

Meeting progress of the Small Working Group on New Stock Assessment Models (SWG NSAM)

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NPFC SWG MSE PS08

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01 Background of SWG NSAM

The SWG NSAM is a small working group established by the SSC PS and aims to develop a more contemporary and biologically realistic stock assessment model for Pacific saury.

Its establishment is in accordance with the relevant paragraphs in the meeting reports of SSC PS11 and PS12:

SSC PS11 meeting report

Para 87. The SSC PS agreed to establish a Technical Working Group on New Stock Assessment Models (TWG NSAM) to further develop the SS3 model and the state-space age-structured model. **The SSC PS agreed that, to enhance collaboration and transparency, the code for the models should be shared among the participants of the SSC PS.**

SSC PS12 meeting report

Para 61. The SSC PS agreed to task the WG NSAM to continue to develop the SS3 model and the state-space age-structured model and to **hold regular virtual meetings and, if necessary, in-person meetings.**

01 Background of SWG NSAM

The SWG NSAM has held eight meetings since 2024, and each year at least one 3-day hybrid meeting is held to facilitate progress in modeling. Dr. Quang Huynh currently serves as the invited expert.

Year	Date	Meeting	Format	Invited experts
2024	June 27-29	SWG NSAM 2024-01	Hybrid	Larry Jacobson
2024	August 02	SWG NSAM 2024-02	Virtual	Larry Jacobson
2024	October 17	SWG NSAM 2024-03	Virtual	Larry Jacobson
2025	May 28	SWG NSAM 2025-01	Virtual	Larry Jacobson & Quang Huynh
2025	July 11-13	SWG NSAM 2025-02	Hybrid	Larry Jacobson & Quang Huynh
2025	November 06	SWG NSAM 2025-03	Virtual	Quang Huynh
2026	June 24	SWG NSAM 2026-01	Virtual	Quang Huynh
2026	July 23-25	SWG NSAM 2026-02	Hybrid	Quang Huynh

02 Meeting progress



Year	Date	Meeting	Track name	Key progress and main changes
2024	June 27-29	SWG NSAM 2024-01	Nanaimo→Shanghai	- Decide to prioritize the development of SS - Develop and test a list of model scenarios - Develop a list of priority items
2024	August 02	SWG NSAM 2024-02	Shanghai	Test model runs in terms of steepness, CPUE residual, and fit to size data
2024	August 26-29	SSC PS13	Shanghai→Step 1-3	Try to estimate growth and selectivity parameters within the model
2024	October 17	SWG NSAM 2024-03	Step 3→ Step 4-8	- Update standardized CPUE, catch and length composition through 2023 - Add 2024 JPN survey
2024	December 11-13&16	SSC PS14	Step 8→Step 9-16	- Nonlinear CPUE and random walk q - Undivided CT CPUE - Asymptotic selectivity - Downweight commercial CPUE - Reduce age class and refine growth curve
2025	May 28	SWG NSAM 2025-01	Step 16	Transition of modeling work to new experts
2025	July 11-13	SWG NSAM 2025-02	Step 16→Step 17-21	- Seasonal structure model - Develop and test a list of model scenarios - Add 2024 catch

02 Meeting progress

Year	Date	Meeting	Track name	Key progress and main changes
2025	September 1-4	SSC PS15	Step 19	• Use survey catchability prior to stabilize the scale of model estimation
2025	November 06	SWG NSAM 2025-03	Step 22	• Update 2024 fishery data and 2025 survey data • Introduce time-varying growth
2025	December 11-14	SSC PS16	Step 22	• Formalize a development report of SS model
2026	May 28	SWG NSAM 2026-01	Step 22	• Discuss a grid approach • Present the seasonal maturity pattern and age-specific natural mortality for PS
2026	July 11-13	SWG NSAM 2026-02	Step 22-23	• Agree to use seasonal maturity ogive with logistic function • Agree to use linear relationship between CPUE and abundance • Agree to retain both individual and joint CPUEs • Agree to proceed with grid approach with important parameters (Natural mortality and Steepness) and input data (individual Members' CPUE and Joint CPUE) • Agree to exclude 2020 survey data

02 Meeting progress

Summary of the latest SS3 specification

Feature	Case scenario with Members' individual CPUE	Case scenario with Joint CPUE
Fishery catch	- Members' seasonal catch and seasonal length composition - RUS comps not used, assume JPN selectivity	- same as left
Fishery CPUE	- Individual CPUE (Assign JPN CPUE to season 4, Assign CHN, CT, RUS, and KOR CPUE to season 3, Separate JPN-early (pre-1994) and JPN-late series)	- Joint CPUE (Assign values to season with highest catch, mirror selectivity to fleet with current highest catch)
Surveys	- Age-aggregated fishery-independent index of abundance with length composition	- same as left
Selectivity	- Asymptotic function estimated for all fleets and surveys	- same as left
Model time step	- Seasonal, model start in 1980	- same as left
Catchability (q)	- Linear biomass-index relationship for survey, individual, and joint CPUE - Catchability prior for biomass scale - Q walk for JPN-early CPUE - Q change in CT series in 2011	- Linear biomass-index relationship for survey and joint CPUE - Catchability prior for biomass scale
Variance weighting	- CPUE downweighted ($\lambda = 0.2$) - McAllister-lanelli method for length composition	- Equal weight between survey and joint CPUE ($\lambda = 1$) - McAllister-lanelli method for length composition
Natural mortality (M)	- $M = 1/\text{age-varying } M$ - Model post-spawning mortality at end of 2 year lifespan	- $M = 1/\text{age-varying } M$ - Model post-spawning mortality at end of 2 year lifespan
Steepness (h)	- $h = 0.59/0.82/0.93$	- $h = 0.59/0.82/0.93$
Recruitment timing	- Delay the recruitment settlement to seasonal age 1 (3 months after spawning)	- same as left
Recruitment deviation	- $\sigma_R = 0.74$	- same as left
Growth	- Time-varying asymptotic length from survey length-age data	- same as left
Growth variability	- Estimated to fit length composition	- same as left
Maturity	- Seasonal maturity ogive (logistic function)	- same as left
Fecundity	- Proportional to weight	- same as left

02 Meeting progress

To date, the SWG NSAM has developed an age-structured model with the following main advances and hypotheses:

- Seasonal structure
- Time-varying growth
- Seasonal maturity
- Age-dependent natural mortality
- Asymptotic selectivity
- Linear relationship between CPUE and abundance
- A grid approach over steepness, natural mortality, and CPUE

02 Meeting progress

However, several critical challenges have been encountered during model development and require further work to resolve, including but not limited to:

- Poor prediction skill
- Poor model fit to recent survey length-composition data
- Lack of a weighting scheme for the ensemble approach
- Difficulty in estimating MSY
- Lack of spatial consideration
- Lack of consideration of environmental impacts

03 Future works

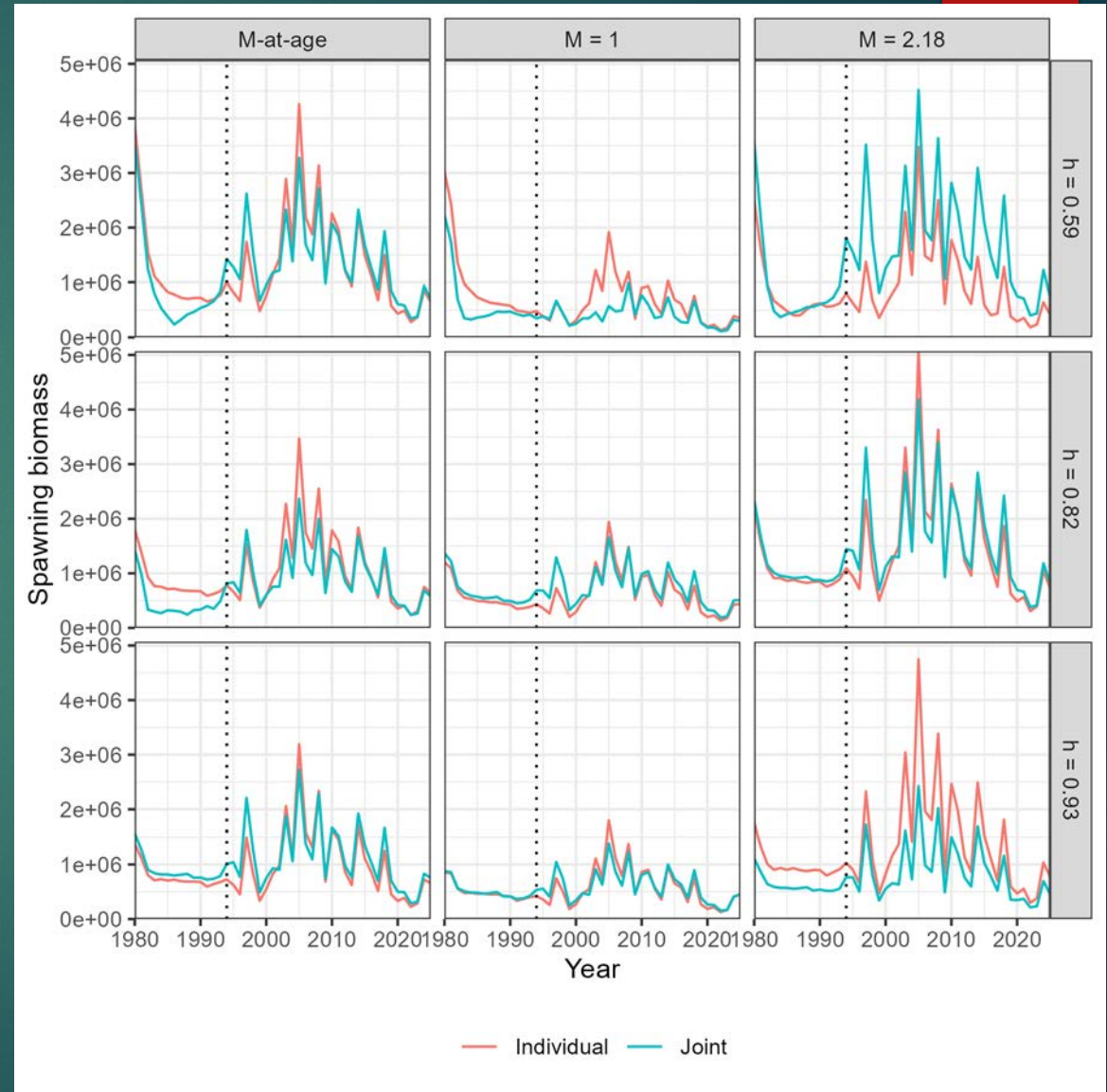
Model weighting and ensemble approach

A two-step approach of weighting was discussed, i.e. different AIC weighting within the specifications and then equal weighting across CPUE.

Options of important parameters and input data

- Natural mortality (2): 1, age-varying M
- Steepness (3): 0.59, 0.82, 0.93
- CPUE (2): individual Members' CPUE, Joint CPUE

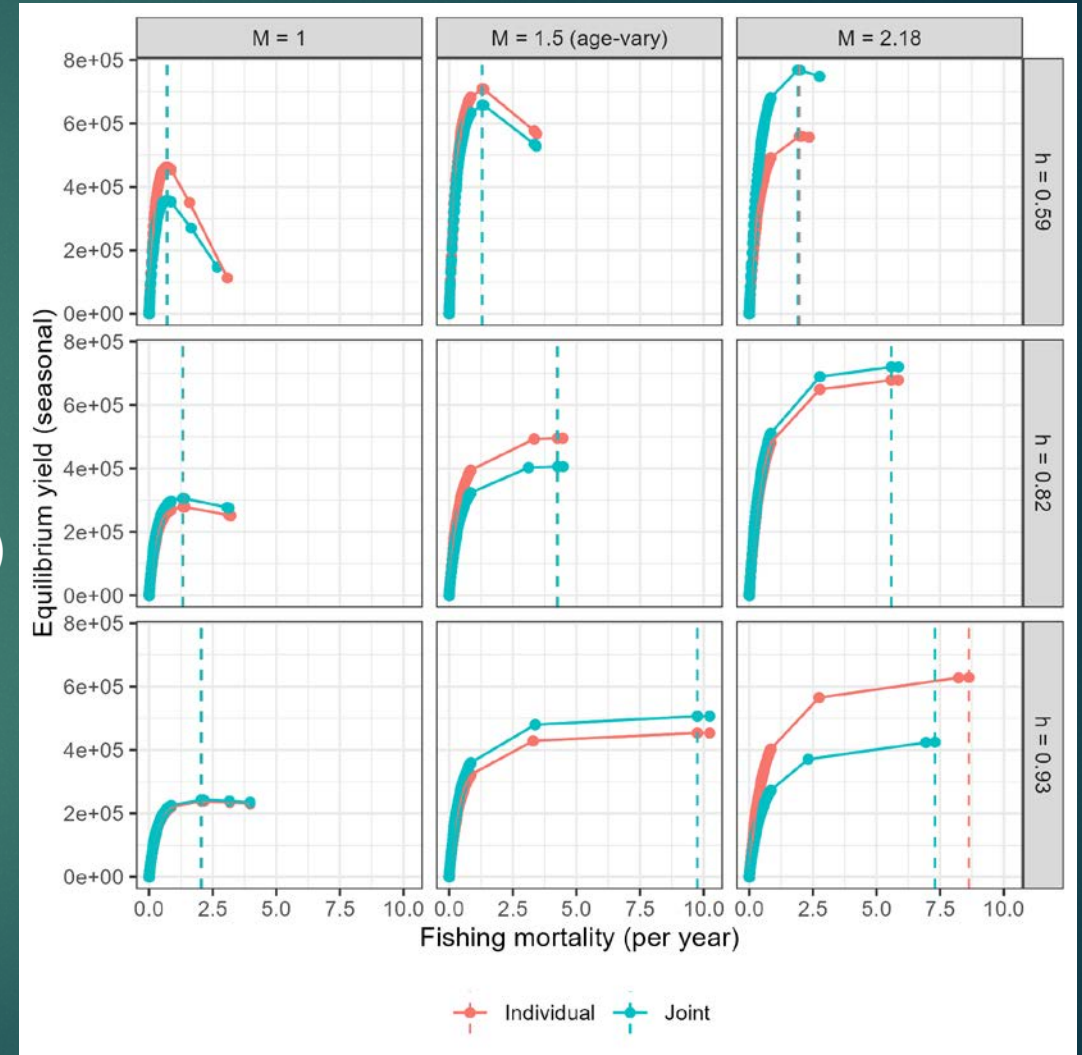
Model runs: $2 \times 3 \times 2 = 12$



03 Future works

Alternative reference points

- F-based reference points
 - F%SPR (25-30%, short/long-term growth pattern)
 - Fmed (median level of recruitment)
- B-based reference points (including SSB, summary biomass, etc)
 - Dynamic B0
 - Static B0
 - Depletion at F%SPR
 - Historical Biomass



03 Future works

Date	Meeting	Work plan and Expectation
2026 Jul	SWG NSAM 2026-02	Finalize model specifications, determine the reference model, review diagnostic results, balance model complexity with biological realism, select an MSY proxy for stock status determination, and formulate recommendations for SSC PS and SWG MSE PS.
2026 Oct	SWG MSE PS08	Discuss management objectives, some elements of OM, reference points, and MPs for MSE.
Intersessional work: • Update SS3 with Members' 2025-2026 fishery data and Japanese 2026 survey data • Calculate the annual reference points outside of the model • Beta prior distribution of h • Time-varying double normal selectivity • Explore weighting scheme for ensemble runs • Common diagnostics for each run (Retro analysis, ASPM, likelihood profile, run test, hindcasting) Future work (for Members): • Spatio-temporal analysis of size composition (see NPFC-2024-SSC PS14-WP13) • Environmental impact (growth, recruitment, etc.) • Area-based survey index		
2026 Dec	SSC PS17	Data preparation meeting. Review the update of SS3.
Intersessional work: Update SS3 if necessary and draft a stock assessment report.		
2027 Jan	SSC PS18	Complete and adopt the first age-structured stock assessment report.



Thank you for your attention