North Pacific Fisheries Commission

NPFC-2025-SSC PS16-Final Report

16th Meeting of the Small Scientific Committee on Pacific Saury REPORT

11–14 December 2025

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North Pacific Fisheries Commission
16th Meeting of the Small Scientific Committee on Pacific Saury

11–14 December 2025
Nagoya, Japan

REPORT

Agenda Item 1. Opening of the Meeting

1. The 16th Meeting of the Small Scientific Committee on Pacific Saury (SSC PS16) was held in a hybrid format, with participants attending in-person in Nagoya, Japan, or online via WebEx, on 11–14 December 2025. The meeting was attended by Members from Canada, China, Japan, the Republic of Korea, the Russian Federation, Chinese Taipei, the United States of America, and the Republic of Vanuatu. The Ocean Foundation and the Pew Charitable Trusts attended as observers. Dr. Quang Huynh participated as an invited expert.

2. The meeting was opened by Dr. Toshihide Kitakado (Japan), the SSC PS Chair, who welcomed the participants.

3. Japan welcomed the in-person participants to Nagoya and the participants joining online. Japan noted that the meeting would focus on reviewing the latest Pacific saury stock assessments and leverage the participants' expertise and experience to formulate clear scientific advice for the Commission. Japan expressed its appreciation for the SSC PS's hard work and cooperation to date and looked forward to constructive discussions and positive outcomes.

4. The Science Manager, Dr. Aleksandr Zavolokin, outlined the meeting procedures and logistics.

5. Mr. Alex Meyer was selected as rapporteur.

Agenda Item 2. Adoption of Agenda

6. The SSC PS agreed to change agenda item 12.1 from "Application of the adopted HCR to set a TAC in 2026" to "Application of the adopted HCR."

7. The agenda was adopted as revised (Annex A). The List of Documents and List of Participants are attached (Annexes B, C).

Agenda Item 3. Overview of the outcomes of previous NPFC meetings

3.1 SSC PS15

8. The Chair presented the outcomes and recommendations from the SSC PS15 meeting.

Agenda Item 4. Review of the Terms of References of the SSC PS and existing protocols

4.1 Terms of References of the SSC PS

9. The SSC PS reviewed the Terms of References (ToR) of the SSC PS and determined that no revisions are currently necessary.

4.2 CPUE Standardization Protocol

10. The SSC PS reviewed the Catch Per Unit Effort (CPUE) Standardization Protocol and determined that no revisions are currently necessary.

4.3 Stock Assessment Protocol

11. The SSC PS reviewed the Stock Assessment Protocol and determined that no revisions are currently necessary.

Agenda Item 5. Member's fishery status including 2025 fishery

5.1 Report from Members including bycatch

12. China presented its Pacific saury fisheries status (NPFC-2025-SSC PS16-IP04). Total catch in 2024 was 40,503 MT, after bottoming out in 2021. In 2025, total catch up to 7 October has been 30,523 MT and a total of 49 vessels have been operating, a decrease of 10 from 2024. From 2023 to 2025, China's fishing seasons were shortened due to the catch limit being nearly exhausted. As of 20 October, nominal CPUE has been 11.37 MT/vessel/day in 2025. Standardized effort was 4,671 vessel days in 2024. Compared to 2024, the fishing grounds in 2025 have moved further south in June and July, then further north in August and September. A yearly comparison of body length compositions has been conducted from 2014 to 2024, and larger fish seem to have been caught in 2025 compared to 2024 based on size box compositions. In terms of bycatch, 16.78 MT of squid was caught in the Chinese Pacific saury stick-held dip net fishery, and 13.26 MT of Pacific saury was caught in the Chinese mackerel fisheries.

13. China also highlighted the importance of feedback from managers and stakeholders, such as at-sea observations of stock condition. China informed the SSC PS that Chinese fishers have taken catches of large fish early in the fishing season unlike previous years and that they have observed fewer parasites compared to previous years. China also shared that many Chinese fishers have disagreed with the NPFC's Pacific saury stock assessment results and consider them to be unrealistic. China encouraged other Members to also share feedback from managers and stakeholders when presenting their fisheries status information in the future.

14. Chinese Taipei presented its Pacific saury fisheries status (NPFC-2025-SSC PS16-IP01 (Rev. 2)). The historical catch reached its highest in 2014. The catch in 2024 was 69,486 MT. 75 vessels conducted fishing activities in 2025. Accumulated catch was 61,292 MT by the end of the 2025 fishing season, which ended in September when the catch limit was reached. The nominal CPUE during the period of June to September is about 2.88 MT/haul in 2025, compared to 1.68 MT/haul and 2.32 MT/haul for the equivalent period in 2024 and 2023, respectively. Compared with the fishing activities distribution in 2024, the fishing grounds in 2025 were observed to be distributed between 42°N and 50°N. Looking at monthly size box composition (S: less than 7 pcs/kg; 1: 7–9 pcs/kg; 2: 10–12 pcs/kg; 3: 13–15 pcs/kg; 4: 16–18 pcs/kg; 5: more than 19 pcs/kg), in 2025, size 3 was dominant in June, while size 1 and 2 were dominant from July to September. By the end of the fishing season, bycatch accounted for 0.00008% of the total catch and comprised mostly sardine.

15. The SSC PS suggested that in future, Chinese Taipei present a time-series plot of size box or length composition, which would help visualize any potential interannual patterns in Pacific saury catch length.

16. Korea presented its Pacific saury fisheries status (NPFC-2025-SSC PS16-IP05). Annual catch decreased continuously from 2018 to 2023, but it has increased slightly since 2024, reaching 5,909 MT in 2025. The number of Korean stick-held dipnet vessels has decreased gradually and only five were in operation in 2024 and 2025 due to the continued low level of Pacific saury catch. Nominal CPUE in 2025 was 6.4 MT/vessel/day, a slight increase from 2024. The standardized effort in 2025 (1,163 days) was nearly the same as in 2024, and both years showed an increase relative to 2023. Fishing operations have taken place around 145–170°E longitude and around 40–50°N latitude in 2023–2025. In 2025, the fork length (FL) ranged from 21 to 33 cm (mean 29.0 cm). The mean values were higher than those of the previous year across all months. From 2008 to 2025, the mean FL ranged from 26 to 29 cm. Although not statistically significant, there has been a slight increasing trend in the mean FL from 2023 to recent years. In terms of size box composition (S: 18–30 cm; M: 23–33 cm; L: 27–34 cm; 2L: 29–34 cm (FL)), the L ratio was dominant until 2016, while the M ratio has been dominant since then. Unusually for other years, the 2L size was reported in 2025. As for bycatch, in 2025, Korea had no bycatch of Pacific saury from other fisheries as there were no other Korean fisheries in the Convention Area. There was also no reported bycatch of other species in Korea’s Pacific saury fishery from 2023 to 2025.

17. Russia presented its Pacific saury fisheries status (NPFC-2025-SSC PS16-IP07). The annual catch increased from 51 MT (from 1 fishing vessel) in 2023 to 814 MT in 2024 (from 2 fishing vessels) in the Convention Area. As of 6 November, catch in 2025 was 733 MT. Two Russian

vessels operated in 2025. Accumulated catch and relative accumulated catch were low. Seasonal trends were not identified due to the low catch level. Nominal CPUE has increased from 2023 to 2025. Standardized effort remained low but increased from 2023 to 2024. Compared to 2024, the 2025 fishing grounds have moved further to the south and west in the latter part of the fishing season. In terms of body length, no data are available for 2024 but more small fish were observed in 2025 compared to 2023.

18. Vanuatu presented its Pacific saury fisheries status (NPFC-2025-SSC PS16-IP06). Total annual catch peaked at 8,231 MT in 2018, before dropping to a historical low in 2022. Total catch in 2025 was 3,211 MT. The number of operating vessels was 4 from 2015 to 2021 and was 3 in 2022. Only 2 vessels were active in 2023 and 2024. 4 vessels were active in 2025. An annual comparison of accumulated catch shows a trend of abundance increasing from August through to October, when fishing ends. An annual comparison of the relative seasonal catch shows that there are usually two peaks in the fishing season. In 2025, there was only one peak, in mid-August, showing a shift in seasonal pattern. Nominal CPUE in 2025 was 2.4 MT/haul or 15.8 MT/day. Generally, the main fishing grounds begin in the east early in the season, before shifting to the west. Compared to 2024, the 2025 fishing grounds were further to the east and the north. In terms of size box compositions (S: less than 7 pcs/kg; 1: 7–9 pcs/kg; 2: 10–12 pcs/kg; 3: 13–15 pcs/kg; 4: 16–18 pcs/kg; 5: more than 19 pcs/kg), caught individuals have generally been larger in 2025. The proportion of bycatch, comprising sardines and mackerel, in the Pacific saury fishery is very low compared to Pacific saury catch and there was no bycatch in 2025.

19. Japan presented its Pacific saury fisheries status (NPFC-2025-SSC PS16-IP08). In 2025, 95 fishing vessels were registered, two fewer than in 2024. Landings by the end of November were 61,269 MT, 158% of the 2024 landings in the same period. Nominal CPUE up to the end of November was 1.37, the highest in the last six years, but the value remains low compared with the 2000s. At the beginning of the fishing season in August, fishing grounds were formed north of 45–50°N in the high seas. After mid-September, the main fishing grounds were located in the Japanese exclusive economic zone (EEZ). The proportion of the EEZ catch against the total catch was 64.3% until the end of November. The average body length of age-1 fish was 30.1 cm. In recent years, the body length of age-1 fish has decreased annually, but this year it has recovered greatly. In the overall catch up to November, the percentage of age-0 fish appears to be slightly higher than that of age-1 fish. The following species have been reported as bycatch: sardine, mackerel, anchovy, and Japanese flying squid.

20. Japan also shared additional observations. Japan suggested that its increased catch in 2025 may be due to two factors: a slight recovery in the stock and a change in the formation of fishing grounds. Japan explained that the anomalous sea surface temperature patterns caused

by the northward shift of the Kuroshio Extension were reversed in 2025, which created more favorable habitat conditions in the Japanese EEZ and resulted in Pacific saury migrating into the Japanese EEZ more than in the previous 5 years.

21. Canada informed the SSC PS that the Small Working Group on Japanese Sardine has compiled indicators for Japanese Sardine and found that the level of chlorophyll in the Kuroshio Extension this spring was more than one standard deviation higher than usual, which suggests that productivity may have been very high in lower trophic levels.

22. The SSC PS noted that because Pacific saury is a short-lived species, the effects of a rapidly changing environment could manifest themselves in the stock in a short period of time. This highlights the need to further explore the relationship between the Pacific saury's changing growth and changing environmental conditions.

23. The SSC PS noted that generally, Members have seen increased catch, yet CPUE has remained mostly the same. The SSC PS noted the need to study the link between CPUE and population size further, including considering potential hyperstability and hyperdepletion conditions.

24. The Science Manager presented the cumulative catch of Pacific saury in 2020–2025 in the Convention Area. The cumulative catch in 2025 as of 28 November is approximately 123,000 MT compared to 145,000 MT in 2024, 102,000 MT in 2023, 95,000 MT in 2022, 89,000 MT in 2021, and 123,000 MT in 2020.

5.2 Others

25. No other information was presented.

Agenda Item 6. Fishery-independent abundance indices

6.1 Any information including survey plans in 2026

26. Japan informed the SSC PS that it plans to conduct its biomass survey with the usual method in 2026.

27. The SSC PS expressed its appreciation to Japan for conducting the biomass survey in 2025 and for planning to do so again in 2026.

6.2 Recommendations for future work

28. No recommendations were made.

Agenda Item 7. Fishery-dependent abundance indices

7.1 Any information

29. No new information was presented.

7.2 Recommendations for future work

30. In light of the changing Pacific saury distribution and fishing patterns, the SSC PS noted the need to explore ways to better incorporate spatio-temporal factors in Members' CPUE standardizations. The SSC PS also noted the potential need to reconsider how data from different fleets are treated and combined in CPUE standardizations.

31. The SSC PS requested Members to conduct their CPUE standardizations using a spatio-temporal model such as has been used for conducting the joint CPUE standardizations (e.g., Vector Autoregressive Spatio Temporal (VAST) or sdmTMB). The SSC PS requested Members to produce two sets of CPUE standardizations, one with an annual time-step and the other with a quarterly or monthly time-step depending on the nature of each Member's fishery as the current SS3 analyses are conducted with a quarterly time-step.

Agenda Item 8. Stock assessment using "provisional base models" (BSSPM)

8.1 Review of results

32. China presented an updated stock assessment for the Pacific saury stock in the Northwestern Pacific Ocean using BSSPM (NPFC-2025-SSC PS16-WP04). Results showed that the estimated median B_{2024} and B_{2025} over the two base case scenarios were 567,100 (80% CI: 354,000-1,066,000) and 678,600 (80% CI: 444,900-1,174,000) metric tons, respectively. The median B_{2025}/B_{MSY} and F_{2024}/F_{MSY} over the two base case scenarios were 0.44 (80% CI: 0.26-0.64) and 1.09 (80% CI: 0.77-1.85), respectively. For the average values for the most recent three years, $B_{2023-2025}$ was estimated below the B_{MSY} ($B_{2023-2025}/B_{MSY}$=0.38, 80% CI: 0.24-0.51), and $F_{2022-2024}$ was estimated to be above F_{MSY} ($F_{2022-2024}/F_{MSY}$=1.02, 80% CI: 0.77-1.63). Over the years, there have been decadal and interannual fluctuations in the biomass trend. Approximately after 2005, the biomass displayed a downward trajectory, albeit with interannual variation. The lowest biomass was recorded in 2020, but a recovery trend has been noted from 2020 to 2025. Since 1999, the harvest rate has shown an upward trend, but it has rapidly declined since 2018. The probability of the 2024 stock status being in the red quadrant of Kobe plot (Prob[$B_{2024}<B_{MSY}$ and $F_{2024}>F_{MSY}$]) was estimated to be 61%. China considered the assessment results to be unrealistic because they still failed to reflect the improving trend in the stock status of Pacific saury due to retrospective pattern and scaling issues. Conversely, the assessment suggested that the stock status was worsening, with B/B_{MSY} remaining fixed and an increased probability of falling into the red zone of the Kobe plot over the years. This outcome contradicts multiple indicators and observations, including the increasing trend in

abundance indices since 2020 and the larger body sizes observed in the 2025 fishing season.

33. Chinese Taipei presented an updated stock assessment for the Pacific saury stock in the Northwestern Pacific Ocean using BSSPM (NPFC-2025-SSC PS16-WP05). Both base case models showed consistent biomass trends after 2011 but differed notably from 1990 to 2010. Base case 2 displayed smoother variability and yielded higher biomass estimates than base case 1 during this period. The ensemble biomass estimates indicate an increasing pattern from 2000, peaking in the mid-2000s, followed by a continuous decline below B_{MSY} since 2009. The lowest stock condition was estimated in 2020 and 2021 (median B_{2020}/B_{MSY} = 0.233; 80% CI: 0.176–0.331; median B_{2021}/B_{MSY} = 0.238; 80% CI: 0.176–0.338), with a slight increase observed in recent years. Biomass in 2025 is below B_{MSY} (median B_{2025}/B_{MSY} = 0.510; 80% CI: 0.340–0.749), showing slightly recovery from the 2020–2021 lows but still not reaching B_{MSY}. Over the most recent three years (2023–2025), biomass was consistently estimated to be below B_{MSY} (median $B_{2023–2025}/B_{MSY}$ = 0.429; 80% CI: 0.309–0.596). F was below F_{MSY} prior to 2007, increased above F_{MSY} thereafter, and reached high levels in 2014 and 2018. A declining pattern in F was estimated from 2021 to 2024, with recent fishing mortality close to the F_{MSY} (median $F_{2022–2024}/F_{MSY}$ = 0.927; 80% CI: 0.684–1.278). Estimated fishing mortality in 2024 increased slightly (median F_{2024}/F_{MSY} = 0.972; 80% range: 0.684–1.408) compared with 2023 (median F_{2023}/F_{MSY} = 0.893; 80% range: 0.646–1.243). The ensemble MCMC stock status results suggest that the stock is likely in the yellow quadrant of the Kobe plot, with biomass below B_{MSY}, while fishing mortality is near or below F_{MSY} (Prob[$B_{2024} < B_{MSY}$ and $F_{2024} < F_{MSY}$] = 54%).

34. Japan presented an updated stock assessment for the Pacific saury stock in the Northwestern Pacific Ocean using BSSPM (NPFC-2025-SSC PS16-WP06 (Rev. 1)). Results showed that the 2025 median depletion level was 22.1% (80% CI: 12.7–34.4%) of the carrying capacity. Furthermore, the B-ratio (=B/B_{MSY}) and F-ratio (=F/F_{MSY}) in 2024 were 0.377 (80% CI: 0.252–0.499) and 1.085 (80% CI: 0.771–1.622), respectively. For the three-year average values, the B-ratio over 2023–2025 and the F-ratio over 2022–2024 were 0.394 (80% CI: 0.264–0.544) and 1.015 (80% CI: 0.752–1.460), respectively. In addition, the probability of the stock being in the green Kobe quadrant in 2024 was estimated to be approximately 0%, while the probabilities of being in the yellow and red Kobe quadrants were assessed as 62% and 38%, respectively. It should be noted that there is a large difference in the biomass series between the two base cases, whereas relative quantities, such as the B- and F-ratios and depletion level, differ little.

35. The SSC PS reviewed the stock assessments conducted by Members and could not reach consensus on the treatment of the results.

36. China expressed concerns that the current BSSPM model used for the Pacific saury stock assessment exhibits instability and considerable uncertainty in key parameter estimates and that it does not adequately capture non-stationary population dynamics. An increasing body of scientific evidence indicates that key biological processes of Pacific saury, including growth, survival, and maturation, are closely linked to environmental variability. China is therefore concerned that the assumption of stationary stock productivity is not appropriate for this small pelagic species and is inconsistent with current scientific understanding. In light of these concerns, China considers that the model specification should be improved by incorporating non-stationary formulations for key population parameters, such as the intrinsic growth rate (r) and carrying capacity (K), and that the assumption of hyperstability should be further evaluated.

37. China also expressed concern regarding the scaling uncertainty in the current BSSPM stock assessments for Pacific saury. The scales of some key assessment outputs such as estimated biomass, biological reference points, and stock status fluctuate across assessment years as newly updated input data are incorporated into the model. Such instability hampers the ability to consistently evaluate management effectiveness and obscures a clear understanding of the true stock status. Until these concerns and limitations are adequately addressed, and to minimize the risk of inappropriate management decisions, China considers that the current assessment results are not sufficiently robust to serve as the basis for developing management advice.

38. Other Members noted China's reservations and recognized that there continue to be some uncertainties in the stock assessment. However, they considered the stock assessment to be the best scientific information available and believed it would be appropriate to aggregate the results, recognizing the agreement in trends among them. It is also noted that, even though Pacific saury stock has been recovering in recent years, the stock has yet to reach past abundance levels and a precautionary approach as incorporated in the interim harvest control rule (HCR) is warranted given the uncertainty of the stock assessment.

39. The SSC PS aggregated the results of the stock assessments conducted by Japan and Chinese Taipei (Annex D), while noting that China did not endorse the stock assessment results.

8.2 Finalization of input values for the adopted HCR

40. The Chair noted that, although the SSC PS could not reach consensus on the stock assessment results, the SSC PS had been tasked by the Commission to provide relevant information for the conservation and management of Pacific saury, including by applying the adopted interim HCR. The Chair suggested finalizing the input values for the adopted HCR based on the aggregated results of the stock assessments conducted by Japan and Chinese Taipei.

41. To provide the management information requested by the CMM for Pacific saury, with the exception of one Member, the SSC PS agreed that the Chair could apply the adopted interim HCR based on input values from Japan and Chinese Taipei's stock assessments and present the result to SC10 as information, rather than as the consensus advice of the SSC PS.

8.3 Recommendations for future work

42. The SSC PS noted that non-stationary assumptions regarding stock productivity should be examined in future assessments, as several key biological processes of Pacific saury are influenced by environmental change. In addition, the assumption of hyperdepletion in CPUE indices should be explored, given evidence such as substantial seasonal and interannual variability in fleet dynamics, which may indicate that fishing fleets do not consistently or promptly locate the main fish habitat.

Agenda Item 9. Biological information on Pacific saury

43. Japan presented an analysis on seasonal variation in the Pacific saury maturity ogive (NPFC-2025-SSC PS16-IP02 (Rev. 1)). Japan explained that the effects of water temperature and body length on maturation differ among seasons, which, for the purpose of this study, were defined as follows: S1 (Jan–Mar), S2 (Apr–Jul), S3 (Aug–Sep), and S4 (Oct–Dec). Individuals smaller than 25 cm mature mainly in warmer conditions in S1. Individuals larger than 29 cm mature mainly in warmer conditions in S2 and S4, and irrespective of temperature in S1. It is problematic to assume a common maturation curve for all seasons and use this curve to calculate the SSB. It should be noted that estimating the seasonal maturation curve requires weighting by area. However, this is difficult due to sampling bias in the current data, especially in S4.

Agenda Item 10. New stock assessment models

10.1 Review of progress in SWG NSAM

44. The Small Working Group on New Stock Assessment Models for Pacific Saury (SWG NSAM) Lead, Dr. Libin Dai, presented a summary of the progress made by the SWG NSAM in 2025 (NPFC-2025-SSC PS16-WP03). The SWG NSAM held three meetings in 2025 to advance the development of an age-structured Stock Synthesis 3 (SS3) assessment model for Pacific saury. Major progress included converting the model from an annual to a seasonal time step, incorporating updated fishery and survey data, and implementing time-varying growth, which improved fits to length composition and partially reduced retrospective patterns. However, important challenges persist, including limited prediction skill and substantial uncertainty in natural mortality and steepness. These uncertainties also hinder the reliable estimation of the yield curve and MSY-related reference points, and MSY proxies may be required. As a result, the SWG was unable to finalize base and sensitivity cases in 2025. The

SWG recommended continuing model development in 2026 and ensuring sustained technical support from the invited expert.

10.2Works toward finalization of new stock assessment models

45. The invited expert presented an update on the development of the SS3 model for Pacific saury in 2025 (NPFC-2025-SSC PS16-WP07 (Rev. 1)). Improvements have been made to model structure and parameterization and the model fits the historical catch, standardized CPUE, fishery-independent index of abundance, and length composition data provided during SSC PS15. Diagnostic procedures were also conducted to determine goodness of fit to the data, estimability and stability of parameter estimates using jitter analysis and comparison of MCMC with maximum likelihood estimation, and predictive ability for short-term forecasting with retrospective analysis and hindcast validation of future index predictions in the first projection year. Likelihood profiles inform alternative choices on natural mortality (M) and steepness for sensitivity analysis. A reduction in growth has improved the fit to the length composition and reduced the retrospective pattern compared to previous models. However, predictive performance remains difficult for such a short-lived species. Sensitivity analyses indicate difficulty estimating MSY reference points with the current M value in the base model. Further evaluation is recommended with respect to the choice of M in the base case model, as the current value does not provide practical management advice.

46. The SSC PS thanked the SWG NSAM and the invited expert for their continued work on the development of the SS3 and the great progress made over the past year.

47. The SSC PS considered these and other issues and updated the table of the SS3 model configurations to reflect the discussions (Annex E).

48. Japan presented an update on the development of a State-space Assessment Model (SAM) for Pacific saury (NPFC-2025-SSC PS16-IP03). Two additional years of data have been included (2024 and 2025), and the Chinese Taipei CPUE data have been split in the same manner as for the BSSPM and SS3 models. The estimates of key parameters including biomass, F, and SPR were mostly consistent with the 2023 SAM results.

10.3 Recommendations for future work

49. The SSC PS tasked the SWG NSAM and the invited expert to continue developing the SS3 model.

Agenda Item 11. Progress on development and evaluation of a management procedure as a mid-term task

11.1 Conditioning of operating models (OMs)

50. The Chair summarized the ongoing work and future tasks for the mid-term goal of developing a full management procedure (MP).

51. The SSC PS noted that work is ongoing to develop an age-structured model and that progress on this work will support the conditioning of OMs and development of a full MP.

11.2 Types of management procedures (MPs)

52. The SSC PS noted that the MP could be model-based, empirical-based, or a combination of the two, and that options remain open.

11.3 Suggestion to SWG MSE PS07 on timeline and technical matters

53. In terms of the timeline, the SSC PS noted that it would be difficult to complete the ongoing simulation work within the coming year.

54. The SSC PS suggested that further discussions on technical and other matters related to the development of a full MP could be held at SWG MSE PS07. The SSC PS noted the need for greater dialogue among scientists, managers, and stakeholders at the SWG MSE PS, and requested Members to encourage greater participation by managers and stakeholders at the SWG MSE PS meetings.

55. The Ocean Foundation and Pew expressed their support for progressing discussion on the MSE process and the development of a full MP. Regarding the continued development of OMs, they emphasized that MSE is specifically designed to work under uncertainty, including situations where stock assessments are unreliable or unavailable, to test how management strategies perform across a range of plausible stock dynamics, and to still provide meaningful management guidance even when using simplified or data-limited operating models to explicitly represent uncertainty. They suggested that the absence of a reliable assessment is a reason to continue to develop the MSE, not to delay development.

56. Japan acknowledged that the MSE process is designed to account for uncertainty and that uncertainty should not be a reason for delaying further action. However, Japan also pointed out that the MSE and MP process would not work well with a very unreliable stock assessment model and without Members’ trust in the model. Japan emphasized the importance of the work to develop an age-structured model.

57. The invited expert suggested that if there are major uncertainties in the stock assessment, it would not make sense to use the stock assessment in the MP. Alternative, simpler MPs could be evaluated in the MSE.

58. The SSC PS recommended that the SWG MSE PS invite Dr. Quang Huynh as an invited expert to SWG MSE PS07.

Agenda Item 12. Development of recommendations to improve conservation and management of Pacific saury stock

12.1 Application of the adopted HCR

59. The interim HCR for Pacific saury under CMM 2025-08 For Pacific Saury was used to calculate the annual catch level in the 2026 fishing year, while noting the lack of endorsement from China. Based on assessment inputs from Japan and Chinese Taipei, the unconstrained annual catch level for 2026 = (B_{2025}*F_{MSY}*(B_{2025}/B_{MSY}) = 91,180 MT. Based on the adopted HCR, the constrained 2026 catch level would be 0.9 x 202,500 = 182,250 MT.

60. As a reference, the unconstrained annual catch level calculated from the interim HCR for 2026 increased by about 20% from 2025 (from 75,741 MT to 91,180 MT).

61. Chinese Taipei stated that based on thorough comparisons of recent stock assessment results across years and alternative model scenarios, contributing Members' assessments indicate substantial uncertainties in the estimation of key stock status indicators, including biomass, fishing mortality, and reference points F_{MSY} and B_{MSY}. In this regard, the estimated annual catch level derived from the interim HCR is subject to considerable uncertainty and potential error. While the HCR provides a consistent framework for translating stock status into management advice, the resulting calculated annual catch level should be interpreted with caution.

62. The Chair provided the comparison of 1) theoretical unconstrained annual catch level calculated based on HCR under CMM 2024-08 using 2025 assessment results, 2) unconstrained catch level for 2024, 2025 and 2026 computed in 2023, 2024 and 2025 assessments, respectively, 3) actual catch, and 4) TAC actually applied. Theoretical unconstrained catch level in 1) is calculated as if the current HCR was applicable historically and assumes equilibrium reference points estimated in the latest stock assessment from 2025 (NPFC-2025-SSC PS16-IP09).

12.2 Others

63. No other recommendations were made.

Agenda Item 13. Review of the Work Plan of the SSC PS

13.1 Climate related issues

64. The SSC PS noted the importance of continuing to advance work to understand and account for the impact of environmental conditions on the distribution and condition of the Pacific saury stock. The SSC PS encouraged Members to conduct related analyses and present them at future meetings of the SSC PS. The SSC PS also encouraged Members to conduct literature reviews and share any other related studies with the SSC PS.

13.2 Work Plan of the SSC PS

65. The SSC PS reviewed, revised and endorsed the 2025–2029 SSC PS 5-Year Rolling Work Plan (NPFC-2025-SSC PS16-WP01 (Rev. 1)).

Agenda Item 14. Other matters

14.1 Observer Program

66. The Science Manager reminded the SSC PS that the Commission previously requested that the SC provide guidance to the Technical and Compliance Committee (TCC) on the scientific aspects of a regional observer program (ROP), that the TCC Chair posed specific questions to the SC and its subsidiary bodies, and that the SC and its subsidiary bodies, including the SSC PS, provided responses. Following this, the TCC Chair has posed additional questions to the SC and its subsidiary bodies, the Small Working Group on Observer Program has drafted responses to these questions, and these responses will be reviewed and finalized at SC10.

14.2 Pacific saury species summary update

67. The SSC PS reviewed and revised the species summary of Pacific saury (NPFC-2025-SSC PS16-WP02 (Rev. 1)).

68. The SSC PS recommended that the SC adopt the updated species summary (Annex F).

14.3 Draft agenda, priority issues and timeline for next meeting

69. The SSC PS prepared an initial draft agenda for its next meeting. The SSC PS requested the Chair to finalize the draft agenda in coordination with Members in the intersessional period.

70. The Science Manager explained that SC10 would discuss potential changes to its typical meeting schedule and presented the various draft options under consideration (NPFC-2025-SC10-WP01 (Rev. 1)).

71. The SSC PS updated the draft options with its input (NPFC-2025-SC10-WP01 (Rev. 2)).

72. The SSC PS recommended holding a data preparatory meeting and a stock assessment meeting in the 2026 operational year and requested the guidance of the SC and Commission for determining the date, format, and location of the meetings. In addition, the SSC PS may hold regular virtual intersessional meetings. The SWG NSAM will also meet intersessionally.

73. The SSC PS agreed on the following priorities for the next meetings in 2026:
   (a) Review standardized CPUE up to 2025 or 2026.
   (b) Review the Japanese fishery-independent survey results up to 2026.
   (c) Update BSSPM analyses.
   (d) Review progress on development and evaluation of management procedure as a medium-term task.
   (e) Review progress made by the SWG NSAM on the development of the SS3 model.
   (f) Review Pacific saury bycatch information from Members.

14.4 Invited expert

74. The SSC PS recommended to continue to hire an invited expert to support the work of the SSC PS and SWG NSAM by conducting the tasks described in Annex G.

14.5 Selection of Chair and vice-Chair for SSC PS

75. The SSC PS re-elected Dr. Toshihide Kitakado (Japan) to serve as its Chair.

76. The SSC PS re-elected Dr. Libin Dai (China) to serve as its vice-Chair.

14.6 Other

77. No other matters were discussed.

Agenda Item 15. Consolidated recommendations to the Scientific Committee

78. The SSC PS recommended that the SC:
   (a) Consider the stock assessment report, while noting that one Member did not endorse the stock assessment results (Annex D).
   (b) Endorse the SSC PS Work Plan (NPFC-2025-SSC PS16-WP01 (Rev. 1)).
   (c) Allocate funds for an invited expert to support the work of the SSC PS and SWG NSAM by conducting the tasks described in Annex G.
   (d) Adopt the updated species summary of Pacific saury (Annex F).

Agenda Item 16. Adoption of Meeting Report

79. The report was adopted by consensus.

Agenda Item 17. Close of the Meeting

80. The Chair thanked the participants for their contributions, the invited expert for his support, Japan for hosting the meeting, and the Secretariat and rapporteur for their assistance.

81. The meeting closed at 13:00 on 14 December 2025, Nagoya time.

LIST OF ANNEXES

Annex A:
Agenda

Agenda Item 1. Opening of the Meeting

Agenda Item 2. Adoption of Agenda

Agenda Item 3. Overview of the outcomes of previous NPFC meetings
- 3.1 SSC PS15

Agenda Item 4. Review of the Terms of References of the SSC PS and existing protocols
- 4.1 Terms of References of the SSC PS
- 4.2 CPUE Standardization Protocol
- 4.3 Stock Assessment Protocol

Agenda Item 5. Member's fishery status including 2025 fishery
- 5.1 Report from Members including bycatch
- 5.2 Others

Agenda Item 6. Fishery-independent abundance indices
- 6.1 Any information including survey plans in 2026
- 6.2 Recommendations for future work

Agenda Item 7. Fishery-dependent abundance indices
- 7.1 Any information
- 7.2 Recommendations for future work

Agenda Item 8. Stock assessment using "provisional base models" (BSSPM)
- 8.1 Review of results
- 8.2 Finalization of input values for the adopted HCR
- 8.3 Recommendations for future work

Agenda Item 9. Biological information on Pacific saury

Agenda Item 10. New stock assessment models
- 10.1 Review of progress in SWG NSAM
- 10.2 Works toward finalization of new stock assessment models
- 10.3 Recommendations for future work

Agenda Item 11. Progress on development and evaluation of a management procedure as a mid-term task
- 11.1 Conditioning of operating models (OMs)
- 11.2 Types of management procedures (MPs)
- 11.3 Suggestion to SWG MSE PS07 on timeline and technical matters

Agenda Item 12. Development of recommendations to improve conservation and management of Pacific saury stock
- 12.1 Application of the adopted HCR

12.2 Others

Agenda Item 13. Review of the Work Plan of the SSC PS
13.1 Climate related issues
13.2 Work Plan of the SSC PS

Agenda Item 14. Other matters
14.1 Observer Program
14.2 Pacific saury species summary update
14.3 Draft agenda, priority issues and timeline for next meeting
14.4 Invited expert
14.5 Selection of Chair and vice-Chair for SSC PS
14.6 Other

Agenda Item 15. Consolidated recommendations to the Scientific Committee

Agenda Item 16. Adoption of Report

Agenda Item 17. Close of the Meeting

Annex B:

List of Documents

MEETING INFORMATION PAPERS

Number	Title
NPFC-2025-SC10-MIP01 (Rev. 1)	Meeting Information
NPFC-2025-SSC PS16-MIP02	Provisional Agenda
NPFC-2025-SSC PS16-MIP03 (Rev. 1)	Annotated Indicative Schedule

WORKING PAPERS

Number	Title
NPFC-2025-SSC PS16-WP01 (Rev. 1)	Five-Year Work Plan of the SSC PS
NPFC-2025-SSC PS16-WP02 (Rev. 1)	Species summary for Pacific saury
NPFC-2025-SSC PS16-WP03	Small Working Group on New Stock Assessment Models for Pacific Saury – Progress Summary for 2025
NPFC-2025-SSC PS16-WP04	Updates of stock assessment for Pacific saury in the North Pacific Ocean up to 2025
NPFC-2025-SSC PS16-WP05	Updates of stock assessment of Pacific saury (*Cololabis saira*) in the Western North Pacific Ocean through 2024
NPFC-2025-SSC PS16-WP06 (Rev. 1)	2025 update on Pacific saury stock assessment in the North Pacific Ocean using Bayesian state-space production models
NPFC-2025-SSC PS16-WP07 (Rev. 1)	Development of the Stock Synthesis model for Pacific saury in 2025

INFORMATION PAPERS

Number	Title
NPFC-2025-SSC PS16-IP01 (Rev. 2)	Fishery status for Pacific saury - Report of Chinese Taipei
NPFC-2025-SSC PS16-IP02 (Rev. 1)	Seasonal variation in maturity ogive of Pacific saury
NPFC-2025-SSC PS16-IP03	2025 simple update of SAM for Pacific saury
NPFC-2025-SSC PS16-IP04	Fishery Status of PS in China including 2025
NPFC-2025-SSC PS16-IP05	Korean Stick-held dip net (SHDN) Fishery Status up to 2025
NPFC-2025-SSC PS16-IP06	Fishery Status for Pacific saury - Vanuatu
NPFC-2025-SSC PS16-IP07	Fishery for Pacific saury by Russian vessels in 2025

NPFC-2025-SSC PS16-IP08	Pacific saury fishing condition in Japan in 2025 (up to the end of November)
NPFC-2025-SSC PS16-IP09	Comparison of theoretical TAC, recommended HCR-based TAC, actual catch, and TAC actually applied

REFERENCE DOCUMENTS

Number	Title
NPFC-2025-SSC PS15-Final Report	SSC PS15 Report
	Terms of References of the SSC PS
	CPUE Standardization Protocol for Pacific Saury
	Stock Assessment Protocol for Pacific Saury

Annex C:
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Annex D:

Stock assessment report for Pacific saury

EXECUTIVE SUMMARY

Data used in the assessment modeling

Data are included from the NPFC Convention Area and Members' Exclusive Economic Zones (EEZs). Pacific saury (*Cololabis saira*) is widely distributed from the subarctic to the subtropical regions of the North Pacific Ocean. The fishing grounds are west of 180º E but differ among Members (China, Japan, Korea, Russia, Chinese Taipei, and Vanuatu). Figure 1 shows the historical catches of Pacific saury by Member. Figure 2 shows CPUE and Japanese survey biomass indices used in the stock assessment. Appendix 1 shows data used for the updated stock assessment.

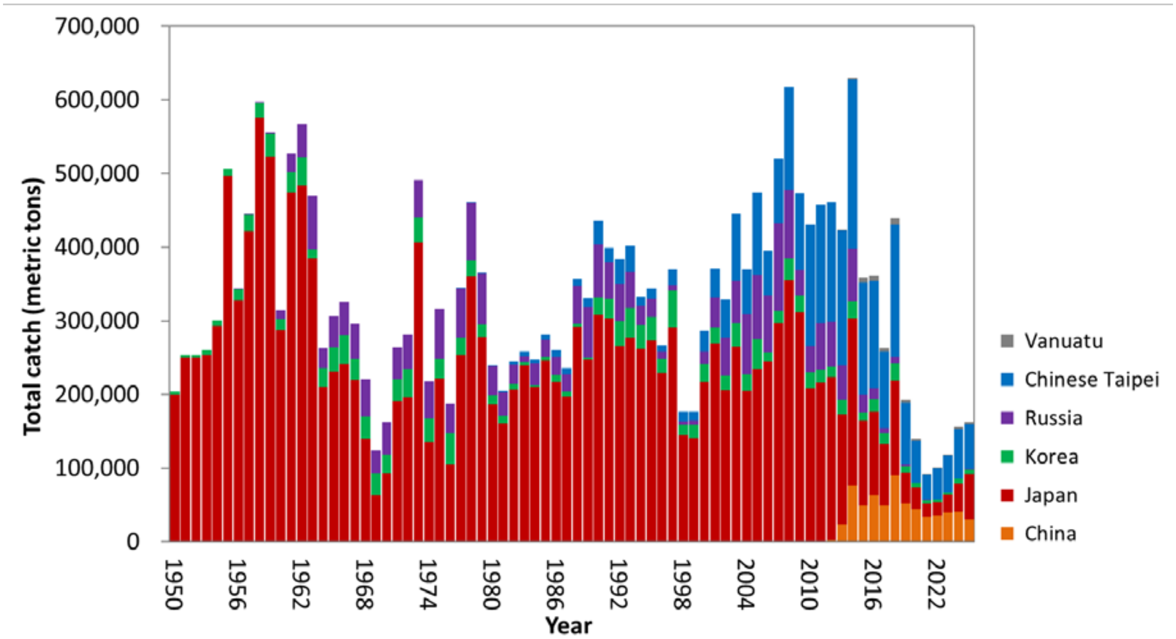


Figure 1. Time series of catch by Member during 1950-2025. The catch data for 1950-1979 are shown but not used in stock assessment modeling. Catch data in 2025 are preliminary (as of 28 November 2025) and not used in the assessment.

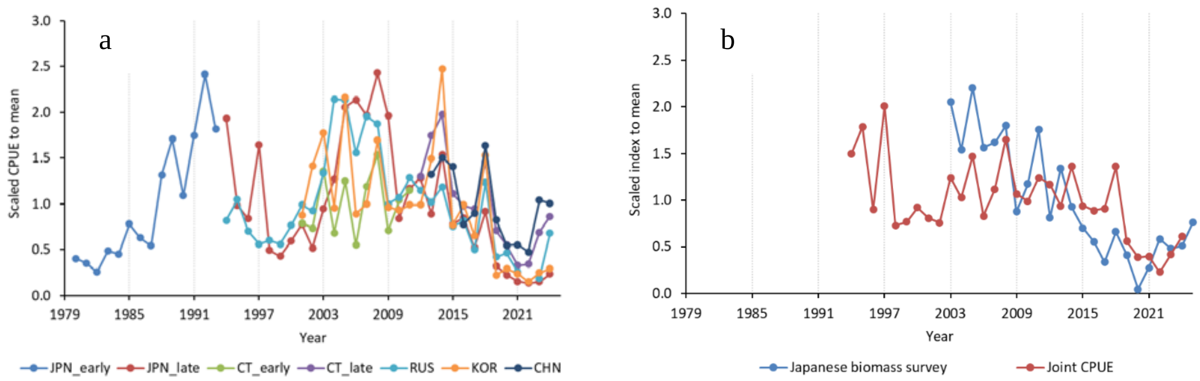


Figure 2. Time series of (a) Japanese survey biomass index and joint CPUE and (b) Member's standardized CPUE indices used in the assessment modeling.

Brief description of specification of analysis and models

A Bayesian state-space production model (BSSPM) used in previous stock assessments was employed as an agreed provisional stock assessment model for Pacific saury during 1980-2025. Scientists from two Members (Japan and Chinese Taipei) each conducted analyses following the agreed specification which called for two base case scenarios and two sensitivity scenarios (see Annex F, SSC PS15 report for more details). The two base case scenarios differ in using each Member's standardized CPUEs (base case B1) or standardized joint CPUEs (base case B2). The CPUE data were modeled as nonlinear indices of biomass. Members used similar approaches with some differences in the assumption of prior distributions for the free parameters in the model.

Summary of stock assessment results

The SSC PS considered the BSSPM results and noted the agreement in trends among Members' results for each base case model. However, there was a marked difference in the biomass level between B1 and B2 due to the different CPUE trends used. The SSC PS discussed and recognized that the results covered a wide range of uncertainties in data, model and estimation, and it therefore concluded the outcomes of MCMC runs could be aggregated over the 4 models (2 base case models x 2 Members) as in the previous assessments. The aggregated results from Japan and Chinese Taipei for assessing the overall median values and their associated 80% credible intervals are shown in Table 1a (the aggregated results for 2024 are shown in Table 1b). The graphical presentations for times series of a) biomass (B), b) B-ratio (=B/B_{MSY}), c) harvest rate (F), d) F-ratio (F/F_{MSY}) and e) B/K are shown in Figure 3. The Kobe plot with time trajectory using aggregated model outcomes is shown in Figure 4. Time series of median estimated values for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K are shown in Table 2.

Table 1. Summary of estimates of reference quantities. Medians and credible intervals for the aggregated results are presented. In addition, median values of Member's combined results (over B1 and B2) are shown.

a. 2025 assessment

	Median	Lower10%	Upper10%	Median_JPN	Median_CT
C_2024 (10000 t)	15.556	15.556	15.556	15.556	15.556
AveC_2022_2024	12.463	12.463	12.463	12.463	12.463
AveF_2022_2024	0.258	0.137	0.414	0.276	0.246
F_2024	0.272	0.150	0.431	0.292	0.258
FMSY	0.269	0.130	0.444	0.271	0.268
MSY (10000 t)	38.165	30.860	45.319	38.064	38.250
F_2024/FMSY	1.027	0.719	1.526	1.085	0.972
AveF_2022_2024/FMSY	0.971	0.712	1.371	1.015	0.927
K (10000 t)	294.397	178.813	593.103	304.173	287.900
B_2024 (10000 t)	57.200	36.107	103.568	53.309	60.330
B_2025 (10000 t)	69.460	45.090	119.897	66.099	72.620
AveB_2023_2025	58.238	37.756	103.933	54.625	61.302
BMSY (10000 t)	142.100	91.670	266.603	141.938	142.200
BMSY/K	0.486	0.385	0.617	0.470	0.503
B_2024/K	0.197	0.127	0.282	0.182	0.211
B_2025/K	0.238	0.143	0.364	0.221	0.254
AveB_2023_2025/K	0.202	0.128	0.288	0.188	0.215
B_2024/BMSY	0.403	0.280	0.562	0.383	0.423
B_2025/BMSY	0.488	0.314	0.725	0.466	0.510
AveB_2023_2025/BMSY	0.411	0.285	0.573	0.394	0.429

b. 2024 assessment

	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

Table 2. Time series of median estimated values for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K. The unit of biomass is 10,000 tons.

Year	Biomass	HarvestRate	Bratio	Fratio	Depletion
1981	167.600	0.122	1.214	0.453	0.593
1982	178.358	0.137	1.310	0.504	0.641
1983	183.284	0.141	1.348	0.513	0.662
1984	186.400	0.133	1.371	0.483	0.675
1985	191.142	0.147	1.399	0.541	0.689
1986	191.001	0.136	1.395	0.500	0.687
1987	193.900	0.121	1.410	0.447	0.695
1988	198.900	0.180	1.439	0.663	0.708
1989	189.862	0.174	1.365	0.647	0.674
1990	186.600	0.234	1.342	0.872	0.660
1991	173.013	0.231	1.236	0.866	0.608
1992	165.400	0.232	1.188	0.875	0.581
1993	159.471	0.252	1.147	0.955	0.559
1994	152.100	0.219	1.091	0.836	0.529
1995	149.829	0.229	1.064	0.893	0.513
1996	142.400	0.187	1.007	0.736	0.485
1997	146.840	0.252	1.016	1.016	0.488
1998	134.022	0.132	0.928	0.530	0.446
1999	144.800	0.122	0.990	0.496	0.477
2000	158.548	0.180	1.091	0.729	0.526
2001	162.200	0.229	1.134	0.897	0.550
2002	163.300	0.201	1.156	0.772	0.563
2003	179.470	0.248	1.276	0.937	0.624
2004	173.522	0.213	1.234	0.799	0.606
2005	187.152	0.253	1.315	0.955	0.648
2006	171.900	0.229	1.209	0.864	0.596
2007	175.900	0.296	1.240	1.112	0.611
2008	166.127	0.372	1.166	1.398	0.576
2009	132.997	0.355	0.939	1.335	0.462
2010	129.900	0.331	0.912	1.249	0.449
2011	130.989	0.348	0.919	1.314	0.454
2012	118.321	0.389	0.834	1.463	0.411
2013	114.364	0.371	0.804	1.390	0.397
2014	107.500	0.586	0.765	2.163	0.377
2015	76.938	0.466	0.545	1.736	0.269
2016	68.550	0.528	0.487	1.959	0.240
2017	58.251	0.451	0.415	1.672	0.205
2018	58.691	0.743	0.422	2.701	0.208
2019	37.030	0.527	0.264	1.946	0.131
2020	31.915	0.438	0.227	1.629	0.112
2021	32.395	0.284	0.230	1.068	0.113
2022	39.852	0.251	0.282	0.944	0.139
2023	47.687	0.248	0.335	0.937	0.165
2024	57.200	0.272	0.403	1.027	0.197
2025	69.460		0.488		0.238

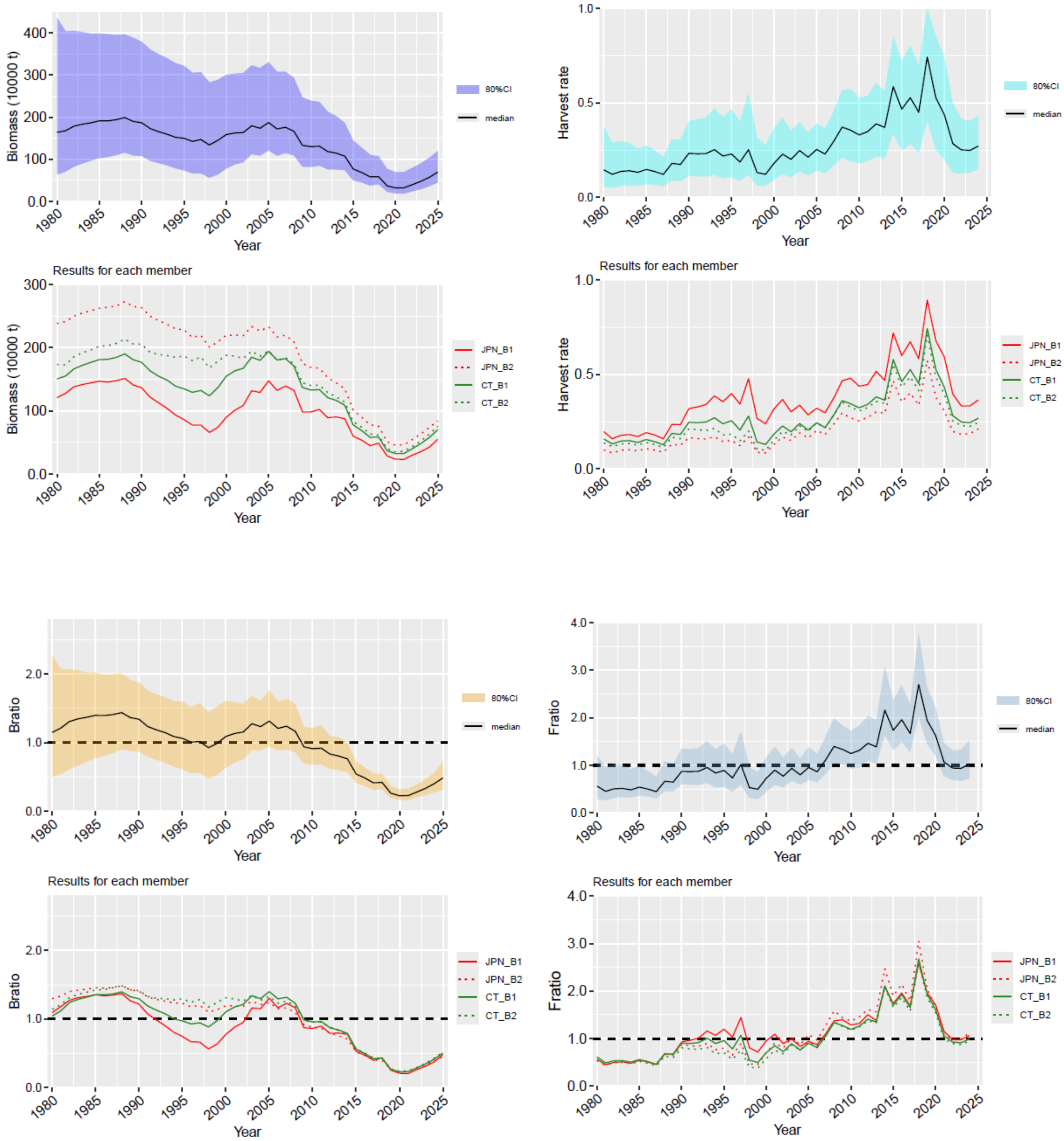


Figure 3. Time series of median estimated values of four runs for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K. The solid and shaded lines correspond to B1 and B2, respectively.

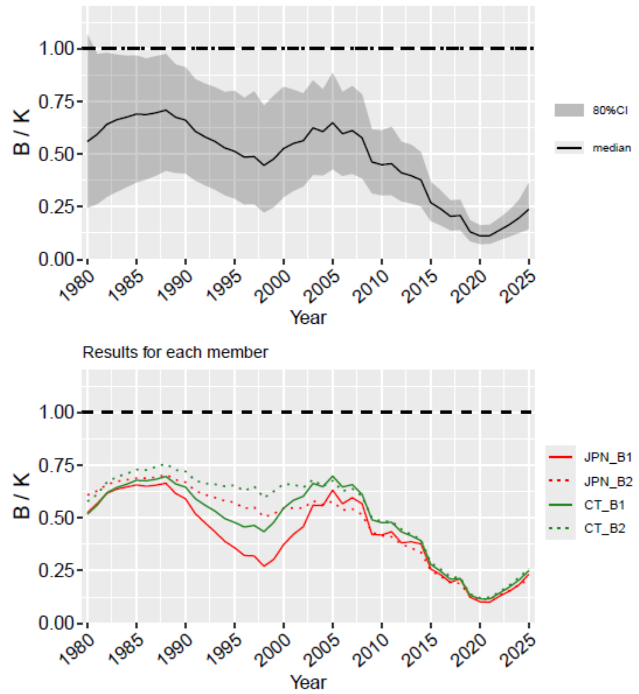
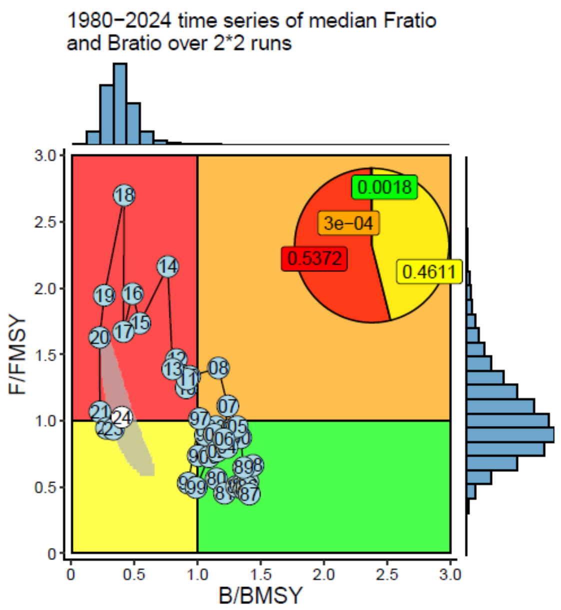


Figure 3 (Continued).

2025 assessment



2024 assessment

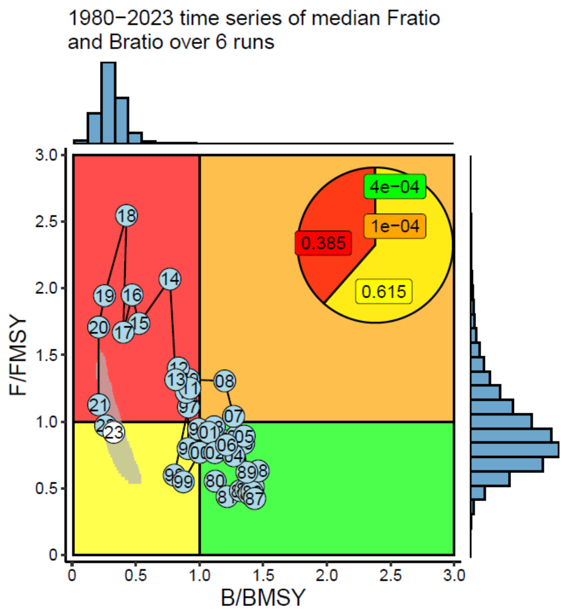


Figure 4. Kobe plot with time trajectory in 2025 (left) and 2024 (right) assessments.

Current stock condition and management advice

Summary of stock status

Results of Japan and Chinese Taipei and combined model estimates indicate the stock declined with high interannual variability from a high biomass level in the mid-2000's after a period of high productivity to the current low biomass levels. The combined results (Table 1a) show that average B was below B_{MSY} during 2023–2025 (median average B/B_{MSY} during 2023–2025 = 0.411, 80%CI = 0.285–0.573) and average F was around F_{MSY} (average F/F_{MSY} during 2022–2024 = 1.027, 80%CI = 0.719–1.526). Thus, stock biomass remained at low levels in recent years. Biomass may have increased during 2020–2025 based on the abundance indices and higher recruitment that may be evident in the Japanese fishery size composition. Based on CPUE, survey data, and model results, the condition of the Pacific saury stock and fishery improved in recent years although biomass remains below B_{MSY}. The improvement could be due at least in part to reductions in catch since 2020 and potentially due to unidentified environmental variability.

Uncertainty in assessment

See discussion in Section 8 in the main report.

Management advice

The interim HCR for Pacific saury under CMM 2025-08 For Pacific Saury was used to calculate the annual catch level in the 2026 fishing year, while noting the lack of endorsement from China. Based on assessment inputs from Japan and Chinese Taipei, the unconstrained annual catch level for 2026 = (B_{2025}*F_{MSY}*(B_{2025}/B_{MSY}) = 91,180 MT. Based on the adopted HCR, the constrained 2026 catch level would be 0.9 x 202,500 = 182,250 MT.

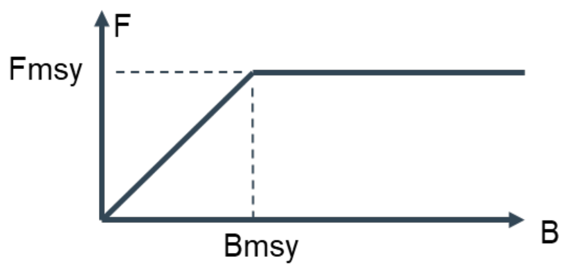


Figure 5. Shapes of the function used in the harvest control rule adopted in 2024 Commission meeting.

Special comments regarding the procedures and stock assessment results

The SSC PS worked collaboratively to produce this stock assessment, incorporating some technical improvements, while noting that China did not endorse the assessment results. This section highlights several important aspects of the stock assessment procedure and results.

1) Standardized CPUE data were assumed to be hyperstable and thus less likely to react to changes in biomass. Thus, standardized CPUE were down-weighted relative to the Japanese survey in the first base case (B1), which used CPUE from individual Members. In B1, a single non-linear parameter was used for the CPUEs for each Member.
2) Estimated trends in relative stock size measures and reference points from Chinese Taipei (CT), Japan (JPN) and combined models were similar to one another. CPUE, survey trends and model results suggest that stock size is still low but increased since 2020.
3) Oceanographic or biological factors responsible for changes in Pacific saury productivity have not yet been determined. Development of modeling procedures to incorporate environmental change is an important area for future research. The work should include refinements to stock assessment models to

better reflect and estimate environmental effects on recruitment and biology. This work should be coordinated among Members and folded into the development of age-structured and improved BSSPM models.

4) Experience with the HCR rule this year suggests that the use of more current data might improve management advice. Currently, the HCR calculation for 2026 is based on CPUE and catch data through 2024 and survey data through 2025. However, catch data are nearly complete for the most recent year when the assessment for that year is completed and reasonably precise CPUE standardization could probably be completed early as well. It would be advisable for the SSC PS to consider approaches to using the most recent data in the assessment. One approach to demonstrating potential benefits would be to do a retrospective analysis of HCR calculations based on the actual terminal year and the year before.

STOCK ASSESSMENT REPORT FOR PACIFIC SAURY

1. INTRODUCTION

1.1 Distribution

Pacific saury (*Cololabis saira* Brevoort, 1856) has a wide distribution extending in the subarctic and subtropical North Pacific Ocean from inshore waters of Japan and the Kuril Islands to eastward to the Gulf of Alaska and southward to Mexico. Pacific saury is a commercially important fish in the western North Pacific Ocean (Parin 1968; Hubbs and Wisner 1980).

1.2 Migration

Pacific saury migrates extensively between the northern feeding grounds in the Oyashio waters around Hokkaido and the Kuril Islands in summer and the spawning areas in the Kuroshio waters off southern Japan in winter (Fukushima 1979; Kosaka 2000). Pacific saury in offshore regions (east of 160°E) also migrate westward toward the coast of Japan after October every year (Suyama et al. 2012).

1.3 Population structure

Genetic evidence suggests there are no distinct stocks in the Pacific saury population based on 141 individuals collected from five distant locales (East China Sea, Sea of Okhotsk, northwest Pacific, central North Pacific, and northeast Pacific) (Chow et al. 2009).

1.4 Spawning season and grounds

The spawning season of Pacific saury is relatively long, beginning in September and ending in June of the following year (Watanabe and Lo 1989). Pacific saury spawns over a vast area from the Japanese coastal waters to eastern offshore waters (Baitaliuk et al. 2013). The main spawning grounds are considered to be located in the Kuroshio-Oyashio transition region in fall and spring and in the Kuroshio waters and the Kuroshio Extension waters in winter (Watanabe and Lo 1989).

1.5 Food and feeding

The Pacific saury larvae prey on the nauplii of copepods and other small-sized zooplankton. As they grow, they begin to prey on larger zooplankton such as krill (Odate 1977). The Pacific saury is preyed on by large fish ranked higher in the food chain, such as *Thunnus alalunga* (Nihira 1988) and coho salmon, *Oncorhynchus kisutsh* (Sato and Hirakawa 1976) as well as by animals such as minke whales *Balaenoptera acutorostrata* (Konishi et al. 2009) and sea birds (Ogi 1984).

1.6 Age and growth

Based on analysis of daily otolith increments, Pacific saury reaches approximately 20 cm in knob length (distance from the tip of lower jaw to the posterior end of the muscular knob at the base of a caudal peduncle; hereafter as body length) in 6 or 7 months after hatching (Watanabe et al. 1988; Suyama et al. 1992). There is some variation in growth rate depending on the hatching month during this long spawning season (Kurita et al. 2004) and geographical differences (Suyama et al. 2012b). The maximum lifespan is 2 years (Suyama et al. 2006). The age 1 fish grow to over 27 cm in body length in June and July when Japanese research surveys are conducted and reach over 29 cm in the fishing season between August and December (Suyama et al. 2006).

1.7 Reproduction

The minimum size of maturity of Pacific saury has been estimated at about 25 cm in the field (Hatanaka 1956) or rearing experiments (Nakaya et al. 2010). Under rearing experiments, Pacific saury begins spawning 8 months after hatching, and spawning activity continues for about 3 months (Suyama et al. 2016). Batch fecundity is about 1,000 to 3,000 eggs per saury (Kosaka 2000).

2. FISHERY

2.1 Overview of fisheries

Western North Pacific

In Japan, the stick-held dip net fishery for Pacific saury was developed in the 1940s. Since then, the stick-held dip net gears have become the dominant fishing technique to catch Pacific saury in the northwest Pacific Ocean. Since 1995, more than 97% of Japan's total catch is caught by the stick-held dip net. The annual catch of Pacific saury for stick-held dip net fishery has fluctuated. Maximum and minimum catches of 355 thousand tons and 18 thousand tons were recorded in 2008 and 2022, respectively.

Pacific saury fisheries in Korea have been operated with gillnet since the late 1950s in Tsushima Warm Current region. Korean stick-held dip net fishery started from 1985 in the Northwest Pacific Ocean. The largest catch of 50 thousand tons was recorded in 1997 (Gong and Suh 2013).

Russian fishery for Pacific saury has been conducted using stick-held dip nets in the northwest Pacific Ocean in the area that includes national waters (mainly within the Russian EEZ) and adjacent NPFC Convention Areas. Russian catch statistics for saury fishery exists, beginning from 1956, and standardized CPUE indices from that fishery were calculated since 1994. Saury fishery traditionally occurred from August to November; however, in recent years, the onset of fishing for saury shifted to the early summer period. Peak catch of saury of over 100 thousand tons was in 2007.

China commenced its exploratory saury fishing using stick-held dip nets in the high seas in 2003, but only started to develop this fishery in 2012. The fishing seasons mainly cover the period from June-November.

Chinese Taipei's Pacific saury fishery can date back to 1975 and had its first commercial catch in 1977. Over the past decade, the number of active Pacific saury fishing vessels has been increasing from 68 to 91 and the catch has fluctuated between 39,750 tons and 229,937 tons since 2001. Aside from Pacific saury fishery, most of the Pacific saury fishing vessels also conduct flying squid jigging operations in the Northwest Pacific Ocean.

Vanuatu commenced its development of Pacific saury fishery by using stick-held dip net in the high seas in 2004. Currently there are four vessels operating in the Northwest Pacific targeting saury, but the total accumulative number of its authorized Pacific saury fishing vessels from 2004 to 2020 is 16. The fishing season mainly covers the period from July to November each year.

Eastern North Pacific

Although Pacific saury occur in the Canada EEZ, there is no targeted fishery for the species. There is no historical record of Canadian participation in international fisheries for saury. Domestic fisheries sometimes capture saury as bycatch in pelagic and bottom trawls and there are a handful of records from other gear types including commercial longlines. The most recently compiled estimates indicate around 300 kg of saury were captured by Canadian commercial fisheries over 17 years from 1997-2013 (Wade and Curtis 2015; NPFC-2022-SSC PS09-IP01). There are also records of saury catches from research trawls (surface, pelagic and bottom trawls) in Canadian waters, but the catches have been minimal.

Management plans developed by the United States' National Marine Fisheries Service currently prohibit targeted fishing on marine forage species including the Pacific saury. In the 1950's to mid-1970's there were sporadic attempts to commercially fish for Pacific saury off of California with limited success using purse seines and light attraction (Kato 1992). Catches from 1969-1972 averaged 450 tons. Currently landings are only "occasionally" reported as bycatch in fisheries on the US west coast. Landings of Pacific saury as bycatch on the US west coast averaged 5.5 kg per year from 2011-2015 (NOAA Fisheries National Bycatch Report Database System, https://www.st.nmfs.noaa.gov/, accessed March 8, 2019)

Historically, Japanese and Russian vessels operated mainly within their own EEZs, but they have shifted into the Convention Area in recent years. Chinese, Korean and Chinese Taipei vessels operate mainly in the high seas of the North Pacific https://www.npfc.int/science/gis/catch-effort/saury.

2.2 Catch records

Figure 2 shows the historical catches of Pacific saury in the northwest Pacific Ocean by Member.

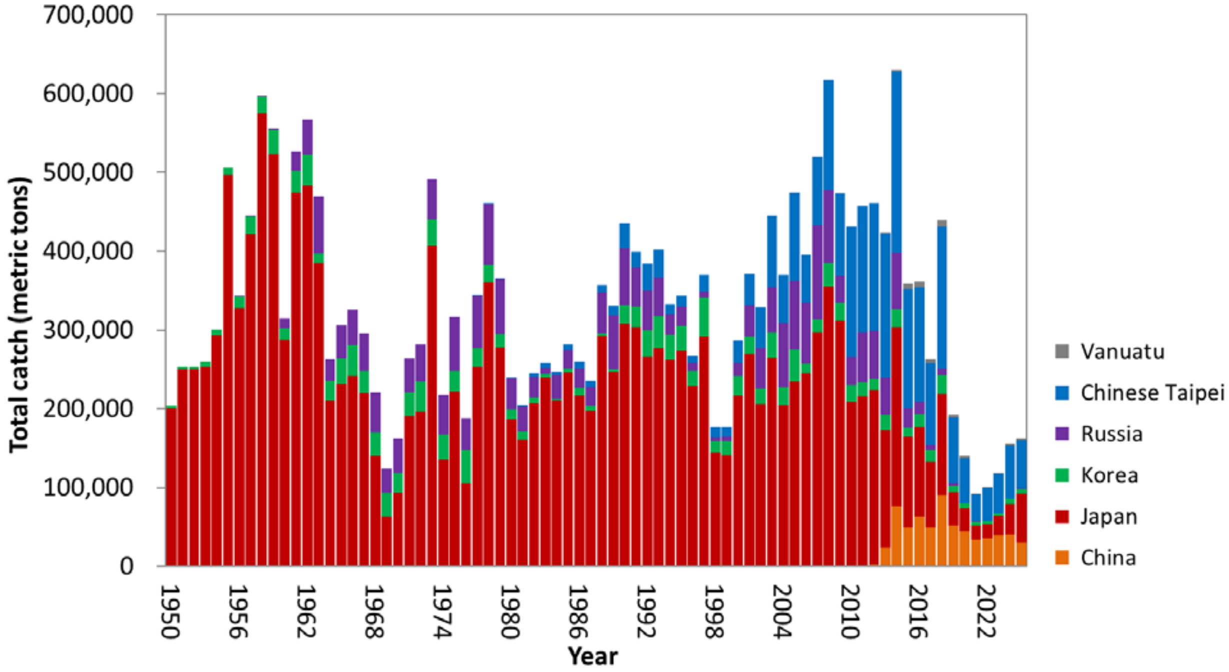


Figure 2. Time series of catch by Member during 1950-2025. The catch data for 1950-1979 are shown but not used in stock assessment modeling. Catch data in 2025 are preliminary (as of 28 November 2025) and not used in the assessment.

3. SPECIFICATION OF STOCK ASSESSMENT

A Bayesian state-space production model (BSSPM) used in previous stock assessments was employed as an agreed provisional stock assessment model for Pacific saury during 1980-2025. Scientists from two Members (Japan and Chinese Taipei) each conducted analyses following the agreed specification which called for two base case scenarios and two sensitivity scenarios (see Annex F, SSC PS15 report for more details). The two base case scenarios differ in using each Member's standardized CPUEs (base case B1) or standardized joint CPUEs (base case B2). The CPUE data were modeled as nonlinear indices of biomass. Members used similar approaches with some differences in the assumption of prior distributions for the free parameters in the model.

3.1 Bayesian state-space production model

The population dynamics is modelled by the following equations:

$$B_t = \{B_{t-1} + B_{t-1} f(B_{t-1}) - C_{t-1}\} e^{u_t}, \quad u_t \sim N(0, \tau^2)$$

$$f(B_t) = r\left[1 - \left(\frac{B_t}{K}\right)^z\right]$$

where

B_t : the biomass at the beginning of year *t*

C_t : the total catch of year *t*

u_t : the process error in year *t*

$f(B)$: the production function (Pella-Tomlinson)
r : the intrinsic rate of natural increase
K : the carrying capacity
z: the degree of compensation (shape parameter; different symbols were used by the 3 members)

The multiple biomass indices are modelled as follows:

Survey biomass estimate

$$I_{t,biomass} = q_{biomass} B_t \, exp(\, v_{t,biomass}), \qquad \text{where} \;\; v_{t,biomass} \sim N\left(0, \sigma^2_{biomass}\right)$$

where

$q_{biomass}$: the relative bias in biomass estimate
$v_{t,biomass}$: the observation error term in year *t* for survey biomass estimate
$\sigma^2_{biomass}$: the observation error variance for survey biomass estimate

CPUE series

$$I_{t,f} = q_f B_t^b \, exp(\, v_{t,f}), \qquad \text{where} \;\; v_{t,f} \sim N\left(0, \sigma_f^2\right)$$

where

$I_{t,f}$: the biomass index in year *t* for biomass index *f*

q_f : the catchability coefficient for biomass index *f*

b: the hyper-stability/depletion parameter
$v_{t,f}$: the observation error term in year *t* for biomass index *f*
σ_f^2: the observation error in year *t* for biomass index *f*

For the estimation of parameters, Bayesian methods were used with Member-specific differences in preferred assumptions for the prior distributions for the free parameters. MCMC methods were employed for simulating the posterior distributions. For the assumptions of uniform priors used in Japan, see documents NPFC-2025-SSC PS16-WP06; for the non-uniform priors used in Chinese Taipei, see document NPFC-2025-SSC PS16-WP05.

3.2 Agreed scenarios

Table 1. Definition of scenarios

	Base case (NB1)	**Base case (NB2)**	**Sensitivity case (NS1)**	**Sensitivity case (NS2)**
Initial year	1980	1980	1980	1980
Biomass survey	$I_{t,bio} = q_{bio}\, B_t e^{v_{t,bio}}$ $v_{t,bio} \sim N\left(0, cv_{t,bio}^2 + \sigma^2\right)$ $q_{bio} \sim$ U(0,1) (2003-2025)	Same as left	Same as left	Same as left
CPUE	CHN(2013-2024) JPN_late(1994-2024) KOR(2001-2024) RUS(1994-2024) CT(2001-2011, 2012-2024) $I_{t,f} = q_f B_t^b e^{v_{t,f}}$ $v_{t,f} \sim N(0, \sigma_f^2)$ $\sigma_f^2 = c \cdot (ave(cv_{t,bio}^2) + \sigma^2)$, where $ave(cv_{t,bio}^2)$ is computed except for 2020 survey (c = 5)	Joint CPUE (1994-2024) $I_{t,joint} = q_{joint} B_t^b e^{v_{t,joint}}$ $v_{t,joint} \sim N(0, cv_{t,joint}^2 + \sigma^2)$	CHN(2013-2024) JPN_early(1980-1993, time-varying q) JPN_late(1994-2024) KOR(2001-2024) RUS(1994-2024) CT(2001-2011, 2012-2024) $I_{t,f} = q_f B_t^b e^{v_{t,f}}$ $v_{t,f} \sim N(0, \sigma_f^2)$ $\sigma_f^2 = c \cdot (ave(cv_{t,bio}^2) + \sigma^2)$, where $ave(cv_{t,bio}^2)$ is computed except for 2020 survey (c = 6)	JPN_early(1980-1993, time-varying q) $I_{t,JE} = q_{t,JE} B_t^b e^{v_{t,JE}}$ $v_{t,JE} \sim N(0, \sigma_{JE}^2)$ $\sigma_{JE}^2 = c\ ave(cv_{t,joint}^2 + \sigma^2)$ Joint CPUE (1994-2024) $I_{t,joint} = q_{joint} B_t^b e^{v_{t,joint}}$ $v_{t,joint} \sim N(0, cv_{t,joint}^2 + \sigma^2)$
Hyper-depletion / stability	A common parameter for all fisheries with a prior distribution, $b \sim U(0, 1)$	$b \sim U$ (0, 1)	A common parameter for all fisheries but JPN_early, with a prior distribution, $b \sim U(0, 1)$ [b for JPN_early is fixed at 1]	$b \sim U$ (0, 1) for joint CPUE. [b for JPN_early is fixed at 1]
Prior for other than q_{bio}	Own preferred options	Own preferred options	Own preferred options	Own preferred options

Table 2. Description of symbols used in the stock assessment

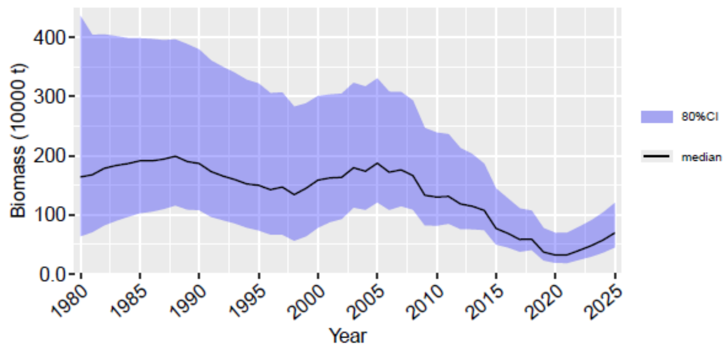
Symbol	Description
C_{2024}	Catch in 2024
$AveC_{2022\text{-}2024}$	Average catch for a recent period (2023–2024)
$AveF_{2022\text{-}2024}$	Average harvest rate for a recent period (2022–2024)
F_{2024}	Harvest rate in 2024
F_{MSY}	Annual harvest rate producing the maximum sustainable yield (MSY)
MSY	Equilibrium yield at F_{MSY}
F_{2024}/F_{MSY}	Average harvest rate in 2024 relative to F_{MSY}
$AveF_{2022\text{-}2024}/F_{MSY}$	Average harvest rate for a recent period (2022–2024) relative to F_{MSY}
K	Equilibrium unexploited biomass (carrying capacity)
B_{2024}	Stock biomass in 2024 estimated in the model
B_{2025}	Stock biomass in 2025 estimated in the model
$AveB_{2023\text{-}2025}$	Stock biomass for a recent period (2023–2025) estimated in the model
B_{MSY}	Stock biomass that will produce the maximum sustainable yield (MSY)
B_{MSY}/K	Stock biomass that produces the maximum sustainable yield (MSY) relative to the equilibrium unexploited biomass[a]
B_{2024}/K	Stock biomass in 2024 relative to K[a]
B_{2025}/K	Stock biomass in 2025 relative to K[a]
$B_{2023\text{-}2025}/K$	Stock biomass in the latest time period (2023-2025) relative to the equilibrium unexploited stock biomass[a]
B_{2024}/B_{MSY}	Stock biomass in 2024 relative to B_{MSY} [a]
B_{2025}/B_{MSY}	Stock biomass in 2025 relative to B_{MSY} [a]
$B_{2023\text{-}2025}/B_{MSY}$	Stock biomass for a recent period (2023–2025) relative to the stock biomass that produces maximum sustainable yield (MSY) [a]

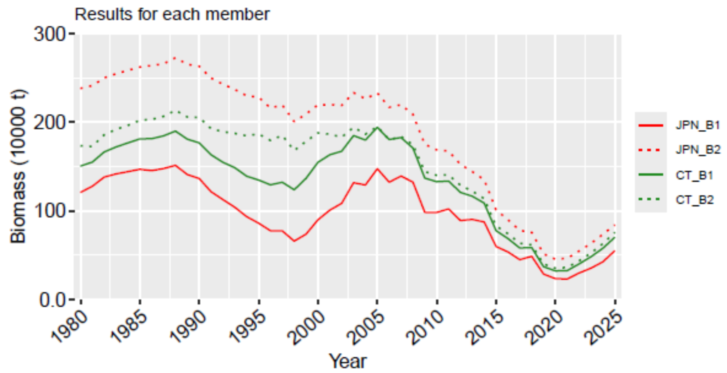
[a]calculated as the average of the ratios.

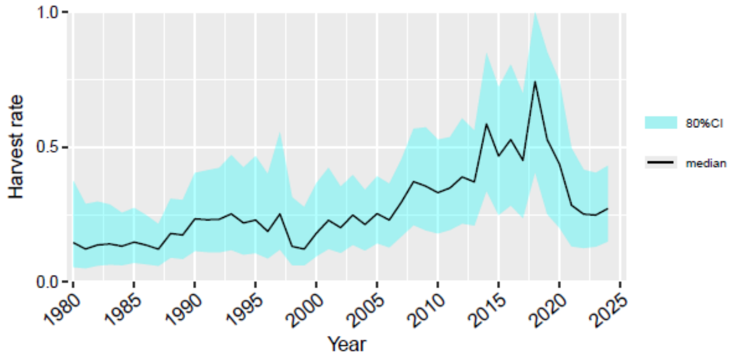
4. SOME AGGREGATED RESULTS FROM JAPAN AND CHINESE TAIPEI FOR VISUALIZATION PURPOSE

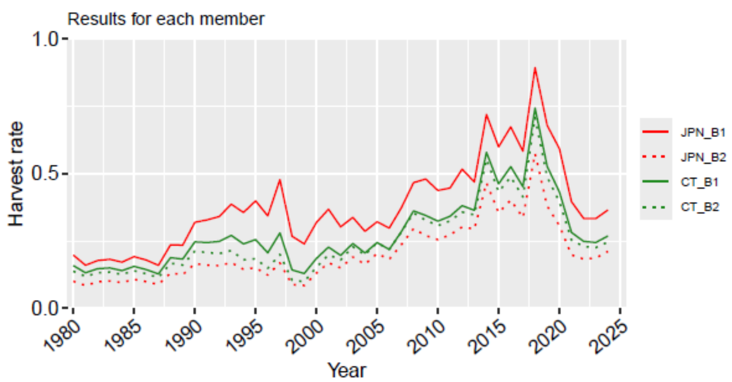
4.1 Visual presentation of results

The graphical presentations for times series of biomass (B), B-ratio (B/B_{MSY}), exploitation rate (F), F-ratio (F/F_{MSY}) and B/K are shown in Figure 3.









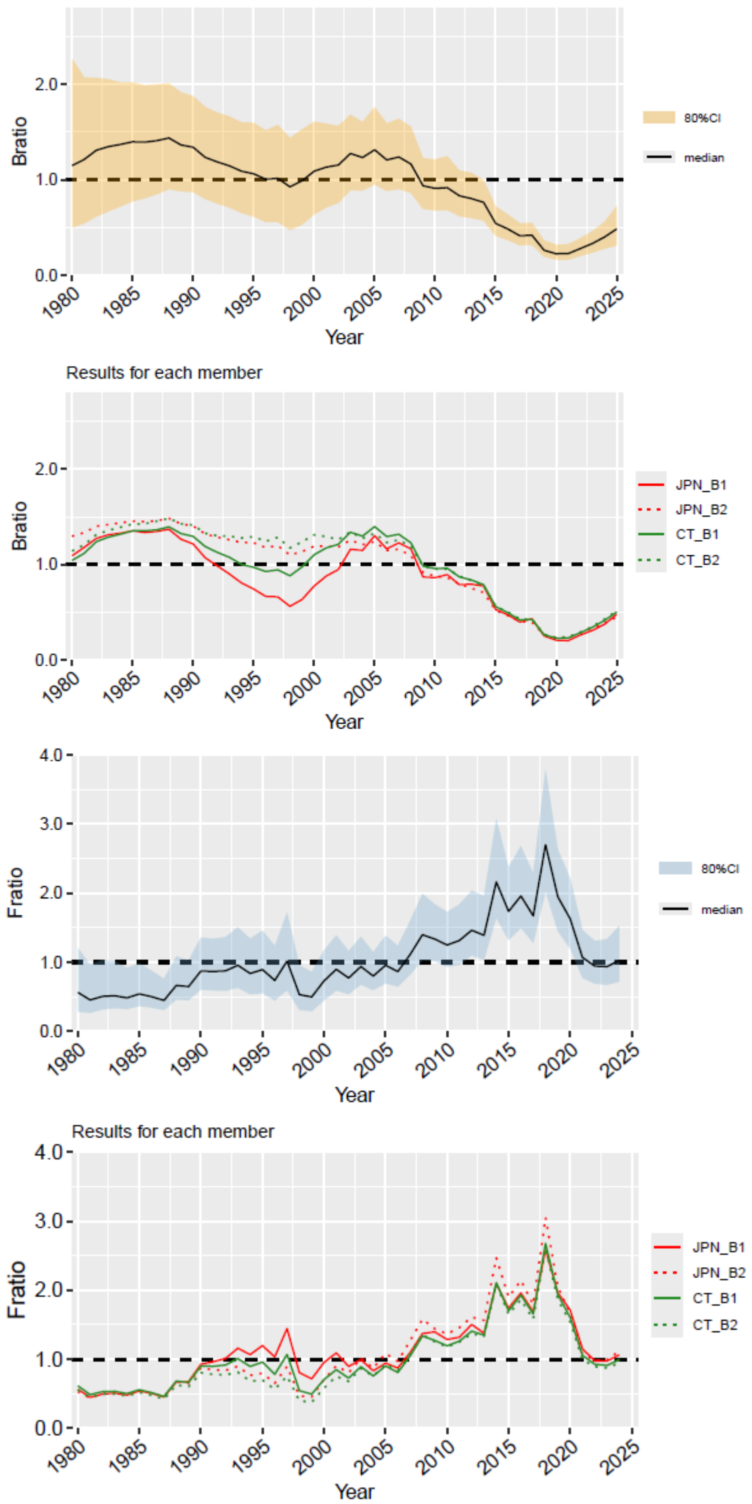


Figure 3. Time series of median estimated values of four runs for biomass, harvest rate, B-ratio, F-ratio and depletion level relative to K. The solid and shaded lines correspond to B1 and B2, respectively.

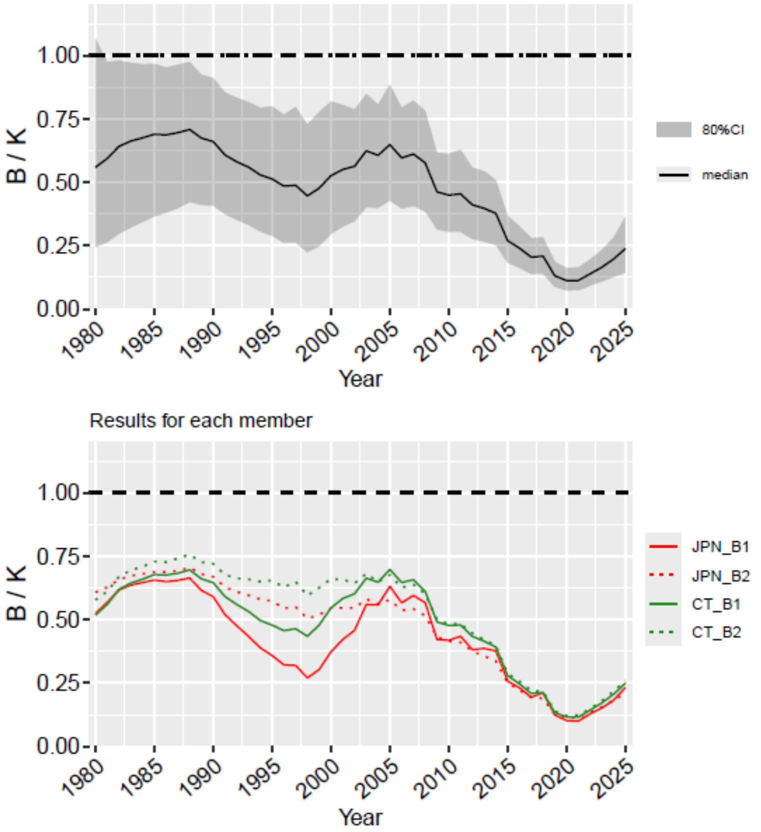


Figure 3 (Continued).

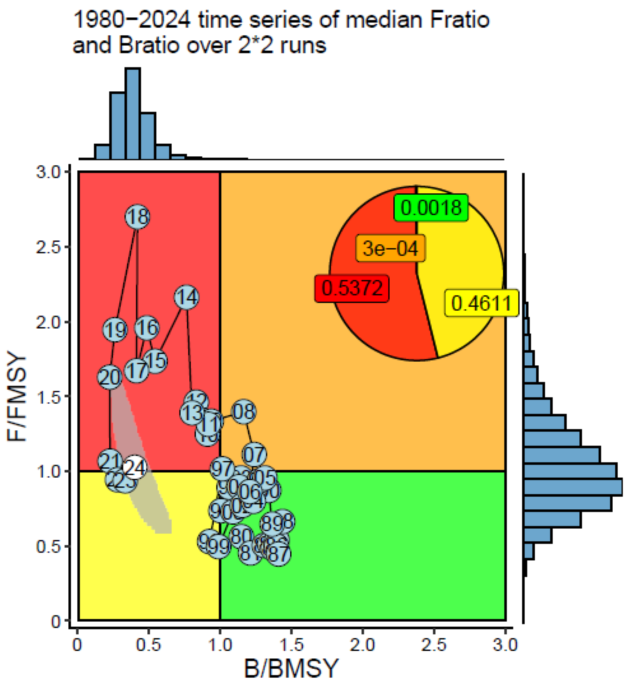


Figure 4. Kobe plot with time trajectory. The data are aggregated across 4 model results (2 base-case models by 2 Members).

4.2 Summary table

Table 3. Summary of estimates of reference quantities. Median and credible interval for the aggregated results are presented. In addition, median values of combined results (over B1 and B2) from Japanese and Chinese Taipei analyses are shown.

	Median	Lower10%	Upper10%	Median_JPN	Median_CT
C_2024 (10000 t)	15.556	15.556	15.556	15.556	15.556
AveC_2022_2024	12.463	12.463	12.463	12.463	12.463
AveF_2022_2024	0.258	0.137	0.414	0.276	0.246
F_2024	0.272	0.150	0.431	0.292	0.258
FMSY	0.269	0.130	0.444	0.271	0.268
MSY (10000 t)	38.165	30.860	45.319	38.064	38.250
F_2024/FMSY	1.027	0.719	1.526	1.085	0.972
AveF_2022_2024/FMSY	0.971	0.712	1.371	1.015	0.927
K (10000 t)	294.397	178.813	593.103	304.173	287.900
B_2024 (10000 t)	57.200	36.107	103.568	53.309	60.330
B_2025 (10000 t)	69.460	45.090	119.897	66.099	72.620
AveB_2023_2025	58.238	37.756	103.933	54.625	61.302
BMSY (10000 t)	142.100	91.670	266.603	141.938	142.200
BMSY/K	0.486	0.385	0.617	0.470	0.503
B_2024/K	0.197	0.127	0.282	0.182	0.211
B_2025/K	0.238	0.143	0.364	0.221	0.254
AveB_2023_2025/K	0.202	0.128	0.288	0.188	0.215
B_2024/BMSY	0.403	0.280	0.562	0.383	0.423
B_2025/BMSY	0.488	0.314	0.725	0.466	0.510
AveB_2023_2025/BMSY	0.411	0.285	0.573	0.394	0.429

5. CONCLUDING REMARKS

See the Executive Summary.

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Appendix 1

Updated total catch, CPUE standardizations and biomass estimates for the stock assessment of Pacific saury

Year	Total catch (metric tons)	Biomass JPN (VAST, 1000 metric tons)	CV (%)	CPUE CHN (metric tons/ vessel/ day)	CPUE JPN_early (metric tons/ net haul)	CPUE JPN_late (metric tons/ net haul)	CPUE KOR (metric tons/ vessel/ day)	CPUE RUS (metric tons/ vessel/ day)	CPUE CT_early (metric tons/ net haul)	CPUE CT_late (metric tons/ net haul)	Joint CPUE (sdmTMB)	CV (%)
1980	238510				0.72							
1981	204263				0.63							
1982	244700				0.46							
1983	257861				0.87							
1984	247044				0.81							
1985	281860				1.4							
1986	260455				1.13							
1987	235510				0.97							
1988	356989				2.36							
1989	330592				3.06							
1990	435869				1.95							
1991	399017				3.13							
1992	383999				4.32							
1993	402185				3.25							
1994	332509					4.10		16.73			1.50	0.315
1995	343743					2.09		21.33			1.79	0.314
1996	266424					1.78		14.37			0.90	0.306
1997	370017					3.49		11.46			2.01	0.337
1998	176364					1.05		12.29			0.73	0.361
1999	176498					0.91		11.43			0.77	0.312
2000	286186					1.27		15.60			0.92	0.295
2001	370823					1.65	7.94	20.19	1.44		0.81	0.269
2002	328362					1.10	12.79	18.90	1.33		0.76	0.259
2003	444642	1147.8	31.7			2.02	16.09	27.25	2.47		1.24	0.258
2004	369400	862.1	22.0			2.70	8.66	43.73	1.24		1.03	0.251
2005	473907	1234.9	33.9			4.37	19.56	43.50	2.27		1.47	0.246
2006	394093	876.2	32.9			4.54	8.07	31.79	1.00		0.83	0.236
2007	520207	905.4	34.6			4.18	9.03	39.97	2.17		1.12	0.238
2008	617509	1006.6	28.5			5.16	15.34	38.26	2.79		1.65	0.224
2009	472177	490.6	22.3			4.16	8.74	20.43	1.29		1.07	0.237
2010	429808	655.7	30.5			1.79	8.43	21.85	1.89		0.99	0.230
2011	456263	981.8	33.2			2.48	8.95	26.24	2.09		1.24	0.248
2012	460544	453.8	21.0			2.72	8.96	23.42		2.60	1.17	0.256
2013	423790	751.2	31.5	11.34		1.89	13.52	20.86		3.48	0.94	0.233
2014	629576	519.2	24.1	12.93		3.27	22.38	24.26		3.94	1.36	0.210
2015	358883	391.5	24.4	12.11		1.66	6.97	15.31		2.22	0.94	0.247
2016	361688	312.2	31.1	6.67		1.80	8.96	16.64		1.95	0.89	0.224
2017	262640	188.5	30.8	7.73		1.11	5.91	10.18		1.89	0.91	0.22
2018	435881	370.6	31.5	14.11		1.95	13.87	25.15		2.90	1.36	0.238

2019	195251	230.7	23.4	7.10		0.69	2.03	8.60		1.41	0.56	0.176
2020	139779	25.2	105.8	4.71		0.47	2.63	9.45		1.10	0.39	0.228
2021	92117	154.8	30.5	4.77		0.32	2.16	5.18		0.65	0.40	0.262
2022	100085	327.1	20.3	4.09		0.28	1.33			0.68	0.23	0.250
2023	118250	270.2	32.4	8.94		0.31	2.23	3.81		1.38	0.42	0.308
2024	155558	284.6	19.0	8.67		0.50	2.63	13.88		1.72	0.61	0.262
2025		428.0	26.5									

Annex E:

Summary of SS3 specification for models presented at SSC PS16, and future modeling plans

Feature	**Current Approach**	**Suggested Changes**
Fishery catch	- Members' seasonal catch and seasonal length composition - RUS comps not used, assume JPN selectivity	
Fishery CPUE	- Members' annual standardized CPUE assigned to season 4 - Separate JPN-early (pre-1994) and JPN-late series	- Assign JPN CPUE to season 4 - Assign CHN, CT, RUS, and KOR CPUE to season 3 - Sensitivity model with joint CPUE (selectivity based on historical catch composition by Members)
Surveys	- Age-aggregated fishery-independent index of abundance with length composition	
Spatial considerations	- None, single area model	- Potential fleets as area-seasons approach, lower priority
Selectivity	- Asymptotic function estimated for all fleets and surveys	
Model time step	- Seasonal, model start in 1980	
Catchability (q)	- Linear biomass-index relationship - Catchability prior for biomass scale - Hyper-stability parameter estimated for CPUE - Q walk for JPN-early CPUE	- Q change in CT series in 2011
Variance weighting	- CPUE downweighted (lambda = 0.2) - McAllister-Ianelli method for length composition	
Natural mortality (M)	- M = 2.18, sensitivity model with M = 1 (both age-independent)	- Sensitivity models with M = 1, 1.5, or 2 - Age-varying M - Model post-spawning mortality at end of 2 year lifespan

Steepness (h)	- Fixed at 0.82	- Sensitivity models with h = 0.6, 0.7, 0.8, 0.95 - Estimate with prior from Hsu et al. (2024)
Recruitment timing	- Beginning of season 1, 2, and 4	
Growth	- Time-varying asymptotic length from survey length-age data	
Growth variability	- Estimated to fit length composition	
Maturity	- Constant ogive (logistic inflection at 25 cm)	- Seasonal maturity ogive
Fecundity	- Proportional to weight	- Update from batch fecundity and spawning frequency data
Environment	- No environmental information in model	- Explore relationships between recruitment, growth with environmental indices outside model

Annex F:
Species summary of Pacific saury

Pacific saury (*Cololabis saira*)

Common names:

秋刀鱼, Qiū dāoyú (China)
サンマ, 秋刀魚, Sanma (Japan)
꽁치, kkongchi (Korea)
сайра, Saira (Russia)
秋刀魚, Chiu-dao-yu or 山瑪魚, San-ma-hi (Chinese Taipei)

Figure 1. Pacific Saury (Cololabis saira).

Management

Active NPFC Management Measures

The following NPFC conservation and management measure (CMM) pertains to this species:

- CMM 2025-08 For Pacific Saury

Available from https://www.npfc.int/active-conservation-and-management-measures

Management Summary

The current management measure for Pacific Saury specifies both catch and effort limits. Catch limits are guided by science advice based on the calculated annual catch level in the entire area of Pacific saury in accordance with the interim HCR. For 2025, Members of the Commission agree that the annual catches of Pacific saury in the Convention Area and the areas under their jurisdiction adjacent to the Convention Area should not exceed 202,500 metric tons. In this year, the annual total allowable catch (TAC) of Pacific saury in the Convention Area shall be limited to 121,500 metric tons. Each Member of the Commission shall reduce the annual total catch of Pacific saury by the fishing vessels entitled to fly its flag in 2025 by 55% from its reported catch in 2018.

To comply with the TAC, the following measures shall be in place in 2025:

(a) Members of the Commission shall report to the Executive Secretary, in the electronic format, weekly catches of Pacific saury in the Convention Area by fishing vessels flying their flags by Wednesday of the next week. The Executive Secretary shall make publicly available the compiled catch of Pacific saury in the Convention Area on the Commission's website as well as share each Member's catch of Pacific saury in the Convention Area on the Member's page of Commission's website without delay; and

(b) In the event that the total reported catch of all Members reaches 90% of the TAC set out in paragraph 8, the Executive Secretary shall notify all Members without delay. Those Members with more than 10,000 mt of catch limits shall close the fishery within 72 hours from the receipt of the notification. Those Members with less than 10,000 mt of catch limits may continue operations, but their total catch shall not exceed 90% of their catch limits.

(c) If any Members commit to reduce its annual total catch of Pacific Saury by fishing vessels entitled to fly its flag in 2025 by 65.5% from its reported catch in 2018, it shall be exempted from the requirements stipulated in Paragraph 10 (b). In case of that, the TAC for the rest of the member referred in the paragraph 10 (b) shall be 121,500 metric tons minus the catch limit of member(s) that make such commitment. Such commitment shall be submitted to the Secretariat no later than May 1st, 2025, and be circulated to all Members, as well as TAC applied to those Members subject to paragraph 10 (c).

The current management measure also states that each Member of the Commission participating in Pacific saury fisheries shall implement either of the following measures:

(a) to reduce the number of fishing vessels flying its flag and fishing for Pacific saury in the Convention Area by 10% from the number of its fishing vessels that fished for Pacific saury in the Convention Area in 2018; or

(b) to prohibit fishing vessels flying its flag from engaging in fishing for Pacific saury in the Convention Area outside its designated fishing period of no longer than 180 consecutive days each year.

In order to protect juvenile fish, Members of the Commission shall take measures for fishing vessels flying their flags to refrain from fishing for Pacific saury in the areas east of 170°E from June to July.

Table 1. Current status of NPFC management measures

Convention or Management Principle	**Status**	**Comment or Consideration**
Biological reference point(s)	Established	Updated annually in stock assessment
Stock status	Established	Updated annually in stock assessment

Convention or Management Principle	Status	Comment or Consideration
Catch limit	Established	Recommended catch limits updated routinely by Commission
Harvest control rule	Established	Interim HCR (in place until a management procedure is established by the Commission)
Other	Not accomplished	Management strategy evaluation in progress, age structured model development in progress

Assessment

A stock assessment for Pacific Saury is conducted annually by the NPFC's Small Scientific Committee on Pacific Saury (SSC PS). It is available at: https://www.npfc.int/stock-assessment-reports. The assessment has been a collaborative effort among Members of SSC PS based on a Bayesian state-space production model (BSSPM) since 2019 (Figure 2).

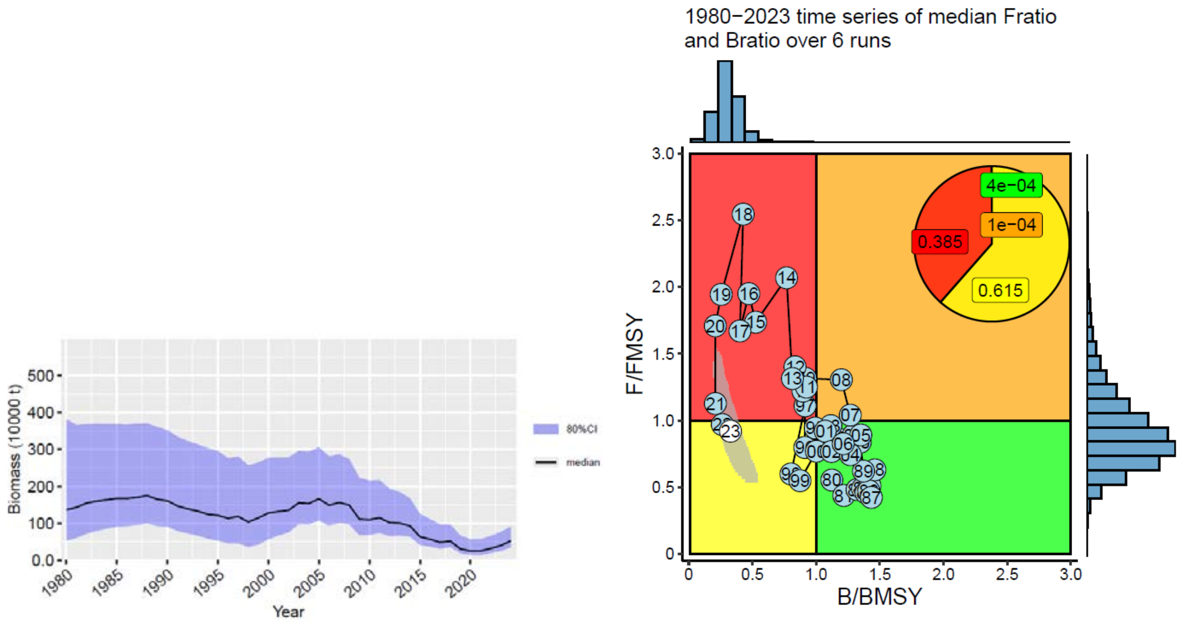

Figure 2. Time series of biomass (left panel) and Kobe plot (right panel) for Pacific Saury stock assessment.

The total catch of Pacific saury has been in decline since approximately 2010 (Figure 3). Similarly, the biomass estimated by the BSSPM stock assessment has also generally declined from its peak during the past two decades.

Data

Surveys

Since 2003, Japan has been conducting a biomass survey covering a wide area of the NPFC Convention area with several research vessels before its main fishing season (Hashimoto et al., 2020). The main purpose of the surveys is to understand the distribution and abundance of Pacific saury and to develop abundance indices for use in stock assessments. Fish sampling also contributes to the understanding of length composition and its inter-annual change.

Fishery

The fishing grounds are west of 180° E but differ among Members who fish for Pacific saury: China, Japan, Korea, Russia, Chinese Taipei, and Vanuatu. The stick-held dip net gear has become the dominant fishing technique to catch Pacific saury in the northwest Pacific Ocean. Near the coast Japan also catches Pacific Saury with setnet gear. The fishing is mainly carried out from June-November with peaks typically in the late summer or fall. Other NPFC Members (Canada and USA) do not target Pacific saury.

Standardized catch per unit effort (CPUE) is calculated by all Members participating in the Pacific saury fishery and a joint standardized CPUE is calculated across all Member each year and utilized in the assessment (Hsu et al. 2023).

Updated data on Pacific saury catches in the northwestern Pacific Ocean from 1995 are available on the NPFC website: https://www.npfc.int/pacific-saury-catches. Prior years fishery catch data was downloaded from FAO data collections at https://www.openfisheries.org using rfisheries package (Karthik Ram, Carl Boettiger, and Dyck 2013).

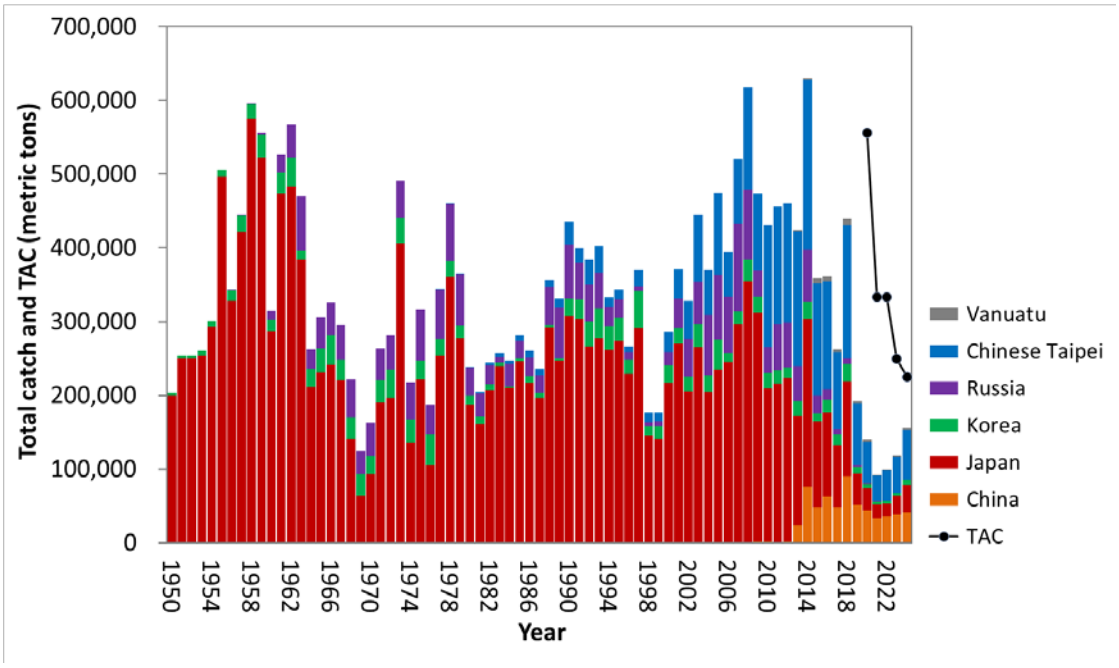

Figure 3. Historical catch and total allowable catch of Pacific Saury.

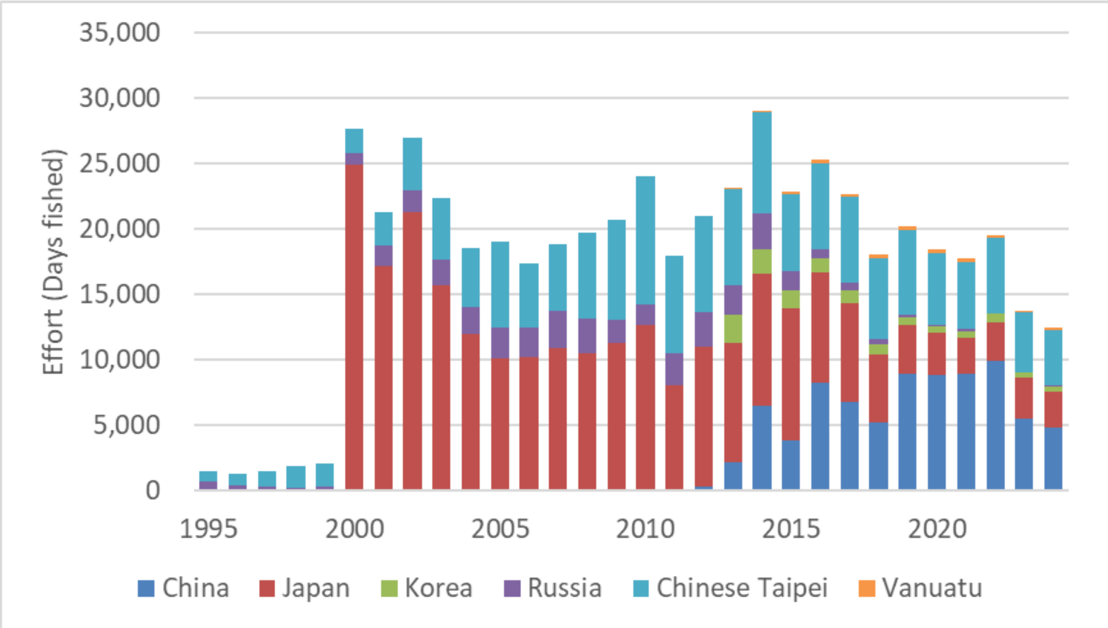

Figure 4. Historical fishing effort for Pacific saury.

Biological collections

All Members collect some size data from fishery catches of Pacific saury. These collections included length data as well as maturity and age structures from some Members.

Japan also collects length, weight, maturity and age data from the survey to support the stock assessment.

Data availability from Members regarding Pacific Saury

Data	**Source**	**Years**	**Comment**
Catch	China	2013-present	Catches from convention area
	Japan	1950-present	Japan<92>s time series of catch data are broken into Early (1980-1993) and Late (1994-2021) CPUE because of time-varying q in the early part of the time series
	Korea	2001-present	
	Russia	1994-present	
	Chinese Taipei	2001-present	

Data	Source	Years	Comment
	Vanuatu	2011-present	
CPUE			CPUE calculated individually by China, Japan, Korea, Russian, Chinese Taipei, and Vanuatu and as a joint CPUE
Survey	Japan		Fishery-independent biomass survey
Length data	All Members		Fishery-independent biomass survey (Japan), fishery data
	Japan		Commercial catch
Maturity/fecundity	Japan		Fishery-independent biomass survey
Age	Japan		Fishery-independent biomass survey

Special Comments

None

Biological Information

Distribution

Pacific saury (*Cololabis saira* Brevoort, 1856) has a wide distribution extending in the subarctic and subtropical North Pacific Ocean from inshore waters of Japan and the Kuril Islands to eastward to the Gulf of Alaska and southward to Mexico. Pacific saury is a commercially important fish in the western North Pacific Ocean (Parin 1968; Hubbs and Wisner 1980). In recent years, the age-0 fish have mainly been distributed in the eastern region east of 170°E in June and July.

Life history

Pacific saury are short-lived and fast growing. Based on analysis of daily otolith increments, Pacific saury reaches approximately 20 cm in knob length (distance from the tip of lower jaw to the posterior end of the muscular knob at the base of a caudal peduncle; hereafter called body length) in 6 or 7 months after hatching (Watanabe et al. 1988; Suyama et al. 1992). There is some variation in growth rate depending on the hatching month during this long spawning season (Kurita et al. 2004) and geographical differences (Suyama et al. 2012b). The maximum lifespan is 2 years (Suyama et al. 2006). The age 1 fish grow to over 27 cm in body length in June and July when Japanese research surveys are conducted and reach over 29 cm in the fishing season between August and December (Suyama et al. 2006). The spawning season of Pacific saury is relatively long, beginning in September and ending in June of the following year (Watanabe and Lo 1989). Pacific saury spawns over a vast area from the Japanese coastal waters to eastern offshore waters (Baitaliuk et al. 2013). The main spawning grounds are considered to be located in the Kuroshio-Oyashio transition region in fall and spring and in the Kuroshio waters and the Kuroshio Extension waters in winter (Watanabe and Lo 1989). The minimum size of maturity of Pacific saury has been estimated at about 25 cm in the field (Hatanaka 1956) or rearing experiments (Nakaya et al. 2010). In rare cases, saury have been found to mature at 22 cm (Sugama 1957; Hotta 1960). Under rearing experiments, Pacific saury begins spawning 8 months after hatching, and spawning activity continues for about 3 months (Suyama et al. 2016). Batch fecundity is about 1,000 to 3,000 eggs (Kosaka 2000). Pacific saury is a highly migratory species that migrates extensively between the northern feeding grounds in the Oyashio waters around Hokkaido and the Kuril Islands in summer and the spawning areas in the Kuroshio waters off southern Japan in winter (Fukushima 1979; Kosaka 2000). Pacific saury in offshore regions (east of 160°E) also migrate westward toward the coast of Japan after October every year (Suyama et al. 2012a). Genetic evidence suggests there are no distinct stocks in the Pacific saury population based on 141 individuals collected from five distant locales (East China Sea, Sea of Okhotsk, northwest Pacific Ocean, central North Pacific Ocean, and northeast Pacific Ocean) (Chow et al. 2009). The Pacific saury larvae prey on the nauplii of copepods and other small-sized zooplankton. As they grow, they begin to prey on larger zooplankton such as krill (Odate 1977). The Pacific saury is preyed on by large fish ranked higher in the food chain, such as *Thunnus alalunga* (Nihira 1988) and coho salmon, *Oncorhynchus kisutsh* (Sato and Hirakawa 1976) as well as by animals such as minke whales *Balaenoptera acutorostrata* (Konishi et al. 2009) and sea birds (Ogi 1984).

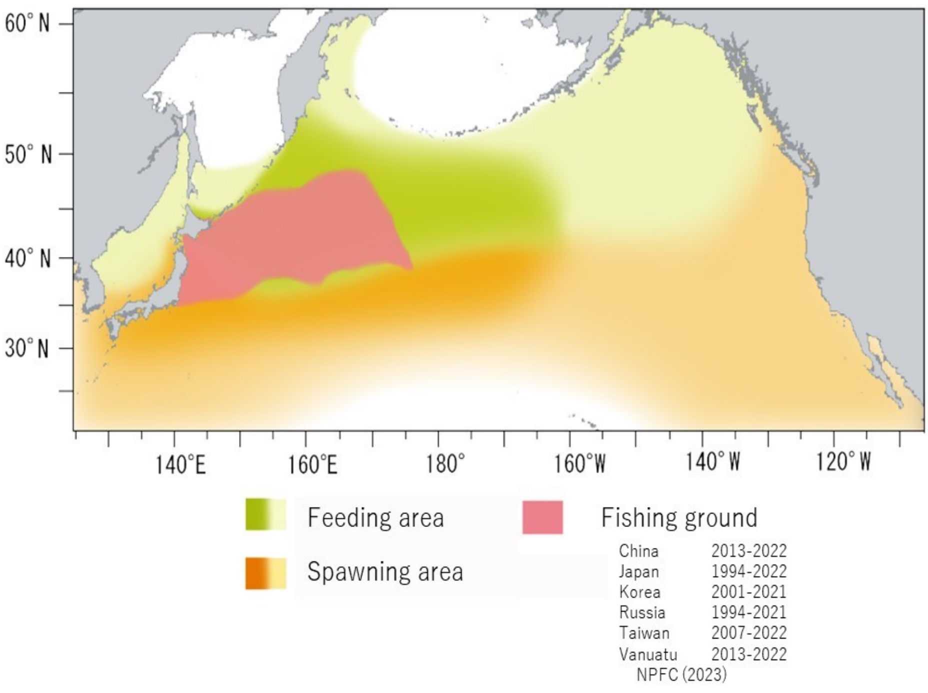

Figure 5. Map of distribution of Pacific saury in the North Pacific.

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Annex G:

Tasks for an invited expert to support the work of the SSC PS and SWG NSAM

Technical developments

- Under the guidance of the SSC PS/SWG NSAM Members, develop/update/improve SS3 model with the goal to complete the development by December 2026, participate in virtual meetings of the SWG NSAM to present/review progress and assist Secretariat in drafting technical portions of a meeting summary document (up to 20 days);

Meetings

- Participate in person in the informal technical group meeting under SWG NSAM in 2026 (3 days), collaborate with meeting participants to facilitate the development of age-structured models and offer technical guidance;

- Participate in the virtual SWG NSAM meeting in 2026 (2 days, 4 hours a day, 1 day in total), collaborate with meeting participants to facilitate the development of age-structured models and offer technical guidance;

- Participate remotely via Webex in the next SSC PS data preparation meeting in 2026 (4 days, 4 hours a day, 2 days in total), contribute to discussions and developments on SS3, BSSPM and, when requested, other work of the SSC PS;

- Participate in person in the next SSC PS stock assessment meeting in 2026 (4 days), contribute to discussions and developments on SS3 and, when requested, other work of the SSC PS.

Note: timing and duration of meetings may change