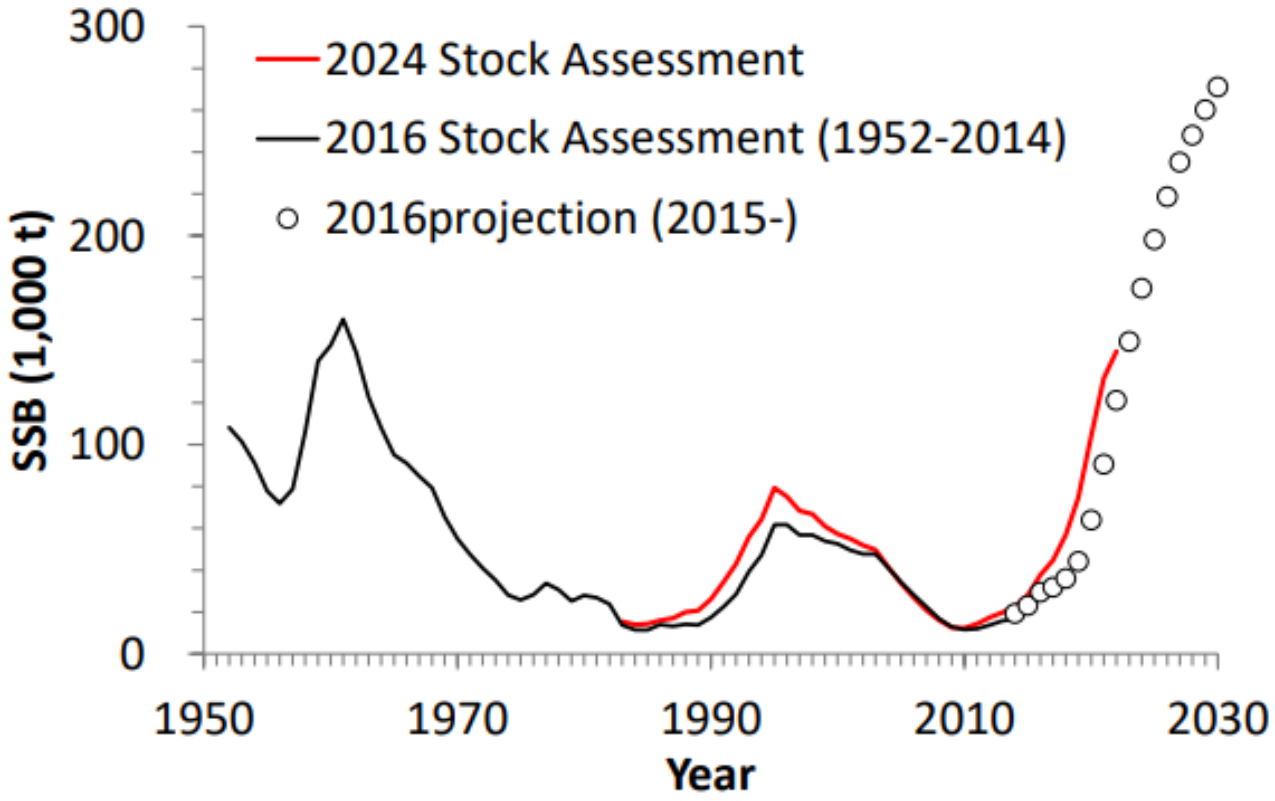
Evolution of PBF management

- Management measures to substantially reduce the catch were introduced in 2015 in WCPFC and IATTC.
- As the stock recovers, the TAC was slightly increased in 2022 following a larger increase in 2025.
- The current (2022) SSB is 23.2% SSB0 and achieved the recovery target much earlier than planned.



Projection and reality (a good news)

- Comparison of the 2016 projection and the 2024 assessment.
- The stock is recovering as projected, which is not so common. (note, not a strict comparison)
- => A quick recovery was not unexpected.
- **PBF stock assessment is reliable and sophisticated and current management is working (without MSE).**



PBF MSE development

- “Why MSE?” was already presented. => Theory is, MSE would enable a collective and inclusive decision-making to select a robust management strategy through more thorough simulation.

- MSE was first mentioned in WCPFC in 2017. “The ISC is requested to start the work to develop a management strategy evaluation (MSE) for Pacific bluefin tuna fisheries in 2019 and have a goal of completing it by 2024.” (HS 2017-02)

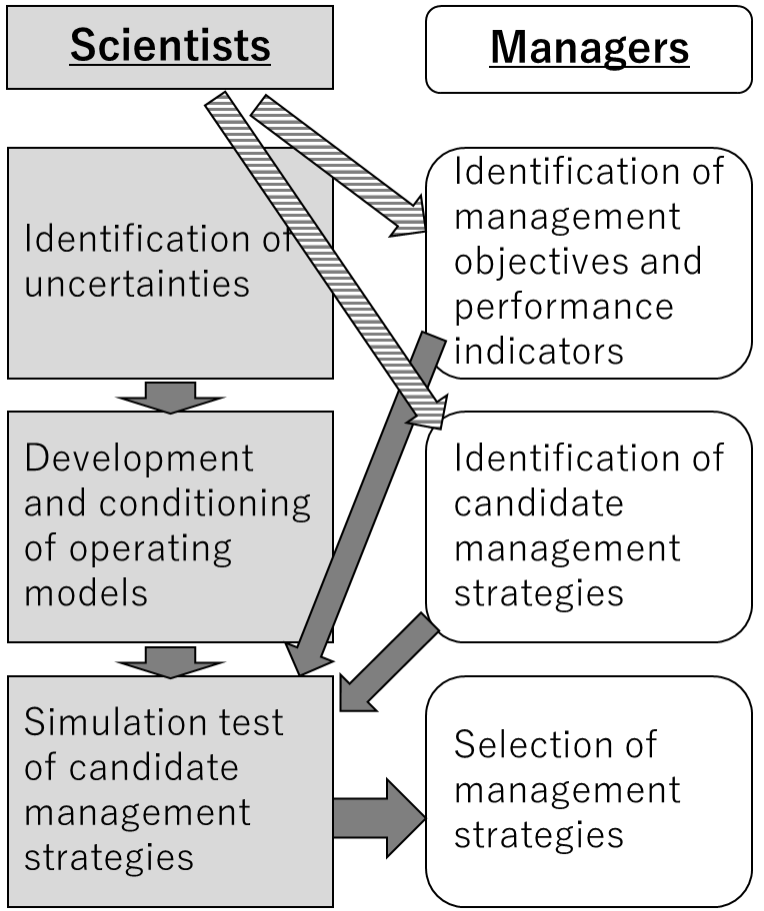
- Responsibilities: **The JWG provides overall guidance** on the MSE while ISC provides technical guidance (JWG4).

- The ISC started development of MSE as requested, but later requested a 1-year extension to be completed in 2025.

Development of PBF MSE

MSE is a collaborative process between scientists and stakeholders to develop a robust harvest strategy. The JWG has already provided substantial input for MSE.

- Management objectives
- Candidate harvest control rules (HCRs)
- Other modalities (TAC change cycle, TAC change restriction, Relative Fs for projection, output for 3 fleets, etc.)



Management objectives

Management objectives were developed by the JWG in 2023.

They cover all key items (safety, status, stability, and yield) and the corresponding performance indicators were also specified.

The important objective of the WPO-EPO impact ratio is included.

Basic guideline of PBF MSE!

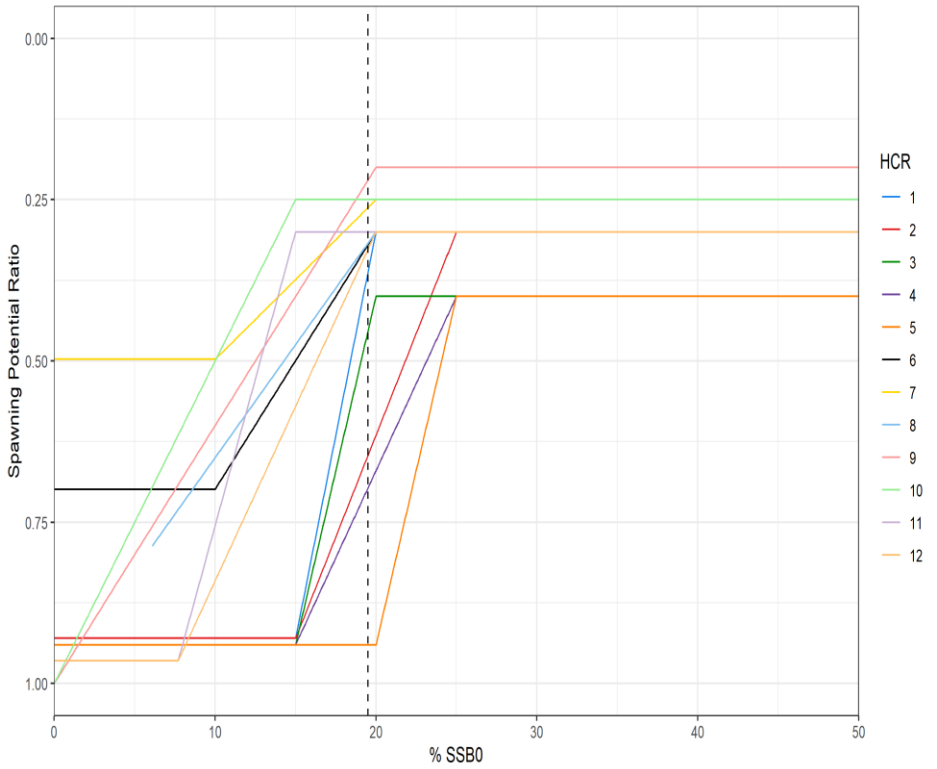
CANDIDATE OPERATIONAL MANAGEMENT OBJECTIVES AND PERFORMANCE INDICATORS FOR PACIFIC BLUEFIN TUNA

Category	Operational Management Objective	Performance Indicator
Safety	There should be a less than 20%[1] probability of the stock falling below the LRP	• Probability that SSB< LRP in any given year of the evaluation period
Status	To maintain fishing mortality at or below FTarget with at least 50% probability	• Probability that F≤FTARGET in any given year of the evaluation period • Probability that SSB is below the equivalent biomass depletion levels associated with the candidates for FTARGET
Stability	To limit changes in overall catch limits between management periods to no more than 25%, unless the ISC has assessed that the stock is below the LRP[2]	• Percent change upwards in catches between management periods excluding periods when SSB<LRP • Percent change downwards in catches between management periods excluding periods when SSB<LRP
Yield	Maintain an equitable balance in proportional fishery impact between the WCPO and EPO	• Median fishery impact (in %) on SSB in the terminal year of the evaluation period by fishery and by WCPO fisheries and EPO fisheries
	To maximize yield over the medium (5-10 years) and long (10-30 years) terms, as well as average annual yield from the fishery.	• Expected annual yield over years 5-10 of the evaluation period, by fishery. • Expected annual yield over years 10-30 of the evaluation period, by fishery.

Harvest Control Rules (HCRs)

- 12 candidate HCRs were also developed by the JWG in 2023.
- They span a wide range thus are expected to show trade-offs among management objectives.
- JWG also requested to conduct projection to provide two impact ratio results (status quo vs. 30%–70% (EPO-WPO))
- In total, 12 x 2 = **<u>24HCRs!</u>**

HCR Number	F_{target}	SSB Control Point 1 (ThRP)	SSB Control Point 2 (LRP)	Number of SSB control points	F_{min}
1	FSPR30%	$20\%SSB_{F=0}$	$15\%SSB_{F=0}$	2	$10\%F_{target}$
2	FSPR30%	$25\%SSB_{F=0}$	$15\%SSB_{F=0}$	2	$10\%F_{target}$
3	FSPR40%	$20\%SSB_{F=0}$	$15\%SSB_{F=0}$	2	$10\%F_{target}$
4	FSPR40%	$25\%SSB_{F=0}$	$15\%SSB_{F=0}$	2	$10\%F_{target}$
5	FSPR40%	$25\%SSB_{F=0}$	$20\%SSB_{F=0}$	2	$10\%F_{target}$
6	FSPR30%	$20\%SSB_{F=0}$	$10\%SSB_{F=0}$	2	FSPR70%
7	FSPR25%	$20\%SSB_{F=0}$	$10\%SSB_{F=0}$	2	FSPR50%
8	FSPR30%	$20\%SSB_{F=0}$	Median SSB 1952-2014	2	CMM limits
9	FSPR20%	$20\%SSB_{F=0}$	NA	1	NA*
10	FSPR25%	$15\%SSB_{F=0}$	NA	1	NA*
11	FSPR30%	$15\%SSB_{F=0}$	$7.7\%SSB_{F=0}$	2	$5\%F_{target}$
12	FSPR30%	$20\%SSB_{F=0}$	$7.7\%SSB_{F=0}$	2	$5\%F_{target}$



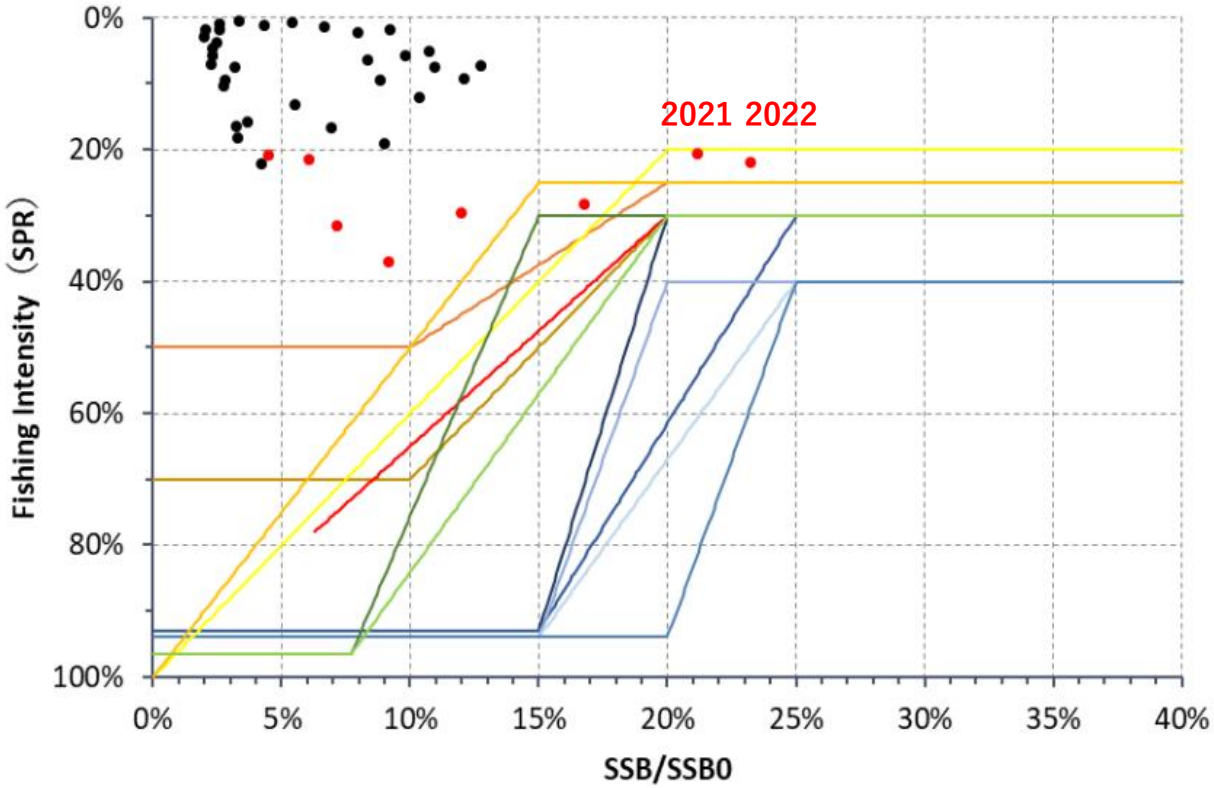
Other modalities of MSE

- TAC change cycle: The ISC suggested a 3-year cycle and no objection was raised in 2023 (so, that is the plan).
- TAC change restriction: A 25% restriction unless below the LRP is specified in the management objectives in 2023.
- Selectivity for projection: The JWG agreed to use the 2015-2022 Relative Fs among fleets (selectivities) in 2024.
- Output fleet: The JWG in 2024 requested to see outputs aggregated for 3 fleets (WPO small, WPO large, and EPO including recreational fisheries).

Thank you for clear instructions.

HCRs and PBF historical trend

Note that, as the stock is at 23.2% SSB0, some HCRs may result in a big cut of the initial TAC. The management objective provides unrestricted reductions in the TAC when the biomass falls below the LRP.



Development of PBF MSE (Summary)

- MSE is a collaborative process between scientists and managers (and other stakeholders) to develop a robust management strategy. (robust in terms of science as well as decision-making.)
- ISC is requested by the JWG to develop an MSE for PBF, to be completed in 2025 (1-year delay from the original schedule). The JWG has already provided substantial input for the PBF MSE.
- PBF MSE is built upon the PBF stock assessment, which is proven to be a reliable basis for the management. The ISC is earnestly developing the PBF MSE to meet the request of the JWG, while simultaneously providing high-quality stock assessment results, and we will show provisional MSE results during this week.

What is ISC hoping to achieve in this WS?

- ISC will present the work so far. As MSE requires enormous computer calculations, the present results are preliminary and could change. **So, please do not to focus on results too much rather focus on overall structure**.
- The main purpose of the presentations from ISC is to “align the expectations” between scientists and stakeholders. i.e., to avoid any surprise in the July JWG meeting when the final MSE results will be presented.

What is ISC hoping to achieve in this WS?

- So, through this WS, we hope the participants
  - familiarize themselves with the MSE process.
  - learn PBF MSE elements (OM, MP, performance indicators, etc.) and provide feedback if any.
  - learn general characteristics and trade-offs in PBF MSE.
  - If possible, reduce the number of candidate HCRs for the ease of work (for ISC) and the selection of the final MP (for JWG). (We are begging..)
- Note requests requiring substantial additional work may not be feasible to be completed by July, thus cannot be part of this MSE.

What is ISC hoping to achieve in this WS?

After the presentations of preliminary results, I will make a summary presentation to seek for feedback from the participants.

Thank you.