NPFC-2025-SSC PS15-IP11

Some observations on Pacific saury stock assessment and management

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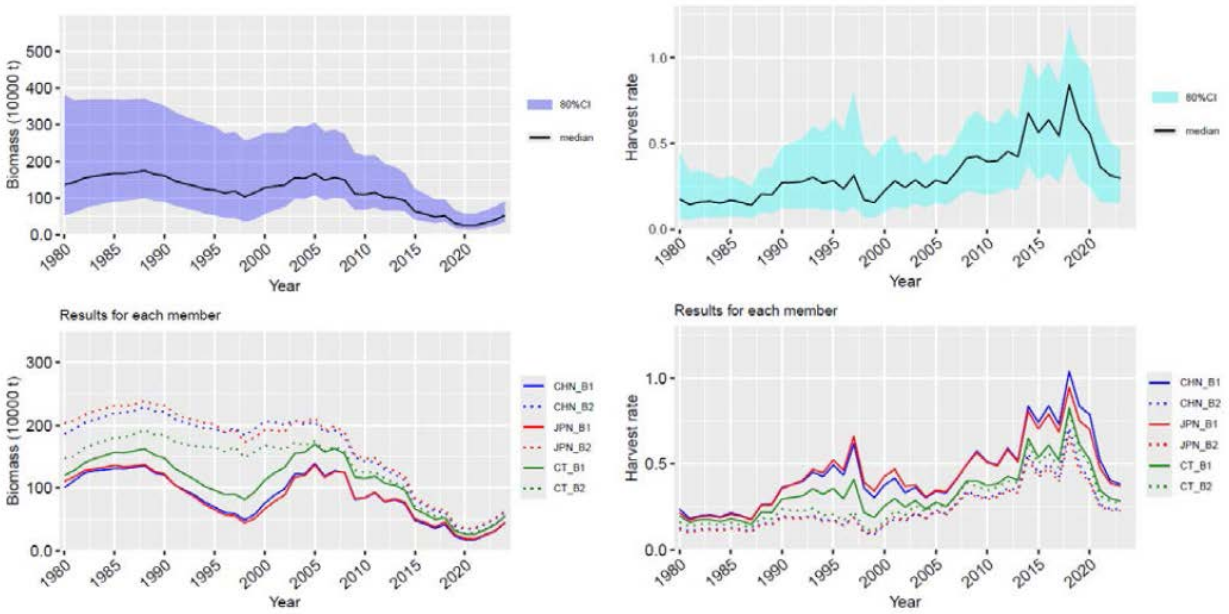
SSC PS15 Meeting

➢Stock assessment

- Model: Bayesian state-space production model
- Data: total catch (y-1), JPN survey (y), Member's individual CPUE (y-1), and joint CPUE (y-1)
- 2 bases * 3 analysts Member (CHN, JPN, CT)
- Aggregate 6 datasets to identify stock status and make catch advice for year y+1
- Projection is not conducted to set TAC due to poor prediction skill of BSSPM



	Median	Lower10%	Upper10%	Median_CHN	Median_JPN	Median_CT
C_2023 (10000 t)	11.836	11.836	11.836	11.836	11.836	11.836
AveC_2021_2023	10.352	10.352	10.352	10.352	10.352	10.352
AveF_2021_2023	0.328	0.158	0.528	0.352	0.339	0.302
F_2023	0.297	0.155	0.469	0.313	0.307	0.277
FMSY	0.330	0.139	0.543	0.357	0.336	0.310
MSY (10000 t)	39.440	32.021	47.010	40.155	39.284	39.010
F_2023/FMSY	0.920	0.656	1.411	0.915	0.942	0.903
AveF_2021_2023/FMSY	1.008	0.755	1.435	1.013	1.026	0.988
K (10000 t)	248.067	151.766	565.726	234.100	253.396	254.500
B_2023 (10000 t)	39.875	25.214	76.394	37.830	38.599	42.720
B_2024 (10000 t)	52.763	35.130	91.631	50.920	52.120	55.155
AveB_2022_2024	41.563	27.387	77.406	39.705	40.555	44.165
BMSY (10000 t)	120.100	78.060	253.481	113.800	119.008	125.100
BMSY/K	0.485	0.392	0.604	0.480	0.471	0.505
B_2023/K	0.161	0.101	0.228	0.158	0.154	0.169
B_2024/K	0.212	0.122	0.315	0.212	0.206	0.219
AveB_2022_2024/K	0.169	0.106	0.236	0.168	0.163	0.175
B_2023/BMSY	0.328	0.225	0.452	0.323	0.322	0.339
B_2024/BMSY	0.435	0.270	0.628	0.433	0.431	0.440
AveB_2022_2024/BMSY	0.345	0.235	0.470	0.341	0.341	0.352

➢Management

- The NPFC began implementing output control (i.e., TAC) for Pacific saury in 2020.
- The type of HCR used has varied over the past six years.
- TAC was set by applying HCR based on stock assessment results only in 2020, 2024, and 2025.
- The ratio of TAC in the Convention Area (CA) to TAC in national waters is 6:4.
- An increasing trend in catch and TAC utilization rate in the CA may indicate that the stock is recovering in recent years.

Apply a hocky-stick HCR

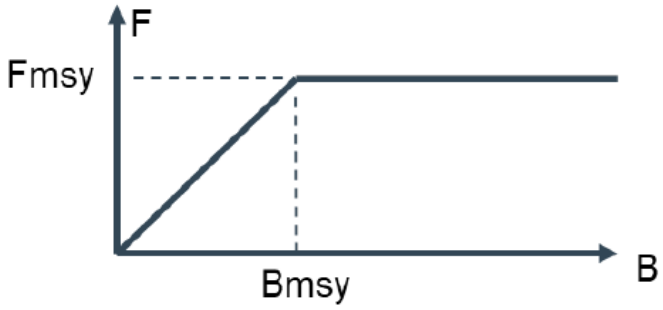
	2020	2021	2022	2023	2024	2025
Harvest control rule (HCR)	$B_{2018}*F_{MSY}$	60% $*C_{2018}$	60% $*C_{2018}$	45% $*C_{2018}$	$B_{2023}*F_{MSY}*(B_{2023}/B_{MSY})$	$B_{2024}*F_{MSY}*(B_{2024}/B_{MSY})$
TAC in CA (10,000t)	33.0	19.8	19.8	15.0	13.50	12.15
Catch in CA (10,000t)	12.7	9.1	9.7	10.4	14.5	
TAC utilization	38%	46%	49%	69%	107%*	

*In 2024, Japan diverted their catch limit for national waters to their own catch of Pacific saury in the Convention Area.

➢Management

- A hocky-stick HCR was adopted and used for catch advice since 2024.

$$TAC_y = \alpha_{y-1} * F_{MSY} * B_{y-1}, \text{ where } \alpha_{y-1} = \min(1, B_{y-1}/B_{MSY})$$



Management objectives

(a) Recovery of the stock (primary objective):

i. The stock status is recovered above B_{tar} within 5 years with 50% probability.

ii. The stock status is maintained above the B_{tar} level in each of years 6-10 with 50% probability.

(b) Avoiding unsustainable state of the stock (secondary objective):

i. The annual probability in each of years 6-10 that the stock drops below B_{lim} should not exceed 10%.

ii. The annual probability in each of years 6-10 that fishing mortality is above F_{lim} should not exceed 10%.

(c) Achieving high and stable catch (tertiary objective):

i. Average catch over years 6-10 is as high as possible.

ii. Catch in each of years 6-10 is as stable as possible.

Reference point
$B_{tar} = B_{MSY}$
$B_{lim} = 0.35B_{MSY}$
$F_{tar} = F_{MSY}$
$F_{lim} = 1.35F_{MSY}$

B_{MSY}/K=0.485 (SSC PS14 report)

SWG MSE PS05 meeting

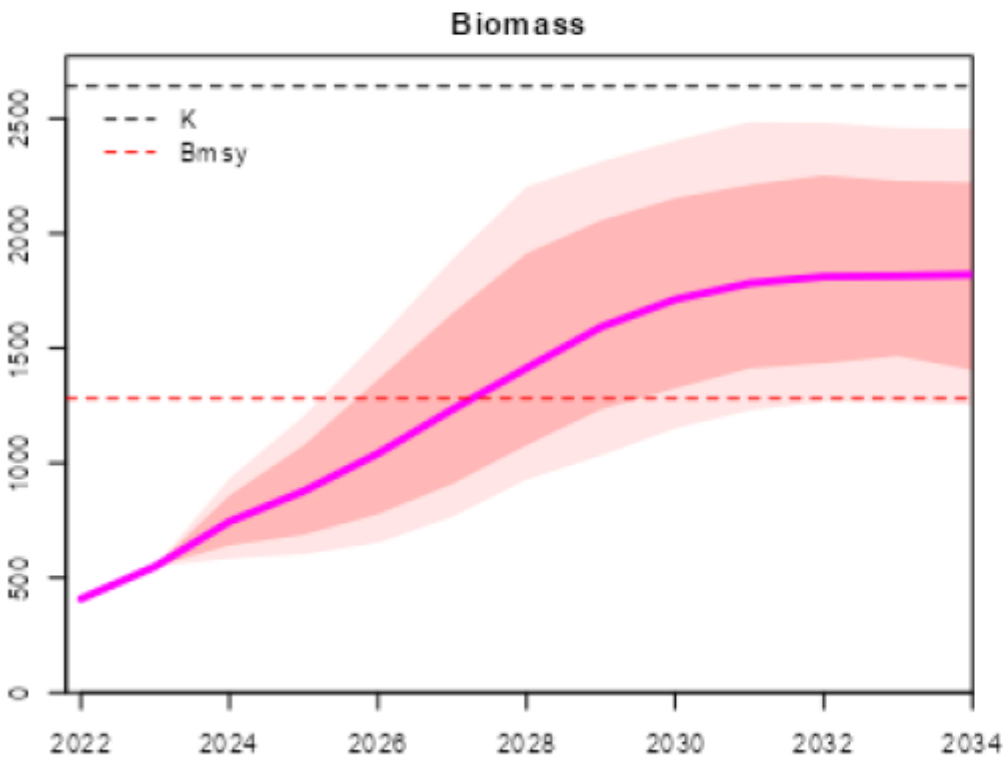
10% is the maximum allowable change in TAC from one year to the next

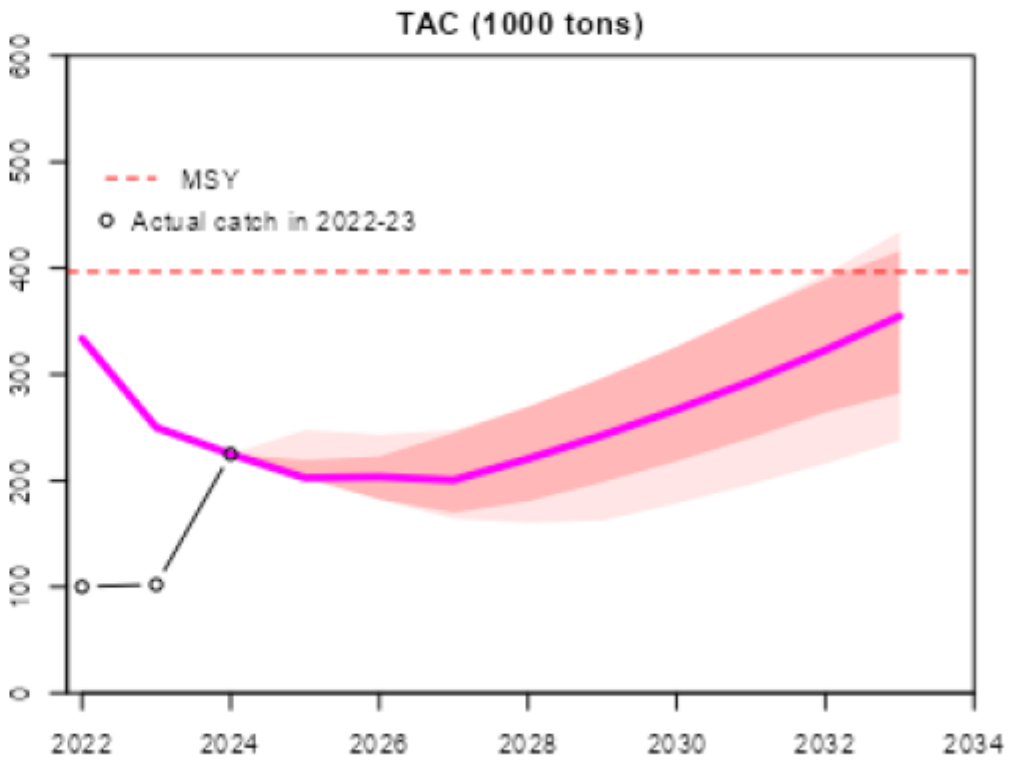
Scenario	Year	HCR1_10%	HCR1_20%	HCR1_40%	HCR1_No_HCR0
Base case	Pr(B2029 > Btar)	0.767	0.824	0.845	0.630
	TAC 2023 (actual)	250.0	250.0	250.0	250.0
	TAC 2024 (fixed)	225.0	200.0	150.0	172.5
	TAC 2025*	202.5	160.0	139.7	139.7
	TAC 2026*	203.5	192.0	156.2	202.9
	TAC 2027*	200.5	208.8	196.5	314.5
	TAC 2028*	220.5	232.7	251.9	415.6
	Average TAC for 2024-2028*	210.4	198.7	178.8	249.0
	Average TAC for 2029-2033*	296.2	348.9	430.9	426.0
	Average TAC for 2029-2033*	253.3	273.8	304.9	337.5
Robustness case	Pr(B2029 > Btar)	0.118	0.188	0.279	0.173

*Median results from simulations for relative comparisons among options only. Units for TAC figures: thousand mt.

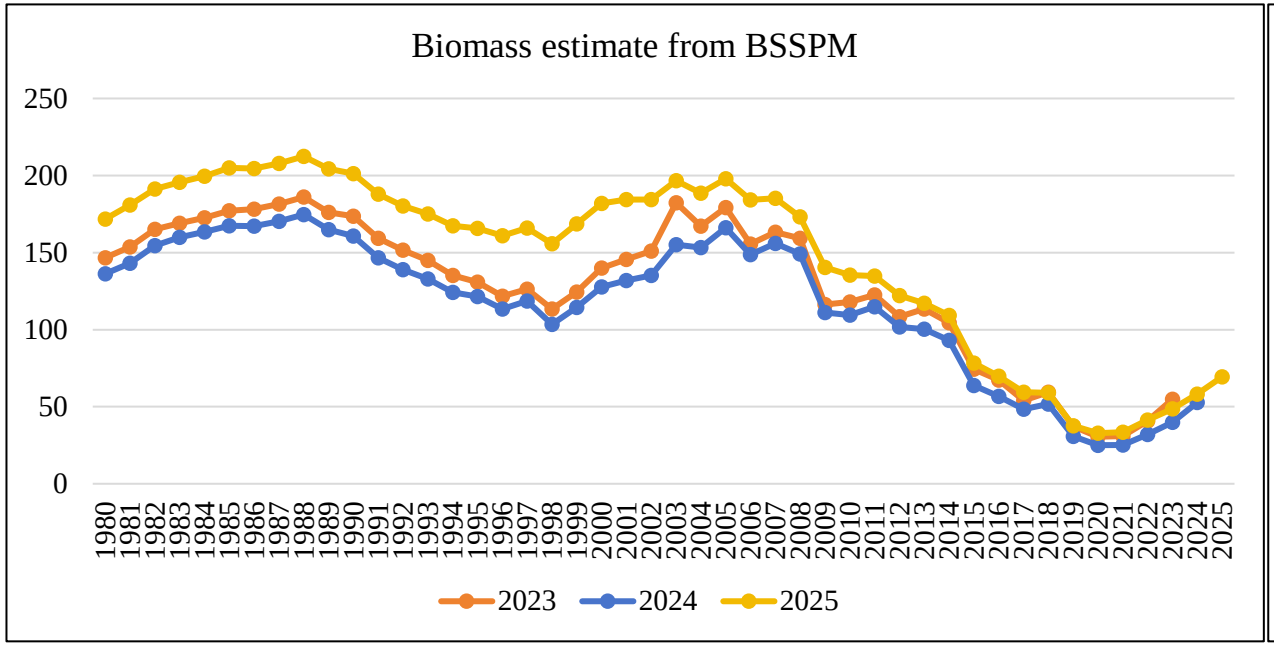
Figure 2. Simulation trajectories of biomass and TAC under the **Base Case**

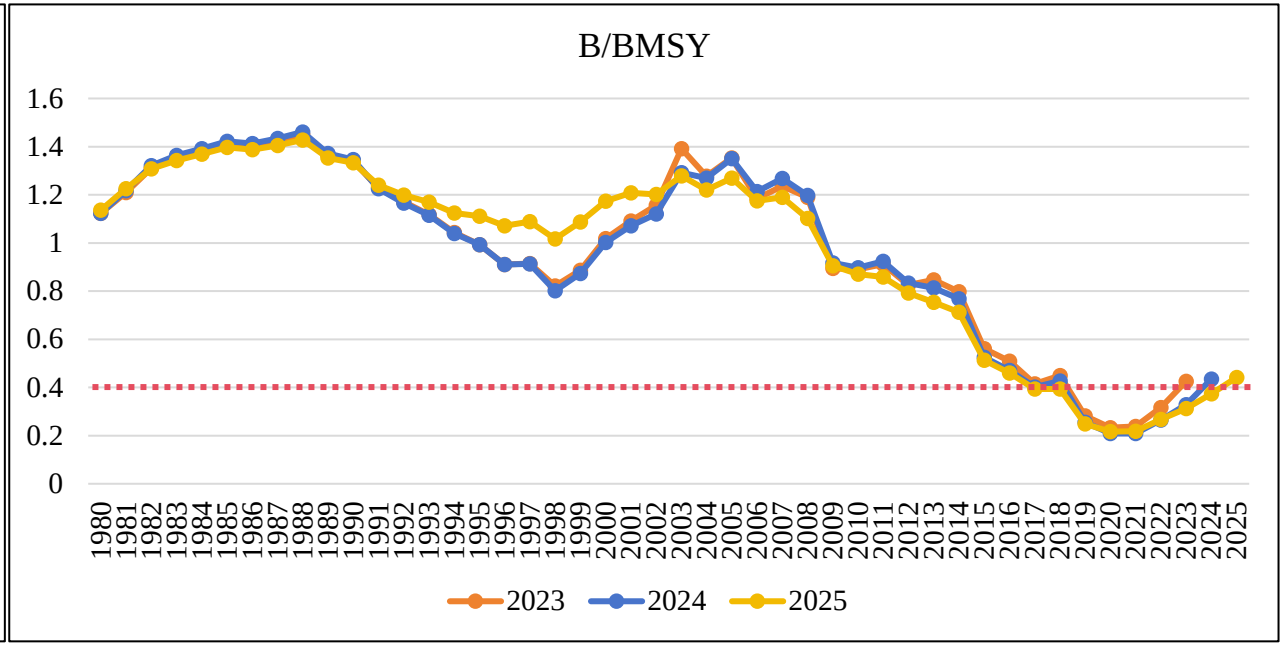
HCR1_10%





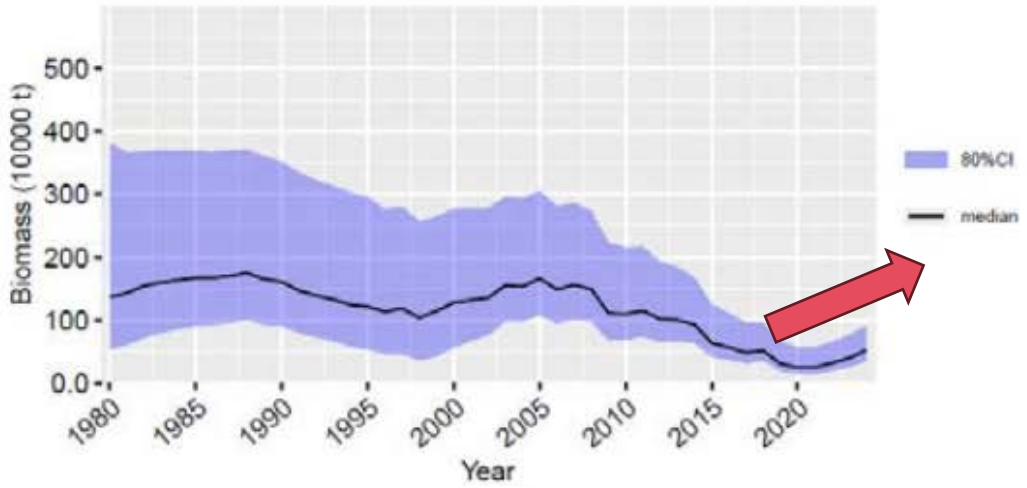
Terminal year			Stock status						Source
Catch	Survey CPUE	Commercial CPUE	B2020/ BMSY	B2021/ BMSY	B2022/ BMSY	B2023/ BMSY	B2024/ BMSY	B2025/ BMSY	
2020	2021	2020	0.361	0.463					SSC PS08 Report
2021	2022	2021		0.315	0.494				SSC PS10 Report
2022	2023	2022			0.316	0.426			SSC PS12 Report
2023	2024	2023				0.328	0.435		SSC PS14 Report
2024	2025	2024					0.374	0.442	China

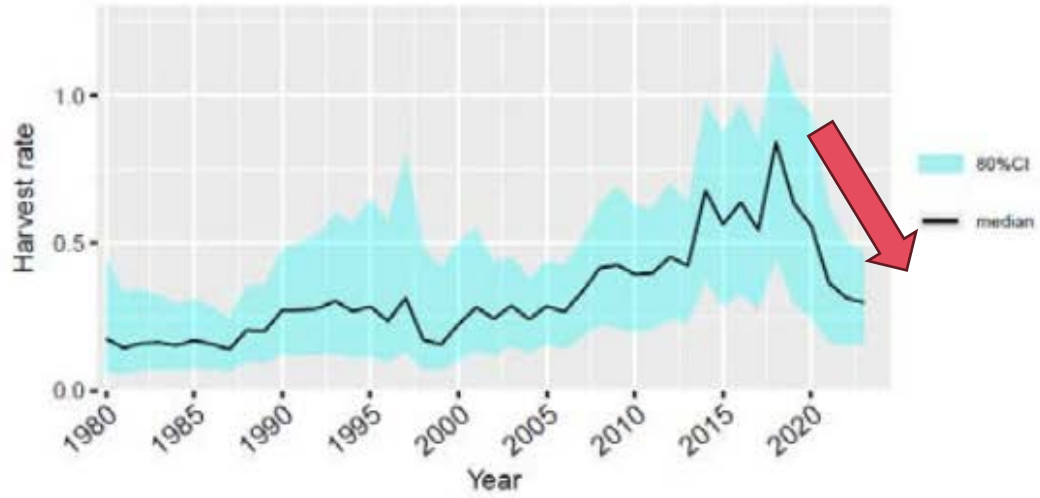


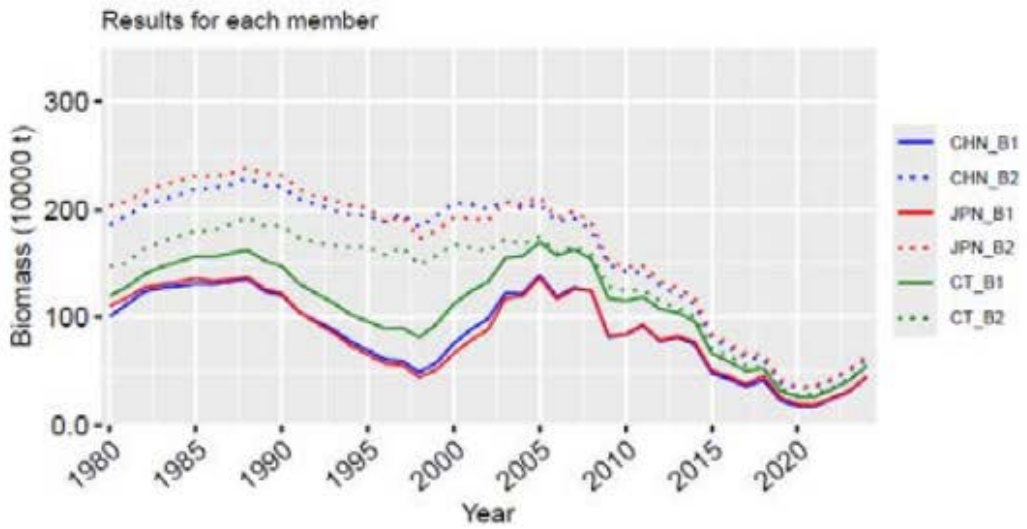


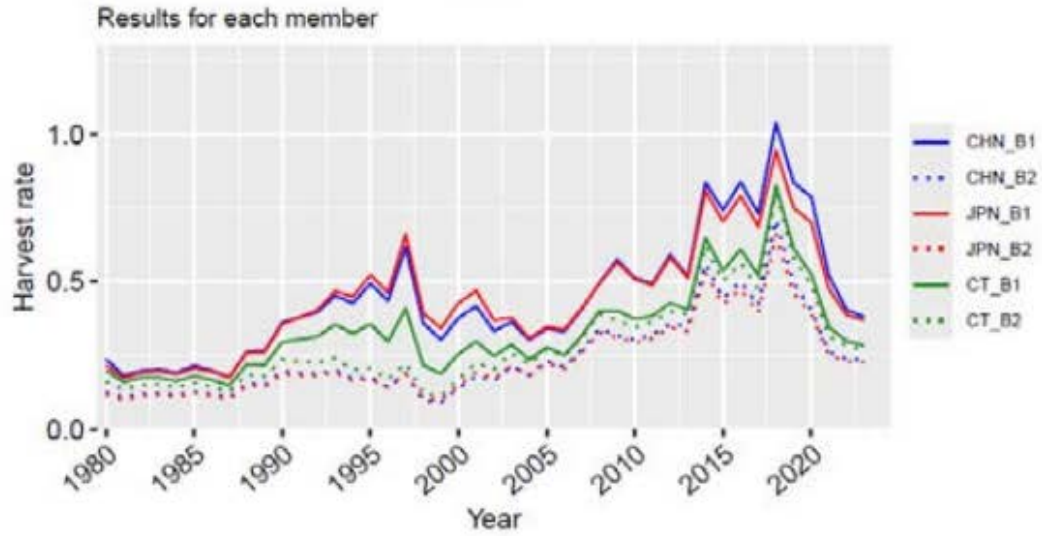
*Data were obtained from Pacific saury stock assessment report in 2023 and 2024, the assessment results in 2025 were preliminary estimated by China.

2024 assessment results

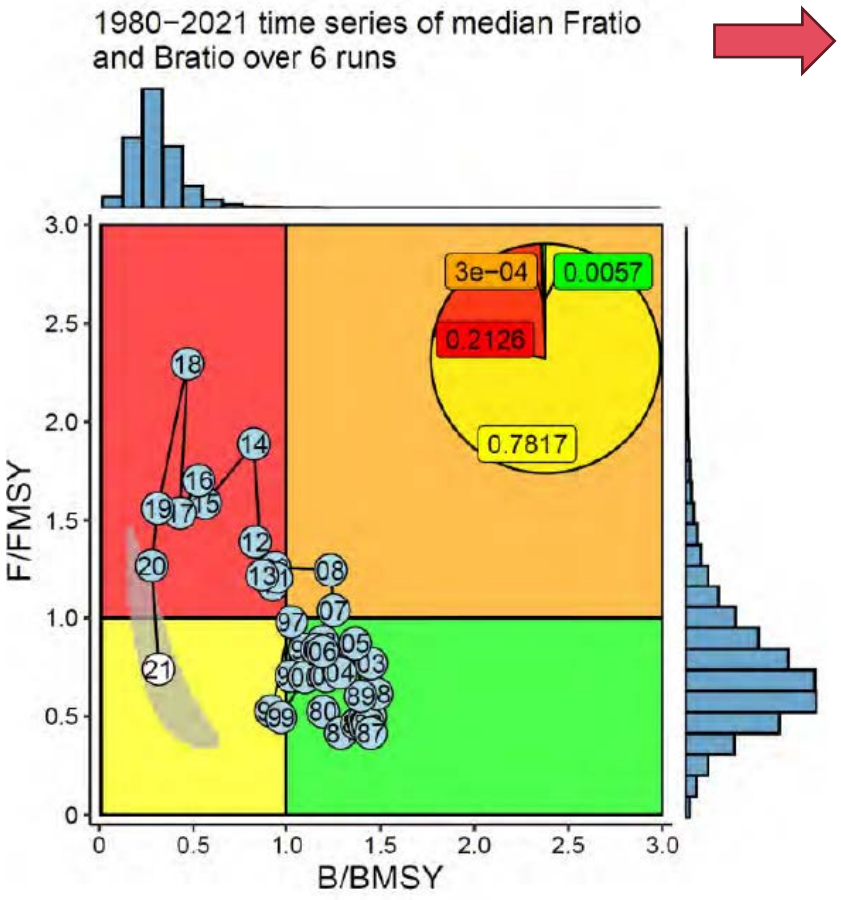




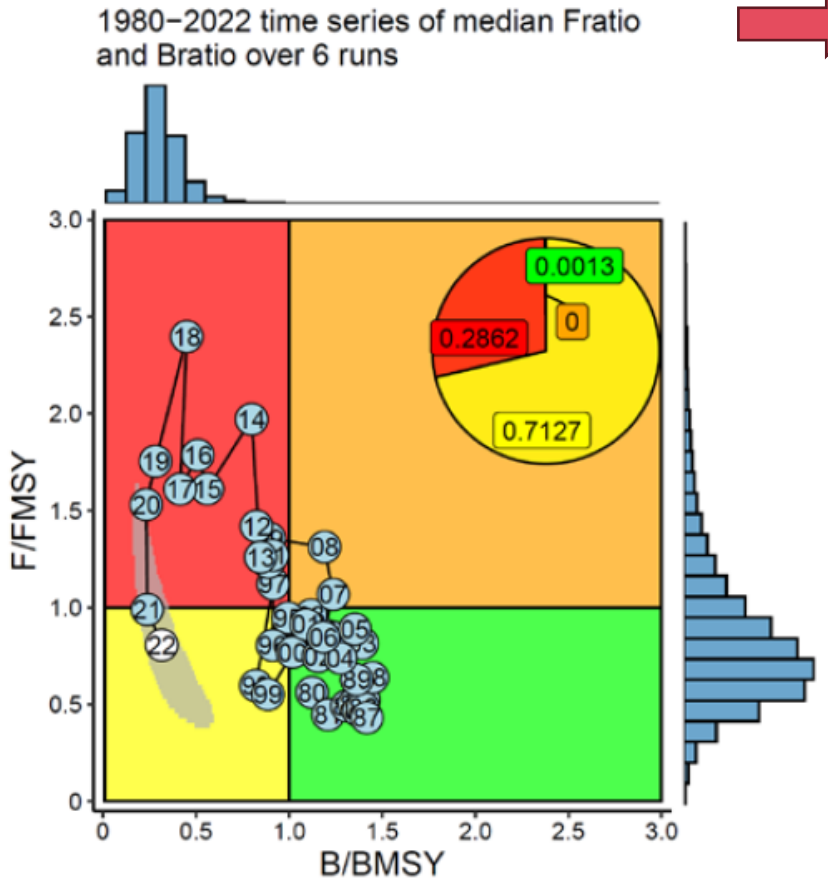




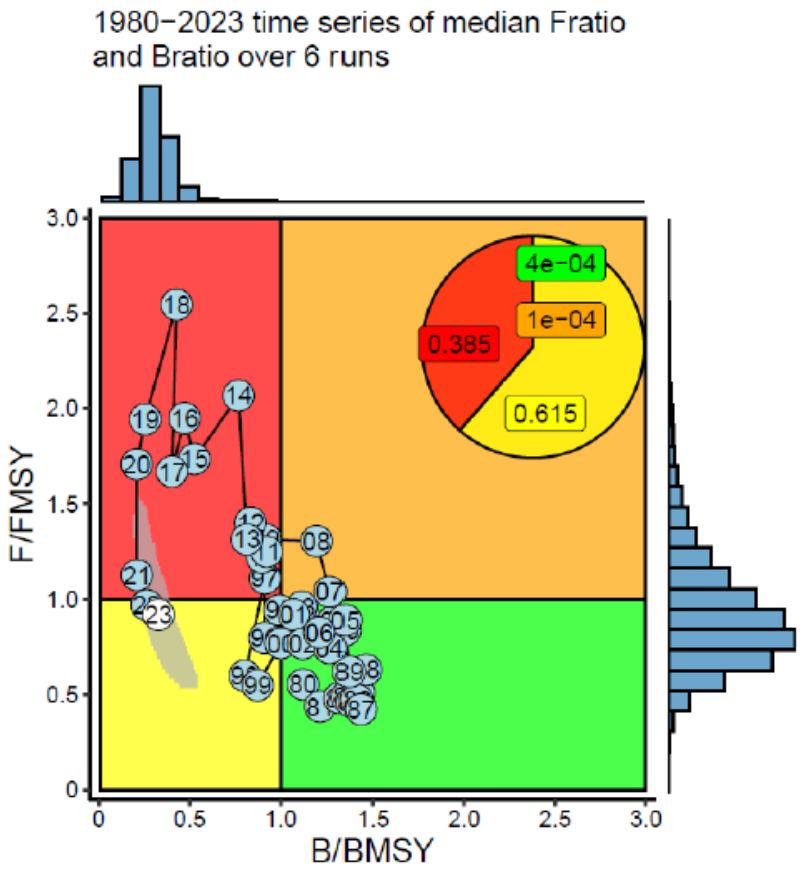
2022 assessment



2023 assessment



2024 assessment



We could not see a recovering trend in terms of stock status from BSSPM!!!

The consequence

- The annual BSSPM assessment has indicated that stock size has been increasing since 2020. However, **the stock status has deteriorated over the years**, with a growing probability of falling into the red zone in the Kobe plot.

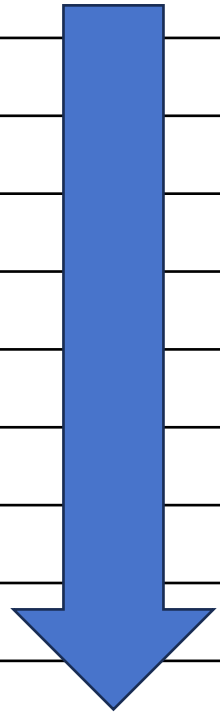
- Both the SC and COM believed the stock was recovering and therefore adopted management advice based on these **contradictory assessment results**. The management is now generating **significant negative socio-economic impacts**.

- The exact extent of stock recovery remains unclear.

$TAC_y = \alpha_{y-1} * F_{MSY} * B_{y-1}$, where $\alpha_{y-1} = \min(1, B_{y-1}/B_{MSY})$

Year	B/BMSY	B	FMSY	TAC advice for next year based on HCR (10,000)	Actual total TAC for in CMM (10,000)
2021	0.463	54.774	0.352		33.3750
2022	0.494	65.500	0.313	8.927	33.3750
2023	0.426	54.940	0.314	10.128	25.00
2024	0.435	52.763	0.330	7.349	22.50
2025	0.442	69.28	0.246	7.574	20.25
2026				7.533	18.225
2027					16.40
2028					14.76
2029					13.29
2030					11.96
2031					10.76
2032					9.69
2033					8.72
2034					7.85
2035	**~0.4???**				7.06

10% reduction



So, what's going on?

- **Hypothesis 1 – Incorrect HCR**
  - The HCR does not work well. The stock status estimated by BSSPM is correct, and the recovery has stalled with B/B_{MSY} remaining around 0.4.

- **Hypothesis 2 – Incorrect assessment**
  - The HCR is working. The stock is recovering as expected or even faster, but BSSPM failed to accurately estimate the stock status and provide correct management advice due to unforeseen technical issues (i.e., retrospective pattern/scaling problems).

Summary, advice, and statement

- I believe Hypothesis 2 (incorrect assessment) is more likely, since all signals and indicators (catch, survey and commercial CPUE, TAC utilization rate, larger body size in 2025, message from fisherman, etc.) are suggesting **the stock is recovering**.

- Unfortunately, the stock assessments conducted by the SSC PS have been **unable to accurately determine the stock status** due to unforeseen technical issues. The scientific uncertainty is undermining confidence and credibility in the scientific advice.

- I encourage the group to continue improving the BSSPM and to resolve these technical issues if the model is expected to be accepted this year. **If the retrospective pattern and scaling issues persist, it will be difficult for China to agree with and endorse the assessment results produced by this model, as they do not reflect reality.**

- Given the limited time and capacity, I suggest the group allocate more time to the development of a seasonal age-structured SS model, which is **biologically more realistic** than production models.

- I also recommend that the SSC and SC **initiate a peer review process as soon as possible** for the stock assessments of Pacific saury to ensure quality control.