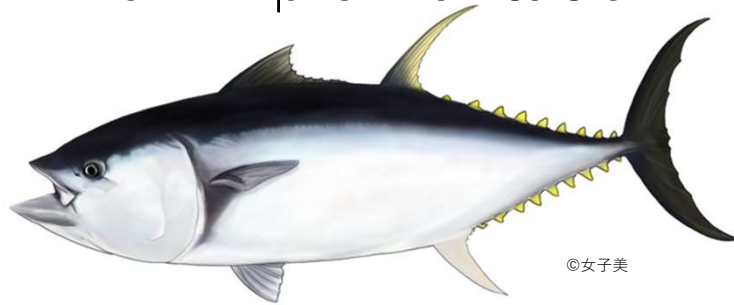


# MSE Application to Pacific Bluefin Tuna: Requirements for Implementation



©女子美

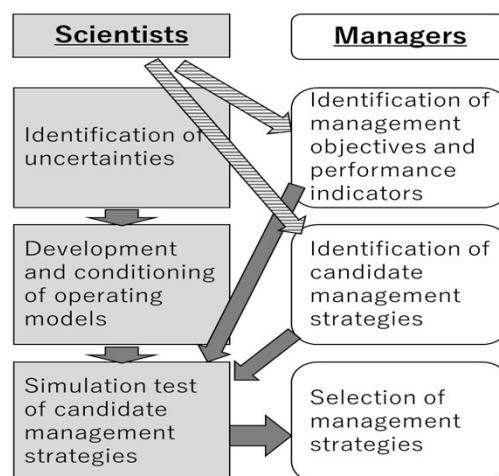
Shuya Nakatsuka, Ph.D.

National Research Institute of Far Seas Fisheries

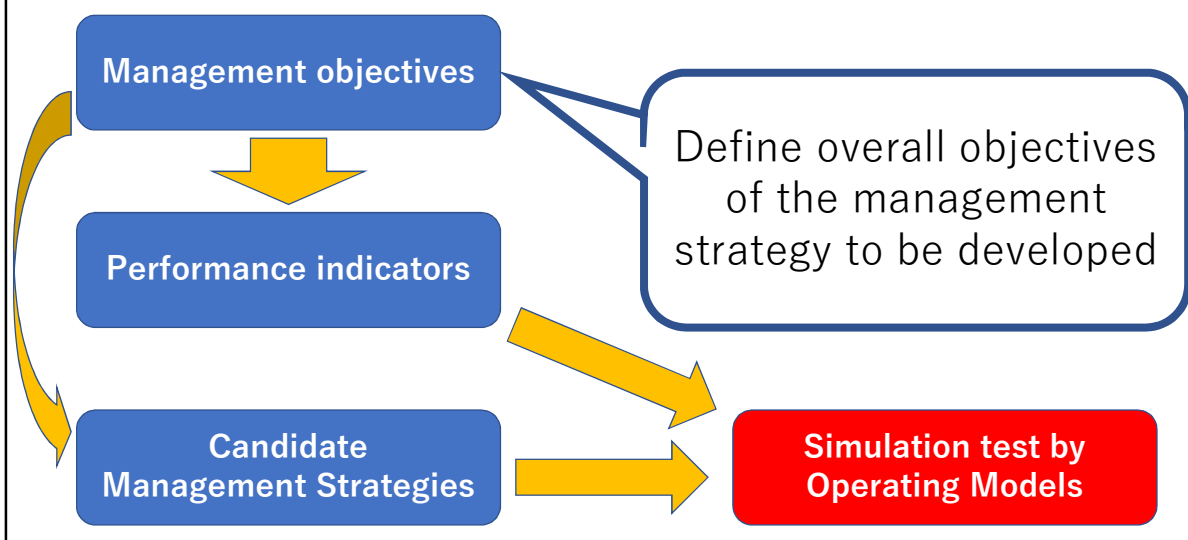
2018.05.30 @ISC PBFMSE Workshop

## Flow of MSE

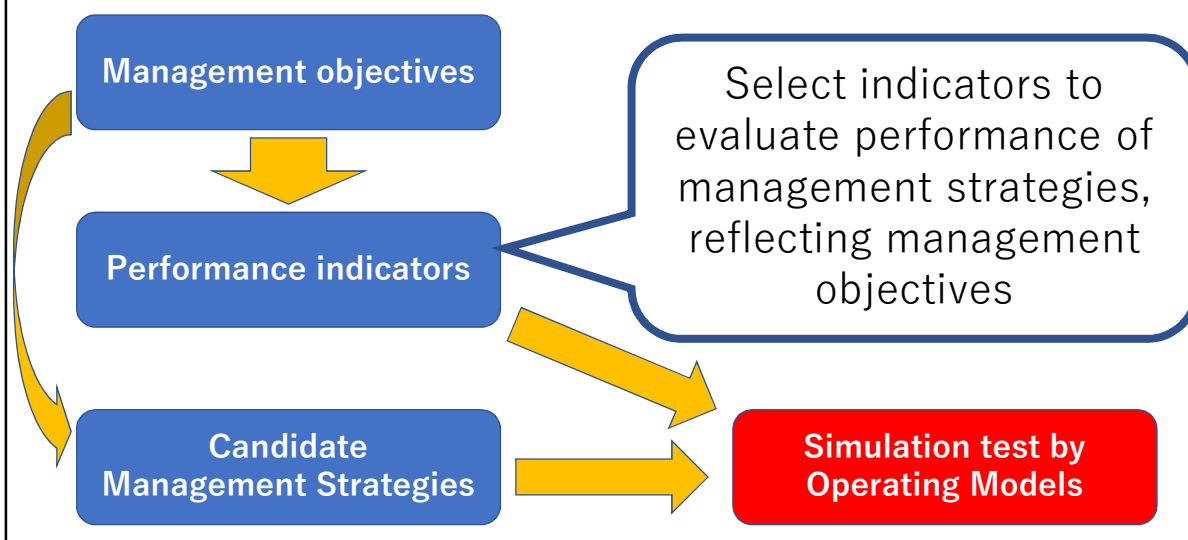
### **Best Practice MSE (Punt et al., 2016)**



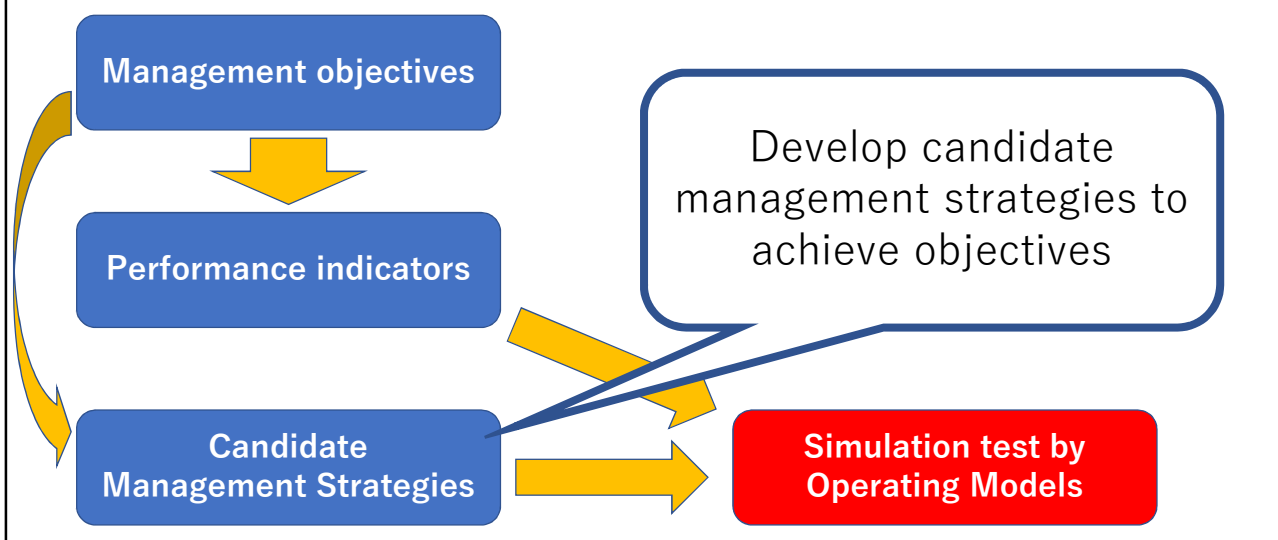
## Flow of MSE (Managers role)



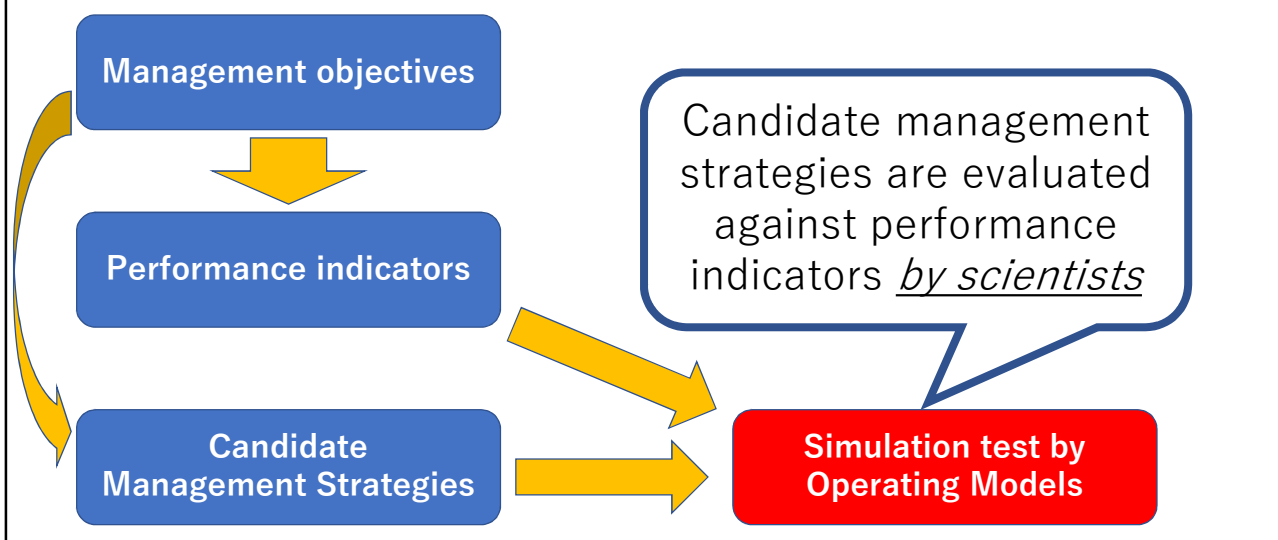
## Flow of MSE (Managers role)

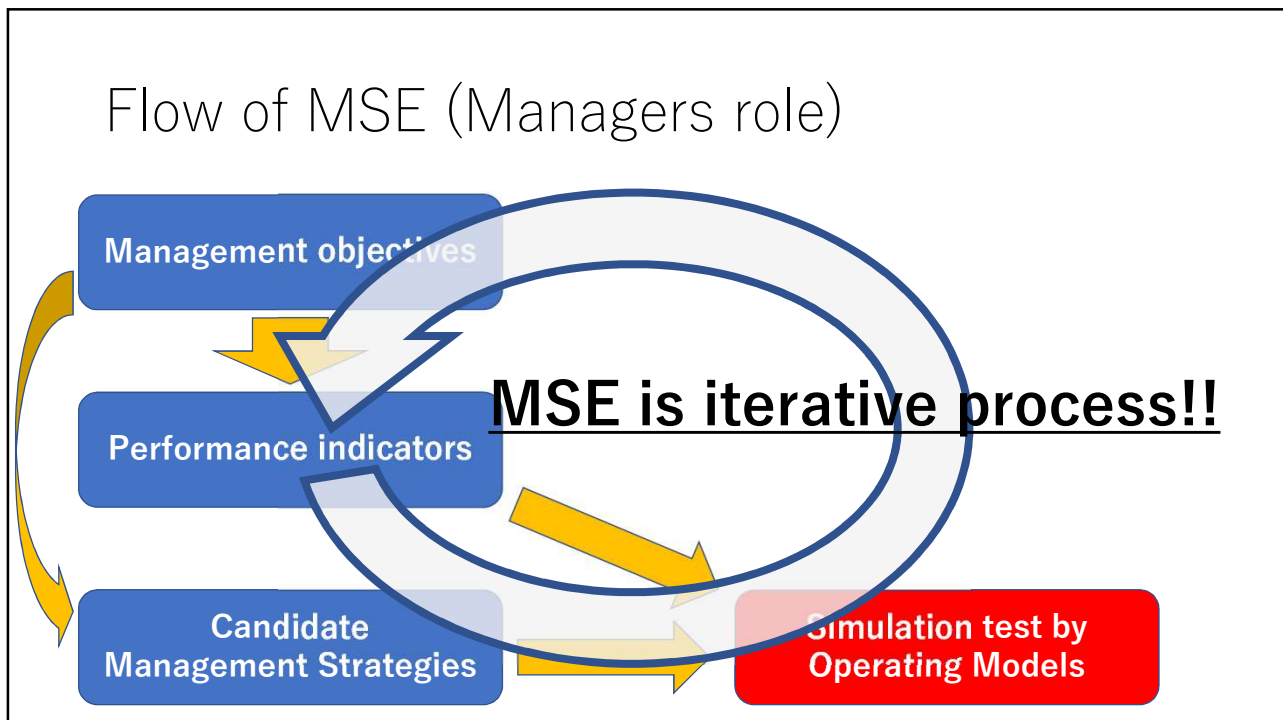
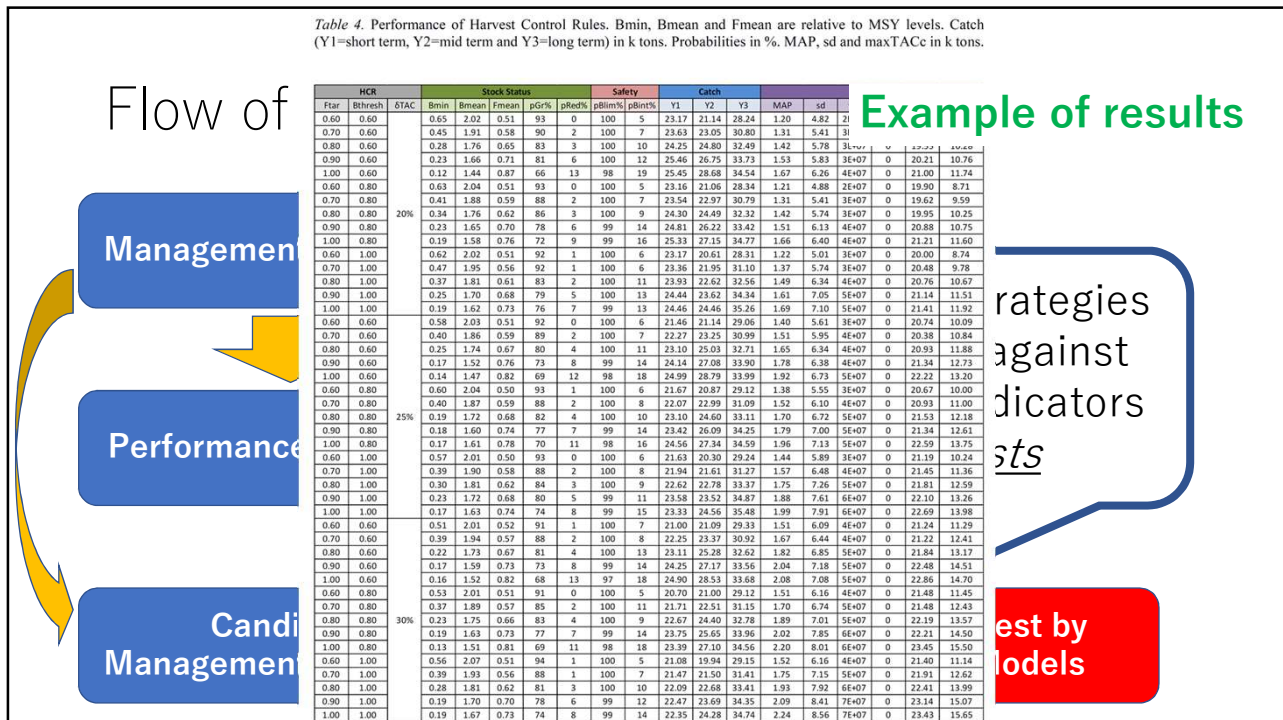


## Flow of MSE (Managers role)



## Flow of MSE (Managers role)





## Flow of MSE (Managers role)

- ISC will develop MSE based on WCPFC Harvest Strategy 2017-02, assuming IATTC also supports it.
- MSE is iterative process; you can come back based on the results.
- Managers (and stakeholders) have a large role; they need to develop management objectives, performance indicators, candidate management strategies, etc.
- **The purpose of this MSE Workshop is to start discussion on items which need to be developed by managers and stakeholders.**

## What needs to be discussed? (0) Purpose of MSE

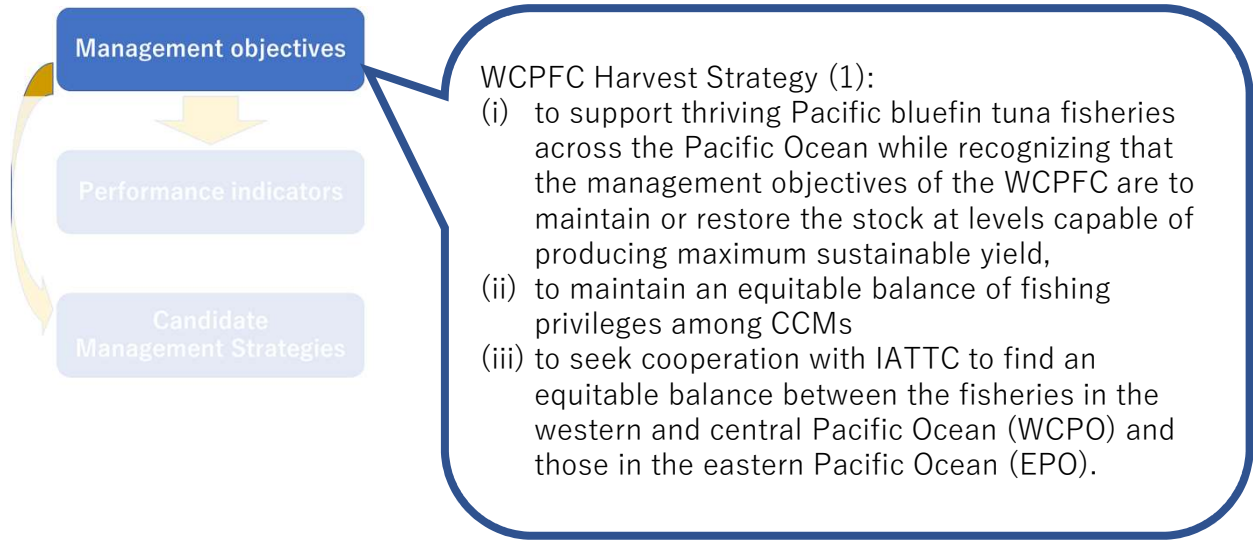


What is the purpose of MSE of PBF?

- (i) To evaluate rebuilding strategy,  
or
- (i) To develop a long-term  
Management Strategy?

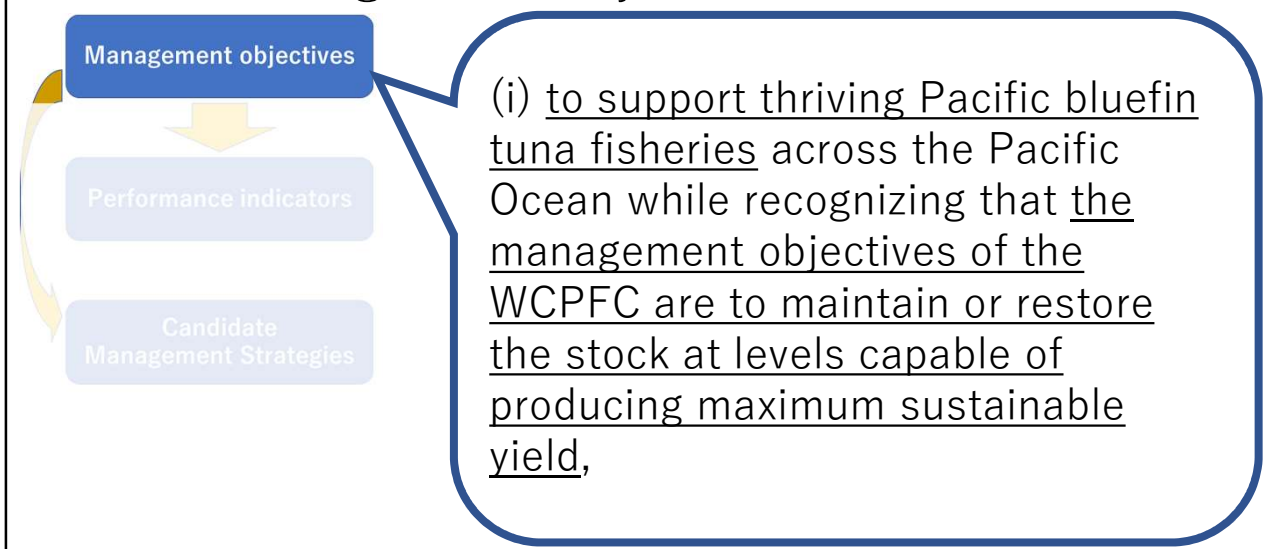
## What needs to be discussed?

### (1) Management objectives



## What needs to be discussed?

### (1) Management objectives



What needs to be discussed?  
(1) Management objectives



(ii) to maintain an equitable balance of fishing privileges among CCMs

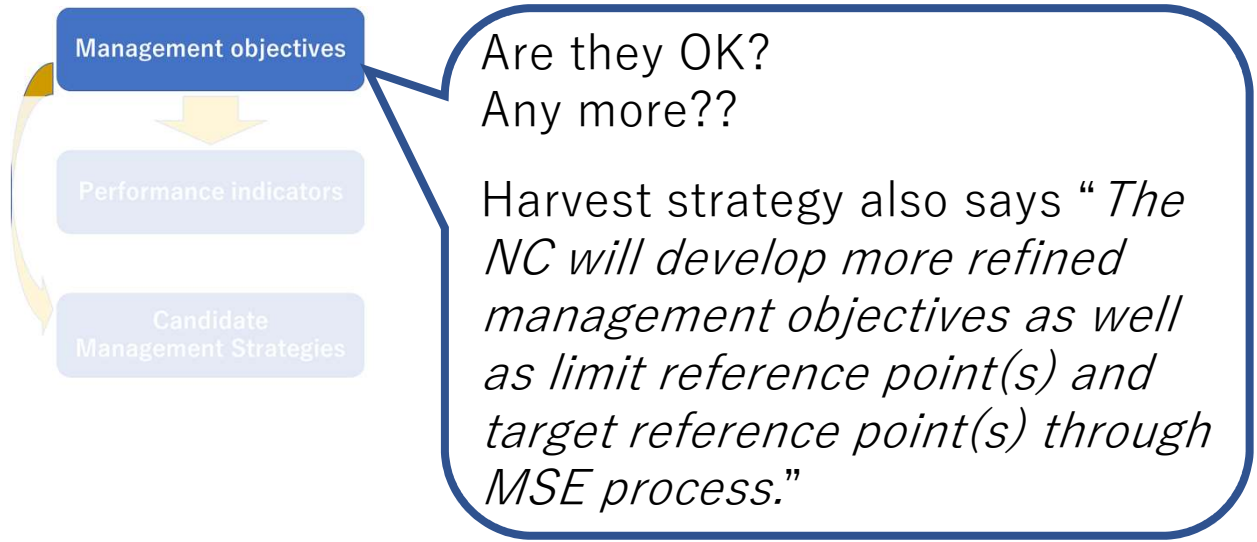
What needs to be discussed?  
(1) Management objectives



(iii) to seek cooperation with IATTC to find an equitable balance between the fisheries in the western and central Pacific Ocean (WCPO) and those in the eastern Pacific Ocean (EPO).

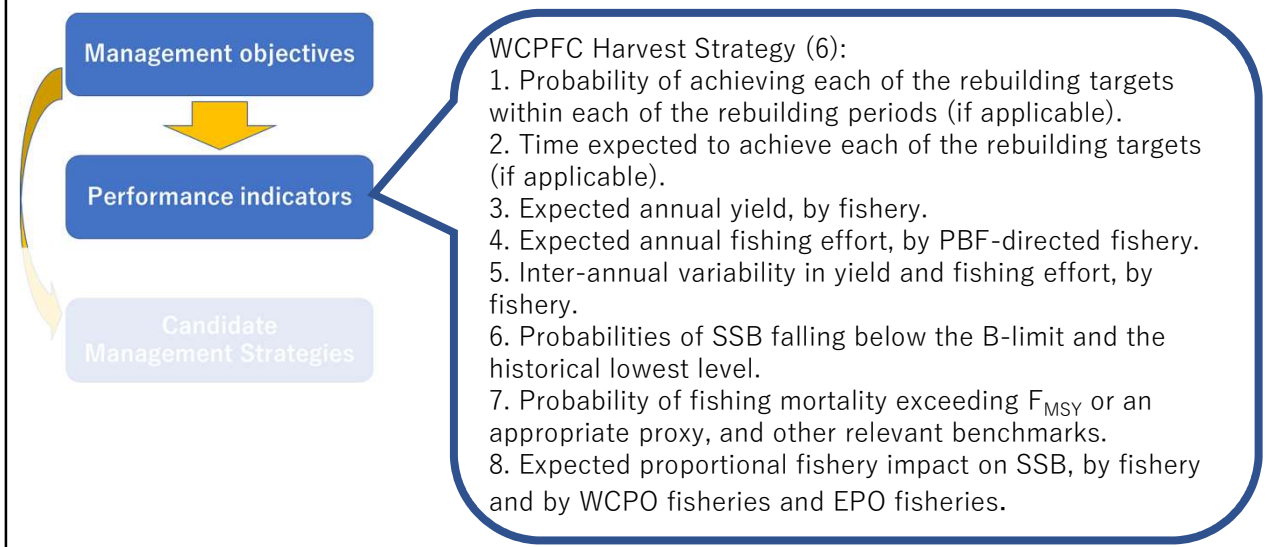
## What needs to be discussed?

### (1) Management objectives



## What needs to be discussed?

### (2) Performance indicators





What needs to be discussed?  
(2) Performance indicators

Management objectives

Performance indicators

Candidate Management Strategies

HCR			Stock Status					Safety			Catch			Stability				
Fish	Brewhsh	STA	Bmin	Bmax	Fmax	pGr%	pRed%	pBlm%	pBlm%	Y1	Y2	Y3	MAP	sd	var	pStut	p10%	maxTACC
0.60	0.60		0.65	2.02	0.51	93	0	100	6	23.12	21.14	28.24	1.20	4.82	2E+07	0	19.84	8.68
0.70	0.60		0.45	1.91	0.58	90	2	100	7	23.63	23.05	30.80	1.31	5.41	3E+07	0	19.31	9.35
0.80	0.60		0.28	1.76	0.65	83	3	100	10	24.25	24.80	32.49	1.42	5.78	3E+07	0	19.55	10.28
0.90	0.60		0.23	1.66	0.71	81	6	100	12	25.46	26.75	33.73	1.53	5.83	3E+07	0	20.21	10.76
1.00	0.60		0.12	1.44	0.87	66	13	98	19	25.45	28.68	34.54	1.67	6.26	4E+07	0	21.00	11.74
0.60	0.80		0.63	2.04	0.51	93	0	100	5	23.16	21.06	28.34	1.21	4.88	2E+07	0	19.90	8.71
0.70	0.80		0.41	1.88	0.59	88	2	100	7	23.54	22.97	30.79	1.31	5.41	3E+07	0	19.62	9.59
0.80	0.80	20%	0.34	1.76	0.62	86	3	100	9	24.30	24.49	32.32	1.42	5.74	3E+07	0	19.95	10.25
0.90	0.80		0.23	1.65	0.70	78	6	99	14	24.81	26.22	33.42	1.51	6.13	4E+07	0	20.88	10.75
1.00	0.80		0.19	1.58	0.76	72	9	99	16	25.33	27.15	34.77	1.66	6.40	4E+07	0	21.21	11.60
0.60	1.00		0.62	2.02	0.51	92	1	100	6	23.17	20.61	28.31	1.22	5.01	3E+07	0	20.00	8.74
0.70	1.00		0.47	1.95	0.56	92	1	100	6	23.36	21.95	31.10	1.37	5.74	3E+07	0	20.48	9.78
0.80	1.00		0.37	1.81	0.61	83	2	100	11	23.93	22.62	32.56	1.49	6.34	4E+07	0	20.76	10.67
0.90	1.00		0.25	1.70	0.68	79	5	100	13	24.44	23.62	34.34	1.61	7.05	5E+07	0	21.14	11.51
1.00	1.00		0.19	1.62	0.73	76	7	99	13	24.46	24.46	35.26	1.69	7.10	5E+07	0	21.41	11.92
0.60	0.60		0.58	2.03	0.51	92	0	100	6	21.46	21.14	29.06	1.40	5.61	3E+07	0	20.74	10.09
0.70	0.60		0.40	1.86	0.59	89	2	100	7	22.27	23.25	30.99	1.51	5.95	4E+07	0	20.38	10.84
0.80	0.60		0.25	1.74	0.67	80	4	100	11	23.10	25.03	32.71	1.65	6.34	4E+07	0	20.93	11.88
0.90	0.60		0.17	1.52	0.76	73	8	99	14	24.14	27.08	33.90	1.78	6.38	4E+07	0	21.34	12.73
1.00	0.60		0.14	1.47	0.82	69	12	98	18	24.99	28.79	31.99	1.92	6.73	5E+07	0	22.22	13.20
0.60	0.80		0.60	2.04	0.50	93	1	100	6	21.67	20.87	29.12	1.38	5.55	3E+07	0	20.67	10.00
0.70	0.80		0.40	1.87	0.59	88	2	100	8	22.07	22.99	31.09	1.52	6.10	4E+07	0	20.93	11.00
0.80	0.80	25%	0.19	1.72	0.68	82	4	100	10	23.10	24.60	33.11	1.70	6.72	5E+07	0	21.53	12.18
0.90	0.80		0.18	1.60	0.74	77	7	99	14	23.42	26.09	34.25	1.79	7.00	5E+07	0	21.34	12.61
1.00	0.80		0.17	1.61	0.78	70	11	98	16	24.56	27.34	34.59	1.96	7.13	5E+07	0	22.59	13.75
0.60	1.00		0.57	2.01	0.50	93	0	100	6	21.63	20.30	29.24	1.44	5.89	3E+07	0	21.19	10.24
0.70	1.00		0.39	1.90	0.58	88	2	100	8	21.94	21.61	31.27	1.57	6.48	4E+07	0	21.45	11.36
0.80	1.00		0.30	1.81	0.62	84	3	100	9	22.62	22.78	33.37	1.75	7.26	5E+07	0	21.81	12.59
0.90	1.00		0.23	1.72	0.68	80	5	99	11	23.58	23.52	34.87	1.88	7.61	6E+07	0	22.10	13.26
1.00	1.00		0.17	1.63	0.74	74	8	99	15	23.33	24.56	35.48	1.99	7.91	6E+07	0	22.69	13.98
0.60	0.60		0.51	2.01	0.52	91	1	100	7	21.00	21.09	29.33	1.51	6.09	4E+07	0	21.24	11.29
0.70	0.60		0.39	1.94	0.57	88	2	100	8	22.25	23.37	30.92	1.67	6.44	4E+07	0	21.22	12.41
0.80	0.60		0.22	1.73	0.67	81	4	100	13	23.11	25.28	32.62	1.82	6.85	5E+07	0	21.84	13.17
0.90	0.60		0.17	1.59	0.73	73	8	99	14	24.25	27.17	33.56	2.04	7.18	5E+07	0	22.48	14.51
1.00	0.60		0.16	1.52	0.82	68	13	97	18	24.90	28.53	33.68	2.08	7.08	5E+07	0	22.86	14.70
0.60	0.80		0.53	2.01	0.51	91	0	100	5	20.70	21.00	29.12	1.51	6.16	4E+07	0	21.48	11.45
0.70	0.80		0.37	1.89	0.57	85	2	100	11	21.71	22.51	31.15	1.70	6.74	5E+07	0	21.48	12.43
0.80	0.80	30%	0.23	1.75	0.66	83	4	100	9	22.67	24.40	32.78	1.89	7.01	5E+07	0	22.19	13.57
0.90	0.80		0.19	1.63	0.73	77	7	99	14	23.75	25.65	33.96	2.02	7.85	6E+07	0	22.21	14.50
1.00	0.80		0.13	1.51	0.81	69	11	98	18	23.39	27.10	34.56	2.20	8.01	6E+07	0	23.45	15.50
0.60	1.00		0.56	2.07	0.51	94	1	100	5	21.08	19.94	29.15	1.52	6.16	4E+07	0	21.40	11.14
0.70	1.00		0.39	1.93	0.56	88	1	100	7	21.47	21.50	31.41	1.75	7.15	5E+07	0	21.91	12.62
0.80	1.00		0.28	1.81	0.62	81	3	100	10	22.09	22.68	33.41	1.93	7.92	6E+07	0	22.41	13.99
0.90	1.00		0.19	1.70	0.70	78	6	99	12	22.47	23.69	34.35	2.09	8.41	7E+07	0	23.14	15.07
1.00	1.00		0.19	1.67	0.73	74	8	99	14	22.35	24.28	34.74	2.24	8.56	7E+07	0	23.43	15.85

16 indicators

building targets  
pplicable).  
rebuilding targets

-directed fishery.  
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3-limit and the

ng  $F_{MSY}$  or an  
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What needs to be discussed?  
(2) Performance indicators

Management objectives

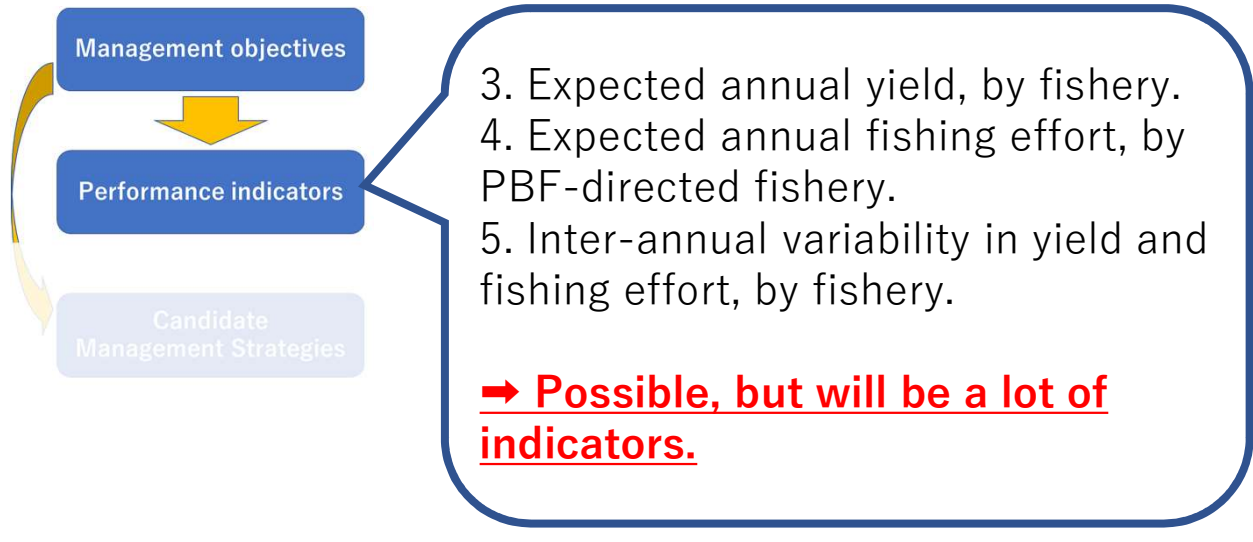
Performance indicators

Candidate Management Strategies

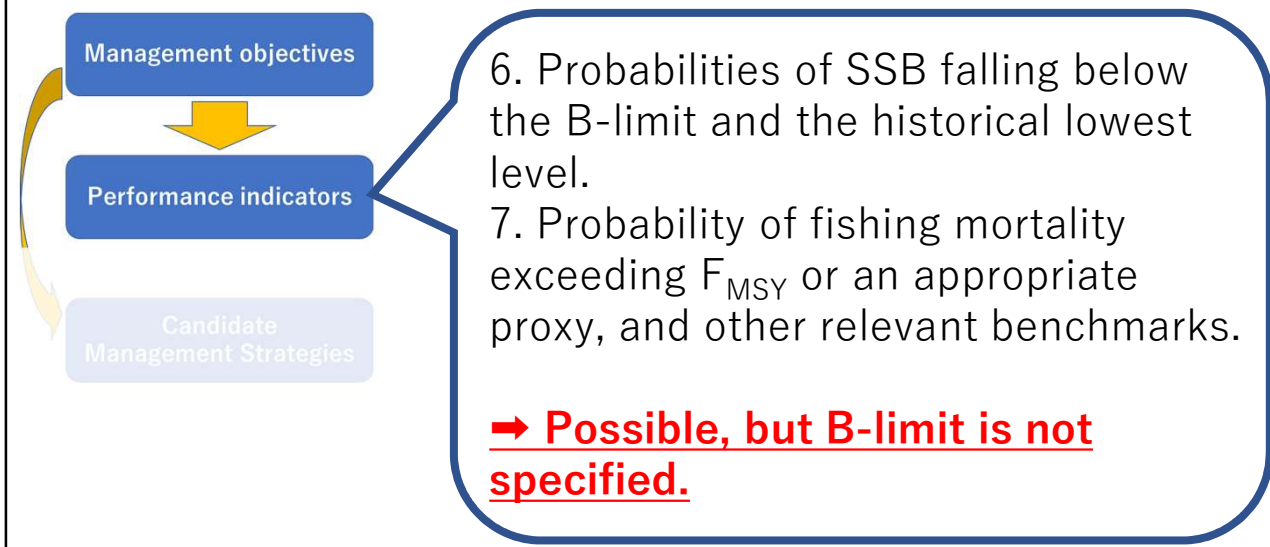
1. Probability of achieving each of the rebuilding targets within each of the rebuilding periods (if applicable).
2. Time expected to achieve each of the rebuilding targets (if applicable).

→ **Probably can be combined.**

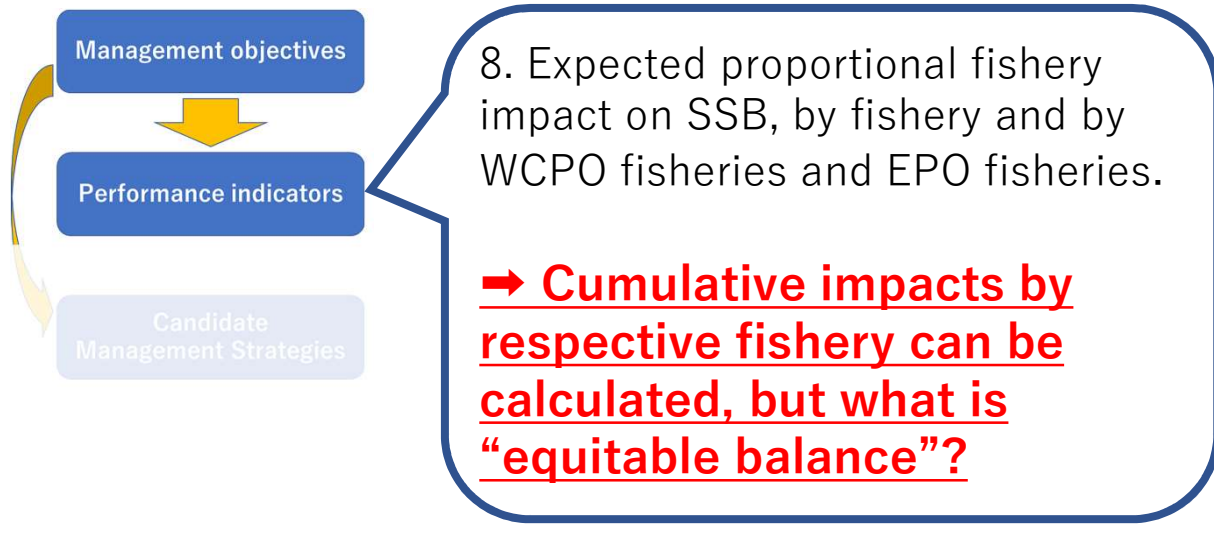
## What needs to be discussed? (2) Performance indicators



## What needs to be discussed? (2) Performance indicators



## What needs to be discussed? (2) Performance indicators



## What needs to be discussed? (2) Objectives → Performance indicators

Management Objectives	Performance Indicators	Comments from scientists	Tentative decision by WS
(i) Support thriving PBF fisheries	1. Probability of achieving each of the rebuilding targets within each of the rebuilding periods	Can be combined?	
	2. Time expected to achieve each of the rebuilding targets		
	3. Expected annual yield, by fishery.	Possible.	
	4. Expected annual fishing effort, by PBF-directed fishery.	Possible, but indispensable?	
	5. Inter-annual variability in yield and fishing effort, by fishery.	Usually trade off with yield.	
	6. Probabilities of SSB falling below the B-limit and the historical lowest level.	Possible.	
	7. Probability of fishing mortality exceeding $F_{MSY}$ or an appropriate proxy, and other relevant benchmarks.	Possible.	
(ii) Maintain Equitable balance	8. Expected proportional fishery impact on SSB, by fishery and by WCPO fisheries and EPO fisheries.	Cumulative impact can be calculated	
(iii) Find equitable balance between WPO and EPO			

## What needs to be discussed? (2) Objectives → Performance indicators

Management Objectives	Performance Indicators	Comments from scientists	Tentative decision by WS
	1. Probability of achieving each of the rebuilding targets within each of the rebuilding periods	Can be combined?	
	2. Time expected to achieve each of the rebuilding targets		
	6. Probabilities of SSB falling below the B-limit and the historical lowest level.	Possible.	
	7. Probability of fishing mortality exceeding $F_{MSY}$ or an appropriate proxy, and other relevant benchmarks.	Possible.	
(ii) Equitable balance	8. Expected proportional fishery impact on SSB, by fishery and by WCPO fisheries and EPO fisheries.	Cumulative impact can be calculated	
(iii) Cooperation			

This table needs to be discussed in this WS.  
But, DO NOT need to be finalized here.

## What needs to be discussed? (3) Features of candidate MSs



### WCPFC Harvest Strategy:

**What is the purpose of MSE?** (To evaluate rebuilding strategy, or to develop a long-term MS?). Two rebuilding targets specified. Recruitment scenario also specified.

**Reference points:** To be developed. Designated as “Level 2” species under WCPFC hierarchical approach (i.e. not appropriate to use MSY based approach). RPs not necessarily indispensable, but low limit is desirable for MSE.

**Risks:** Only specified for rebuilding strategy.

## What needs to be discussed?

### (3) Features of candidate MSs

Features	Status
Purpose	Specified ? (To evaluate rebuilding strategies?)
Rebuilding targets	Specified (SSB <sub>med</sub> and 20%SSB <sub>F=0</sub> , including timeframe)
Risks	Specified for rebuilding strategy
Type of Management Strategy	Not specified. Empirical or Model based?
Reference points	Not specified. Not indispensable, but low limit is desirable to evaluate MSs
Duration of TAC	e.g. 2 or 3 years
Change of TAC	e.g. 10%, 20% or absolute value (e.g. maximum or minimum)
Any other features	e.g. Area-wise, size-wise, country-wise TAC? Any other?

## What needs to be discussed?

### (3) Features of candidate MSs

Features	Status
Purpose	Specified ? (To evaluate rebuilding strategies?)
Rebuilding targets	Specified (SSB <sub>med</sub> and 20%SSB <sub>F=0</sub> , including timeframe)
Risks	Specified for rebuilding strategy
Type of Strategy	<u>These also need to be discussed.</u>
Reference points	Not specified. Not indispensable, but low limit is desirable to evaluate MSs
Duration of TAC	e.g. 2 or 3 years
Change of TAC	e.g. 10%, 20% or absolute value (e.g. maximum or minimum)
Any other features	e.g. Area-wise, size-wise, country-wise TAC? Any other?

## Purpose of this Workshop

- WCPFC and IATTC requested ISC to start MSE of Pacific bluefin tuna in 2019 and complete it by 2024.
- In order to conduct MSE, certain inputs and decisions by managers and stakeholders are necessary.
- The purpose of this workshop is **to start** discussions on those elements.
- The discussion will continue as MSE goes on.

## Main topics need to be discussed at this Workshop

- Purpose of MSE
- Management objectives
- Performance indicators
- Features of management strategies
- Control Room of PBF MSE – Joint NC-IATTC meeting?
- ISC work – To be done by ISC PBFWG? Need additional resources.

## Something to note

- Management measures are already in place to achieve rebuilding targets based on the results of stock assessment.
- PBF stock is slowly recovering and recruitment is not collapsing (the results of the latest assessment will be briefly presented tomorrow).
- Indices are monitored annually to detect “unexpected”.
- Assessment is conducted (at least) once in two years.
- MSE requires additional personnel and will stretch ISC resources.

Thank you and welcome to  
a long journey of MSE

